

*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:**

2013-2014 USGS Lidar: Olympic Peninsula (WA)

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

TASK NAME: USGS Olympic Peninsula Washington LIDAR

LiDAR Data Acquisition and Processing Production Task

USGS Contract No. G10PC00057

Task Order No. G13PD00849

Woolpert Order No. 073622

CONTRACTOR: Woolpert, Inc.

This data set is comprised of LiDAR point cloud data, raster DEM, raster DSM, hydrologic 3-d breaklines, raster intensity, survey control, project tile index, and project data extent, which encompasses approximately 437 square miles along with a 100 meter buffer of the Olympic Peninsula in the counties of Jefferson and Clallam in north-western coastal Washington. 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 0.35m. The final products include classified LAS, one (1) meter pixel raster DEMs of the bare-earth surface in ERDAS IMG Format, 1 meter pixel raster DSMs of the first return pulses in ERDAS IMG Format, one (1) meter pixel raster 8-bit intensity images. Each LAS file contains lidar point information, which has been calibrated, controlled, and classified. Additional deliverables include hydrologic breakline data, control data, tile index, lidar processing and survey reports in PDF format, FGDC metadata files for each data deliverable in .xml format, and LAS swath data. Collected swath files that were that were larger than 2GB were provided in multiple sub-swath files, each less than 2GB. Ground conditions: Water at normal levels; no unusual inundation; no snow; leaf off.

**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:**

2013-10-13 to 2014-01-25

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

W: -124.605508, E: -123.85369, N: 47.916396, S: 47.514631

**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:

- 2013-10-14 00:00:00 - Using a combination of Leica ALS70 and ALS60 (ALS70/ALS60) systems on board a Pentavia aircraft, high density data, at a nominal pulse spacing (NPS) of 0.35 meters, was collected for this task order (approximately 437 square miles of the Olympic Peninsula in the counties of Jefferson and Clallam in north-western coastal Washington). AGL = 1300/900 meters - Aircraft Speed = variable, Field of View (Full) = 28-30/28 degrees, Pulse Rate = 180-199/95-106 kHz, Scan Rate = 41.7/63.6 Hz, with an average side lap of 50%. Multiple returns were recorded for each laser pulse along with an intensity value for each return. A total of eleven (21) missions were flown between October 13, 2013 and January 25, 2014. The geoid used to reduce satellite derived elevations to orthometric heights was GEOID12A. Data for the task order is referenced to the UTM Zone 10N, North American Datum of 1983 (2011), and NAVD88, in meters. 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. 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.

- 2013-10-14 00:00:00 - Ground control and QAQC control point survey was performed by WSI. This control supported the Olympic Peninsula WA lidar project. Ground survey points (GSP) were collected using real time kinematic (RTK), and

post-processed kinematic (PPK) survey techniques. A Trimble R7 base unit was positioned at a nearby monument to broadcast a kinematic correction to a roving Trimble R10 receiver. All GSP measurements were made during periods with a Position Dilution of Precision (PDOP) of less than 3.0 with at least six satellites in view of the stationary and roving receivers. When collecting RTK and PPK data, the rover records data while stationary for five seconds, then calculates the pseudo-range position using at least three one-second epochs. Relative errors for the position must be less than 1.5 cm horizontal and 2.0 cm vertical in order to be accepted. GSP were collected in areas where good satellite visibility was achieved on paved roads and other hard surfaces such as gravel or packed dirt roads. GSP measurements were not taken on highly reflective surfaces such as center line stripes or lane markings on roads due to the increased noise seen in the laser returns over these surfaces. GSP were collected within as many flight lines as possible, however the distribution of GSP depended on ground access constraints and monument locations and may not be equitably distributed throughout the study area. All horizontal GPS control was based on UTM Zone 10N, NAD83 (2011) expressed in meters. The vertical datum used for this project was based on the North American Vertical Datum of 1988 (NAVD88), GEOID12A, also expressed in meters.

- 2013-10-14 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 homogeneous 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 (Class 1), Ground (Class 2), Noise (Class 7), Water (Class 9), and Ignored Ground (Class 10). 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 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. The hydrologic breakline data was compiled using a combination of lidar intensity data, bare earth surface models, and open source imagery. Compiled hydrologic lines are processed to best represent the water level at the time of the lidar collection. Intensity data is recorded by the lidar sensor and stored in LAS data. The intensity data product was created by isolating the recorded intensity information and generating a gridded raster product from the intensity information. The first return DSM product was created by isolating the first return laser pulses and then creating a gridded raster product derived from the first return data set. The DEM product was created by isolating the ground (class 2) points along with breakline data generated from the hydrologic breakline dataset and generating gridded raster data from this data.

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.

- 2013-10-14 00:00:00 - Project data extent was provided by USGS and subsequently buffered by 100 meters and provided in shape file format. Project deliverables were clipped to the 100 meter data extent.

- 2013-10-14 00:00:00 - Tile Size: 1,000m x 1,000m. The tile file name was derived from the southwest corner of each tile. The tiles are named based on the US National Grid. (Citation: Tile index)

- 2016-02-05 00:00:00 - The NOAA Office for Coastal Management (OCM) received topographic files in LAS format. The files contained lidar elevation measurements. The data were received in UTM 10N meters, NAD83 coordinates and were vertically referenced to NAVD88 using the Geoid99 model. The vertical units of the data were feet. OCM performed the following processing for data storage and Digital Coast provisioning purposes: 1. LAS files were delivered from USGS via ftp. 2. The files were removed of duplicate and outlier points as well as noise classified points. 3. The LAS files were converted from orthometric (NAVD88) heights to ellipsoidal heights using Geoid12a. 4. The LAS files were converted from UTM coordinates (10N) in meters to a Geographic Coordinate system with decimal degrees units. 5. Names of the LAS tiles were changed slightly to agree with OCM naming conventions, though tiles and points have not be altered.

**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/50175>

**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?**

**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=5008>

[https://coast.noaa.gov/htdata/lidar1\\_z/geoid18/data/5008](https://coast.noaa.gov/htdata/lidar1_z/geoid18/data/5008)

**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=5008>;

**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.*