# Maryland

Maryland’s most prominent geographic feature, the Chesapeake Bay, provides a wealth of history, recreation activities, attendant infrastructure, transportation, and natural resources. Therefore, it follows that coastal zones and tidal watersheds figure prominently into the state’s elevation primary Business Use (BU) cases and Mission Critical Activities (MCAs). For each of the 18 listed primary BU cases, the MCAs enumerate a coastal component or their spatial distribution encompasses coastal or related features for which elevation data are used. In a further aggregation of BU cases, Maryland has three broad areas of elevation data needed for regular state agency use: Natural and Cultural Resource Assessment and Management; Hazard Assessment and Mitigation Planning; and Infrastructure Monitoring and Regional and Urban Planning.

Rising sea level poses a threat for each of the BU cases in terms of changing habitat for plants and animals, and increased risk to infrastructure, population centers and the economy (e.g. farming) especially for considerable parts of low elevation areas on the eastern shore of the Chesapeake Bay. Elevation data assists in planning to maintain economic viability for sea and bayside resort communities, dock and mooring infrastructure for commercial fishing, inundation modeling for hurricane evacuation, and bridges and commercial shipping infrastructure. All the mentioned BU cases listed will depend on quality elevation data and the trends established from change detection. Enhanced risk from sea level rise for federal facilities is of concern, such as the U.S. Naval Academy, Patuxent Naval Air Station, and Blackwater National Wildlife Refuge. Maryland requires Quality Level 1 (QL1) inland topography, QL1B inland and nearshore bathymetry, and Order 1a offshore bathymetry all updated every 4-5 years.

Maryland at present has statewide lidar coverage, which varies in age and quality level. The state initiated lidar coverage in 2003-2008 for the eastern shore counties. Subsequently a significant portion of the state has been acquired by federal agency initiatives such as the 2014 Hurricane Sandy Supplemental acquisition and the Federal Emergency Management Agency (FEMA) 2012 acquisition. Maryland State agencies are not presently funded for large regional or statewide data acquisitions such as lidar or orthoimagery. The mechanism in place successfully employed for orthoimagery acquisition is to request funding from the E-911 Board by a County sponsor, and the state contract is used to acquire spatial data. To date no lidar acquisition has been funded in this manner. The explanation from the E-911 Board is that orthoimagery has a direct positive benefit for the E-911 call centers, and as yet a similar benefit for lidar acquisition has not been accepted by the E-911 Board. Several counties have funded their own data collection through the state contract, including Anne Arundel and Calvert in 2017 at QL1 specifications. Cecil and Queen Anne’s counties funded collection of lidar in 2012 at QL3, and Harford County using those same specifications in 2013 was acquired via the state contract. The Maryland National Capital Parks and Planning Commission funded and contracted for QL2 lidar in 2018 for Montgomery and Prince George’s counties using their own funding and the state contract, and they coordinated with the Maryland State Geographic Information Committee’s Elevation Work Group.

Maryland has not submitted data for inclusion into the 3D Elevation Program holdings as the requirements and data to be assembled for analysis is a considerable task for the small staff of a county GIS department, and in the past the wait for acceptance notification has been considerable with no measurable benefit to the county. The state has posted lidar from all sources on its [imap.maryland.gov](https://imap.maryland.gov/Pages/default.aspx) elevation portal which provides access via download and REST services to countywide DEMs and the following DEM derivative products: slope, aspect, hillshade, and shaded relief. MD iMAP also provides options to download point cloud data in bulk or by smaller area of interest. Additionally, MD iMAP provides access to metadata, tutorials (pdf and video), and acquisition status maps.

Future acquisitions are funded for Worcester, Wicomico, and Somerset counties on the lower eastern shore thanks to the USDA-Natural Resources Conservation Service. Queen Anne’s and Harford counties will be funded by the USGS Core Science Systems in support of USGS Chesapeake Bay science activity. These acquisitions will be tide-coordinated, whereas all previous lidar collections in Maryland were not tide-coordinated. Recent coordination by the Maryland Geological Survey with the NOAA Remote Sensing Division has resulted in greatly expanded nearshore topo/bathymetric lidar in the Chesapeake Bay.

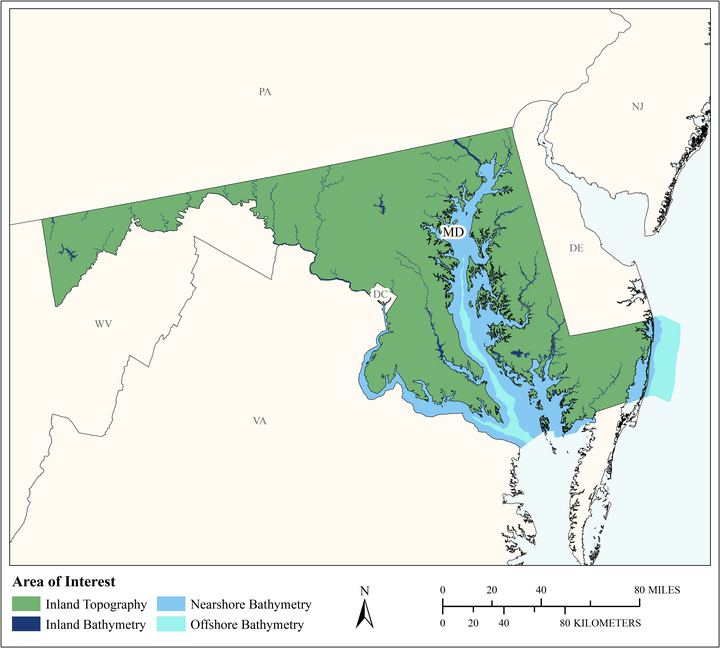
Prognosis for the State of Maryland participation in the 3DEP Broad Agency Announcement proposal process is not promising as a result of the in-place funding mechanism for large data acquisitions. The Maryland geospatial data coordinating body, the Maryland State Geographic Information Committee (MSGIC), formed an Elevation Work Group in 2017 that is coordinating acquisition as best it can but is limited by participation from not all county jurisdictions. The Elevation Work Group has promoted the 3DEP lidar standards so that the state contract will follow 3DEP base specifications and guidance should individual counties decide to pursue acquisition. The Elevation Work Group has proposed to the State Geographic Information Officer an Elevation Data Return-on-Investment (ROI) study for Maryland elevation data which all agree makes sense. As yet funding has not been identified to conduct such a study. A completed Elevation ROI report would be presented to the E911 Board and legislators in order to identify a funding source for periodic lidar acquisition. Paired with the 3D Nation survey data and assessments, a strong case for state elevation data funding can be assembled.

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

# Summary Table

| **MCA Description** | | | | **Requirements** | | | **Future Operational Benefits** | **Future Customer Service Benefits** | **Future Societal Benefits** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Primary Business Use | Agency/ Organization Name | MCA No. | Mission Critical Activity | Data Type | QL/Order | Update Frequency | Total Estimated Annual Operational Benefits | Total Estimated Annual Customer Service Benefits | Education or Outreach | Environ- mental | Public Safety |
| BU 03 – Coastal Zone Management | Maryland Department of Natural Resources | 1388 | Maintain Sustainable Populations of Living Resources and Aquatic Habitat | Inland Topo | QL1 | 4-5 years | $510,444 | $89,473 | Major | Major | Major |
| Inland Bathy | QL1B | 4-5 years | $219,434 | $128,420 | Minor | Major | Major |
| Nearshore Bathy | QL1B | 2-3 years | $54,993 | $66,923 | Minor | Major | Major |
| Offshore Bathy | Order 1b | 4-5 years | $38,208 | $11,577 | Minor | Major | Major |
| BU 06 – Natural Resource Management | State of Maryland | 60214 | Natural Resources Conservation | Inland Topo | QL1 HD | 4-5 years | $387,814 | $1,424,172 | Major | Major | Major |
| Inland Bathy | Better than options | 6-10 years | $52,563 | $2,366 | Major | Major | Major |
| Nearshore Bathy | More accurate than options provided | 6-10 years | Unable to quantify | Unable to quantify | Moderate | Major | Moderate |
| BU 07 – Wildlife and Habitat Management | State of Maryland | 60215 | Wildlife and Habitat Management | Inland Topo | QL2 | 4-5 years | $2,355 | $6,802 | Moderate | Major | Moderate |
| Nearshore Bathy | QL0B | 4-5 years | $173 | $10 | Moderate | Major | Moderate |
| BU 08 – Agriculture | State of Maryland | 60216 | Agriculture and Precision Farming | Inland Topo | QL2 | 2-3 years | $11,447 | $9,075 | Major | Major | Minor |
| BU 09 – Fisheries Management and Aquaculture | State of Maryland | 60217 | Fisheries Management and Aquaculture | Nearshore Bathy | QL0B | 6-10 years | $27,600 | $2,027 | Moderate | Major | Minor |
| BU 10 – Geologic Assessment | Maryland Geological Survey | 1198 | Geologic Mapping and Analysis | Inland Topo | QL2 | >10 years | $70,300 | $3,015 | Moderate | Moderate | Moderate |
| BU 10 – Geologic Assessment | Maryland Geological Survey | 22160 | Sediment Studies | Inland Bathy | QL0B | 4-5 years | $21,105 | Unable to quantify | Moderate | Moderate | Major |
| Nearshore Bathy | I do not need any of the QLs listed. We need vertical accuracies of 1-2cm throughout the beach profile and down to -18 feet. | 4-5 years | $3,015 | Unable to quantify | I don't know | I don't know | I don't know |
| Offshore Bathy | I do not need any of the QLs listed. We need vertical accuracies of 1-2 cm throughout the beach profile and down to -18 feet. | 4-5 years | Unable to quantify | Unable to quantify | I don't know | I don't know | I don't know |
| BU 14 – Cultural Resource Management | Maryland Department of Planning | 21633 | Cultural Resources Management and Preservation | Inland Topo | QL1 HD | 4-5 years | Unable to quantify | Unable to quantify | Minor | None | None |
| Inland Bathy | QL0B | 4-5 years | $6,633 to $6,874 | Unable to quantify | I don't know | None | None |
| Nearshore Bathy | QL0B | 4-5 years | $6,633 to $6,874 | Unable to quantify | Minor | Moderate | None |
| Offshore Bathy | Order 1a | 4-5 years | $1,206 | Unable to quantify | Minor | Moderate | None |
| BU 15 – Flood Risk Management | MD Dept. of the Environment | 1397 | Statewide Environmental Management | Inland Topo | QL1 HD | 2-3 years | $462,751 | $80,967 | Major | Major | Major |
| Inland Bathy | QL1B | 2-3 years | Unable to quantify | Unable to quantify | Major | Major | Major |
| Nearshore Bathy | QL1B | 2-3 years | $11,088 | $8,217 | Major | Major | Major |
| Offshore Bathy | Cross sections meet needs |  | Unable to quantify | Unable to quantify | Major | Major | Major |
| BU 15 – Flood Risk Management | Eastern Shore Regional GIS Cooperative at Salisbury University | 21576 | Hazard Modeling and Mapping | Inland Topo | QL2 | 2-3 years | $462,875 | $80,967 | Moderate | None | Major |
| Inland Bathy | QL2B | 2-3 years | Unable to quantify | Unable to quantify | I don't know | I don't know | Moderate |
| Nearshore Bathy | QL2B | 2-3 years | $11,088 | $8,217 | Minor | I don't know | Minor |
| Offshore Bathy | Order 3 | 2-3 years | Unable to quantify | Unable to quantify | I don't know | I don't know | I don't know |
| BU 15 – Flood Risk Management | Maryland Emergency Management | 22422 | Statewide Emergency Management | Inland Topo | QL2 | 4-5 years | $462,751 | $80,967 | I don't know | I don't know | I don't know |
| Inland Bathy | QL1B | 4-5 years | Unable to quantify | Unable to quantify | I don't know | I don't know | I don't know |
| Nearshore Bathy | QL1B | Event driven | $11,088 | $8,217 | I don't know | I don't know | I don't know |
| BU 16 – Sea Level Rise and Subsidence | Maryland DOT State Highway Administration | 21676 | Multi-Modal Transportation Asset Management | Inland Topo | QL1 HD | 2-3 years | $291,681 | $5,155 | Major | Major | Major |
| Inland Bathy | QL1B | 2-3 years | $82,144 | $5,240 | Major | Major | Major |
| Nearshore Bathy | QL1B | 2-3 years | Unable to quantify | Unable to quantify | Major | Major | Major |
| Offshore Bathy | (a) Order 1a (b) Order 1 | (a) 6 months (b) 2-3 years | Unable to quantify | Unable to quantify | Major | Major | Major |
| BU 17 – Wildfire Management | State of Maryland | 60218 | Wildfire Management, Planning, and Response | Inland Topo | QL1 | 4-5 years | $53,123 | Unable to quantify | Major | Major | Major |
| BU 18 – Homeland Security | Maryland Department of Information Technology | 11478 | Statewide Geospatial Services | Inland Topo | QL2 | 2-3 years | Unable to quantify | Unable to quantify | Minor | Moderate | Major |
| Inland Bathy | QL1B | 2-3 years | Unable to quantify | Unable to quantify | Minor | Major | Major |
| Nearshore Bathy | QL1B | 2-3 years | Unable to quantify | Unable to quantify | Moderate | Major | Major |
| BU 19 – Land Navigation | State of Maryland | 60219 | Land Navigation and Safety | Inland Topo | QL0 | 2-3 years | $128,085 | $10,343 | Minor | Major | Major |
| BU 21 – Aviation Navigation | State of Maryland | 60220 | Aviation Navigation and Safety | Inland Topo | QL1 HD | Annually | $33,424 | $41,629 | Minor | Moderate | Moderate |
| BU 22 – Infrastructure Management | State of Maryland | 60221 | Infrastructure and Construction Management | Inland Topo | QL0 HD | 4-5 years | $444,339 | $1,307,601 | Minor | Moderate | Major |
| Inland Bathy | QL0B | 4-5 years | $149,705 | $15,545 | Minor | Moderate | Moderate |
| Nearshore Bathy | QL1B | 4-5 years | $3,671 | $504 | Minor | Moderate | Major |
| BU 23 – Urban and Regional Planning | Talbot County Public Works | 1113 | Talbot County Government | Inland Topo | QL1 | 6-10 years | $396,215 | $711,807 | Moderate | Moderate | Moderate |
| Inland Bathy | QL2B | 6-10 years | $392,981 | $414,125 | Moderate | Moderate | Moderate |
| Nearshore Bathy | QL2B | >10 years | $392,981 | $414,125 | Moderate | Moderate | Moderate |
| BU 23 – Urban and Regional Planning | Maryland Department of Planning | 1263 | Land Use Planning and Analysis | Inland Topo | QL2 | 4-5 years | $2,660,327 | $307,136 | I don't know | I don't know | I don't know |
| Inland Bathy | QL2B | 4-5 years | Unable to quantify | Unable to quantify | I don't know | I don't know | I don't know |
| Nearshore Bathy | QL2B | 4-5 years | Unable to quantify | Unable to quantify | I don't know | I don't know | I don't know |
| BU 23 – Urban and Regional Planning | Washington County Maryland Government | 11480 | Mapping and GIS Support of Elevation Dependent County Government Activities | Inland Topo | QL2 | 6-10 years | Unable to quantify | Unable to quantify | Major | Major | Major |
| Inland Bathy | Cross sections and/or transects meet needs | Event driven | Unable to quantify | Unable to quantify | Major | Major | Major |
| BU 23 – Urban and Regional Planning | Maryland National Capital Planning Commission (MNCPPC) | 21525 | Development Review, Floodplain Management, Property Mapping, and Parks Planning and Management | Inland Topo | QL2 | 2-3 years | Unable to quantify | Unable to quantify | I don't know | I don't know | I don't know |
| BU 25 – Real Estate, Banking, and Insurance | State of Maryland | 60222 | Real Estate, Banking, Mortgage, and Insurance | Inland Topo | QL1 HD | 4-5 years | $343,543 | Unable to quantify | Minor | Minor | Major |
| BU 26 – Education and Basic Research | State of Maryland | 60223 | Education K12 and Beyond, Basic Research | Inland Topo | QL1 HD | 2-3 years | $51,959 | $124,198 | Major | Major | Major |
| Inland Bathy | QL1B | 4-5 years | $13,588 | Unable to quantify | Major | Major | Major |
| Nearshore Bathy | QL2B | 4-5 years | $1,152 | $45 | Major | Major | Minor |
| BU 28 – Telecom-munications | State of Maryland | 60224 | Telecommunications | Inland Topo | QL2 | 4-5 years | Unable to quantify | Unable to quantify | I don't know | I don't know | I don't know |

# MCA Title: Maintain Sustainable Populations of Living Resources and Aquatic Habitat



| **MCA Area of Interest** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Data Type | Required | Required | Required | Required |
| Geographic Area Requirements | One or more states, territories, or counties | One or more states, territories, or counties | Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states) | Custom description |
| Sub Area Requirements |  |  |  | 10 miles off Maryland |

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Maintain Sustainable Populations of Living Resources and Aquatic Habitat. Elevation data are needed for fisheries management, habitat analysis, flood assessment, shoreline stabilization, management of oyster leases and bottom habitat, recreational and commercial boating, siting for BMPs, and dredging sand to protect shorelines. An additional Business Use is BU 27 – Recreation. |
| MCA Title | Maintain Sustainable Populations of Living Resources and Aquatic Habitat |
| MCA ID | 1388 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | Maryland Department of Natural Resources |
| Sub-Agency or Division |  |
| Organization Mission | The Department of Natural Resources leads Maryland in securing a sustainable future for our environment, society, and economy by preserving, protecting, restoring, and enhancing the State's natural resources. |
| Program Name | Maryland's Chesapeake & Coastal Service |
| Total Annual Program Budget |  |
| Primary Business Use | BU 03 - Coastal Zone Management |
| Secondary Business Use | BU 07 - Wildlife and Habitat Management |
| Tertiary Business Use | BU 09 - Fisheries Management and Aquaculture |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | 50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.) |
| Smallest 3D features needed | Small features |
| Description of smallest 3D features | Buildings, docks, roads, hydrography, ditches, submerged vegetation |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL1 | QL1B | QL1B | Order 1b |
| Update Frequency | 4-5 years | 4-5 years | 2-3 years | 4-5 years |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Up to 80 cm | Up to 2 meters | Up to 2 meters | Up to 5 meters |
| Acceptable Vertical Error | Up to 20 cm | Up to 30 cm | Up to 30 cm | Up to 60 cm |
| How far onshore needed |  |  | 500 meters inland |  |
| How far down the beach profile needed | Below MLLW |  | Below MLLW |  |
| Tide correction requirement |  |  | MHW | MHW |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Highly desirable | Nice to have | Nice to have | Nice to have |
| DTM | Highly desirable | Nice to have | Nice to have | Nice to have |
| DEM | Required | Required | Required | Required |
| Raw point cloud data | Highly desirable | Required | Required | Required |
| Classified point cloud | Nice to have | Nice to have | Nice to have |  |
| Edited/cube XYZ |  | Nice to have | Nice to have | Nice to have |
| Full waveform | Nice to have | Nice to have | Nice to have | Nice to have |
| Bathymetric Attributed Grid (BAG) |  | Nice to have | Nice to have | Nice to have |
| Breaklines required for standard hydro-flattening | Highly desirable | Nice to have |  |  |
| Additional breaklines for hydro-enforcement of culverts | Nice to have |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  | Nice to have | Nice to have |
| Tide Predictions |  |  | Nice to have | Nice to have |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  | Nice to have | Nice to have |
| Intensity imagery/sidescan imagery | Nice to have | Nice to have | Nice to have | Nice to have |
| Ground control/ground truthing | Nice to have | Nice to have | Nice to have | Nice to have |

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

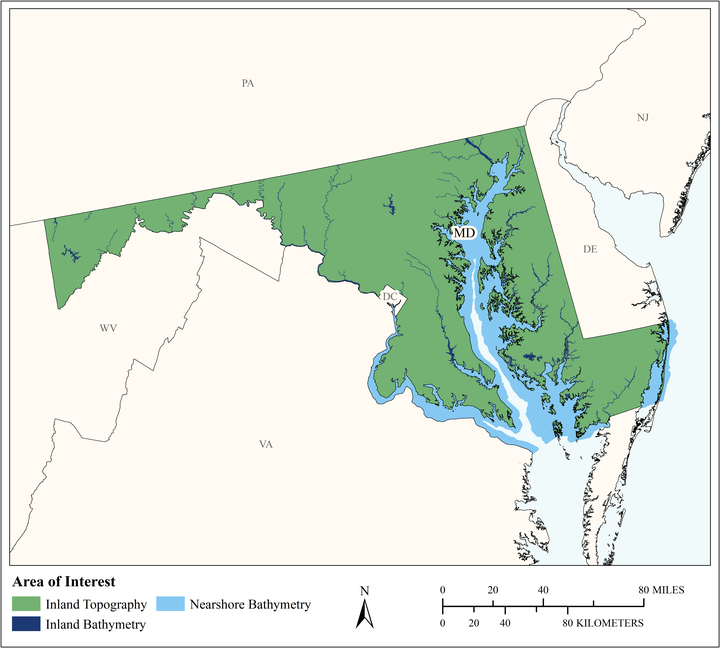
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | Data currently used is outlined in the following file: http://imap.maryland.gov/Pages/lidar-metadata.aspx | Partial coverage of reservoirs single beam or multi beam, side scan sonar | Partial coverage of inland bays | https://coast.noaa.gov/inventory/ |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  | Yes |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes |  | Yes |  |
| State repositories used | Maryland MD iMap: http://imap.maryland.gov/Pages/lidar.aspx |  | MD iMap, Maryland Geological Survey |  |
| Other |  | Yes |  |  |
| Other description |  | Maryland DNR |  |  |
| Data that meet my needs are not available |  | Yes |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Moderate | Moderate | Moderate | Moderate |
| Cost savings/cost reduction | Moderate | Moderate | Moderate | Moderate |
| Cost avoidance | None | Minor | Minor | Minor |
| Increased revenues | None | None | None | None |
| Mission-driven performance improvements | Major | Major | Major | Major |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Major | Major | Major | Moderate |
| Improved response or timeliness | Major | Major | Major | Moderate |
| Improved customer experience | Major | Major | Major | Moderate |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Major | Major | Major | Moderate |
| Environmental | Major | Major | Major | Moderate |
| Public safety, including life and property | Major | Major | Major | Moderate |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Moderate | Annual dollars saved/realized | $33,286 | Moderate | Annual dollars saved/realized | $33,286 | Moderate | Annual dollars saved/realized | $54,994 | Minor | Annual dollars saved/realized | $5,789 |
| Cost savings/cost reduction | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Cost avoidance | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Increased revenues | None |  |  | None |  |  | None |  |  | None |  |  |
| Mission-driven performance improvements | Major | Annual percent improvement | 33% | Moderate | Annual percent improvement | 20% | Major | Annual percent improvement | 37% | Major | Annual percent improvement | 33% |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $477,158 |  | Annual dollars saved/ realized | $186,148 |  |  |  |  | Annual dollars saved/ realized | $32,419 |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | None |  |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Improved response or timeliness | Major | Annual dollars saved/realized | $17,366 | Moderate | Annual dollars saved/realized | $8,683 | Major | Annual dollars saved/realized | $17,366 | Major | Annual dollars saved/realized | $11,578 |
| Improved customer experience | Major | Unable to provide |  | Moderate | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $72,106 |  | Annual dollars saved/ realized | $119,737 |  | Annual dollars saved/ realized | $49,556 |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Major | | | Minor | | | Minor | | | Minor | | |
| Education or outreach description | Provide an understanding of areas affected by flooding and sea level rise, environmental easement monitoring for new or removed buildings/structures | | |  | | |  | | |  | | |
| Environmental | Major | | | Major | | | Major | | | Major | | |
| Environmental description | Tree canopy height estimates, biomass estimates, stream and shoreline delineation, identification of areas subject to erosion | | |  | | | Location of SAV, stream and shoreline delineation | | |  | | |
| Public safety, including life and property | Major | | | Major | | | Major | | | Major | | |
| Public safety, including life and property description | Flood and sea level rise models | | |  | | | Locating underwater hazards | | |  | | |

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

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

# MCA Title: Natural Resources Conservation



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks. |
| MCA Title | Natural Resources Conservation |
| MCA ID | 60214 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 06 - Natural Resources Conservation |
| Secondary Business Use | BU 04 - Forest Resources Management |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Required | Highly desirable | Highly desirable |  |
| DTM | Required | Required | Required |  |
| DEM | Required | Required | Required |  |
| Raw point cloud data | Required | Required | Required |  |
| Classified point cloud | Required | Required | Required |  |
| Edited/cube XYZ |  | Nice to have | Nice to have |  |
| Full waveform | Nice to have | Nice to have | Nice to have |  |
| Bathymetric Attributed Grid (BAG) |  | Highly desirable | Required |  |
| Breaklines required for standard hydro-flattening | Required | Required |  |  |
| Additional breaklines for hydro-enforcement of culverts | Required |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  | Required |  |
| Tide Predictions |  |  | Highly desirable |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  | Highly desirable |  |
| Intensity imagery/sidescan imagery | Highly desirable | Highly desirable | Nice to have |  |
| Ground control/ground truthing | Required | Required | Required |  |

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

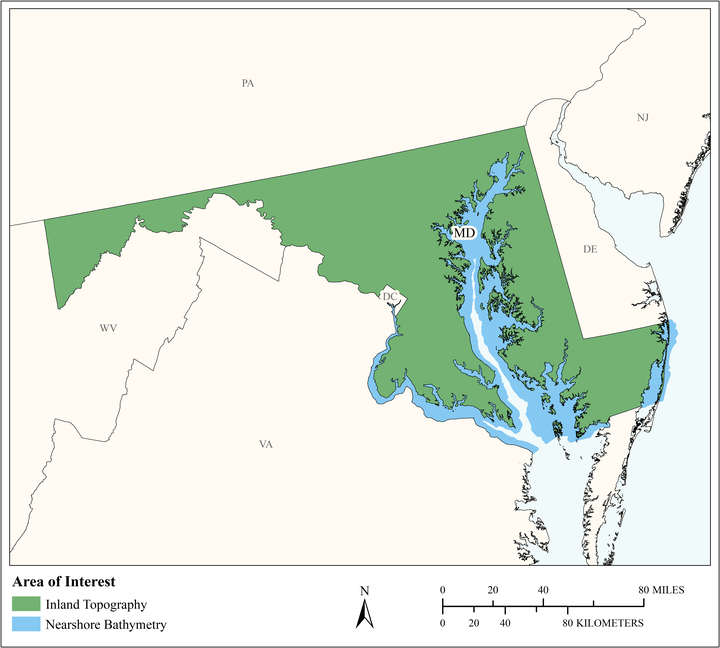
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Cost savings/cost reduction | Major | Unable to provide |  | Major | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Cost avoidance | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Increased revenues | Minor | Unable to provide |  | Minor | Unable to provide |  | None |  |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $387,814 |  | Annual dollars saved/ realized | $52,563 |  |  |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Improved customer experience | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $1,424,172 |  | Annual dollars saved/ realized | $2,366 |  |  |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Major | | | Major | | | Moderate | | |  | | |
| Environmental | Major | | | Major | | | Major | | |  | | |
| Public safety, including life and property | Major | | | Major | | | Moderate | | |  | | |

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

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

# MCA Title: Wildlife and Habitat Management



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources. |
| MCA Title | Wildlife and Habitat Management |
| MCA ID | 60215 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 07 - Wildlife and Habitat Management |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL2 |  | QL0B |  |
| Update Frequency | 4-5 years |  | 4-5 years |  |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Up to 1 meter |  | Up to 2 meters |  |
| Acceptable Vertical Error | Up to 20 cm |  | Up to 30 cm |  |
| How far onshore needed |  |  |  |  |
| How far down the beach profile needed |  |  |  |  |
| Tide correction requirement |  |  |  |  |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

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

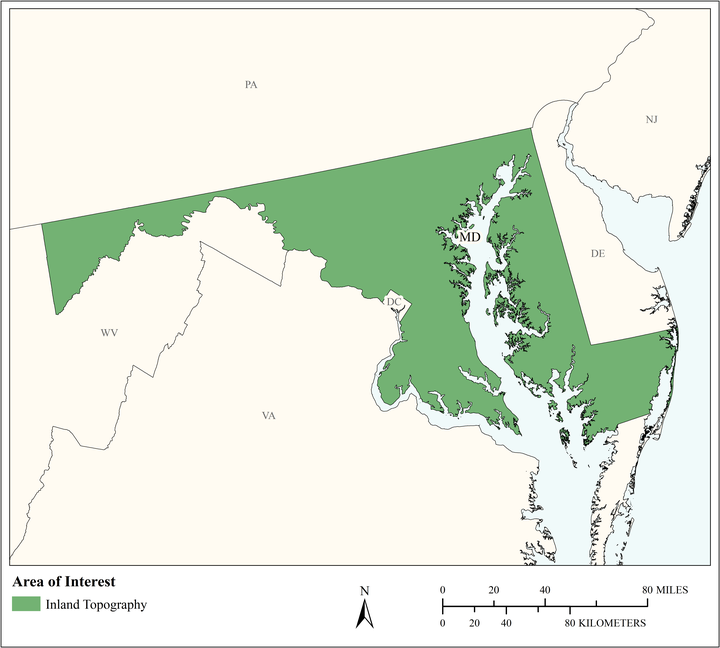
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  |  |  |  | Major | Unable to provide |  |  |  |  |
| Cost savings/cost reduction | Minor | Unable to provide |  |  |  |  | Moderate | Unable to provide |  |  |  |  |
| Cost avoidance | Major | Unable to provide |  |  |  |  | Major | Unable to provide |  |  |  |  |
| Increased revenues | Minor | Unable to provide |  |  |  |  | Minor | Unable to provide |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  |  |  |  | Major | Unable to provide |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $2,355 |  |  |  |  | Annual dollars saved/ realized | $173 |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Moderate | Unable to provide |  |  |  |  | Moderate | Unable to provide |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  |  |  |  | Moderate | Unable to provide |  |  |  |  |
| Improved customer experience | Moderate | Unable to provide |  |  |  |  | Moderate | Unable to provide |  |  |  |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $6,802 |  |  |  |  | Annual dollars saved/ realized | $10 |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Moderate | | |  | | | Moderate | | |  | | |
| Environmental | Major | | |  | | | Major | | |  | | |
| Public safety, including life and property | Moderate | | |  | | | Moderate | | |  | | |

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

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

# MCA Title: Agriculture and Precision Farming



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Farm pond design. Irrigation system design. Detailed site analysis to support precision farming. Analysis of farm sedimentation and runoff. Calibration of fertilizer application, fertilizer management, and irrigation planning. Optimized terraforming. |
| MCA Title | Agriculture and Precision Farming |
| MCA ID | 60216 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 08 - Agriculture and Precision Farming |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Highly desirable |  |  |  |
| DTM | Required |  |  |  |
| DEM | Required |  |  |  |
| Raw point cloud data | Nice to have |  |  |  |
| Classified point cloud | Nice to have |  |  |  |
| Edited/cube XYZ |  |  |  |  |
| Full waveform | Nice to have |  |  |  |
| Bathymetric Attributed Grid (BAG) |  |  |  |  |
| Breaklines required for standard hydro-flattening | Required |  |  |  |
| Additional breaklines for hydro-enforcement of culverts | Required |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  |  |  |
| Tide Predictions |  |  |  |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  |  |  |
| Intensity imagery/sidescan imagery | Nice to have |  |  |  |
| Ground control/ground truthing | Highly desirable |  |  |  |

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

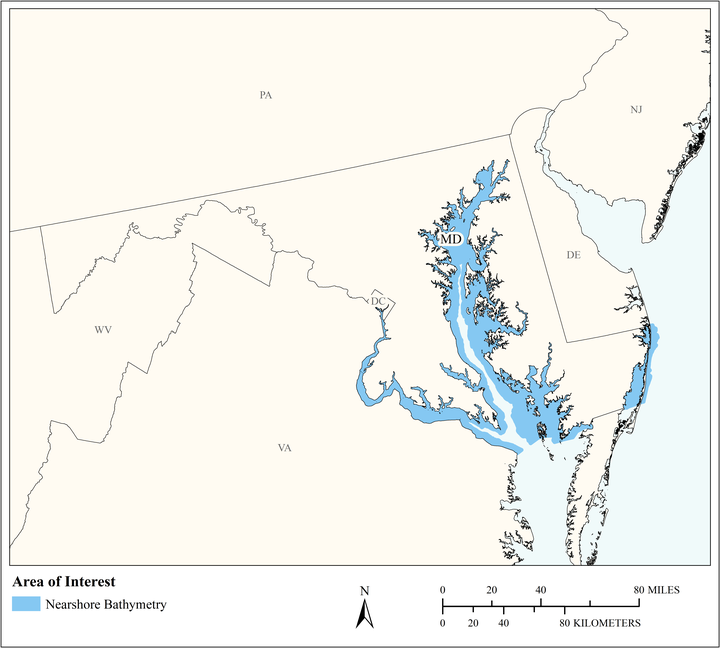
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost savings/cost reduction | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost avoidance | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Increased revenues | Minor | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $11,447 |  |  |  |  |  |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved customer experience | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $9,075 |  |  |  |  |  |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Major | | |  | | |  | | |  | | |
| Environmental | Major | | |  | | |  | | |  | | |
| Public safety, including life and property | Minor | | |  | | |  | | |  | | |

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

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

# MCA Title: Fisheries Management and Aquaculture



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Management of fisheries. Sustainable aquaculture. |
| MCA Title | Fisheries Management and Aquaculture |
| MCA ID | 60217 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 09 - Fisheries Management and Aquaculture |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

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

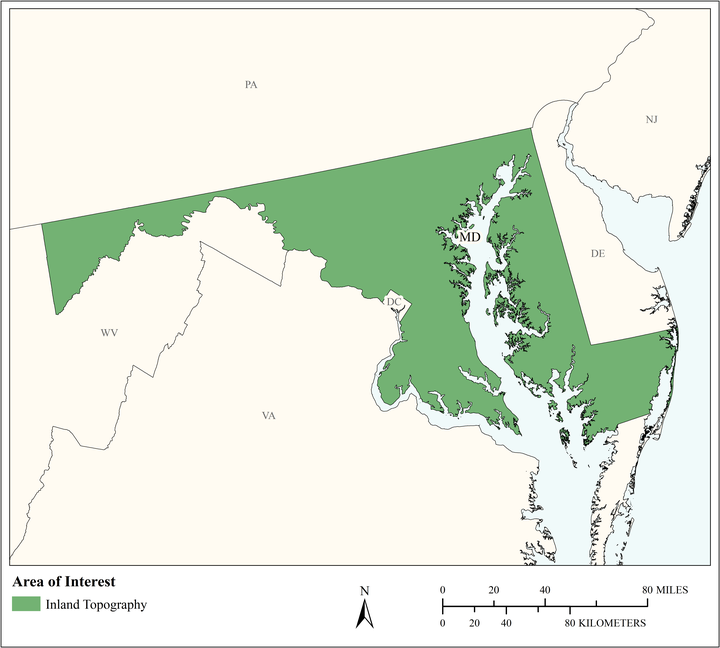
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings |  |  |  |  |  |  | Major | Unable to provide |  |  |  |  |
| Cost savings/cost reduction |  |  |  |  |  |  | Moderate | Unable to provide |  |  |  |  |
| Cost avoidance |  |  |  |  |  |  | Moderate | Unable to provide |  |  |  |  |
| Increased revenues |  |  |  |  |  |  | Minor | Unable to provide |  |  |  |  |
| Mission-driven performance improvements |  |  |  |  |  |  | Major | Unable to provide |  |  |  |  |
| Potential future annual operational benefits added during validation |  |  |  |  |  |  |  | Annual dollars saved/ realized | $27,600 |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services |  |  |  |  |  |  | Minor | Unable to provide |  |  |  |  |
| Improved response or timeliness |  |  |  |  |  |  | Major | Unable to provide |  |  |  |  |
| Improved customer experience |  |  |  |  |  |  | Moderate | Unable to provide |  |  |  |  |
| Potential future annual customer service benefits added during validation |  |  |  |  |  |  |  | Annual dollars saved/ realized | $2,027 |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach |  | | |  | | | Moderate | | |  | | |
| Environmental |  | | |  | | | Major | | |  | | |
| Public safety, including life and property |  | | |  | | | Minor | | |  | | |

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

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

# MCA Title: Geologic Mapping and Analysis



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge. |
| MCA Title | Geologic Mapping and Analysis |
| MCA ID | 1198 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | Maryland Geological Survey |
| Sub-Agency or Division |  |
| Organization Mission | Maryland Geological Survey is charged with the many-faceted role of investigating the earth resources of Maryland through the application of the various disciplines within the general field of earth science. Thus, its primary mission concerns geologic studies, including geologic mapping, environmental geology, geology of mineral resources, water-resources investigations, coastal and estuarine geology, and topographic and geophysical mapping. |
| Program Name | Environmental Geology |
| Total Annual Program Budget |  |
| Primary Business Use | BU 10 - Geologic Assessment and Hazard Mitigation |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | 50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.) |
| Smallest 3D features needed | Small features |
| Description of smallest 3D features | Rock outcrops (1 meter cubed) |

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

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Nice to have |  |  |  |
| DTM | Required |  |  |  |
| DEM | Required |  |  |  |
| Raw point cloud data | Required |  |  |  |
| Classified point cloud | Highly desirable |  |  |  |
| Edited/cube XYZ |  |  |  |  |
| Full waveform | Nice to have |  |  |  |
| Bathymetric Attributed Grid (BAG) |  |  |  |  |
| Breaklines required for standard hydro-flattening | Highly desirable |  |  |  |
| Additional breaklines for hydro-enforcement of culverts | Highly desirable |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  |  |  |
| Tide Predictions |  |  |  |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  |  |  |
| Intensity imagery/sidescan imagery | Highly desirable |  |  |  |
| Ground control/ground truthing | Highly desirable |  |  |  |

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

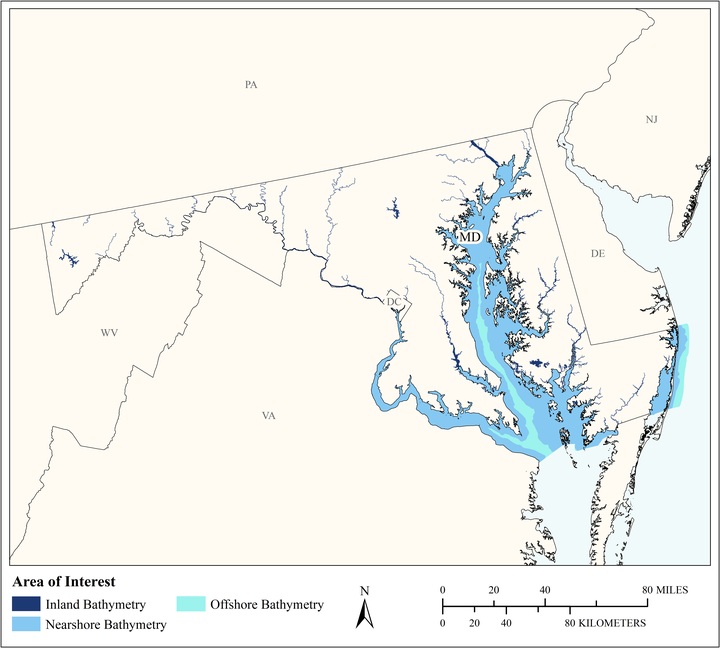
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | We are currently using LIDAR at various quality levels. Over 50% of the State is QL2 or acceptable. The rest of the state is covered with LIDAR but at a slightly lesser accuracy and resolution. |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  |  |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes |  |  |  |
| State repositories used | Salisbury University holds all of the LIDAR collected data. This data is also accessed through DEMs on the State GIS servers. |  |  |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Major |  |  |  |
| Cost savings/cost reduction | Moderate |  |  |  |
| Cost avoidance | Moderate |  |  |  |
| Increased revenues | None |  |  |  |
| Mission-driven performance improvements | Major |  |  |  |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Moderate |  |  |  |
| Improved response or timeliness | Major |  |  |  |
| Improved customer experience | Major |  |  |  |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Major |  |  |  |
| Environmental | Major |  |  |  |
| Public safety, including life and property | Major |  |  |  |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Annual dollars saved/realized | $60,300 |  |  |  |  |  |  |  |  |  |
| Time savings description | Field mappers will be able to identify rock outcrops. Easier site selections. Mappers will be able to differentiate layers more readily. | | |  | | |  | | |  | | |
| Cost savings/cost reduction | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost avoidance | Minor | Annual dollars saved/realized | $10,000 |  |  |  |  |  |  |  |  |  |
| Cost avoidance description | Labor time. | | |  | | |  | | |  | | |
| Increased revenues | None |  |  |  |  |  |  |  |  |  |  |  |
| Mission-driven performance improvements | Moderate | Annual percent improvement | 150% |  |  |  |  |  |  |  |  |  |
| Mission-driven performance improvements description | Better use of on the ground mapper time. Creation of more detailed maps at greater scales. Selection of better field locations for work. | | |  | | |  | | |  | | |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Value added to products or services description | I think this is duplicative of benefits characterized above for a state research agency. | | |  | | |  | | |  | | |
| Improved response or timeliness | Minor | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved customer experience | Moderate | Annual dollars saved/realized | $3,015 |  |  |  |  |  |  |  |  |  |
| Improved customer experience description | Saves time gathering data. | | |  | | |  | | |  | | |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Moderate | | |  | | |  | | |  | | |
| Education or outreach description | Being able to 3D print areas and show areas where people live develops a connection | | |  | | |  | | |  | | |
| Environmental | Moderate | | |  | | |  | | |  | | |
| Public safety, including life and property | Moderate | | |  | | |  | | |  | | |

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

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

# MCA Title: Sediment Studies



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Coastal Sediment Studies. Elevation data are needed for habitat assessment based on depth and sediment type, sand resources assessment, sediment classification for grain size, monitor for bottom of reservoir sedimentation, transport of sediments in inland waters, beach nourishment, pipeline assessments, CO2 sequestration, and wind platform siting. |
| MCA Title | Sediment Studies |
| MCA ID | 22160 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | Maryland Geological Survey |
| Sub-Agency or Division |  |
| Organization Mission | Maryland Geological Survey is charged with the many-faceted role of investigating the earth resources of Maryland through the application of the various disciplines within the general field of earth science. Thus, its primary mission concerns geologic studies, including geologic mapping, environmental geology, geology of mineral resources, water-resources investigations, coastal and estuarine geology, and topographic and geophysical mapping. |
| Program Name | Coastal and Estuarine Geology |
| Total Annual Program Budget |  |
| Primary Business Use | BU 10 - Geologic Assessment and Hazard Mitigation |
| Secondary Business Use | BU 03 - Coastal Zone Management |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | 1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.]) |
| Smallest 3D features needed | Survey-level features |
| Description of smallest 3D features | Shoreline shelfs. Typically, these are less than 6 inches tall in silty areas and marshes where the tidal erosion line is located. |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order |  | QL0B | I do not need any of the QLs listed. We need vertical accuracies of 1-2cm throughout the beach profile and down to -18 feet. | I do not need any of the QLs listed. We need vertical accuracies of 1-2 cm throughout the beach profile and down to -18 feet. |
| Update Frequency |  | 4-5 years | 4-5 years | 4-5 years |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error |  | Up to 1 meter | Less than 50 cm | Less than 50 cm |
| Acceptable Vertical Error |  | Less than 10 cm | Less than 10 cm | Less than 10 cm |
| How far onshore needed |  |  | 500 meters inland |  |
| How far down the beach profile needed |  |  | Below MLLW |  |
| Tide correction requirement |  |  | MHW | MHW |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

| **Seamlessness Requirements** | **Within Inland Topo Data** | **Within Inland Bathy Data** | **Within Nearshore Data** | **Within Offshore Data** | **Between Inland Topo and Inland Bathy** | **Between Topo, Topobathy, and/or Bathy** |
| --- | --- | --- | --- | --- | --- | --- |
| **Importance of Seamlessness** |  |  |  |  |  |  |
| **Temporal Seamlessness** |  |  |  |  |  |  |
| Entire AOI in same acquisition season |  | Nice to have | Nice to have | Nice to have |  | Nice to have |
| Entire AOI under same environmental conditions |  | Required | Required | Nice to have |  | Nice to have |
| **Spatial Seamlessness** |  |  |  |  |  |  |
| Point cloud for entire AOI needs to be seamless |  | Required | Required | Nice to have |  | Nice to have |
| DEM for entire AOI needs to be seamless |  | Required | Required | Nice to have |  | Nice to have |
| Amount of acceptable vertical manipulation to achieve spatial seamlessness |  | None | None | None |  | None |

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

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

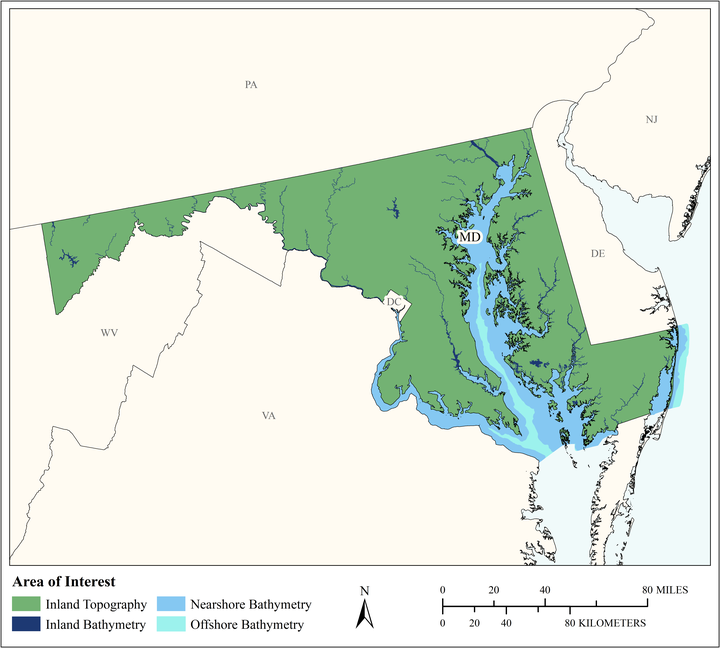
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  | We collect our own at much greater accuracy than QL0. | We use our own data from transects that is not meeting our needs, but the best we can obtain. We also use the NOAA CUSP shorelines that are critical to be maintained. We are a geological survey and we can collect sidescan, seismic, and bottom classification so that is not needed. | We use our own data from transects that is not meeting our needs, but the best we can obtain. We also use the NOAA CUSP shorelines that are critical to be maintained. We are a geological survey and we can collect sidescan, seismic, and bottom classification so that is not needed. |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  | Yes | Yes | Yes |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  | Yes | Yes |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories |  | Yes | Yes |  |
| State repositories used |  | Our own, and previously collected data from contractors. | Our own |  |
| Data that meet my needs are not available |  | Yes |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings |  | Moderate | Moderate | Minor |
| Cost savings/cost reduction |  | Moderate | Moderate | Minor |
| Cost avoidance |  | I don't know | Moderate | Minor |
| Increased revenues |  | None | None | None |
| Mission-driven performance improvements |  | Moderate | Moderate | Minor |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services |  | Moderate | Moderate | Minor |
| Improved response or timeliness |  | Moderate | Moderate | Minor |
| Improved customer experience |  | Moderate | Moderate | Minor |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach |  | Moderate | Minor | Minor |
| Environmental |  | Moderate | Minor | Minor |
| Public safety, including life and property |  | Major | Minor | Minor |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings |  |  |  | Major | Annual dollars saved/realized | $21,105 | Moderate | Annual dollars saved/realized | $3,015 | I don't know | Unable to provide |  |
| Time savings description |  | | | Complete datasets allow complete analysis rather than interpolation. Sites can be identified remotely. | | |  | | |  | | |
| Cost savings/cost reduction |  |  |  | None |  |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Cost avoidance |  |  |  | Minor | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Cost avoidance description |  | | | We will process the point cloud data. | | |  | | |  | | |
| Increased revenues |  |  |  | Minor | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Mission-driven performance improvements |  |  |  | Moderate | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Mission-driven performance improvements description |  | | | Could save field time if accuracies are obtainable. | | |  | | |  | | |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services |  |  |  | None |  |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Improved response or timeliness |  |  |  | Moderate | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Improved response or timeliness description |  | | | Would allow more recent analyses to be run on reservoir siltation. | | |  | | |  | | |
| Improved customer experience |  |  |  | Minor | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach |  | | | Moderate | | | I don't know | | | I don't know | | |
| Environmental |  | | | Moderate | | | I don't know | | | I don't know | | |
| Public safety, including life and property |  | | | Major | | | I don't know | | | I don't know | | |
| Public safety, including life and property description |  | | | Divers are always looking for updated maps of reservoirs | | |  | | |  | | |

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

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

# MCA Title: Cultural Resources Management and Preservation



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Cultural resources management and preservation. Identification of cultural resources through research, survey and analysis. Protection and preservation of resources through outreach and education as well as planning (including hazard mitigation). Elevation data are needed for permit reviews, research on natural resources, Management of cultural habitat and cultural resources, historical landscaping, discovery of historic roads and trails, identification of changed paths of waterways, and viewshed analysis. |
| MCA Title | Cultural Resources Management and Preservation |
| MCA ID | 21633 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | Maryland Department of Planning |
| Sub-Agency or Division |  |
| Organization Mission | The Maryland Department of Planning collaborates with state agencies, local governments and the private sector, providing assistance and data so that each community can shape their future in a way that reflects local values, honors its heritage and presents opportunities for Maryland to flourish. Planning facilitates the coordination of planning efforts statewide. Planning provides essential planning data, information and analysis for the state of Maryland. Planning plays an important role in preserving Maryland's heritage and conserving its natural resources |
| Program Name | State Historic Preservation Office |
| Total Annual Program Budget |  |
| Primary Business Use | BU 14 - Cultural Resources Preservation and Management |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

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

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

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

| **Hydrologic Processing Required** | **Response** |
| --- | --- |
| Hydro-flattening | Required |
| Hydro-enforcement | Nice to have |
| Hydro-conditioning | Nice to have |
| No Treatment | Required |

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

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

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

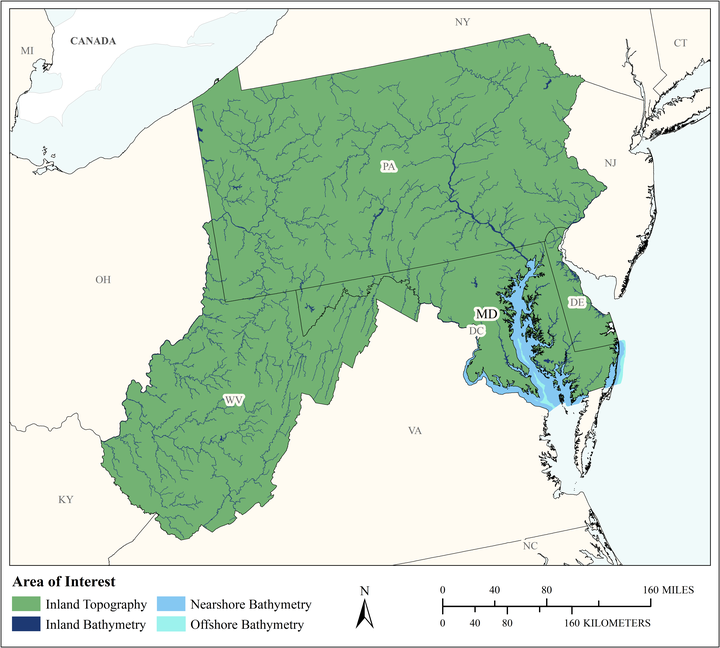
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | LiDAR data from state | -NOAA charts -Acquire data in house +/- 30 cm H&V for project-specific areas | NOAA charts -Acquire data in house +/- 30 cm H&V for project-specific areas | Offshore NOAA charts |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  |  |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  | Yes | Yes | Yes |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes |  |  |  |
| State repositories used | MD iMap |  |  |  |
| Other |  | Yes | Yes |  |
| Other description |  | See above + DNR shorelines, Current/historic; georeferencing of historic charts | Department of Natural Resources (DNR) GIS data |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Moderate | Moderate | Moderate | Moderate |
| Cost savings/cost reduction | Major | None | None | None |
| Cost avoidance | Moderate | None | None | None |
| Increased revenues | None | None | None | None |
| Mission-driven performance improvements | Major | Minor | Minor | Minor |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Major | None | None | None |
| Improved response or timeliness | Major | Moderate | Moderate | Moderate |
| Improved customer experience | Moderate | Moderate | Moderate | Moderate |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Major | Minor | Minor | Minor |
| Environmental | None | Moderate | Moderate | Moderate |
| Public safety, including life and property | None | None | None | None |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Minor | Unable to provide |  | Minor | Annual dollars saved/realized | $6,633 to $6,874 | Minor | Annual dollars saved/realized | $6,633 to $6,874 | Minor | Annual dollars saved/realized | $1,206 |
| Time savings description |  | | | 0-8 hours saved. Expected avoided site visits. Collect/process data. | | | 0-8 hours saved. | | |  | | |
| Cost savings/cost reduction | Minor | Unable to provide |  | None |  |  | None |  |  | Minor | Unable to provide |  |
| Cost avoidance | Minor | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Minor | Unable to provide |  |
| Increased revenues | None |  |  | None |  |  | None |  |  | None |  |  |
| Mission-driven performance improvements | Moderate | Unable to provide |  | Minor | Unable to provide |  | Minor | Unable to provide |  | Minor | Unable to provide |  |
| Other operational benefits |  |  |  | Minor | Unable to provide |  | Minor | Unable to provide |  |  |  |  |
| Other operational benefits description |  | | |  | | |  | | |  | | |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Moderate | Unable to provide |  | Minor | Unable to provide |  | Minor | Unable to provide |  | Minor | Unable to provide |  |
| Improved response or timeliness | Moderate | Unable to provide |  | Minor | Unable to provide |  | Minor | Unable to provide |  | Minor | Unable to provide |  |
| Improved customer experience | Minor | Unable to provide |  | None |  |  | Minor | Unable to provide |  | Minor | Unable to provide |  |
| Other customer service benefits |  |  |  |  |  |  | Minor | Unable to provide |  |  |  |  |
| Other customer service benefits description |  | | |  | | |  | | |  | | |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Minor | | | I don't know | | | Minor | | | Minor | | |
| Education or outreach description | Hazard mitigation for historical and cultural resources | | |  | | |  | | |  | | |
| Environmental | None | | | None | | | Moderate | | | Moderate | | |
| Public safety, including life and property | None | | | None | | | None | | | None | | |
| Other |  | | |  | | |  | | |  | | |
| Other benefits |  | | |  | | | Minor | | |  | | |

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

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

# MCA Title: Statewide Environmental Management



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | FEMA Floodplain Coordination/Mitigation; Wetland regulation; Submerged Aquatic Vegetation (SAV); Water Quality; Ground water/Drinking water; NHD/WBD State Steward; Oil Control; Voluntary Clean-up Program (VCP)/Land Restoration; Mining |
| MCA Title | Statewide Environmental Management |
| MCA ID | 1397 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | MD Dept. of the Environment |
| Sub-Agency or Division |  |
| Organization Mission | To protect and restore the environment for the health and well-being of all Marylanders. |
| Program Name | NFIP - National Flood Insurance Program; Environmental Assessment and Standards; Integrated Water Planning; Sediment, Stormwater, and Dam Safety; Water Supply; Oil Control; Voluntary Clean-up/Land Restoration; Wetlands and Waterways; Mining |
| Total Annual Program Budget |  |
| Primary Business Use | BU 15 - Flood Risk Management |
| Secondary Business Use | BU 02 - Riverine Ecosystem Management |
| Tertiary Business Use | BU 10 - Geologic Assessment and Hazard Mitigation |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | Individual feature (e.g. single tree, single structure) |
| Smallest 3D features needed | Small features |
| Description of smallest 3D features | Building/house, 1st order stream. Underwater habitat features in inland waters, shellfish and oyster beds, submerged aquatic vegetation. |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL1 HD | QL1B | QL1B |  |
| Update Frequency | 2-3 years | 2-3 years | 2-3 years |  |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Less than 20 cm | Less than 50 cm | Less than 50 cm |  |
| Acceptable Vertical Error | Less than 5 cm | Less than 10 cm | Less than 10 cm |  |
| How far onshore needed |  |  | To MHW |  |
| How far down the beach profile needed | Below MLLW |  | Below MLLW |  |
| Tide correction requirement |  |  | MHW |  |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

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

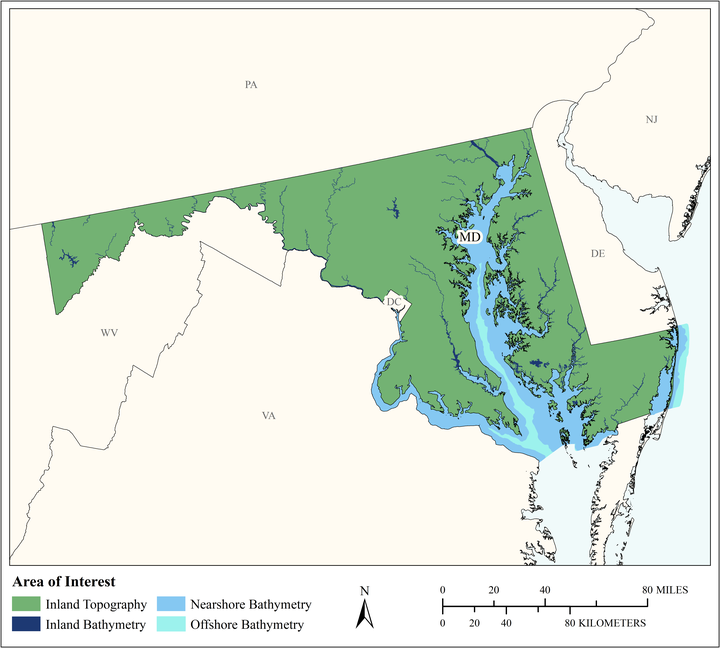
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | USGS QL-2 for all of Maryland | NOAA 2010 data and Older data derived by the Maryland Geologic Survey 2000. | NOAA 2010 - 3 meter and 6 meter. Maryland Geologic Survey data from 2000?? Otherwise, a little of this and a little of that. Whatever we can get our hands on. | NOAA 2010 - 3 meter and 6 meter. Maryland Geologic Survey data from 2000?? Otherwise, a little of this and a little of that. Whatever we can get our hands on. |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  |  |
| NCEI |  | Yes | Yes | Yes |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  | Yes |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes | Yes | Yes |  |
| State repositories used | Maryland Dept of IT/GIS has a statewide data server which includes Lidar data. | Maryland Dept of IT/DOIT has a statewide data server which includes Lidar/Elevation data | Maryland Dept of IT/DOIT has a statewide data server which includes Lidar/elevation data |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Major | Minor | Minor | Minor |
| Cost savings/cost reduction | Major | Minor | Minor | Minor |
| Cost avoidance | Moderate | Moderate | Moderate | Moderate |
| Increased revenues | None | None | None | None |
| Mission-driven performance improvements | Major | Moderate | Moderate | Moderate |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Major | Major | Major | Major |
| Improved response or timeliness | Moderate | Major | Major | Major |
| Improved customer experience | Moderate | Major | Major | Major |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Moderate | Moderate | None | None |
| Environmental | Moderate | Moderate | Moderate | Moderate |
| Public safety, including life and property | Major | Moderate | Minor | Minor |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Cost savings/cost reduction | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |
| Cost avoidance | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Increased revenues | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |
| Mission-driven performance improvements | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Other operational benefits | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $462,751 |  |  |  |  | Annual dollars saved/ realized | $11,088 |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Improved response or timeliness | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Improved customer experience | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $80,967 |  |  |  |  | Annual dollars saved/ realized | $8,217 |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Major | | | Major | | | Major | | | Major | | |
| Education or outreach description | Flood Insurance Program | | |  | | |  | | |  | | |
| Environmental | Major | | | Major | | | Major | | | Major | | |
| Environmental description | Mapping of all streams within Maryland for improved water quality, wetland and near shore SAV | | |  | | |  | | |  | | |
| Public safety, including life and property | Major | | | Major | | | Major | | | Major | | |
| Public safety, including life and property description | Flood mapping/modeling for FEMA | | |  | | |  | | |  | | |
| Other | More accurate elevation required for NHD/WBD enhancements/updates | | |  | | |  | | |  | | |
| Other benefits | Major | | |  | | |  | | |  | | |
| Other description | More accurate elevation required for NHD/WBD enhancements/updates | | |  | | |  | | |  | | |

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

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

# MCA Title: Hazard Modeling and Mapping



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Coastal hazard modeling and mapping, Riverine hazard modeling and mapping, Sea level change modeling and asset management, Hazard mitigation planning, Storm surge modeling. |
| MCA Title | Hazard Modeling and Mapping |
| MCA ID | 21576 |
| Organization Type | Academic or Not-for-Profit |
| Organization Name | Eastern Shore Regional GIS Cooperative at Salisbury University |
| Sub-Agency or Division |  |
| Organization Mission | The Eastern Shore Regional GIS Cooperative (ESRGC) provides access to geographic information system (GIS) technology, data, technical support, and training to the local governments of Maryland's Eastern Shore. |
| Program Name | GIS Program |
| Total Annual Program Budget |  |
| Primary Business Use | BU 15 - Flood Risk Management |
| Secondary Business Use | BU 16 - Sea Level Rise and Subsidence |
| Tertiary Business Use | BU 03 - Coastal Zone Management |

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

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

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL2 | QL2B | QL2B | Order 3 |
| Update Frequency | 2-3 years | 2-3 years | 2-3 years | 2-3 years |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Up to 80 cm | Up to 5 meters | Up to 5 meters | Greater than 20 meters |
| Acceptable Vertical Error | Up to 20 cm | Up to 40 cm | Up to 40 cm | Up to 10 meters |
| How far onshore needed |  |  | To MHW |  |
| How far down the beach profile needed | To MLLW |  | Below MLLW |  |
| Tide correction requirement |  |  | MSL | MSL |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

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

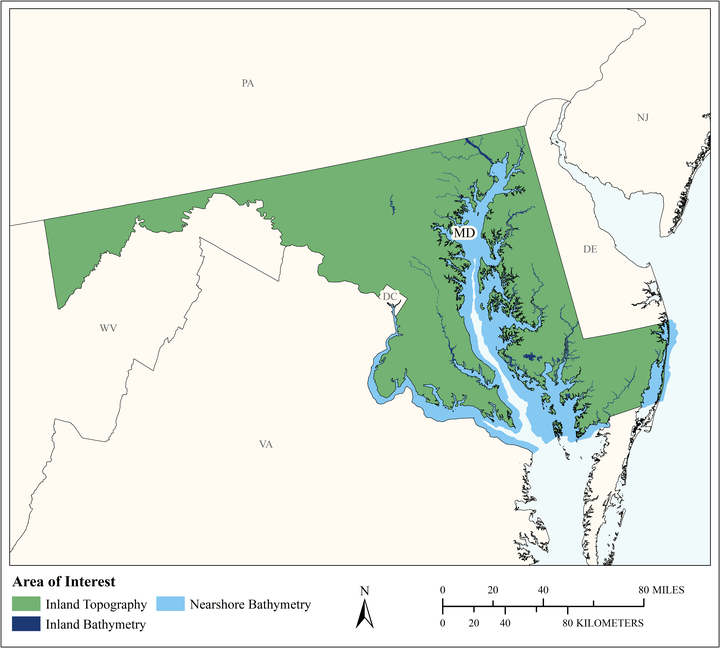
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | 2011 FEMA LiDAR: Coastal Worcester County, MD - QL2 2011 NRCS LiDAR: Pocomoke and Atlantic Coastal Watersheds, MD - QL2 2012 NRCS LiDAR: Somerset and Wicomico Counties, MD - QL2 2014 USGS Hurricane Sandy Supplemental, MD - QL2 2015 Sandy Supplemental LiDAR, MD - QL2 2013 Queen Anne's County, MD - QL3 2014 Cecil County, MD - QL2 2013 Harford County, MD - QL3 2014 Baltimore County, MD - QL2 2016-2017 Anne Arundel County, MD - QL1 2017 Calvert County, MD - QL1 2014 USGS Hurricane Sandy Supplemental LiDAR, National Capital Region (NCR) - QL2 2013 Montgomery-Prince Georges LiDAR - QL2 2011 Howard County, MD - QL3 2012 FEMA Frederick County, MD - QL2 2012 FEMA Washington County, MD - QL2 2012 FEMA Allegany County, MD - QL3 2015 Garrett County, MD - QL2 | Currently our projects do not require bathymetric datasets for model inputs. The services provided are dependent upon the clients desired level of analysis; bathymetry could be an essential dataset with future project proposals. | Currently not using these data; potential for usage in future projects would lead to NOAA Digital Coast for data availability. | Currently not using these data; potential for usage in future projects would lead to NOAA Digital Coast for data availability. |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  | Yes | Yes | Yes |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes |  |  |  |
| State repositories used | Maryland - Department of Information Technology |  |  |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Major | I don't know | I don't know | I don't know |
| Cost savings/cost reduction | Major | I don't know | I don't know | I don't know |
| Cost avoidance | Major | I don't know | I don't know | I don't know |
| Increased revenues | Major | I don't know | Minor | Minor |
| Mission-driven performance improvements | Major | I don't know | Minor | Minor |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Major | I don't know | Minor | Minor |
| Improved response or timeliness | Major | I don't know | I don't know | I don't know |
| Improved customer experience | Major | I don't know | I don't know | I don't know |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Major | I don't know | Minor | Minor |
| Environmental | Minor | I don't know | Minor | Minor |
| Public safety, including life and property | Major | I don't know | Minor | Minor |
| **Other Current Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Other | Major |  |  |  |
| Other description | Our projects are not site specific in nature; thus the availability of topographic data is a requirement for our work. Otherwise these projects would likely not exist. |  |  |  |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Annual dollars saved/realized | $6,030 | Moderate | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Time savings description | Higher accuracy data would definitely help with model inputs and success rates. Hydro-enforcement is greatly desirable to remove 'damming' effects in the dataset that would otherwise need to be addressed manually. Our project entirely depends on topographic data for modeling. Having a standard on specification across our entire geographic area would help limit processing hours for model inputs; particularly with resampling to common resolution. Our projects typically do not include field work inspections. In-office project planning may see marginal benefits with "better" data. Having topographic data is required for these projects so this is only assuming the comparison between existing datasets and potentially improved datasets in the future. Our project entirely depends on topographic data for modeling. Having hydro-enforced data would benefit us in reducing the hours spent on data preparation for model inputs. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | |  | | |
| Cost savings/cost reduction | None |  |  | Moderate | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |
| Cost savings/cost reduction description | Not applicable. We currently obtain data through the state repository or directly from the client/county/vendor. Cost savings would not affect us directly. | | | Data is acquired through state entities or municipalities. Data costs are typically not an issue with our MCA as we use pre-existing datasets through the Maryland Open Data Policy. Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | | Data is currently obtained through existing public applications. Costs savings are unknown at this time. | | |  | | |
| Cost avoidance | Major | Unable to provide |  | Moderate | Unable to provide |  | Minor | Unable to provide |  | I don't know | Unable to provide |  |
| Cost avoidance description | Data errors could potentially decrease from higher quality datasets. Unable to determine exact amount compared to existing data. Main projects include asset management regarding sea level change and flooding. These datasets assist in determining model outputs and preparation actions. Full classified point clouds would be highly desirable, along with higher level of hydrotreatment. Hydroenforced datasets would allow us to spend less time on manual data preparation for model inputs. | | | Unfamiliar with data processing of bathymetric data for flood input models. Potential for cost savings; more information required based on the project. Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | |  | | |
| Increased revenues | None |  |  | None |  |  | Minor | Unable to provide |  | I don't know | Unable to provide |  |
| Increased revenues description |  | | |  | | | Potential for new services or applications based on updated model outputs. | | |  | | |
| Mission-driven performance improvements | Major | Annual percent improvement | 100% | Moderate | Unable to provide |  | Minor | Unable to provide |  | I don't know | Unable to provide |  |
| Mission-driven performance improvements description | Without these topographic datasets, our mission would likely not be possible. These datasets are required to perform the necessary analyses and provide the desired services sought out by our clients. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | |  | | |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $456,845 |  |  |  |  | Annual dollars saved/ realized | $11,088 |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  | Moderate | Unable to provide |  | Minor | Unable to provide |  | I don't know | Unable to provide |  |
| Value added to products or services description | Property preservation is possible based on the initial results from model outputs. Newer and improved topographic datasets allow us to update hazard models and maps. Proper flood preparations are dependent upon quality data and analysis. Temporal datasets are necessary to monitor changes in the environment. | | | Improved datasets lead to improved maps and services. Inclusion of Bathymetric data has potential to improve upon existing and future services and applications. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | |  | | |
| Improved response or timeliness | Major | Unable to provide |  | Moderate | Unable to provide |  | Minor | Unable to provide |  | I don't know | Unable to provide |  |
| Improved response or timeliness description | Potential data visualizations with temporal datasets and high quality collections. Higher quality datasets will allow for higher quality maps and services. Temporal datasets, especially post disaster, can help with prevention and mitigation of future events. Improved data model inputs may provide insight into potentially hazardous flood areas that were not considered before with lower quality data. Hazard Mitigation Planning is dependent upon the input model datasets. | | | Potential for wave action inclusion in flood modeling and mitigation plans. Potential for additional services and maps rendered from updated model outputs. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | |  | | |
| Improved customer experience | Major | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  | I don't know | Unable to provide |  |
| Improved customer experience description | Perceived customer confidence is difficult to measure. Assumption that high quality temporal data will provide answers to some questions, and lead to new questions as well. Potential to build out services and web maps/apps based on model outputs. Particularly with higher temporally available datasets. Higher quality data typically means larger in size as well... This may actually lead to slower downloads; however the availability of temporal datasets on a statewide scale can lead to comprehensive repositories that streamline data acquisition for users. | | | Potential for additional services and maps rendered from updated model outputs. Additional model outputs provides options for client visualization. More data means more storage and longer load times with higher resolution products. Considerations for hardware upgrades based on the availability of data. | | | Potential for new apps and services for the client to share publicly. Potentially larger data requirements for updated/improved data model inputs. | | |  | | |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $80,967 |  |  |  |  | Annual dollars saved/ realized | $8,217 |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Moderate | | | I don't know | | | Minor | | | I don't know | | |
| Education or outreach description | Educating users on what data IS and what data is NOT... Higher availability of data leads to more questions being asked about data and how to properly use it. Education and outreach will ultimately expand as temporal datasets become more widely available. | | |  | | | Potential for training and outreach based on new model outputs | | |  | | |
| Environmental | None | | | I don't know | | | I don't know | | | I don't know | | |
| Public safety, including life and property | Major | | | Moderate | | | Minor | | | I don't know | | |
| Public safety, including life and property description | Projects primarily focus on asset management/inventory based on flood modeling outputs and sea level change predictions. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | | Potential for bathymetric inclusion in our MCA; however at this time we are not utilizing these datasets. Bathymetric data would allow for higher detailed analysis. | | |  | | |

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

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

# MCA Title: Statewide Emergency Management



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Coastal Hazard Mitigation, Inundation Modeling, Flood Studies, Watershed Studies |
| MCA Title | Statewide Emergency Management |
| MCA ID | 22422 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | Maryland Emergency Management |
| Sub-Agency or Division |  |
| Organization Mission | To ensure that Maryland families, communities, and key stakeholders are provided the tools they need to prepare for, mitigate against, respond to, and recover from the consequences of emergency and disaster events. |
| Program Name | Hazard Mitigation, Operations, Recovery, Planning |
| Total Annual Program Budget |  |
| Primary Business Use | BU 15 - Flood Risk Management |
| Secondary Business Use | BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | 1 sq mi - 49 sq mi |
| Smallest 3D features needed | Large features |
| Description of smallest 3D features | Could be used for damage assessments to structures and infrastructure |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL2 | QL1B | QL1B |  |
| Update Frequency | 4-5 years | 4-5 years | Event driven only – Data need to coincide with a specific event. |  |
| Event type(s) |  |  | Natural or man-made disaster |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | The best horizontal accuracy achievable for the vertical accuracy I need | The best horizontal accuracy achievable for the vertical accuracy I need | The best horizontal accuracy achievable for the vertical accuracy I need |  |
| Acceptable Vertical Error | Up to 10 cm | Up to 20 cm | Up to 20 cm |  |
| How far onshore needed |  |  | To Mean Lower Low Water (MLLW) |  |
| How far down the beach profile needed | To MHHW |  | To MLLW |  |
| Tide correction requirement |  |  | I don't know |  |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

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

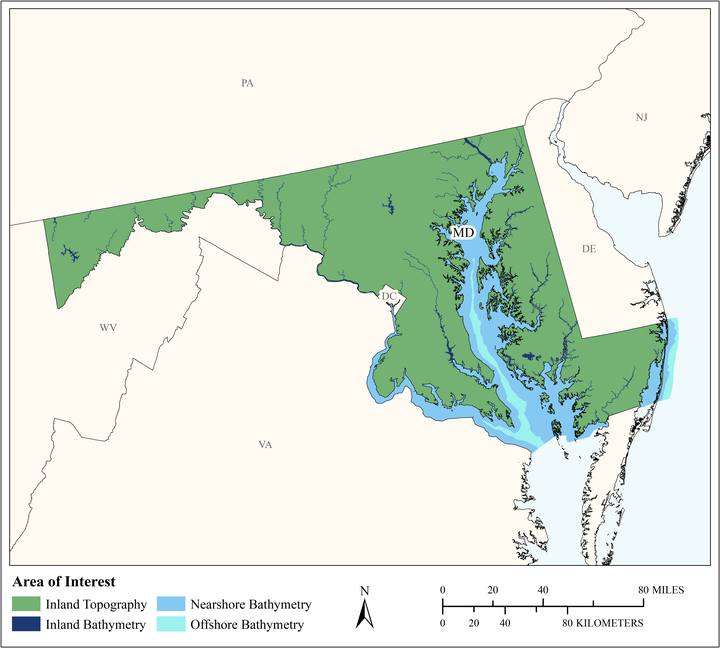
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | https://imap.maryland.gov/Pages/lidar.aspx | Best available | Best available |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  |  |
| NCEI |  |  | Yes |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes |  |  |  |
| State repositories used | https://imap.maryland.gov/Pages/lidar.aspx |  |  |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | I don't know | I don't know | I don't know |  |
| Cost savings/cost reduction | I don't know | I don't know | I don't know |  |
| Cost avoidance | I don't know | I don't know | I don't know |  |
| Increased revenues | I don't know | I don't know | I don't know |  |
| Mission-driven performance improvements | I don't know | I don't know | I don't know |  |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | I don't know | I don't know | I don't know |  |
| Improved response or timeliness | I don't know | I don't know | I don't know |  |
| Improved customer experience | I don't know | I don't know | I don't know |  |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | I don't know | I don't know | I don't know |  |
| Environmental | I don't know | I don't know | I don't know |  |
| Public safety, including life and property | I don't know | I don't know | I don't know |  |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Cost savings/cost reduction | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Cost avoidance | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Increased revenues | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Mission-driven performance improvements | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $462,751 |  |  |  |  | Annual dollars saved/ realized | $11,088 |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Improved response or timeliness | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Improved customer experience | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $80,967 |  |  |  |  | Annual dollars saved/ realized | $8,217 |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | I don't know | | | I don't know | | | I don't know | | |  | | |
| Environmental | I don't know | | | I don't know | | | I don't know | | |  | | |
| Public safety, including life and property | I don't know | | | I don't know | | | I don't know | | |  | | |

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

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

# MCA Title: Multi-Modal Transportation Asset Management



| **MCA Area of Interest** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Data Type | Required | Required | Required | Required |
| Geographic Area Requirements | One or more states, territories, or counties | One or more states, territories, or counties | Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states) | Area split by varying quality level or update frequency |
| Sub Area Requirements |  |  |  | Maryland |

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Coastal hazard mitigation, facility/assets/roads vulnerability with sea level change, line of site analysis, storm water network modeling. Harbor dredging and dredging for the Chesapeake Bay, Ocean City, Salisbury, etc. Also sediment analysis. |
| MCA Title | Multi-Modal Transportation Asset Management |
| MCA ID | 21676 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | Maryland DOT State Highway Administration |
| Sub-Agency or Division |  |
| Organization Mission | The Maryland Department of Transportation is a customer-driven leader that delivers safe, sustainable, intelligent, and exceptional transportation solutions in order to connect our customers to life's opportunities |
| Program Name | NPDES (National Pollutant Discharge Elimination System), Climate Change Vulnerability Analysis |
| Total Annual Program Budget |  |
| Primary Business Use | BU 16 - Sea Level Rise and Subsidence |
| Secondary Business Use | BU 23 - Urban and Regional Planning |
| Tertiary Business Use | BU 22 - Infrastructure and Construction Management |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | 25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region) |
| Smallest 3D features needed | Survey-level features |
| Description of smallest 3D features | Utility infrastructure (storm drains, outfalls), bottom surface, underwater archaeological features |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL1 HD | QL1B | QL1B | (a) Order 1a (b) Order 1 |
| Update Frequency | 2-3 years | 2-3 years | 2-3 years | (a) 6 months (b) 2-3 years |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI | Coastal areas need more accuracy than higher elevation areas of state, but QL1 data will help with predictive modelling of increased “flashy” type of storm events in non-coastal areas |  |  | Every 6 months for port dredging, others 2-3 years |
| Acceptable Horizontal Error | Less than 20 cm | Less than 50 cm | Less than 50 cm | Up to 5 meters |
| Acceptable Vertical Error | Less than 5 cm | Less than 10 cm | Less than 10 cm | Less than 1 meter |
| How far onshore needed |  |  | To MHW |  |
| How far down the beach profile needed | Below MLLW |  | Below MLLW |  |
| Tide correction requirement |  |  | MHW | MHW |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

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

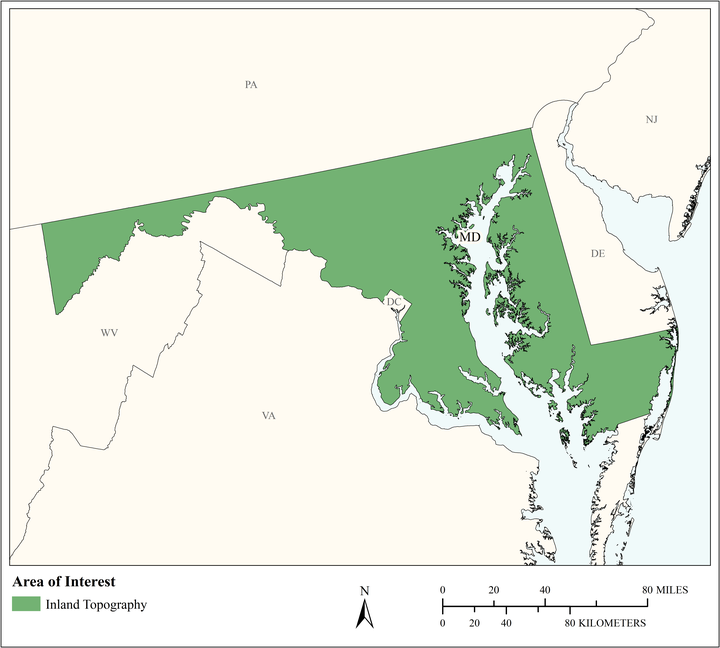
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | USGS QL-2 for all of Maryland | NOAA 2010 data and older data derived by the Maryland Geologic Survey 2000. | NOAA 2010 - 3 meter and 6 meter. Maryland Geologic Survey data from 2000?? Otherwise, a little of this and a little of that. Whatever we can get our hands on. | NOAA 2010 - 3 meter and 6 meter. Maryland Geologic Survey data from 2000?? Otherwise, a little of this and a little of that. Whatever we can get our hands on. |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map | Yes |  |  |  |
| Digital Coast |  | Yes | Yes | Yes |
| NCEI |  | Yes | Yes | Yes |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  | Yes | Yes | Yes |
| USACE navigation charts |  | Yes | Yes | Yes |
| USGS Inland Waters server |  | Yes |  |  |
| USGS data series |  | Yes |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes | Yes | Yes |  |
| State repositories used | Maryland Dept of IT/GIS has a statewide data server which includes Lidar data. | Maryland Dept of IT/DOIT has a statewide data server which includes Lidar/Elevation data | Maryland Dept of IT/DOIT has a statewide data server which includes Lidar/elevation data |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Major | Minor | Minor | Minor |
| Cost savings/cost reduction | Major | Minor | Minor | Minor |
| Cost avoidance | Moderate | Moderate | Moderate | Moderate |
| Increased revenues | None | None | None | None |
| Mission-driven performance improvements | Major | Moderate | Moderate | Moderate |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Major | Major | Major | Major |
| Improved response or timeliness | Moderate | Major | Major | Major |
| Improved customer experience | Moderate | Major | Major | Major |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Moderate | Moderate | None | None |
| Environmental | Moderate | Moderate | Moderate | Moderate |
| Public safety, including life and property | Major | Moderate | Minor | Minor |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Cost savings/cost reduction | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |
| Cost avoidance | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Increased revenues | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |
| Mission-driven performance improvements | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Other operational benefits | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $291,681 |  | Annual dollars saved/ realized | $82,144 |  |  |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Improved response or timeliness | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Improved customer experience | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Other customer service benefits | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $5,155 |  | Annual dollars saved/ realized | $5,240 |  |  |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Major | | | Major | | | Major | | | Major | | |
| Education or outreach description | Flood Insurance Program | | |  | | | Flood Insurance Program | | |  | | |
| Environmental | Major | | | Major | | | Major | | | Major | | |
| Environmental description | Mapping of all streams within Maryland for improved water quality, wetland and near shore SAV | | |  | | | Mapping of all streams within Maryland for improved water quality, wetland and near shore SAV | | |  | | |
| Public safety, including life and property | Major | | | Major | | | Major | | | Major | | |
| Public safety, including life and property description | Flood mapping/modeling for FEMA | | |  | | | Flood mapping/modeling for FEMA | | |  | | |
| Other |  | | |  | | |  | | |  | | |
| Other benefits | Major | | |  | | | Major | | |  | | |
| Other description | More accurate elevation required for NHD/WBD enhancements/updates | | |  | | | More accurate elevation required for NHD/WBD enhancements/updates | | |  | | |

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

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

# MCA Title: Wildfire Management, Planning, and Response



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas. |
| MCA Title | Wildfire Management, Planning, and Response |
| MCA ID | 60218 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 17 - Wildfire Management, Planning, and Response |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

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

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

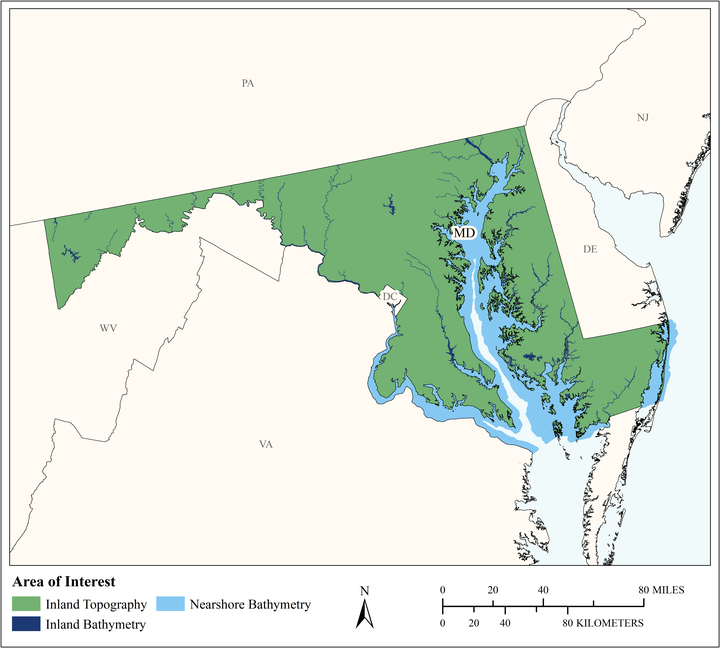
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost savings/cost reduction | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost avoidance | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Increased revenues | Minor | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $53,123 |  |  |  |  |  |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved customer experience | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Major | | |  | | |  | | |  | | |
| Environmental | Major | | |  | | |  | | |  | | |
| Public safety, including life and property | Major | | |  | | |  | | |  | | |

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

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

# MCA Title: Statewide Geospatial Services



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | The Maryland Department of Information Technology, Geographic Information Office provides a centralized enterprise GIS platform to store and serve GIS data. Additionally, we have initiatives that include the collection and dissemination of core framework layers such as LiDAR and Imagery. We provide services for the majority of the BUs listed. |
| MCA Title | Statewide Geospatial Services |
| MCA ID | 11478 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | Maryland Department of Information Technology |
| Sub-Agency or Division |  |
| Organization Mission | 1) Improve the quality and lower the cost of government services, through collective investment in and effective application of geospatial data and systems and 2) Reach beyond government by making data freely and publicly available to the fullest extent possible in consideration of privacy and security. To succeed in this mission, the GIO Office administers and monitors a number of initiatives. These include, but are not limited to: Maintenance and support of the State's Enterprise GIS, making maps, apps and services available to GIS end users. Management of the State's GIS Software Master Contract, providing software, training and technical support to employees of eligible State agencies. Communication of statewide GIS pursuits and interests through this website, as well as, other social media outlets and GIS partners, including MSGIC and TUgis. The GIO Office strives to support existing and future efforts to improve the quality of GIS in Maryland through coordination and collaboration with the larger GIS community. |
| Program Name | The Maryland Department of Information Technology, Geographic Information Office provides direct support to the Maryland Emergency Management Agency (MEMA) for the State Emergency Operations Center. Our office provides the OSPREY Platform for Situational Awareness |
| Total Annual Program Budget |  |
| Primary Business Use | BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | 25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region) |
| Smallest 3D features needed | Large features |
| Description of smallest 3D features | In the case of Emergency Management, we are likely looking at buildings and roads |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL2 | QL1B | QL1B |  |
| Update Frequency | 2-3 years | 2-3 years | 2-3 years |  |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Up to 80 cm | Up to 2 meters | Up to 2 meters |  |
| Acceptable Vertical Error | Up to 20 cm | Up to 30 cm | Up to 30 cm |  |
| How far onshore needed |  |  | To the fall line |  |
| How far down the beach profile needed | To MHW |  | To MLLW |  |
| Tide correction requirement |  |  | No requirement for tide correction |  |
| Cross sections and/or transects meet needs | Partial | Partial | Partial |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

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

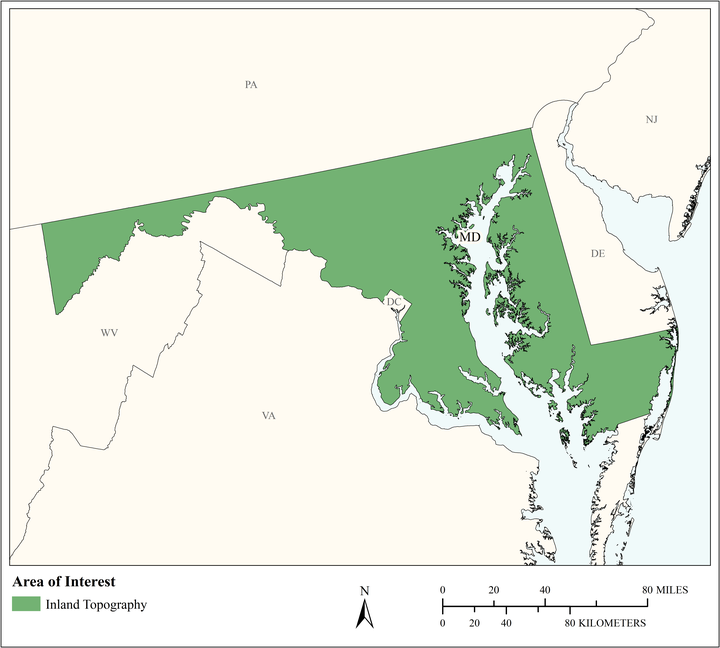
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | COUNTY​ DATE ​COLLECTION NAME​ POINT SPACING ​DEM RESOLUTION VERTICAL A​CCU​RACY (RMSE) PROJECT PARTNERS FULL METADATA ​Allegany 2012​ FEMA Region 3 FY12 LiDAR: Allegany, Frederick and Washington​ ​0.5 m​ ​1m ​3.2ft ​13.0 cm ​Funded by NRCS and FEMA Contracted through USGS ​Link Anne Arundel ​2011 Anne Arundel County LiDAR 1.4 m 0.9m​ ​3ft 15.0 cm Anne Arundel County Link Baltimore City ​​2015 MD / PA Sandy Supplemental LiDAR 0.7 m 0.7m​ 2.3ft​ 15.6 cm USGS Link ​Baltimore ​​2015 Baltimore County LiDAR 0.7 m ​0.7m ​2.3ft 6.79 cm Baltimore County Link ​Calvert ​​2011 Calvert County LiDAR 1.4 m ​2m ​6.6ft 18.5 cm Calvert County Link ​Carolin​e ​2013 Hurricane Sandy Supplemental LiDAR: Caroline, Dorchester 0.7 m ​1m ​3.2ft 16.2 cm USGS Link ​Carroll ​​2015 ​MD / PA Sandy Supplemental LiDAR 0.7 m 0.7m​ 2.3ft​ 15.6 cm USGS Link ​Cecil ​​2013 ​Cecil County HD LiDAR ​0.46m ​0.6m ​2ft 12.5 cm Cecil County, USGS Link ​Charles ​​2014 ​Hurricane Sandy Supplemental LiDAR: Charles, Prince George's and St. Mary's ​0.7 m ​0.9m ​3ft 11.5 cm USGS Link ​Dorchester ​​2013 ​Hurricane Sandy Supplemental LiDAR: Caroline, Dorchester 0.7 m 0.9m​ ​3ft 16.2 cm USGS Link ​Frederick ​​2012 ​FEMA Region 3 FY12 LiDAR: Allegany, Frederick and Washington ​0.5 m ​1m ​3.2ft 10.0 cm Funded by NRCS and FEMA Contracted through USGS​ Link ​Garrett ​​2015 ​Garrett County LiDAR ​0.7 m 1m 3.2ft​ 7.2 cm Garrett County, USGS Link ​Harford ​​2013 ​Harford County LiDAR 1.​2 m 1.5m​ 4.9ft​ 6.8 cm Harford County Link ​Howard ​​2011 Howard County LiDAR ​1.4 m ​2m ​6.6ft 18.5 cm Howard County Link ​Kent ​​2015 ​MD / PA Sandy Supplemental LiDAR​ ​0.7 m ​0.7m 2.3ft​ 15.6 cm USGS Link ​Montgomery ​​2013 Montgomery County LiDAR ​0.9 m 1.2m​ 3.9ft​ 5.24 cm Montgomery County Link Prince George's ​​2014 ​Hurricane Sandy Supplemental LiDAR: Charles, Prince George's and St. Mary's ​0.7 m ​0.9m 3ft​ 11.5 cm USGS Link ​Queen Anne's ​​2013 ​Queen Anne's County HD LiDAR ​0.46 m ​0.6m 2ft​ 12.5 cm Queen Anne's County Link Somerset (Riverine) ​​2011 ​Pocomoke and Atlantic Coastal Watersheds in Maryland 0.7 m ​1m 3.2ft​ 9.25 cm Funded by NRCS Contracted through USGS Link Somerset (Western) ​​2012 ​NRCS Maryland LiDAR: Somerset and Wicomico 0.7 m ​1m 3.2ft​ 8.0 cm Funded by NRCS Contracted through USGS Link St. Mary's ​​2014 ​Hurricane Sandy Supplemental LiDAR: Charles, Prince George's and St. Mary's 0.7 m ​0.9m 3ft​ 11.5 cm USGS Link Talbot ​​2015 MD / PA Sandy Supplemental LiDAR 0.7 m ​0.7m 2.3ft​ 15.6 cm USGS Link ​Washington ​​2012 ​FEMA Region 3 FY12 LiDAR: Allegany, Frederick and Washington 0.5 m ​1m 3.2ft​ 10.0 cm ​Funded by NRCS and FEMA Contracted through USGS​ Link ​Washington, D.C. ​​2014 ​Hurricane Sandy Supplemental LiDAR ​0.7 m ​1m 3.2ft​ 11.5 cm USGS Link ​Wicomico (Riverine) ​​2011 ​Pocomoke and Atlantic Coastal Watersheds in Maryland ​0.7 m ​1m 3.2ft​ 9.25 cm Funded by NRCS Contracted through USGS Link ​Wicomico (Western) ​​2012 ​NRCS Maryland LiDAR: Somerset and Wicomico ​0.7 m ​1m 3.2ft​ 8.0 cm Funded by NRCS Contracted through USGS Link Worcester (Coastal) ​​2011 ​VA FEMA LiDAR: Coastal Worcester ​0.5 m ​1m 3.2ft​ 9.25 cm Funded by NRCS Contracted through USGS Link Worcester (Riverine) ​​2011 ​Pocomoke and Atlantic Coastal Watersheds in Maryland ​0.7 m ​1m 3.2ft​ 9.25 cm Funded by NRCS Contracted through USGS Link | We are currently not using inland bathymetry | No bathymetric data currently being used. |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  | Yes | Yes |  |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes | Yes | Yes |  |
| State repositories used | MD iMAP Topography Server (https://lidar.geodata.md.gov/imap/rest/services) | MD iMAP LiDAR Services | MD iMAP LiDAR Services |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Moderate | Inland bathy data not available | Moderate |  |
| Cost savings/cost reduction | Moderate | Inland bathy data not available | Major |  |
| Cost avoidance | Moderate | Inland bathy data not available | Major |  |
| Increased revenues | None | Inland bathy data not available | None |  |
| Mission-driven performance improvements | Moderate | Inland bathy data not available | Major |  |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Major | Inland bathy data not available | Major |  |
| Improved response or timeliness | Major | Inland bathy data not available | Moderate |  |
| Improved customer experience | Major | Inland bathy data not available | Moderate |  |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Major | Inland bathy data not available | Moderate |  |
| Environmental | Moderate | Inland bathy data not available | Major |  |
| Public safety, including life and property | Moderate | Inland bathy data not available | Major |  |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Time savings description | Agencies such as the Maryland Department of Environment perform these tasks. Avoids contractual work to correct data. Collection at same QL level and resolution will save time trying to normalize data. | | |  | | |  | | |  | | |
| Cost savings/cost reduction | Major | Unable to provide |  | I don't know | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Cost avoidance | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Cost avoidance description | Contractor costs saved. | | |  | | |  | | |  | | |
| Increased revenues | I don't know | Unable to provide |  | None |  |  | None |  |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  | Major | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  | Major | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  | Moderate | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Improved customer experience | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Minor | | | Minor | | | Moderate | | |  | | |
| Environmental | Moderate | | | Major | | | Major | | |  | | |
| Public safety, including life and property | Major | | | Major | | | Major | | |  | | |

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

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

# MCA Title: Land Navigation and Safety



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization. |
| MCA Title | Land Navigation and Safety |
| MCA ID | 60219 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 19 - Land Navigation and Safety |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Nice to have |  |  |  |
| DTM | Required |  |  |  |
| DEM | Required |  |  |  |
| Raw point cloud data | Highly desirable |  |  |  |
| Classified point cloud | Highly desirable |  |  |  |
| Edited/cube XYZ |  |  |  |  |
| Full waveform | Nice to have |  |  |  |
| Bathymetric Attributed Grid (BAG) |  |  |  |  |
| Breaklines required for standard hydro-flattening | Highly desirable |  |  |  |
| Additional breaklines for hydro-enforcement of culverts | Highly desirable |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  |  |  |
| Tide Predictions |  |  |  |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  |  |  |
| Intensity imagery/sidescan imagery | Highly desirable |  |  |  |
| Ground control/ground truthing | Required |  |  |  |

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

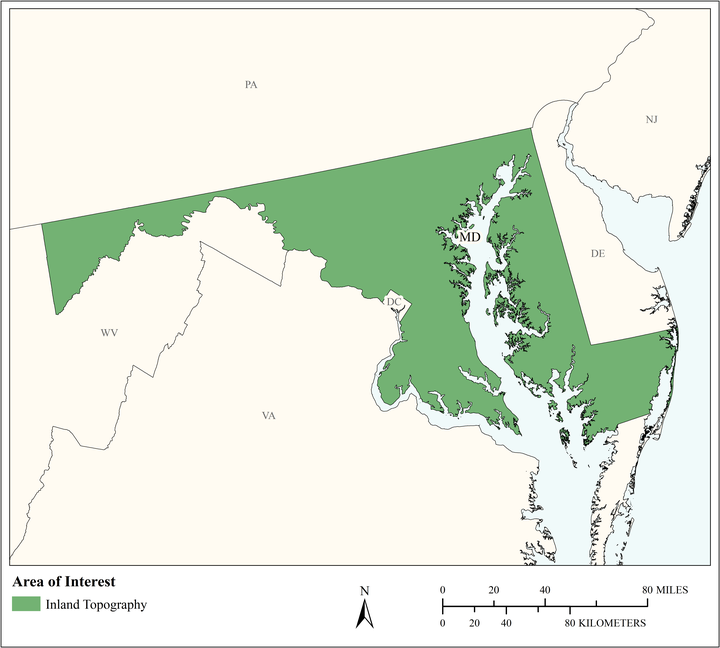
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost savings/cost reduction | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost avoidance | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Increased revenues | Minor | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Mission-driven performance improvements | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $128,085 |  |  |  |  |  |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved customer experience | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $10,343 |  |  |  |  |  |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Minor | | |  | | |  | | |  | | |
| Environmental | Major | | |  | | |  | | |  | | |
| Public safety, including life and property | Major | | |  | | |  | | |  | | |

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

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

# MCA Title: Aviation Navigation and Safety



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair. |
| MCA Title | Aviation Navigation and Safety |
| MCA ID | 60220 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 21 - Aviation Navigation and Safety |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Required |  |  |  |
| DTM | Required |  |  |  |
| DEM | Required |  |  |  |
| Raw point cloud data | Highly desirable |  |  |  |
| Classified point cloud | Highly desirable |  |  |  |
| Edited/cube XYZ |  |  |  |  |
| Full waveform | Highly desirable |  |  |  |
| Bathymetric Attributed Grid (BAG) |  |  |  |  |
| Breaklines required for standard hydro-flattening | Highly desirable |  |  |  |
| Additional breaklines for hydro-enforcement of culverts | Highly desirable |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  |  |  |
| Tide Predictions |  |  |  |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  |  |  |
| Intensity imagery/sidescan imagery | Highly desirable |  |  |  |
| Ground control/ground truthing | Required |  |  |  |

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

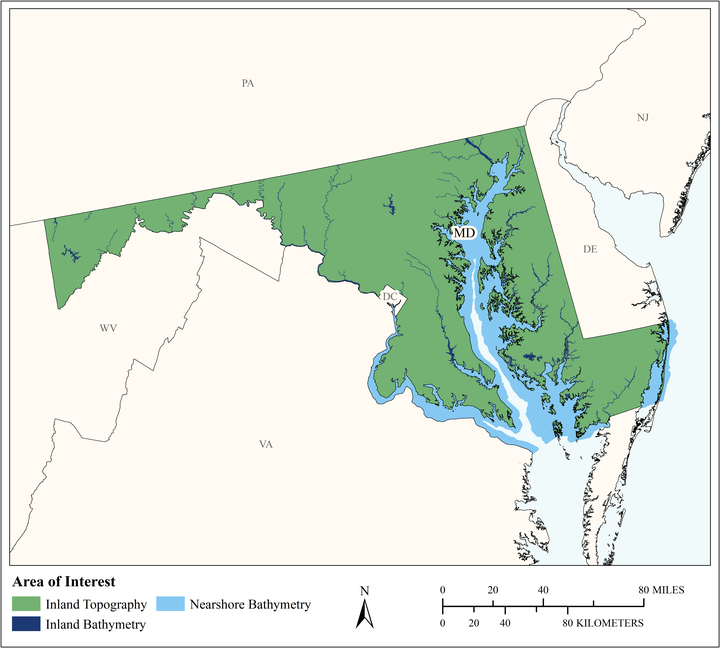
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost savings/cost reduction | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost avoidance | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Increased revenues | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $33,424 |  |  |  |  |  |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved customer experience | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $41,629 |  |  |  |  |  |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Minor | | |  | | |  | | |  | | |
| Environmental | Moderate | | |  | | |  | | |  | | |
| Public safety, including life and property | Moderate | | |  | | |  | | |  | | |

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

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

# MCA Title: Infrastructure and Construction Management



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change. |
| MCA Title | Infrastructure and Construction Management |
| MCA ID | 60221 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 22 - Infrastructure and Construction Management |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL0 HD | QL0B | QL1B |  |
| Update Frequency | 4-5 years | 4-5 years | 4-5 years |  |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Up to 50 cm | Up to 2 meters | Up to 2 meters |  |
| Acceptable Vertical Error | Up to 10 cm | Up to 30 cm | Up to 30 cm |  |
| How far onshore needed |  |  |  |  |
| How far down the beach profile needed |  |  |  |  |
| Tide correction requirement |  |  |  |  |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

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

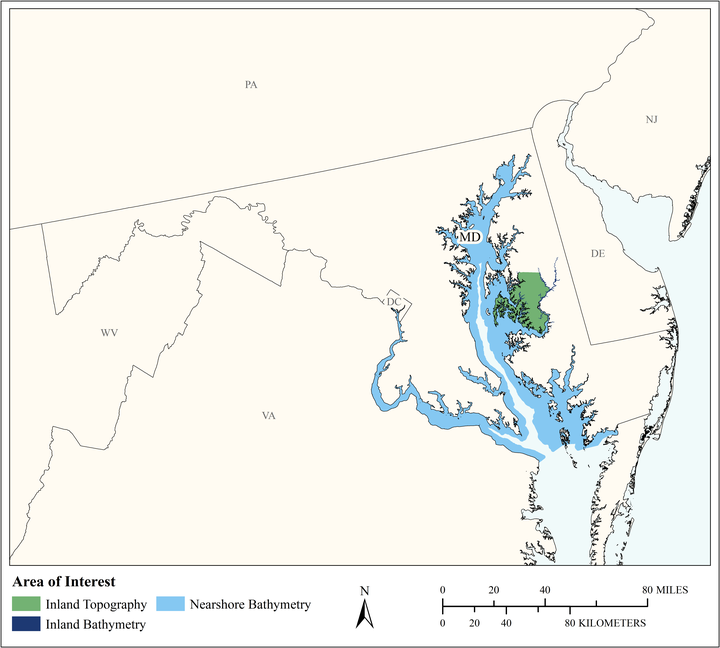
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  | Major | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Cost savings/cost reduction | Major | Unable to provide |  | Major | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Cost avoidance | Major | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Increased revenues | None |  |  | None |  |  | Minor | Unable to provide |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $444,339 |  | Annual dollars saved/ realized | $149,705 |  | Annual dollars saved/ realized | $3,671 |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  | Minor | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Improved customer experience | Major | Unable to provide |  | Minor | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $1,307,601 |  | Annual dollars saved/ realized | $15,545 |  | Annual dollars saved/ realized | $504 |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Minor | | | Minor | | | Minor | | |  | | |
| Environmental | Moderate | | | Moderate | | | Moderate | | |  | | |
| Public safety, including life and property | Major | | | Moderate | | | Major | | |  | | |

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

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

# MCA Title: Talbot County Government



| **MCA Area of Interest** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Data Type | Required | Required | Required |  |
| Geographic Area Requirements | One or more states, territories, or counties | Custom description | Custom description |  |
| Sub Area Requirements | Talbot County, MD | Miles River, Choptank River, Chesapeake Bay, Tred Avon River, Harris Creek, Tuchahoe River, and Wye River | Bay waters of Maryland |  |

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | The GIS staff in Talbot County Maryland actively supports all county departments including Emergency Services, Planning and Zoning, Permits and Inspections, Public Works, Parks and Recreation. We also provide GIS support to the municipalities, residential and business communities. Our primary engagement with issues regarding the need for high resolution elevation data include floodplain management, stormwater management, sea level rise, permitting in coastal communities, hazardous mitigation project, environmental planning and protection, tracking impervious surfaces, road maintenance, development review, damage assessment (tidal flooding), water and sewer service, water and sewer service extension planning, well head protection, emergency shelter evaluation, evacuation routes, boat ramp and landings maintenance, etc. |
| MCA Title | Talbot County Government |
| MCA ID | 1113 |
| Organization Type | Regional, County, City, or other local government |
| Organization Name | Talbot County Public Works |
| Sub-Agency or Division |  |
| Organization Mission | The Talbot County government is committed to providing the best possible service to the citizens who have given us their public trust. The County strives to preserve the rural and agricultural character of the area, while promoting economic development and protecting the environment and natural resources so that the special quality of life we enjoy remains intact. |
| Program Name | The development of the Talbot County Comprehensive Plan is the primary critical activity that established the goals and future activity. |
| Total Annual Program Budget |  |
| Primary Business Use | BU 23 - Urban and Regional Planning |
| Secondary Business Use | BU 15 - Flood Risk Management |
| Tertiary Business Use | BU 22 - Infrastructure and Construction Management |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | 50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.) |
| Smallest 3D features needed | Large features |
| Description of smallest 3D features | Road side ditches, drainage features through vegetated areas, sheds, barns, berms, |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL1 | QL2B | QL2B |  |
| Update Frequency | 6-10 years | 6-10 years | >10 years |  |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Up to 50 cm | Up to 1 meter | Up to 2 meters |  |
| Acceptable Vertical Error | Up to 20 cm | Up to 40 cm | Up to 40 cm |  |
| How far onshore needed |  |  | To Mean Higher High Water (MHHW) |  |
| How far down the beach profile needed | To MLLW |  | Below MLLW |  |
| Tide correction requirement |  |  | Any tide correction is acceptable, as long as it is defined |  |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

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

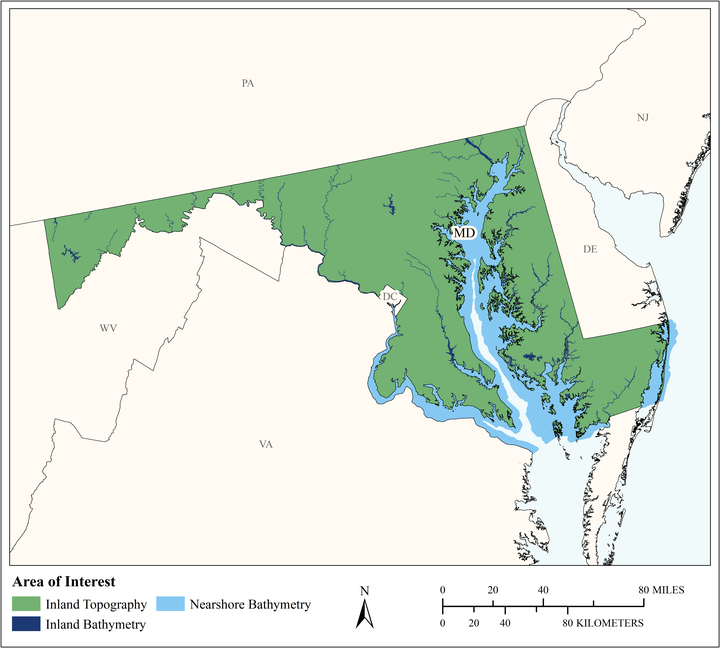
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | December 2015 LiDAR Sandy Supplemental DEM | NOAA National Ocean Service Bathymetry of the Chesapeake Bay and Tributaries (coarse) Approx 1998 plus or minus | NOAA NOS Chesapeake Bay and Tributaries (?10 meter?) DEM approx 1998 |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  |  |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories |  |  |  |  |
| State repositories used |  |  |  |  |
| Other | Yes | Yes | Yes |  |
| Other description | USGS / Local Files | NOAA NOS / Local files | NOAA NOS download from 1998ish |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Major | Minor | None |  |
| Cost savings/cost reduction | Major | Minor | None |  |
| Cost avoidance | Major | Minor | None |  |
| Increased revenues | I don't know | None | None |  |
| Mission-driven performance improvements | Major | Minor | None |  |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Major | Minor | Minor |  |
| Improved response or timeliness | Major | Minor | None |  |
| Improved customer experience | Major | Minor | Minor |  |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Major | Minor | None |  |
| Environmental | Major | Minor | None |  |
| Public safety, including life and property | Major | Minor | None |  |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Annual dollars saved/realized | $93,465 | Minor | Annual dollars saved/realized | $1,357 | Minor | Annual dollars saved/realized | $1,357 |  |  |  |
| Time savings description | Digital distribution avoids staff effort and improves customer service. Staff can better prepare and follow up with accurate information. Better information results in better design and decision making. Digital data can be displayed via web mapping and save valuable time. Answer here overlaps with hours saved in answers above. Improves site evaluation accuracy and reliability, better visuals. | | | 2 hrs @ 15 trips / 2. 2hrs @ 30 trips / 2. | | | 2hrs @ 30 trips / 2. 2 hrs @ 15 trips / 2. | | |  | | |
| Cost savings/cost reduction | Moderate | Annual dollars saved/realized | $200 | Minor | Annual dollars saved/realized | $625 | Minor | Annual dollars saved/realized | $625 |  |  |  |
| Cost savings/cost reduction description | Saved staff time on LiDAR collection and project management. | | | $50 @ 200 hrs / 8 yrs assuming 8 yr data collection cycle / 2. | | | $50 @ 200 hrs / 8 yrs assuming 8 yr data collection cycle / 2. | | |  | | |
| Cost avoidance | Major | Annual dollars saved/realized | $1,050 | Minor | Annual dollars saved/realized | $625 | Minor | Annual dollars saved/realized | $625 |  |  |  |
| Cost avoidance description | People will make a decision with or without the best data available. A problem avoided. Staff time saved. Derived products and added value analysis would save staff time. Improved decision making for hazardous mitigation projects. | | | $50 @ 200 hrs / 8 yrs / 2. | | | $50 @ 200 hrs / 8 yrs /2. | | |  | | |
| Increased revenues | None |  |  | Moderate | Annual dollars saved/realized | $13,500 | Moderate | Annual dollars saved/realized | $13,500 |  |  |  |
| Increased revenues description |  | | | Oyster bar restoration and water quality improvement / HTML benefits. Increased ability to identify habitat and environmental threats. | | | Oyster bar restoration and water quality improvement / HTML benefits. Increased ability to identify habitat and environmental threats. | | |  | | |
| Mission-driven performance improvements | Moderate | Annual percent improvement | 40% | Major | Annual percent improvement | 10% | Major | Annual percent improvement | 10% |  |  |  |
| Mission-driven performance improvements description |  | | | 80% / 8 yrs Environmental / water quality projects / maritime industry and tourism. 80% / 8 yrs. | | | 80% / 8 yrs Environmental / water quality projects / maritime industry and tourism. 80% / 8 yrs. | | |  | | |
| Other operational benefits | Major | Annual dollars saved/realized | $301,500 | Moderate | Annual dollars saved/realized | $376,875 | Moderate | Annual dollars saved/realized | $376,875 |  |  |  |
| Other operational benefits description | The general public still does not read or frequently use elevation data. Elevevation is largest untapped potential. | | | Improved SLOSH Models. Improvement in velocity wave action, wave height, and LIMWA designations. | | | Improved SLOSH Models. Improvement in velocity wave action, wave height, and LIMWA designations. | | |  | | |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Moderate | Annual dollars saved/realized | $650,000 | Minor | Annual dollars saved/realized | $401,875 | Minor | Annual dollars saved/realized | $401,875 |  |  |  |
| Value added to products or services description | Tidal flooding mitigation and improved floodplain policy. Public outreach maps with high value information easy to read. | | | Hazard identification relates to maritime safety / Flood hazard mitigation. Improved navigation products relates to more maritime related tourism. | | | Hazard identification relates to maritime safety / Flood hazard mitigation. Improved navigation products relates to more maritime related tourism. | | |  | | |
| Improved response or timeliness | Moderate | Annual dollars saved/realized | $13,568 | Minor | Annual dollars saved/realized | $9,250 | Minor | Annual dollars saved/realized | $9,250 |  |  |  |
| Improved response or timeliness description | Information resources become available for developers / buyers to protect their assets. Added value to be able to generate quick custom flood inundation maps. Better information results in better decisions both public and privately. Digital web products help. Both parties can reference the same high quality information. Better information system tools don't necessarily relate to faster approvals. Low probability but high impact. Better decision when allocating recovery resources. | | | Public outreach through interactive maps. Related to improved prediction of road closure. Hazardous mitigation decision making improved and implemented. Staff time savings. Improved product reliability and decision making resources. | | | Public outreach through interactive maps. Related to improved prediction of road closure. Hazardous mitigation decision making improved and implemented. Staff time savings. Improved product reliability and decision making resources. | | |  | | |
| Improved customer experience | Moderate | Annual dollars saved/realized | $48,240 | Moderate | Annual dollars saved/realized | $3,000 | Moderate | Annual dollars saved/realized | $3,000 |  |  |  |
| Improved customer experience description | Unknown future products will be helpful. Both staff and customers have access to the same high quality information. Easily searchable high quality GIS data for download is very valuable. | | | New data products for public outreach. Reliable authoritative source / easy to use and interpret. Better data equals better decision making. | | | New data products for public outreach. Reliable authoritative source / easy to use and interpret. Better data equals better decision making. | | |  | | |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Moderate | | | Moderate | | | Moderate | | |  | | |
| Education or outreach description | What if scenarios and easy to understand visuals will help educators | | | Improved data equals better tools for scientific and environmental impact analysis. | | | Improved data equals better tools for scientific and environmental impact analysis. | | |  | | |
| Environmental | Moderate | | | Moderate | | | Moderate | | |  | | |
| Environmental description | Analysis and decisions are made easy by open source high quality elevation data | | | Ability to measure and quantify with precision and adjust scientific methods | | | Ability to measure and quantify with precision and adjust scientific methods | | |  | | |
| Public safety, including life and property | Moderate | | | Moderate | | | Moderate | | |  | | |
| Public safety, including life and property description | Good and easy to understand visual tools will save lives | | | Hazard identification and improved navigation tools / emergency response improves | | | Hazard identification and improved navigation tools / emergency response improves | | |  | | |
| Other | Better land use decisions | | |  | | |  | | |  | | |
| Other benefits | Moderate | | |  | | |  | | |  | | |

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

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

# MCA Title: Land Use Planning and Analysis



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Land use analysis (includes residential growth and density analyses; land use/land cover mapping; analyses regarding the status, vulnerability, threat and stability of rural resource lands; and development capacity analyses) |
| MCA Title | Land Use Planning and Analysis |
| MCA ID | 1263 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | Maryland Department of Planning |
| Sub-Agency or Division |  |
| Organization Mission | The Maryland Department of Planning collaborates with state agencies, local governments and the private sector, providing assistance and data so that each community can shape their future in a way that reflects local values, honors its heritage and presents opportunities for Maryland to flourish. Planning facilitates the coordination of planning efforts statewide. Planning provides essential planning data, information and analysis for the state of Maryland. Planning plays an important role in preserving Maryland's heritage and conserving its natural resources |
| Program Name | Planning Services Division |
| Total Annual Program Budget |  |
| Primary Business Use | BU 23 - Urban and Regional Planning |
| Secondary Business Use | BU 06 - Natural Resources Conservation |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | Less than 1 sq mi |
| Smallest 3D features needed | Small features |
| Description of smallest 3D features | Building footprints, agricultural fields, and site development constraints such as steep slopes, wooded areas, and wetlands/waterways. We generally compile data at the individual property scale to complete analyses at larger scales (e.g. to generate larger generalized landscapes, or complete land use analysis at the zip code, town, or county scale). |

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

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

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

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

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

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

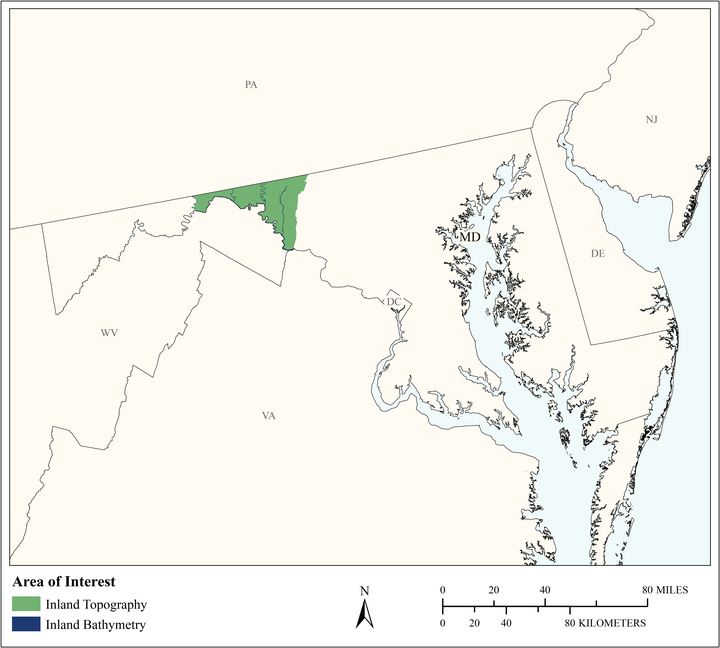
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | Lidar data for Maryland counties collected between 2011 and 2015. Point cloud and DEMs downloadable from MD iMap at http://imap.maryland.gov/Pages/lidar-download.aspx (Can Download Aspect, Shaded Relief, DEM, Hillshade, Slope and Point Cloud data) Point spacing varies by county (~0.46 to 1.4 meters). DEM Resolution ranges from ~0.6 m to 2m (http://imap.maryland.gov/Pages/lidar-metadata.aspx) | Lidar data for Maryland counties collected between 2011 and 2015. Point cloud and DEMs downloadable from MD iMap at http://imap.maryland.gov/Pages/lidar-download.aspx (Can Download Aspect, Shaded Relief, DEM, Hillshade, Slope and Point Cloud data) Point spacing varies by county (~0.46 to 1.4 meters). DEM Resolution ranges from ~0.6 m to 2m (http://imap.maryland.gov/Pages/lidar-metadata.aspx) | Not currently using nearshore bathymetric data |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  |  |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes | Yes |  |  |
| State repositories used | Lidar data are available through MdImap, a central GIS data portal for the State of Maryland: http://imap.maryland.gov/Pages/lidar-download.aspx Users can view the data interactively or download it. | Lidar data are available through MdImap, a central GIS data portal for the State of Maryland: http://imap.maryland.gov/Pages/lidar-download.aspx Users can view the data interactively or download it. |  |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | I don't know | I don't know | None |  |
| Cost savings/cost reduction | None | None | None |  |
| Cost avoidance | None | None | None |  |
| Increased revenues | None | None | None |  |
| Mission-driven performance improvements | Moderate | Moderate | None |  |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Moderate | Moderate | None |  |
| Improved response or timeliness | None | None | None |  |
| Improved customer experience | Moderate | Moderate | None |  |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | None | None | None |  |
| Environmental | Moderate | Moderate | None |  |
| Public safety, including life and property | I don't know | I don't know | None |  |

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Time savings description | Seamless integration of 3D data and derivatives would reduce the need to collect data from external sources for mapping purposes. Seamless integration of 3D data and derivatives would reduce the need to collect and align data from multiple sources. | | | Seamless integration of 3D data and derivatives would reduce the need to collect data from external sources for mapping purposes. Seamless integration of 3D data and derivatives would reduce the need to collect and align data from multiple sources. | | | Seamless integration of 3D data and derivatives would reduce the need to collect and align data from multiple sources. Seamless integration of 3D data and derivatives would reduce the need to collect data from external sources for mapping purposes. | | |  | | |
| Cost savings/cost reduction | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Cost avoidance | Moderate | Unable to provide |  | Moderate | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Cost avoidance description | High resolution land cover data (and derivatives) would improve the quality of site development constraint analyses. | | | High resolution land cover data (and derivatives) would improve the quality of site development constraint analyses. | | |  | | |  | | |
| Increased revenues | None |  |  | None |  |  | None |  |  |  |  |  |
| Mission-driven performance improvements | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Mission-driven performance improvements description | Improved 3D data would enhance land use analyses and related data products, comprehensive plan reviews, and technical assistance projects that may contribute to planning decisions. Additionally, it would enable visualization projects (e.g. flyovers for transit oriented development areas, site selection analyses, etc.). More accurate base data for land use analysis would contribute to the organization's mission to provide essential planning data, information and analysis for Maryland. | | | Improved 3D data would enhance land use analyses and related data products, comprehensive plan reviews, and technical assistance projects that may contribute to planning decisions. Additionally, it would enable visualization projects (e.g. flyovers for transit oriented development areas, site selection analyses, etc.). More accurate base data for land use analysis would contribute to the organization's mission to provide essential planning data, information and analysis for Maryland. Improved land use analyses based on improved land use / land cover data would facilitate planning decisions across the state. | | | Improved 3D data would enhance land use analyses and related data products, comprehensive plan reviews, and technical assistance projects that may contribute to planning decisions. Additionally, it would enable visualization projects (e.g. flyovers for transit oriented development areas, site selection analyses, etc.). More accurate base data for land use analysis would contribute to the organization's mission to provide essential planning data, information and analysis for Maryland. | | |  | | |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $2,660,327 |  |  |  |  |  |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Moderate | Unable to provide |  | Moderate | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Value added to products or services description | High resolution land cover data (and derivatives) would improve the quality of site development constraint analyses. | | | Many of our products (analyses) rely on an accurate land use/land cover dataset. | | | High resolution land cover data (and derivatives) would improve the quality of site development constraint analyses. | | |  | | |
| Improved response or timeliness | I don't know | Unable to provide |  | I don't know | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Improved customer experience | Moderate | Unable to provide |  | Moderate | Unable to provide |  | I don't know | Unable to provide |  |  |  |  |
| Improved customer experience description | Many of our products (analyses) rely on an accurate land use/land cover dataset. | | | Many of our products are analyses that rely on an accurate land use/land cover dataset. | | |  | | |  | | |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $307,136 |  |  |  |  |  |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | I don't know | | | I don't know | | | I don't know | | |  | | |
| Environmental | I don't know | | | I don't know | | | I don't know | | |  | | |
| Environmental description | Improved land use / land cover mapping may support natural resource conservation efforts | | | Improved land use / land cover mapping may support natural resource conservation efforts | | | Improved land use / land cover mapping may support natural resource conservation efforts. | | |  | | |
| Public safety, including life and property | I don't know | | | I don't know | | | I don't know | | |  | | |

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

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

# MCA Title: Mapping and GIS Support of Elevation Dependent County Government Activities



| **MCA Area of Interest** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Data Type | Required | Required |  |  |
| Geographic Area Requirements | One or more states, territories, or counties | One or more states, territories, or counties |  |  |
| Sub Area Requirements | Washington County, MD | Washington County, MD |  |  |

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | The Washington County GIS Office is the enterprise GIS hub for Washington County government. It supports all the other departments that have their own GIS staff and those smaller ones without any GIS staff. It establishes the Mission – Vision – Goals – and Objectives for the GIS on the county level. It also sets priorities and direction, sets an example of data stewardship and manages expectations. It coordinates policy, and assures quality through setting standards. |
| MCA Title | Mapping and GIS Support of Elevation Dependent County Government Activities |
| MCA ID | 11480 |
| Organization Type | Regional, County, City, or other local government |
| Organization Name | Washington County Maryland Government |
| Sub-Agency or Division |  |
| Organization Mission | The Washington County GIS Office is the enterprise GIS hub for Washington County government. It supports all the other departments that have their own GIS staff and those smaller ones without any GIS staff. It establishes the Mission – Vision – Goals – and Objectives for the GIS on the county level. It also sets priorities and direction, sets an example of data stewardship and manages expectations. It coordinates policy, and assures quality through setting standards. |
| Program Name | NextGen 9-1-1 |
| Total Annual Program Budget |  |
| Primary Business Use | BU 23 - Urban and Regional Planning |
| Secondary Business Use | BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management |
| Tertiary Business Use | BU 27 - Recreation |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area | Individual feature (e.g. single tree, single structure) |
| Smallest 3D features needed | Large features |
| Description of smallest 3D features | Groups of trees, house, building, roads |

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL2 | Cross sections and/or transects meet needs |  |  |
| Update Frequency | 6-10 years | Event driven only – Data need to coincide with a specific event. |  |  |
| Event type(s) |  | Major flood event. |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Up to 60 cm | Up to 1 meter |  |  |
| Acceptable Vertical Error | Up to 20 cm | Up to 60 cm |  |  |
| How far onshore needed |  |  |  |  |
| How far down the beach profile needed | Not applicable |  |  |  |
| Tide correction requirement |  |  |  |  |
| Cross sections and/or transects meet needs |  | Yes |  |  |
| Cross section/transect requirement |  | Every 100'; 1' accuracy |  |  |

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Required | Required |  |  |
| DTM | Required | Required |  |  |
| DEM | Required | Required |  |  |
| Raw point cloud data | Highly desirable | Highly desirable |  |  |
| Classified point cloud | Required | Required |  |  |
| Edited/cube XYZ |  | Highly desirable |  |  |
| Full waveform | Highly desirable | Highly desirable |  |  |
| Bathymetric Attributed Grid (BAG) |  | Highly desirable |  |  |
| Breaklines required for standard hydro-flattening | Required | Required |  |  |
| Additional breaklines for hydro-enforcement of culverts | Required |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  |  |  |
| Tide Predictions |  |  |  |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  |  |  |
| Intensity imagery/sidescan imagery | Highly desirable | Highly desirable |  |  |
| Ground control/ground truthing | Required | Required |  |  |

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

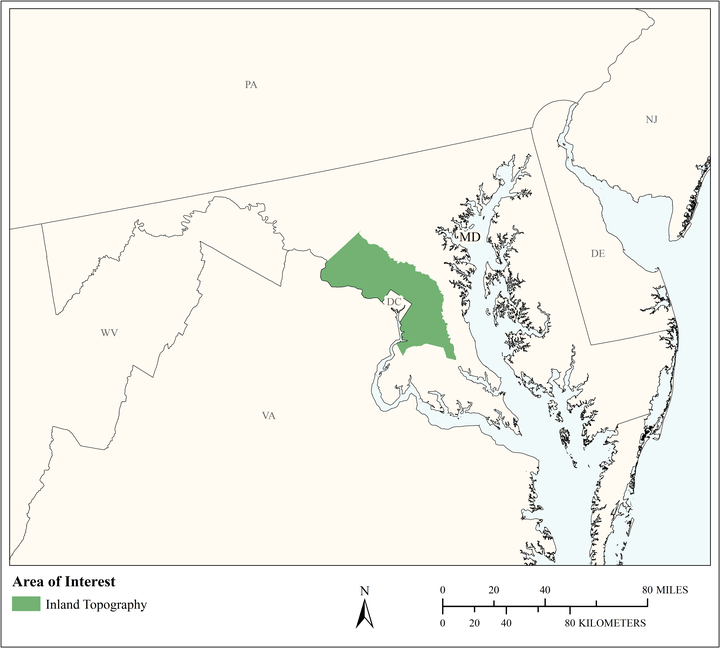
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | LAS 1.2 files: Dewberry collected LiDAR for Washington County, MD. The acquisition was performed by Geodigital. The nominal pulse spacing for this project is 1.6 ft (0.5 meters). This project was collected with a sensor which collects intensity values for each discrete pulse extracted from the waveform. GPS Week Time, Intensity, Flightline and echo number attributes were provided for each LiDAR point. Dewberry used proprietary procedures to classify the LAS according to contract specifications: 1-Unclassified, 2-Ground, 7-Noise, 9-Water, 10-Ignored Ground due to breakline proximity, and 11-Withheld. | None |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  |  |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  | Yes |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories | Yes | Yes |  |  |
| State repositories used | MDimap | MDimap |  |  |
| Other | Yes |  |  |  |
| Other description | In-house |  |  |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Major | None |  |  |
| Cost savings/cost reduction | Major | None |  |  |
| Cost avoidance | Major | None |  |  |
| Increased revenues | Major | None |  |  |
| Mission-driven performance improvements | Major | None |  |  |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Major | None |  |  |
| Improved response or timeliness | Major | None |  |  |
| Improved customer experience | Major | None |  |  |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Major | None |  |  |
| Environmental | Major | None |  |  |
| Public safety, including life and property | Major | None |  |  |

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

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

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

# MCA Title: Development Review, Floodplain Management, Property Mapping, and Parks Planning and Management



| **MCA Area of Interest** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Data Type | Required |  |  |  |
| Geographic Area Requirements | One or more states, territories, or counties |  |  |  |
| Sub Area Requirements | Montgomery and Prince George's Counties, MD |  |  |  |

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | We are responsible for development review, floodplain management, property mapping, and parks planning and management. All require accurate elevation information. |
| MCA Title | Development Review, Floodplain Management, Property Mapping, and Parks Planning and Management |
| MCA ID | 21525 |
| Organization Type | Regional, County, City, or other local government |
| Organization Name | Maryland National Capital Planning Commission (MNCPPC) |
| Sub-Agency or Division |  |
| Organization Mission | Regional Planning Parks and Recreation Management |
| Program Name | All Park and Planning programs. |
| Total Annual Program Budget |  |
| Primary Business Use | BU 23 - Urban and Regional Planning |
| Secondary Business Use | BU 15 - Flood Risk Management |
| Tertiary Business Use | BU 27 - Recreation |

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

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

| **Requirements** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Quality Level/IHO Order | QL2 |  |  |  |
| Update Frequency | 2-3 years |  |  |  |
| Event type(s) |  |  |  |  |
| Quality Level and/or update frequency variability across AOI |  |  |  |  |
| Acceptable Horizontal Error | Less than 20 cm |  |  |  |
| Acceptable Vertical Error | Up to 10 cm |  |  |  |
| How far onshore needed |  |  |  |  |
| How far down the beach profile needed | Not applicable |  |  |  |
| Tide correction requirement |  |  |  |  |
| Cross sections and/or transects meet needs |  |  |  |  |
| Cross section/transect requirement |  |  |  |  |

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

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

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

| **Importance of Integration with Other Datasets** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Hydrographic survey data |  |  |  |  |
| Nautical and/or navigation charts |  |  |  |  |
| Acoustic imagery of the seafloor |  |  |  |  |
| Aerial and/or satellite imagery | Required |  |  |  |
| Underwater videography |  |  |  |  |
| Bottom texture |  |  |  |  |
| Bottom type |  |  |  |  |
| Submerged features |  |  |  |  |
| Subbottom characteristics |  |  |  |  |
| Geologic and seismic data | Not required |  |  |  |
| Water column properties - Physical |  |  |  |  |
| Water column properties - Chemical |  |  |  |  |
| Water column properties - Biological |  |  |  |  |
| Currents |  |  |  |  |
| Tide/wave heights |  |  |  |  |
| Sea ice conditions |  |  |  |  |
| Habitat distribution and classification |  |  |  |  |
| Boundaries |  |  |  |  |
| Routes |  |  |  |  |
| Offshore cadastral |  |  |  |  |
| Lease areas |  |  |  |  |
| Fixed obstructions |  |  |  |  |
| Floating observation/navigation systems |  |  |  |  |
| Shorelines – current, historic, change rates | Required |  |  |  |
| Land use/land cover | Required |  |  |  |
| Wetlands | Required |  |  |  |
| Estuaries |  |  |  |  |
| Inland surface water features | Required |  |  |  |
| Bridges/culverts | Required |  |  |  |
| Landmark features | Required |  |  |  |
| Cultural resources | Required |  |  |  |
| Coastal and riverine structures | Required |  |  |  |
| Overhead structures |  |  |  |  |
| Lowest Floor Elevation of Buildings | Required |  |  |  |

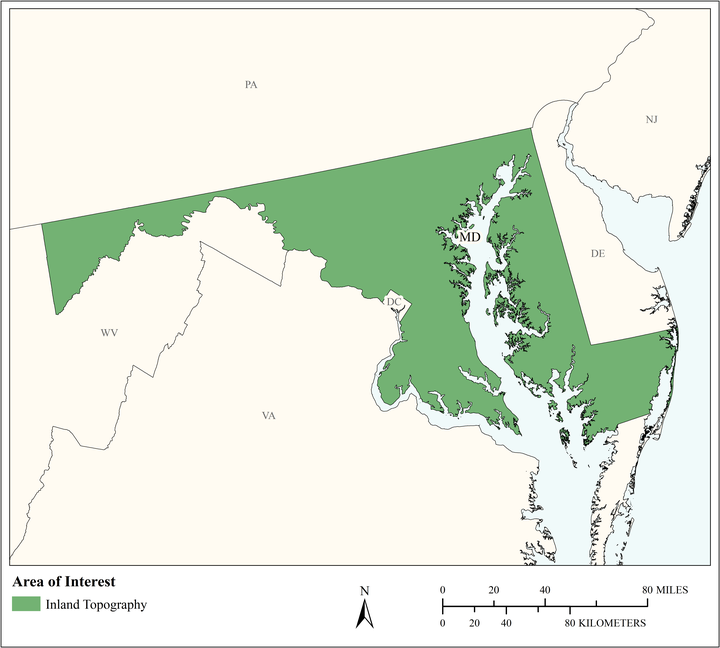
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used | Locally acquired lidar |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| National Map |  |  |  |  |
| Digital Coast |  |  |  |  |
| NCEI |  |  |  |  |
| Open Topography |  |  |  |  |
| NOAA nautical charts |  |  |  |  |
| USACE navigation charts |  |  |  |  |
| USGS Inland Waters server |  |  |  |  |
| USGS data series |  |  |  |  |
| Marine Minerals Program GIS |  |  |  |  |
| State Repositories |  |  |  |  |
| State repositories used |  |  |  |  |
| Other | Yes |  |  |  |
| Other description | Local acquisition |  |  |  |
| Data that meet my needs are not available |  |  |  |  |
| **Current Operational Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Time savings | Major |  |  |  |
| Cost savings/cost reduction | Moderate |  |  |  |
| Cost avoidance | Moderate |  |  |  |
| Increased revenues | Minor |  |  |  |
| Mission-driven performance improvements | Major |  |  |  |
| **Current Customer Service Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Value added to products or services | Moderate |  |  |  |
| Improved response or timeliness | Moderate |  |  |  |
| Improved customer experience | Moderate |  |  |  |
| **Current Societal Benefits** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| Education or outreach | Moderate |  |  |  |
| Environmental | Moderate |  |  |  |
| Public safety, including life and property | Minor |  |  |  |

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

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

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

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



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Assessment of risk for natural hazards (e.g., sinkholes, flooding) to inform insurance policy rates and the determination of mandatory insurance. Building permit compliance. |
| MCA Title | Real Estate, Banking, Mortgage, and Insurance |
| MCA ID | 60222 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 25 - Real Estate, Banking, Mortgage, and Insurance |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Highly desirable |  |  |  |
| DTM | Required |  |  |  |
| DEM | Required |  |  |  |
| Raw point cloud data | Nice to have |  |  |  |
| Classified point cloud | Required |  |  |  |
| Edited/cube XYZ |  |  |  |  |
| Full waveform | Nice to have |  |  |  |
| Bathymetric Attributed Grid (BAG) |  |  |  |  |
| Breaklines required for standard hydro-flattening | Nice to have |  |  |  |
| Additional breaklines for hydro-enforcement of culverts | Nice to have |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  |  |  |
| Tide Predictions |  |  |  |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  |  |  |
| Intensity imagery/sidescan imagery | Highly desirable |  |  |  |
| Ground control/ground truthing | Required |  |  |  |

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

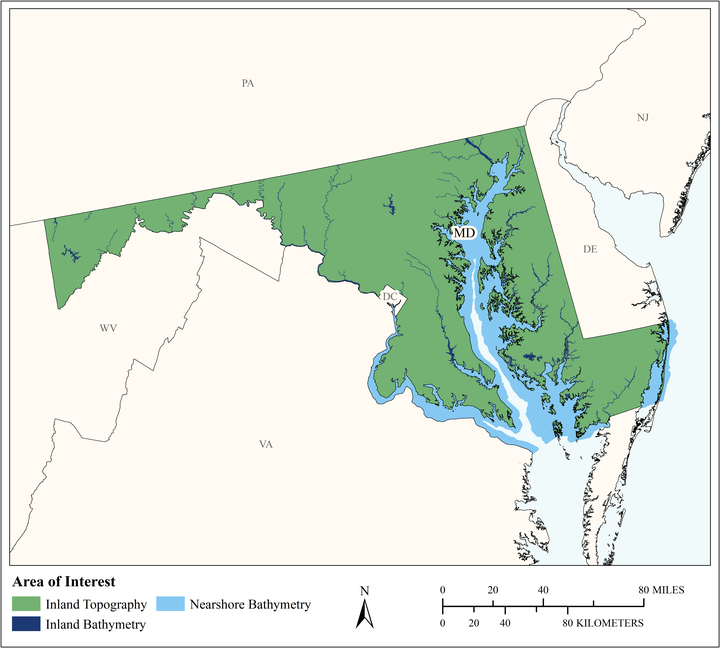
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost savings/cost reduction | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Cost avoidance | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Increased revenues | Minor | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $343,543 |  |  |  |  |  |  |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| Improved customer experience | Moderate | Unable to provide |  |  |  |  |  |  |  |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Minor | | |  | | |  | | |  | | |
| Environmental | Minor | | |  | | |  | | |  | | |
| Public safety, including life and property | Major | | |  | | |  | | |  | | |

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

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

# MCA Title: Education K12 and Beyond, Basic Research



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Development of 3-D visualizations to help students understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific research. Data dissemination. Development of training simulators. |
| MCA Title | Education K12 and Beyond, Basic Research |
| MCA ID | 60223 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 26 - Education K12 and Beyond, Basic Research |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Highly desirable | Highly desirable | Required |  |
| DTM | Required | Highly desirable | Required |  |
| DEM | Required | Required | Required |  |
| Raw point cloud data | Required | Required | Required |  |
| Classified point cloud | Required | Required | Highly desirable |  |
| Edited/cube XYZ |  | Nice to have | Nice to have |  |
| Full waveform | Nice to have | Nice to have | Nice to have |  |
| Bathymetric Attributed Grid (BAG) |  | Nice to have | Highly desirable |  |
| Breaklines required for standard hydro-flattening | Highly desirable | Highly desirable |  |  |
| Additional breaklines for hydro-enforcement of culverts | Highly desirable |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  | Highly desirable |  |
| Tide Predictions |  |  | Highly desirable |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  | Nice to have |  |
| Intensity imagery/sidescan imagery | Nice to have | Highly desirable | Nice to have |  |
| Ground control/ground truthing | Highly desirable | Highly desirable | Required |  |

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

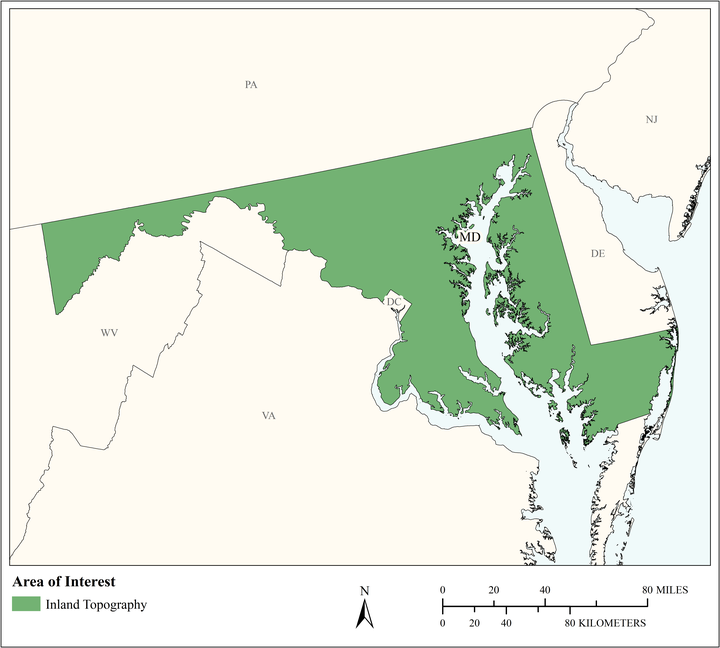
| **Benefits of Currently Used Elevation Data** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| Current dataset used |  |  |  |  |
| **Where current elevation data are accessed** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy**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

| **Future Benefits if Elevation Data Requirements Are Met** | **Inland Topo** | | | **Inland Bathy** | | | **Nearshore Bathy** | | | **Offshore Bathy** | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Future Operational Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Time savings | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Cost savings/cost reduction | Major | Unable to provide |  | Major | Unable to provide |  | Minor | Unable to provide |  |  |  |  |
| Cost avoidance | Major | Unable to provide |  | Major | Unable to provide |  | Moderate | Unable to provide |  |  |  |  |
| Increased revenues | Minor | Unable to provide |  | Minor | Unable to provide |  | Minor | Unable to provide |  |  |  |  |
| Mission-driven performance improvements | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Potential future annual operational benefits added during validation |  | Annual dollars saved/ realized | $51,959 |  | Annual dollars saved/ realized | $13,588 |  | Annual dollars saved/ realized | $1,152 |  |  |  |
| **Future Customer Service Benefits** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** | **Benefits** | **Units** | **Amount** |
| Value added to products or services | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Improved response or timeliness | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Improved customer experience | Major | Unable to provide |  | Major | Unable to provide |  | Major | Unable to provide |  |  |  |  |
| Potential future annual customer service benefits added during validation |  | Annual dollars saved/ realized | $124,198 |  |  |  |  | Annual dollars saved/ realized | $45 |  |  |  |
| **Societal Benefits** | **Benefits** | | | **Benefits** | | | **Benefits** | | | **Benefits** | | |
| Education or outreach | Major | | | Major | | | Major | | |  | | |
| Environmental | Major | | | Major | | | Major | | |  | | |
| Public safety, including life and property | Major | | | Major | | | Minor | | |  | | |

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

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

# MCA Title: Telecommunications



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

|  |  |
| --- | --- |
| **MCA Description** | **Response** |
| Mission Critical Activity | Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment. |
| MCA Title | Telecommunications |
| MCA ID | 60224 |
| Organization Type | State or U.S. Territorial government |
| Organization Name | State of Maryland |
| Sub-Agency or Division |  |
| Organization Mission |  |
| Program Name |  |
| Total Annual Program Budget |  |
| Primary Business Use | BU 28 - Telecommunications |
| Secondary Business Use |  |
| Tertiary Business Use |  |

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

| **General Geographic Area and Size** |  |
| --- | --- |
| Average geographic extent of day-to-day area |  |
| Smallest 3D features needed |  |
| Description of smallest 3D features |  |

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

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

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

| **Importance of 3D Products** | **Inland Topo** | **Inland Bathy** | **Nearshore Bathy** | **Offshore Bathy** |
| --- | --- | --- | --- | --- |
| DSM | Highly desirable |  |  |  |
| DTM | Highly desirable |  |  |  |
| DEM | Highly desirable |  |  |  |
| Raw point cloud data | Highly desirable |  |  |  |
| Classified point cloud | Required |  |  |  |
| Edited/cube XYZ |  |  |  |  |
| Full waveform | Highly desirable |  |  |  |
| Bathymetric Attributed Grid (BAG) |  |  |  |  |
| Breaklines required for standard hydro-flattening | Highly desirable |  |  |  |
| Additional breaklines for hydro-enforcement of culverts | Highly desirable |  |  |  |
| National Vertical Datum Transformation Tool (V-Datum) |  |  |  |  |
| Tide Predictions |  |  |  |  |
| Tidal Constituent And Residual Interpolation (TCARI) |  |  |  |  |
| Intensity imagery/sidescan imagery | Highly desirable |  |  |  |
| Ground control/ground truthing | Highly desirable |  |  |  |

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

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

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

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

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