

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:

2019 WA DNR Lidar DEM: San Juan County, WA

### 1.2. Summary description of the data:

No metadata record was provided with the data. This record is populated with information from the Quantum Spatial, Inc. technical report downloaded from the Washington Dept. of Natural Resources Washington Lidar Portal. The technical report is available for download from the link provided in the URL section of this metadata record.

Washington Department of Natural Resources (WA DNR) contracted with Quantum Spatial, Inc. (QSI) in January 2019 to collect Light Detection and Ranging (LiDAR) data for the 2019 San Juan County LiDAR study area. A total of 128,731 acres of 8 pulses per square meter (PPSM) LiDAR data were acquired and delivered to the client. The data were collected between March 2 and March 21, 2019 and delivered to Washington DNR on June 14, 2019.

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 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:

2019-03-02 to 2019-03-04, 2019-03-21

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

W: -123.238792, E: -122.740526, N: 48.790179, S: 48.413671

### 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 NOAA Office for Coastal Management (OCM) downloaded the GeoTiff files from the Washington Lidar Portal.

Process Steps:

- Planning: Flightlines were developed using Mission Pro software. Careful planning of the pulse rate, flight altitude, and ground speed ensured that data quality and coverage conditions were met while optimizing flight paths and ensuring the necessary pulse density of greater than eight points per square meter. The known factors were prepared for, such as: GPS constellation availability, acquisition windows, and resource allocation. In addition, a variety of logistical barriers were anticipated, namely private property access and acquisition personnel logistics. Finally, weather hazards and conditions affecting flight were continuously monitored due to their impact on the daily success of airborne and ground operations.
- Geospatial Corrections of Aircraft Positional Data PP-RTX To improve precision and accuracy of the aircraft trajectory, the latest generation of Global Navigation Satellite System (GNSS) satellites and recent advances in GNSS post-processing technology have made possible trajectory processing methods that do not require conventional base support: specifically, Trimble CenterPoint Post-Processed Real-Time Extended (PP-RTX). PP-RTX using Applanix POSPac MMS software leverages near real-time atmospheric models from Trimble's extensive worldwide network of continuously operating base stations to produce highly accurate trajectories. When utilized properly and sufficiently controlled by a ground survey during post-processing, PP-RTX has the following advantages over conventional collection methods: Agility: The airborne acquisition is untethered by access constraints of the ground survey team at the time of acquisition, particularly in remote areas that lack permanent base stations. Flexibility: The airborne acquisition team can instantly shift collection priorities based on weather and client needs without waiting for a ground survey team to relocate. Accuracy: If properly controlled with a ground survey and datum adjustment during post-processing, PP-RTX produces results at least as accurate as conventional methods utilizing base stations.
- Ground Survey Points The ground survey for the WA DNR San Juan County project was conducted between March 10 and March 19, 2019. Ground survey data were used for data calibration and accuracy assessment purposes. Ground survey points (GSPs) were collected using real time kinematic (RTK), post-processed kinematic (PPK), and Fast Static (FS) techniques. For RTK surveys, a base receiver was positioned at a nearby monument to broadcast a kinematic correction to a roving receiver; for PPK and FS surveys, however, these corrections were post-processed. RTK and PPK surveys recorded observations for a minimum of five seconds on each

GCP/GSP in order to support longer baselines for post-processing; FS surveys record observations for up to fifteen minutes on each point in order to support longer baselines for postprocessing. All GSP measurements were made during periods with a Position Dilution of Precision (PDOP) no greater than 3.0 and in view of at least six satellites for both receivers. Relative errors for the position were required to be less than 1.5 centimeters horizontal and 2.0 centimeters vertical in order to be accepted. Base Stations Base stations were utilized for collection of GSPs and selected with consideration for satellite visibility, field crew safety, and optimal location for GSP coverage. A combination of Leica SmartNet Real-Time Network (RTN) base stations, Washington State Reference Network (WSRN) RTN base stations, and QSI-established monuments were utilized for this project. New monumentation was set using magnetic survey nails.

- Airborne Survey All data for the 2019 San Juan County project area were flown between March 2 and March 21, 2019 utilizing a Riegl LMS -Q1560 sensor mounted in a Piper Navajo twin-engine turbine aircraft. The LiDAR system for Riegl LMS-Q1560 sensor was set to acquire greater than or equal to 800,000 laser pulses per second (i.e. 800 kHz pulse rate; 400 kHz per channel) and flown at 1400 meters above ground level (AGL), capturing a 58.5 degree field of view. These settings and flight parameters are developed to yield points with an average native density of greater than or equal to 8 over terrestrial surfaces. The native pulse density is the number of pulses emitted by the LiDAR system. Some types of surfaces (e.g., dense vegetation or water) may return fewer pulses than the laser originally emitted. Therefore, the delivered density can be less than the native density and vary according to distributions of terrain, land cover, and water bodies. The study area was surveyed with opposing flight line side-lap of greater than or equal to 60% (greater than or equal to 100% overlap) for Riegal LMS-Q1560 sensor to reduce laser shadowing and increase surface laser painting. The system allows for an unlimited number of LiDAR return measurements per pulse, and all discernible laser returns were processed for the output data set. The LiDAR sensor operators constantly monitored the data collection settings during acquisition of the data, including pulse rate, power setting, scan rate, gain, field of view, and pulse mode. For each flight the crew performed airborne calibration maneuvers designed to improve the calibration results during the data processing stage. The LiDAR coverage was completed with no data gaps or voids, barring non-reflective surfaces (e.g., open water, wet asphalt). All necessary measures were taken to acquire data under conditions (e.g., minimum cloud decks, no snow on the ground) and in a manner (e.g., adherence to flight plans) that prevented the possibility of data gaps. All QSI LiDAR systems are calibrated per the manufacturer and our own specifications, and tested by QSI for internal consistency among every mission using proprietary methods. To solve for laser point position, an accurate description of aircraft position and attitude is vital. Aircraft position is described as x, y, and z and was measured twice per second (two hertz) by an on-board differential GPS unit. Aircraft attitude is described as pitch, roll, and yaw (heading) and was measured 200 times per second (200 hertz) from an onboard inertial measurement unit (IMU).

Weather conditions were constantly assessed in flight, as adverse conditions not only affect data quality, but can prove unsafe for flying.

- Once the LiDAR data arrived in the laboratory, QSI employed a suite of automated and manual techniques for processing tasks. Processing tasks included: GPS, kinematic corrections, calculation of laser point position, relative accuracy testing, classification of ground and non-ground points, and assessments of statistical absolute accuracy. The general workflow for calibration of the LiDAR data was as follows: Resolve GNSS kinematic corrections for aircraft position data using kinematic aircraft GNSS (collected at 2Hz) and IMU (collected at 200Hz) data with Trimble CenterPoint PP-RTX methodologies. Used POSGNSS, PosPac MMS Develop a smoothed best estimate of trajectory (SBET) file that blends post-processed aircraft position with attitude data. Sensor heading, position, and attitude are calculated throughout the survey. Used POSGNSS, PosPac MMS Calculate laser point position by associating SBET position to each laser point return time, with offsets relative to scan angle, intensity, etc. This process creates the raw laser point cloud data for the entire survey in \*.las (ASPRS v 1.2) format, in which each point maintains the corresponding scan angle, return number (echo), intensity, and x, y, z information. These data are converted to orthometric elevation (NAVD88 & NGVD29) by applying a Geoid correction. Used RiProcess and RiWorld Test relative accuracy using ground classified points per each flight line. Perform automated line-to-line calibrations for system attitude parameters (pitch, roll, heading), mirror flex (scale), and GNSS/IMU drift. Calibrations are performed on ground classified points from paired flight lines. Every flight line is used for relative accuracy calibration. Used TerraMatch, TerraScan, QSI Proprietary Software Assess NVA via direct comparisons of ground classified points to ground RTK survey data. Point classifications are assigned for features of interest via a combination of QSI custom algorithms and manual inspection. Used TerraScan, TerraMatch, Trimble Business Center

- 2022-03-07 00:00:00 - The NOAA Office for Coastal Management (OCM) downloaded 15 raster DEM files in GeoTiff format from the Washington Lidar Portal. The data were in Washington State Plane South NAD83(HARN), US survey feet coordinates and NAVD88 (Geoid12B) elevations in feet. The bare earth raster files were at a 3 feet grid spacing. No metadata record was provided with the data. This record is populated with information from the Quantum Geospatial, Inc. technical report downloaded from the Washington Dept. of Natural Resources Washington Lidar Portal. NOAA OCM noted that there is water surface data that extends out into the coastal water bordering along the topographic data. OCM performed the following processing on the data for Digital Coast storage and provisioning purposes: 1. Used internal an script to assign the EPSG codes (Horizontal EPSG: 2927 and Vertical EPSG: 6360) to the GeoTiff formatted files. 2. Copied the files to https.

**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):**

QSI has high standards and adheres to best practices in all efforts. In the laboratory, quality checks are built in throughout processing steps, and automated methodology allows for rapid data processing. QSI's innovation and adaptive culture rises to technical challenges and the needs of clients like Washington DNR. Reporting and communication to our clients are prioritized through regular updates and meetings.

**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
- 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/67179>

**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=9496/details/9496>

[https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/WA\\_SanJuan\\_DEM\\_2019\\_9496/ir](https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/WA_SanJuan_DEM_2019_9496/ir)

**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.*