Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed

1.1. Name of the Data, data collection Project, or data-producing Program:
2013 USGS Lidar: Norfolk (VA)

1.2. Summary description of the data:
Laser Mapping Specialist, Inc (LMSI) and The Atlantic Group (Atlantic) provided high accuracy, calibrated multiple return LiDAR for roughly 1,130 square miles around Norfolk, Virgina that either fully or partially cover the Virginia counties of Chesapeake, Hampton, James City, Newport News, Norfolk, Poquoson City, Portsmouth, Suffolk, Virginia Beach, Williamsburg, and York as well as the North Carolina counties of Camden and Currituck. The nominal point spacing for this project was no greater than 1 point every 0.7 meters. Dewberry used proprietary procedures to classify the LAS according to project specifications: 1-Unclassified, 2-Ground, 7-Noise, 9-Water, 10-Ignored Ground, 11-Withheld Points. OCM reclassified class 11 points to Class 15 - (as needed: Witheld Points). Dewberry produced 3D breaklines and combined these with the final LiDAR data to produce seamless hydro flattened DEMs for the 1,458 (1500 m x 1500 m) UTM tiles and the 1,400 (5000 ft x 5000ft) State Plane tiles that cover the project area.

1.3. Is this a one-time data collection, or an ongoing series of measurements?
One-time data collection

1.4. Actual or planned temporal coverage of the data:
2013-03-21 to 2013-04-05

1.5. Actual or planned geographic coverage of the data:
W: -76.759887, E: -75.860149, N: 37.382867, S: 36.522422

1.6. Type(s) of data:
(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
las

1.7. Data collection method(s):
(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys,

enforcement activities, numerical model, etc.)

1.8. If data are from a NOAA Observing System of Record, indicate name of system:

1.8.1. If data are from another observing system, please specify:

2. Point of Contact for this Data Management Plan (author or maintainer)

2.1. Name:
NOAA Office for Coastal Management (NOAA/OCM)

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:
NOAA Office for Coastal Management (NOAA/OCM)

2.4. E-mail address:
coastal.info@noaa.gov

2.5. Phone number:
(843) 740-1202

3. Responsible Party for Data Management
Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:

3.2. Title:
Data Steward

4. Resources
Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

5. Data Lineage and Quality
NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible

(describe or provide URL of description):

Process Steps:

- 2013-03-01 00:00:00 - The Atlantic Group (Atlantic) and Laser Mapping Specialist, Inc (LMSI) completed LiDAR data acquisition and data calibration for the USGS Norfolk, VA LiDAR project area. The project area included approximately 1,130 contiguous square miles for portions of Virginia and North Carolina. Dewberry elected to subcontract the LiDAR Acquisition and Calibration activities to The Atlantic Group (Atlantic) and Laser Mapping Specialist Inc (LMSI). Atlantic and LMSI were responsible for providing LiDAR acquisition, calibration and delivery of LiDAR data files to Dewberry. Dewberry received high accuracy, calibrated multiple return swath data from Atlantic on May 21, 2013 and from LMSI on June 5, 2013. Atlantic operated a Cessna T-210 (Tail Number N732JE) outfitted with a LEICA ALS70-HP LiDAR system during the collection of the Southern portion of the study area. LIDAR acquisition began on March 25, 2013 and was completed on April 5, 2013. The flight plan was flown as planned with no modifications. There were no unusual occurrences during the acquisition and the sensor performed within specifications. There were 65 flight lines required to complete the project. Atlantic planned 64 passes for the Southern portion of the project area as a series of parallel flight lines with cross flightlines for the purposes of quality control. The flight plan included zigzag flight line collection as a result of the inherent IMU drift associated with all IMU systems. In order to reduce any margin for error in the flight plan, Atlantic followed FEMAs Appendix A guidelines for flight planning and, at a minimum, includes the following criteria: A digital flight line layout using LEICA MISSION PRO flight design software for direct integration into the aircraft flight navigation system. Planned flight lines; flight line numbers; and coverage area. LiDAR coverage extended by a predetermined margin beyond all project borders to ensure necessary over-edge coverage appropriate for specific task order deliverables. Local restrictions related to air space and any controlled areas have been investigated so that required permissions can be obtained in a timely manner with respect to schedule. Additionally, Atlantic Group will file our flight plans as required by local Air Traffic Control (ATC) prior to each mission. Atlantic monitored weather and atmospheric conditions and conducted LiDAR missions only when no conditions exist below the sensor that will affect the collection of data. These conditions include leaf-off for hardwoods, no snow, rain, fog, smoke, mist and low clouds. LiDAR systems are active sensors, not requiring light, thus missions may be conducted during night hours when weather restrictions do not prevent collection. Atlantic accesses reliable weather sites and indicators (webcams) to establish the highest probability for successful collection in order to position our sensor to maximize successful data acquisition. Within 72-hours prior to the planned day(s) of acquisition, Atlantic closely monitored the weather, checking all sources for forecasts at least twice daily. As soon as weather conditions were conducive to acquisition, our aircraft mobilized to the project site to begin data collection. Once

on site, the acquisition team took responsibility for weather analysis. Atlantic LiDAR sensors are calibrated at a designated site located at the Lawrence County Airport in Courtland, Alabama and are periodically checked and adjusted to minimize corrections at project sites.
- 2013-03-01 00:00:00 - All surveys were performed to Federal Geodetic Control Subcommittee (FGCS) FGCS guidelines. Atlantic Group maximized existing NGS control and the ALDOT CORS stations to provide the control network, designed with proper redundancies, session occupation times, and time between sessions according to the applicable NOS technical standards. GPS observations were conducted using Federal Geodetic Control Committee (FGCC) approved dual frequency GPS receivers. A minimum of two fixed-height tripods were used as ground base stations running at a one (1.0) second epoch collection rate during every mission, typically at a minimum of four hours. The control locations are planned to ensure a 28km baseline distance from the furthest flight line distance. All mission collections were conducted with a PDOP of 3.2 or lower. Also, the KP index is considered prior to mission collection and no collection occurred when the KP index was at or above 4. Airborn GPS Kinematic LEICA IPAS TC was used to post process the airborne solutions for the mission. IGS08 (EPOCH 2013.1011) coordinates from the OPUS solutions was used in the post processing. Generation and Calibration of Laser Points (raw data) Data collected by the LiDAR unit is reviewed for completeness, acceptable density and to make sure all data is captured without errors or corrupted values. In addition, all GPS, aircraft trajectory, mission information, and ground control files are reviewed and logged into a database. On a project level, a supplementary coverage check is carried out to ensure no data voids are present. The initial points for each mission calibration are inspected for flight line errors, flight line overlap, slivers or gaps in the data, point data minimums, or issues with the LiDAR unit or GPS. Roll, pitch and scanner scale are optimized during the calibration process until the relative accuracy is met. Relative accuracy and internal quality are checked using at least 3 regularly spaced QC blocks in which points from all lines are loaded and inspected. Vertical differences between ground surfaces of each line are displayed. Color scale is adjusted so that errors greater than the specifications are flagged. Cross sections are visually inspected across each block to validate point to point, flight line to flight line and mission to mission agreement. Deliverables for the project included a raw (unclassified) calibrated LiDAR point cloud, survey control, and a final control report. Overall the LiDAR data products collected by Atlantic meet or exceed the requirements set out in the Statement of Work. The quality control requirements of Atlantics quality management program were adhered to throughout the acquisition stage fo this project to ensure product quality. For this project the specifications used are as follow: Relative accuracy <= 6cm RMSEZ within individual swaths and < =8 cm RMSEZ or within swath overlap (between adjacent swaths). UTM coordinate system, meters, zone 18, horizontal datum NAD83, vertical datum NAVD88, Geoid 12A
- 2013-03-01 00:00:00 - The Atlantic Group (Atlantic) and Laser Mapping Specialist,

Inc (LMSI) completed LiDAR data acquisition and data calibration for the USGS Norfolk, VA LiDAR project area. The project area included approximately 1,130 contiguous square miles for portions of Virginia and North Carolina. Dewberry elected to subcontract the LiDAR Acquisition and Calibration activities to The Atlantic Group (Atlantic) and Laser Mapping Specialist Inc (LMSI). Atlantic and LMSI were responsible for providing LiDAR acquisition, calibration and delivery of LiDAR data files to Dewberry. Dewberry received high accuracy, calibrated multiple return swath data from Atlantic on May 21, 2013 and from LMSI on June 5, 2013. LMSI planned 90 passes for the Northern portion of the project area as a series of parallel flight lines with cross flightlines for the purposes of quality control. The flight plan included zigzag flight line collection as a result of the inherent IMU drift associated with all IMU systems. In order to reduce any margin for error in the flight plan, LMSI followed FEMAs Appendix A guidelines for flight planning and, at a minimum, includes the following criteria: A digital flight line layout using ALTM-NAV flight management software for direct integration into the aircraft flight navigation system. Planned flight lines; flight line numbers; and coverage area. LiDAR coverage extended by a predetermined margin beyond all project borders to ensure necessary over-edge coverage appropriate for specific task order deliverables. Local restrictions related to air space and any controlled areas have been investigated so that required permissions can be obtained in a timely manner with respect to schedule. Additionally LMSI will file our flight plans as required by local Air Traffic Control (ATC) prior to each mission. LMSI monitored weather and atmospheric conditions and conducted LiDAR missions only when no conditions exist below the sensor that will affect the collection of data. These conditions include leaf-off for hardwoods, no snow, rain, fog, smoke, mist and low clouds. LiDAR systems are active sensors, not requiring light, thus missions may be conducted during night hours when weather restrictions do not prevent collection. LMSI accesses reliable weather sites and indicators (webcams) to establish the highest probability for successful collection in order to position our sensor to maximize successful data acquisition. Within 72-hours prior to the planned day(s) of acquisition, LMSI closely monitored the weather, checking all sources for forecasts at least twice daily. As soon as weather conditions were conducive to acquisition, our aircraft mobilized to the project site to begin data collection. Once on site, the acquisition team took responsibility for weather analysis.
- 2013-03-01 00:00:00 - All airborne GPS trajectories were processed and checked on site. All trajectories were very high quality with forward/revers separation between 2cm-5cm. The initial step of calibration is to verify availability and status of all needed GPS and Laser data against field notes and compile any data if not complete. If a calibration error greater than specification is observed within the mission, the roll, pitch and scanner scale corrections that need to be applied are calculated. The missions with the new calibration values are regenerated and validated internally once again to ensure quality. Data collected by the LiDAR unit is reviewed for completeness, acceptable density and to make sure all data is captured without errors or corrupted values. In addition, all GPS, aircraft trajectory, mission

information, and ground control files are reviewed and logged into a database. On a project level, a supplementary coverage check is carried out to ensure no data voids unreported by Field Operations are present. The initial points for each mission calibration are inspected for flight line errors, flight line overlap, slivers or gaps in the data, point data minimums, or issues with the LiDAR unit or GPS. Roll, pitch and scanner scale are optimized during the calibration process until the relative accuracy is met. Relative accuracy and internal quality are checked using at least 3 regularly spaced QC blocks in which points from all lines are loaded and inspected. Vertical differences between ground surfaces of each line are displayed. Color scale is adjusted so that errors greater than the specifications are flagged. Cross sections are visually inspected across each block to validate point to point, flight line to flight line and mission to mission agreement. Deliverables for the project included a raw (unclassified) calibrated LiDAR point cloud, survey control, and a final control report. Overall the LiDAR data products collected by LMSI meet or exceed the requirements set out in the Statement of Work. The quality control requirements of LMSIs quality management program were adhered to throughout the acquisition stage fo this project to ensure product quality. For this project the specifications used are as follow: Relative accuracy <= 6cm RMSEZ within individual swaths and <=8 cm RMSEZ or within swath overlap (between adjacent swaths). UTM coordinate system, meters, zone 18, horizontal datum NAD83, vertical datum NAVD88, Geoid 12A

- 2013-04-01 00:00:00 - Dewberry utilizes a variety of software suites for inventory management, classification, and data processing. All LiDAR related processes begin by importing the data into the GeoCue task management software. The swath data is tiled according to project specifications (1,500 m x 1,500 m). The tiled data is then opened in Terrascan where Dewberry uses proprietary ground classification routines to remove any non-ground points and generate an accurate ground surface. Before the actual ground routine is run points with scan angles greater than plus or minus 19 degrees are classified to class 11, withheld. Due to these higher scan angles these points have the potential to introduce issues into the ground and are therefore not used in the final ground surface. The ground routine consists of three main parameters (building size, iteration angle, and iteration distance); by adjusting these parameters and running several iterations of this routine an initial ground surface is developed. The building size parameter sets a roaming window size. Each tile is loaded with neighboring points from adjacent tiles and the routine classifies the data section by section based on this roaming window size. The second most important parameter is the maximum terrain angle, which sets the highest allowed terrain angle within the model. Once the ground routine has been completed a manual quality control routine is done using hillshades, cross-sections, and profiles within the Terrasolid software suite. After this QC step, a peer review and supervisor manual inspection is completed on a percentage of the classified tiles based on the project size and variability of the terrain. After the ground classification corrections were completed, the dataset was processed through a water classification routine that utilizes breaklines compiled

by Dewberry to automatically classify hydrographic features. The water classification routine selects ground points within the breakline polygons and automatically classifies them as class 9, water. During this water classification routine, points that are within 1 meter of the hydrographic features are moved to class 10, an ignored ground due to breakline proximity. In addition to classes 1, 2, 9, 10, and 11, there is a Class 7, noise points . This class was used for both low and high noise points. The fully classified dataset is then processed through Dewberry's comprehensive quality control program. The data was classified as follows: Class 1 = Unclassified. This class includes vegetation, buildings, noise etc. Class 2 = Ground Class 7= Noise Class 9 = Water Class 10=Ignored Class 11=Withheld Points The LAS header information was verified to contain the following: Class (Integer) Adjusted GPS Time (0.0001 seconds) Easting (0.003 m) Northing (0.003 m) Elevation (0.003 m) Echo Number (Integer 1 to 4) Echo (Integer 1 to 4) Intensity (8 bit integer) Flight Line (Integer) Scan Angle (Integer degree)
- 2014-09-24 00:00:00 - The NOAA Office for Coastal Management (OCM) received the topographic lidar files in LAS format from USGS. The files contained lidar easting, northing, elevation, intensity, return number, etc. The data was received in State Plane Virginia South 4502 NAD83 NADCON (US ft) and NAVD88 (US ft). OCM performed the following processing for data storage and Digital Coast provisioning purposes: 1. The files were reviewed and erroneous elevations were removed. 2. Class 11 points (Witheld Points) were reclassified to Class 15 (as needed) to fit OCM DAV class scheme.

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):

6. Data Documentation

The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?

No

6.1.1. If metadata are non-existent or non-compliant, please explain:

Missing/invalid information:
- 1.7. Data collection method(s)
- 3.1. Responsible Party for Data Management
- 4.1. Have resources for management of these data been identified?
- 4.2. Approximate percentage of the budget for these data devoted to data management

- 5.2. Quality control procedures employed
- 7.1. Do these data comply with the Data Access directive?
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.1.2. If there are limitations to data access, describe how data are protected
- 7.4. Approximate delay between data collection and dissemination
- 8.1. Actual or planned long-term data archive location
- 8.3. Approximate delay between data collection and submission to an archive facility
- 8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

6.2. Name of organization or facility providing metadata hosting:

NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:

https://www.fisheries.noaa.gov/inport/item/50134

6.4. Process for producing and maintaining metadata

(describe or provide URL of description):

Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access

NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:

NOAA Office for Coastal Management (NOAA/OCM)

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:
https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=4699
https://noaa-nos-coastal-lidar-pds.s3.amazonaws.com/laz/geoid18/4699/index.html

7.3. Data access methods or services offered:
This data can be obtained on-line at the following URL:

https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=4699;

7.4. Approximate delay between data collection and dissemination:

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

8. Data Preservation and Protection

The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:
(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)

8.1.1. If World Data Center or Other, specify:

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:

8.2. Data storage facility prior to being sent to an archive facility (if any):
Office for Coastal Management - Charleston, SC

8.3. Approximate delay between data collection and submission to an archive facility:

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?
Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection

9. Additional Line Office or Staff Office Questions

Line and Staff Offices may extend this template by inserting additional questions in this section.