

# 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	$RMSE_z$ (nonvegetated) (m)	NVA at the 95-percent confidence level (m)	VVA at the 95th percentile (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):	121
Check Points with Lidar Coverage	121
Check Points with Lidar Coverage (NVA)	70
Check Points with Lidar Coverage (VVA)	51
Average Z Error (NVA)	0.015/0.050
Maximum Z Error (NVA)	0.115/0.377
Median Z Error (NVA)	0.012/0.041
Minimum Z Error (NVA)	-0.063/-0.208
Standard deviation of Vertical Error (NVA)	0.040/0.132
Skewness of Vertical Error (NVA)	0.563
Kurtosis of Vertical Error (NVA)	0.134
Non-vegetated Vertical Accuracy (NVA) RMSE(z) <sup>1</sup>	0.043/0.140 PASS
Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/- <sup>1</sup>	0.084/0.275 PASS
FGDC/NSSDA Vertical Accuracy at the 95% Confidence Level +/-	0.084/0.275
Non-vegetated Vertical Accuracy (NVA) RMSE(z) (DEM) <sup>2</sup>	0.043/0.142 PASS
Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level (DEM) +/- <sup>2</sup>	0.085/0.278 PASS
Vegetated Vertical Accuracy (VVA) at the 95th Percentile (DEM) +/- <sup>2</sup>	0.194/0.636 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 = 4.3cm, equating to +/- 8.4cm at the 95% confidence level. Actual VVA accuracy was found to be +/- 19.4cm 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).