

## **Read me file – Barrow 2012 LiDAR**

The read me file contains the details of 0.5 m LiDAR dataset processed by LANL and Aerometric, Inc. Aerometric Inc. acquired the LiDAR data set on August 12, 2012. The first LiDAR DEM delivered to LANL had a horizontal resolution of 1M. By analyzing the point cloud data, LANL determined that a DEM of 0.5M could be developed and requested a revised DEM from Aerometric, Inc. The final LiDAR DEM delivered to LANL by Aerometric, Inc., was 0.5 m spatial resolution with the vertical accuracy of 15 cm. The DEM was delivered as individual tiles, which LANL reprocessed into the single DEM mosaic (see figure 1) available for use with permission from Cathy Wilson.

LiDAR data acquisition was completed on August 12, 2012. One mission was flown. The LiDAR data for this project was collected with the Aerometric's Leica ALS-70 LiDAR system. All flight planning and acquisition was completed using Leica FPES. Aerometric used the following sensor acquisition settings. The flight altitude (above ground level) was 1195-1197 meters, laser pulse rate was 230.8 kHz, mirror scan frequency was 58 Hz, scan angle (+/-) was 16°, side lap was 50 %, and ground speed was 160 kts.

The LiDAR data for this project was acquired in one mission. Airborne GPS and IMU data was collected during acquisition for use in determining the sensor's position. The mission included the acquisition of all planned project lines and cross flights. The cross flights were flown perpendicular to the planned flight lines and their data used in the in-situ calibration of the sensor. The mission was processed using Leica IPAS-TC software to determine both the airborne GNSS trajectory, and the blending of inertial data. Aerometric operated a GPS base station on location during the acquisition of this data. The position of the base station and raw GPS data were computed by Aerometric for use in processing.

The airborne GNSS/IMU post processed data along with the LiDAR raw measurements were processed using Leica IPAS-TC 3.1. This software was used to match the raw LiDAR measurements with the computed positions and attitudes of the LiDAR sensor. The result was a "point cloud" of LiDAR measured points referenced to the ground control system. One LAS 1.2 file was generated per flightline.

### **Vertical Accuracy**

We used 285 check points acquired by UMIAQ to compute the vertical accuracy. The computed RMSE at the 95th percentile confidence interval was 0.145 meters, meeting the general LiDAR data vertical accuracy specifications.

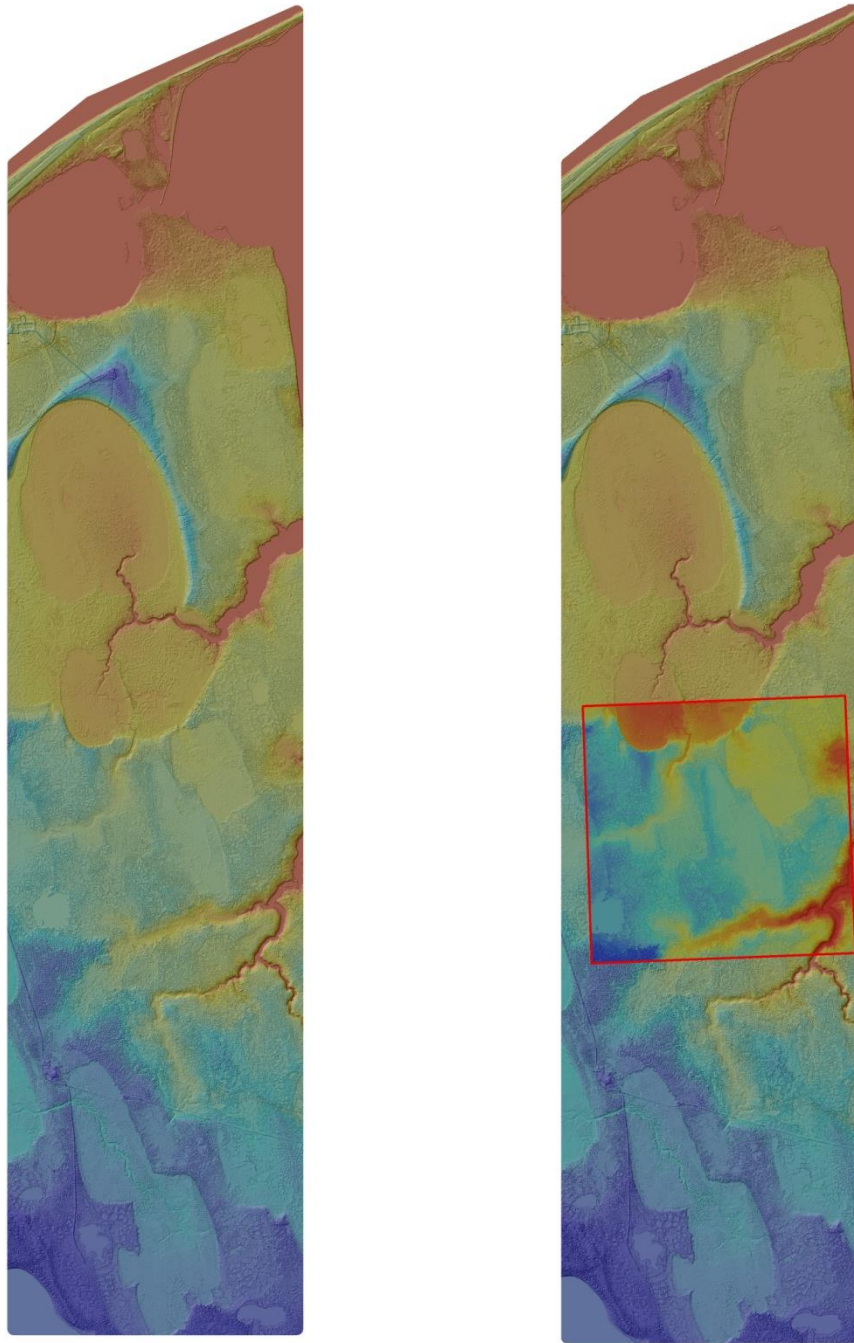


Figure 1: LiDAR 2012 dataset overlain on a shaded relief dataset. Red color box shows the 2005 LiDAR dataset.

Please note that the datum of this dataset is in NAVD88 and it used the GEOID09. The 2005 LiDAR dataset (provided by Craig Twedie, University of Texas at El Paso) used the GEOID99 which results in about a 0.5m verticle elevation difference between the two data sets.

In order to directly compare the 2005 LiDAR to the NGEE/LANL 2012 LiDAR, the 2005 data needs to be corrected to the 2009 Geoid. Please refer Appendix-A for details on coordinate system and datum information. This analysis was carried out by Chandana Gangodagamage and Cathy Wilson at the Los Alamos National Laboratory. For further technical details contact Chandana Gangodagamage at [chandana@lanl.gov](mailto:chandana@lanl.gov).

Use of this data recommends the user collaborates with the NGEE LiDAR data PI, Cathy Wilson <cjw@lanl.gov>, and involve her as a co-author on presentations and publications resulting from its use.

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Please cite this data using the following citation:

Wilson, C., C. Gangodagamage, J. Rowland. 2014. Digital Elevation Model, 0.5 m, Barrow Environmental Observatory, Alaska, 2012. Next Generation Ecosystem Experiments Arctic Data Collection, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA. Data set accessed at <http://dx.doi.org/10.5440/1109234>.

## Appendix-A

The details on coordinate system, datum, and geoid used for this dataset are given below.

Coordinate System: UTM Zone 4N

Datum: North American Datum 1983

Cellsize: 0.5 m

Dimensions: 5527 columns and 24937 rows

Spatial extent:

Top: 7918599.627 m

Bottom: 7906131.127 m

Left: 584326.559

Right: 587090.059

### Vertical and Horizontal Datum

Horizontal Datum:	NAD83 (2011)
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Vertical Datum:	NAVD88 (GEOID09)
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### Local Projection Parameters:

Type: Transverse Mercator

Scale Factor: 0.9996

Central Meridian (Longitude): -159°

Latitude of Origin: 0°

False Easting: 500000

False Northing: 0

Units: Meters

