

*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:**

2015 PADEP Lidar DEM: Lake Erie Watershed, PA

### **1.2. Summary description of the data:**

Lake Erie Watershed 2015 Ortho/LiDAR/Hydro Project

To better understand one of the state's most vital natural resources and accurately plan for the future, the Pennsylvania Department of Environmental Protection (PADEP), through grant funding provided to the Pennsylvania Sea Grant (PASG) College Program, partnered with Woolpert to acquire imagery and lidar data for the entire Pennsylvania Lake Erie Watershed and all 77 miles of shoreline.

This task is for a high resolution data set of lidar covering approximately 512 square miles of the Lake Erie Shoreline, PA. The lidar data was acquired and processed under the requirements identified in this task order. Lidar data is a remotely sensed high resolution elevation data collected by an airborne platform. The lidar sensor uses a combination of laser range finding, GPS positioning, and inertial measurement technologies. The lidar systems collect data point clouds that are used to produce highly detailed Digital Elevation Models (DEMs) of the earth's terrain, man-made structures, and vegetation. The task required the LiDAR data to be collected at a nominal pulse spacing (NPS) of 0.7 meters. The final products include classified LAS, 2.5' pixel raster DEMs of the bare-earth surface in ERDAS IMG Format. Each LAS file contains lidar point information, which has been calibrated, controlled, and classified. Additional deliverables include hydrologic breakline data, 8-bit intensity images, control data, tile index, lidar processing and survey reports in PDF format, FGDC metadata files for each data deliverable in .xml format.

Ground conditions: Water at normal levels; no unusual inundation; no snow; leaf off.

This metadata record supports the data entry in the NOAA Digital Coast Data Access Viewer (DAV).

The NOAA Office for Coastal Management (OCM) downloaded raster digital elevation model (DEM) data files from the PASDA (Pennsylvania Spatial Data Access) site. The data were processed to the NOAA Digital Coast Data Access Viewer (DAV) to make the data

available for bulk and custom downloads. In addition to these bare earth Digital Elevation Model (DEM) data, the lidar point data that these DEM data were created from, are also available. These data are available for custom download at the link provided in the URL section of this metadata record.

**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:**

2015-04-29, 2015-05-01, 2015-05-07

**1.5. Actual or planned geographic coverage of the data:**

W: -80.552193, E: -79.73936, N: 42.27633, S: 41.649693

**1.6. Type(s) of data:**

*(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)*  
Model (digital)

**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?**

Yes

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

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):*

Lineage Statement:

The Pennsylvania Department of Environmental Protection (PADEP), through grant funding provided to the Pennsylvania Sea Grant (PASG) College Program, partnered with Woolpert to acquire imagery and lidar data for the entire Pennsylvania Lake Erie Watershed and all 77 miles of shoreline. Data were collected and processed by Woolpert and were made available on the PASDA (Pennsylvania Spatial Data Access) site. The data were downloaded from PASDA by the NOAA Office for Coastal Management (OCM), where the data were processed to make it available for custom download from the NOAA Digital Coast Data Access Viewer (DAV) and for bulk download from https.

Process Steps:

- 2015-04-29 00:00:00 - Using a Leica ALS70 (lidar) systems on board Woolpert aircraft, high density data, at a nominal pulse spacing (NPS) of 0.7 meters, were collected for this task order (approximately 512 square miles). Leica Specs- AGL = 6, 500 ft - Aircraft Speed = 150 Knots, Field of View (Full) = 40 degrees, Pulse Rate = 272 kHz, Scan Rate = 41 Hz, with an average side lap of 25 %. Multiple returns were recorded for each laser pulse along with an intensity value for each return. Three (3) missions were flown between April 29, 2015 and May 7, 2015. One (1) Global Navigation Satellite System (GNSS) Base Station was used in support of the lidar data acquisition. Specific information regarding latitude, longitude, and ellipsoid height to the L1 phase center is included in the lidar processing report. The geoid used to reduce satellite derived elevations to orthometric heights was GEOID09. Data for the task order is referenced to the to NAD 83 (2007) Pennsylvania State

Plane North, NAVD88, US Survey Feet. Once the data acquisition and GPS processing phases are complete, the lidar data was processed immediately to verify the coverage had no voids. The GPS and IMU data was post processed using differential and Kalman filter algorithms to derive a best estimate of trajectory. The quality of the solution was verified to be consistent with the accuracy requirements of the project. The SBET was used to reduce the lidar slant range measurements to a raw reflective surface for each flight line. The coverage was classified to extract a bare earth digital elevation model (DEM) and separate last returns. The ALS70 calibration and system performance is verified on a periodic basis using Woolpert's calibration range. The calibration range consists of a large building and runway. The edges of the building and control points along the runway have been located using conventional survey methods. Inertial measurement unit (IMU) misalignment angles and horizontal accuracy are calculated by comparing the position of the building edges between opposing flight lines. The scanner scale factor and vertical accuracy is calculated through comparison of lidar data against control points along the runway. Field calibration is performed on all flight lines to refine the IMU misalignment angles. IMU misalignment angles are calculated from the relative displacement of features within the overlap region of adjacent (and opposing) flight lines. The raw lidar data is reduced using the refined misalignment angles.

- 2015-06-15 00:00:00 - For this survey, Woolpert field crews utilized two (2) Woolpert-owned, Trimble Navigation R8 Model 3 series dual frequency GPS receivers, and one (1) Woolpert-owned, Trimble Navigation R8 Model 2 series dual frequency GPS receiver. The field crew utilized Real-Time Kinematic (RTK) GPS surveying throughout the ground control data collection process. Using RTK GPS techniques, observations were performed on LiDAR quality control points. The survey was conducted using a 1-second epoch rate, in a fixed solution RTK mode, with each observation lasting 180 seconds. Each station was occupied twice to ensure the necessary horizontal and vertical accuracies were being met for this project.

- 2015-04-29 00:00:00 - The individual flight lines were inspected to ensure the systematic and residual errors have been identified and removed. Then, the flight lines were compared to adjacent flight lines for any mismatches to obtain a homogenous coverage throughout the project area. The point cloud underwent a classification process to determine bare-earth points and non-ground points utilizing "first and only" as well as "last of many" lidar returns. This process determined Default points (Class 1), Ground points (Class 2), Low vegetation (Class 3), Medium vegetation (Class 4), High vegetation (Class 5), Building (Class 6), Noise (Class 7), Water (Class 9), Ignored Ground (Class 10), Bridge deck (Class 13), Overlap Default (Class 17), Overlap Ground (Class 18). The bare-earth (Class 2 - Ground) lidar points underwent a manual QA/QC step to verify the quality of the DEM as well as a peer-based QC review. This included a review of the DEM surface to remove artifacts and ensure topographic quality. Classification of water (class 9) and ignored ground (class 10) was completed via the use of the hydrologic breaklines collected for the hydro-flattening phase. The overlap classes were determined by

first identifying the overlapping areas and reclassifying the LAS data by offset from a corridor. This allows the returns located on the edge of the swath to be removed from the bare earth coverage in an effort to produce a more uniform data density. The surveyed ground control points are used to make vertical adjustments to the data set and to perform the accuracy checks and statistical analysis of the lidar dataset. Supervisory QC monitoring of work in progress and completed editing ensured consistency of classification character and adherence to project requirements across the entire project area. The resulting deliverables for this task order consist of classified LAS file in LAS 1.2 format, 2.5 ft pixel size DEM files in ERDAS IMG format and Hydrologic Breakline data in ESRI shape file format. The method used to create the DEM consisted of isolating the ground (class 2) points and introducing 3-d breakline data derived from delineating hydrologic features and applying USGS v1.0 hydro flattening specification z-values. This combined dataset was then processed into a gridded format for additional QAQC to ensure DEM quality. Following QAQC process completion, a gridded raster file was created on a per tile basis. The task order projection information was applied to the final raster dataset. Prior to delivery, all raster files were visually reviewed to ensure coverage and reviewed using automated processes to ensure proper formatting.

- 2015-04-29 00:00:00 - The compilation procedure included use of lidar intensity, bare earth surface model, point cloud data, and open source imagery in an effort to manually compile hydrologic features in a 2-d environment. Following the compilation phase, a separate process was used to adjust the breakline data to best match the water level at the time of the lidar collection. Any ponds and/or lakes were adjusted to be at or just below the bank and to be at a constant elevation. Any streams were adjusted to be at or just below the bank and to be monotonic. Manual QAQC and peer-based QC review was performed on all delineated data to ensure horizontal placement quality and on all adjusted data to ensure vertical placement quality. The final hydrologic breakline product was delivered in ESRI shape file format and was also used in the processing of the DEM deliverable.

- 2015-04-29 00:00:00 - Tile Size: 2,500ft x 2,500ft. The tile file name was derived from the southwest corner of each tile. Tile index and extent are provided in shape file format.

- 2023-06-12 00:00:00 - The NOAA Office for Coastal Management (OCM) downloaded 2606 raster DEM files in ERDAS .img format from this PASDA site: <https://www.pasda.psu.edu/download/seagrant/2015/LiDAR/dem/> The data were in Pennsylvania State Plane North (NAD83 HARN), US survey feet coordinates and NAVD88 (Geoid09) elevations in feet. The bare earth hydro-flattened files were at a 2.5 ft grid spacing. OCM converted the raster files to cloud optimized files in GeoTiff format for Digital Coast storage and provisioning purposes.

**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
- 5.2. Quality control procedures employed
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.4. Approximate delay between data collection and dissemination
- 8.3. Approximate delay between data collection and submission to an archive facility

**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/70161>

**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](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?**

Yes

**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=9847/details/9847>

[https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/PA\\_Erie\\_Wtrshd\\_DEM\\_2015\\_984](https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/PA_Erie_Wtrshd_DEM_2015_984)

**7.3. Data access methods or services offered:**

Data is available online for bulk and custom downloads.

**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)*

NCEI\_CO

**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*

Data is backed up to tape and to cloud storage.

**9. Additional Line Office or Staff Office Questions**

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