

# DPH-11 Report on Absolute Vertical Accuracy

The USGS Lidar Base Specification Version 1.3 states: "Absolute vertical accuracy of the lidar data and the derived DEM will be assessed and reported in accordance with the ASPRS (2014). Two broad land cover types shall be assessed: vegetated and nonvegetated. Three absolute accuracy values shall be assessed and reported: (1) NVA for the point data, (2) NVA for the DEM, and (3) VVA for the DEM. The minimum NVA and VVA requirements for all data, using the ASPRS methodology, are listed in Table 4. Both the NVA and VVA required values shall be met."

**Table 4.** Absolute vertical accuracy for light detection and ranging data and digital elevation models.

[QL, quality level,  $RMSE_z$ , root mean square error in the z direction; NVA, nonvegetated vertical accuracy; VVA, vegetated vertical accuracy; m, meter;  $\leq$ , less than or equal to]

| Quality level | $RMSE_z$<br>(nonvegetated)<br>(m) | NVA at the 95-percent<br>confidence level<br>(m) | VVA at the 95th percentile<br>(m) |
|---------------|-----------------------------------|--|-----------------------------------|
| QL0           | $\leq 0.050$                      | $\leq 0.098$                                     | $\leq 0.15$                       |
| QL1           | $\leq 0.100$                      | $\leq 0.196$                                     | $\leq 0.30$                       |
| QL2           | $\leq 0.100$                      | $\leq 0.196$                                     | $\leq 0.30$                       |
| QL3           | $\leq 0.200$                      | $\leq 0.392$                                     | $\leq 0.60$                       |

The purpose of this section is to report on the absolute vertical accuracy of the lidar data and DEMs generated from it by testing for NVA (Nonvegetated Vertical Accuracy) and VVA (Vegetated Vertical Accuracy) against surveyed ground check points.

# DPH-11 Report on Absolute Vertical Accuracy - continued

Units: Meter (/Feet)

Vertical Accuracy Class tested: 10-cm

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|--|------------------|
| Check Points in defined project area (DPA):  | 93               |
| Check Points with Lidar Coverage   | 93               |
| Check Points with Lidar Coverage (NVA)   | 54               |
| Check Points with Lidar Coverage (VVA)   | 39               |
| Average Z Error (NVA)  | 0.041/0.136      |
| Maximum Z Error (NVA)  | 0.189/0.620      |
| Median Z Error (NVA)   | 0.039/0.127      |
| Minimum Z Error (NVA)  | -0.038/-0.124    |
| Standard deviation of Vertical Error (NVA)   | 0.040/0.130      |
| Skewness of Vertical Error (NVA)   | 0.907            |
| Kurtosis of Vertical Error (NVA)   | 2.186            |
| Non-vegetated Vertical Accuracy (NVA) RMSE(z) <sup>1</sup>                               | 0.057/0.187 PASS |
| Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/- <sup>1</sup>       | 0.112/0.367 PASS |
| FGDC/NSSDA Vertical Accuracy at the 95% Confidence Level +/-                             | 0.112/0.367      |
| Non-vegetated Vertical Accuracy (NVA) RMSE(z) (DEM) <sup>2</sup>                         | 0.058/0.190 PASS |
| Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level (DEM) +/- <sup>2</sup> | 0.113/0.372 PASS |
| Vegetated Vertical Accuracy (VVA) at the 95th Percentile (DEM) +/- <sup>2</sup>          | 0.225/0.737 PASS |

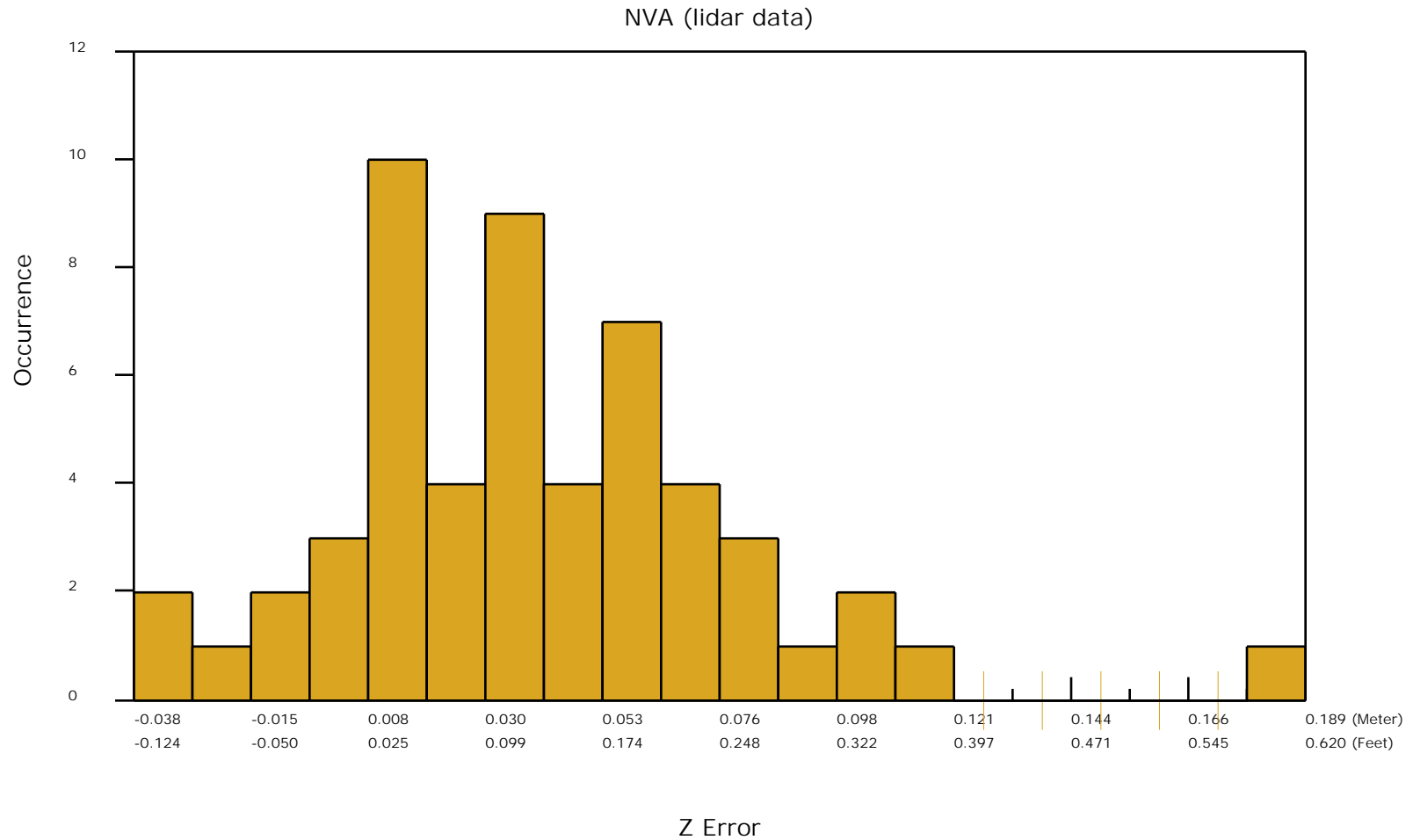
This data set was tested to meet ASPRS Positional Accuracy Standard for Digital Geospatial Data (2014) for a 10-cm RMSEz Vertical Accuracy Class. Actual NVA accuracy was found to be RMSEz = 5.708cm, equating to +/- 11.188cm at the 95% confidence level. Actual VVA accuracy was found to be +/- 22.469cm at the 95th percentile.

<sup>1</sup> This value is calculated from TIN-based testing of the lidar point cloud data.

<sup>2</sup> This value is calculated from RAM-based grid testing of the lidar data. The grid cells are sized according to the Quality Level selected, and are defined in the USGS NGP Lidar Base Specification Version 1.3 (page 24, Table 6).

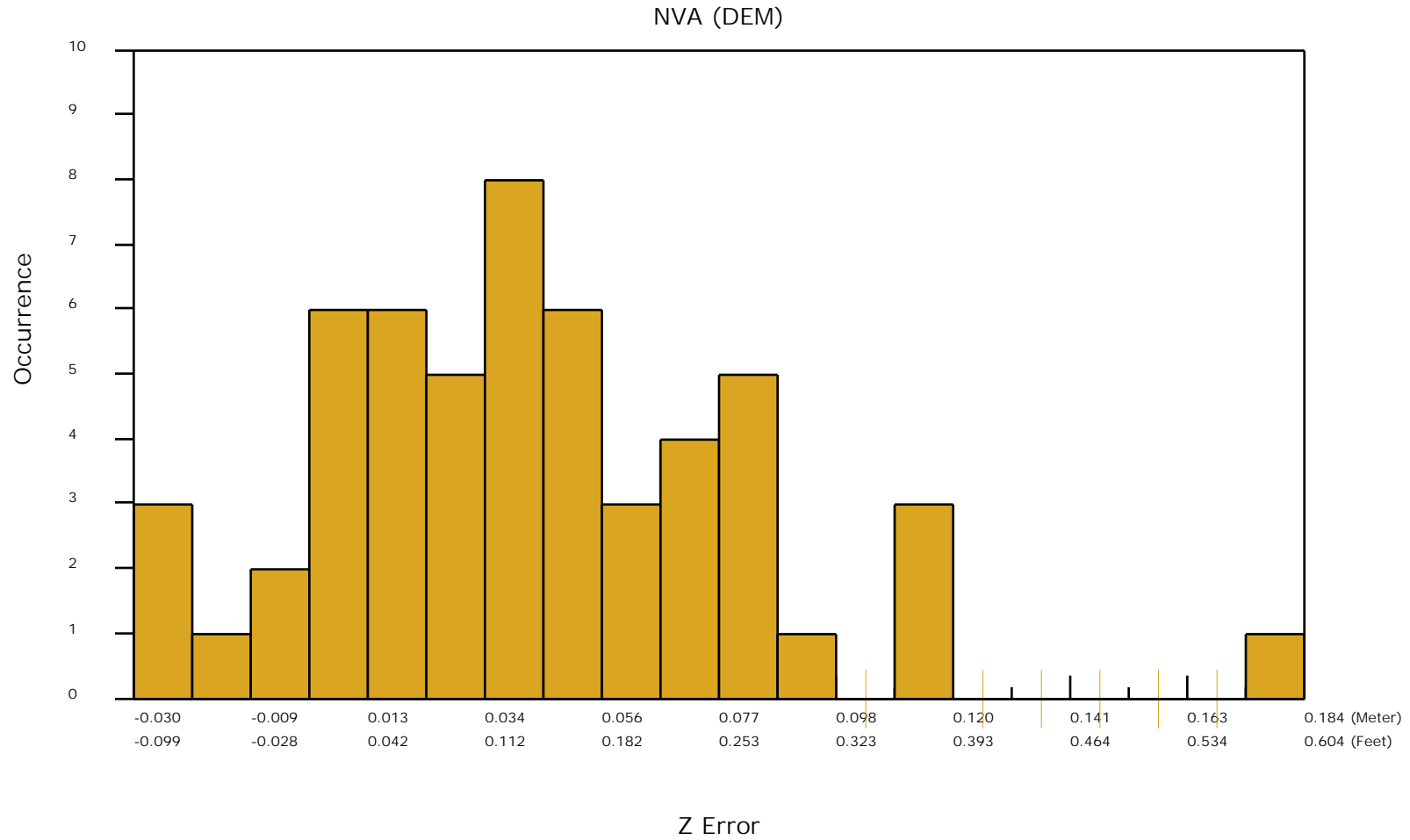
## DPH-11 Report on Absolute Vertical Accuracy - continued

The purpose of this section is to show a frequency distribution chart of the non-vegetated vertical accuracy (NVA) of the lidar point cloud data measured against surveyed ground check points.



## DPH-11 Report on Absolute Vertical Accuracy - continued

The purpose of this section is to show a frequency distribution chart of the non-vegetated vertical accuracy (NVA) of the DEM data measured against surveyed ground check points.



## DPH-11 Report on Absolute Vertical Accuracy - continued

The purpose of this section is to show a frequency distribution chart of the vegetated vertical accuracy (VVA) of the DEM data measured against surveyed ground check points.

