

# 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

[Data Source - Z:\MARS\\_OC\2900112\\_Lot\\_7\Check\\_Points\TX\\_WestTexas\\_Lot7\\_70NVA\\_51VVA\\_pts\\_u14.csv](#)

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).

# DPH-11 Report on Absolute Vertical Accuracy - continued

The purpose of this section is to report the results of measuring the lidar point cloud data against surveyed ground NVA (nonvegetated vertical accuracy) check points. All XY coordinates and Z values reported are in the selected data units.

## NVA (lidar data)

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Minimum Z	Median Z	Maximum Z	Intensity	Scan Angle Rank	Returns	Description	Comments
1143	210808.951	3331570.848	Yes	617.009	617.081	0.072	617.077	617.082	617.089	22357	1748	1,1,1	LIPT	
1355	233461.977	3311931.162	Yes	545.302	545.299	-0.003	545.278	545.284	545.303	12228	699	1,1,1	LIPT	
1357	313219.01	3292455.333	Yes	533.781	533.805	0.024	533.797	533.81	533.811	17051	1159	1,1,1	LIPT	
1357A	319569.076	3293463.942	Yes	485.624	485.566	-0.058	485.562	485.565	485.579	12583	-671	1,1,1	LIPT	
1361	312816.333	3297570.866	Yes	434.413	434.376	-0.037	434.358	434.369	434.387	17087	-1907	1,1,1	LIPT	
1365	296552.164	3278212.842	Yes	433.018	433.07	0.052	433.068	433.069	433.075	24684	77	1,1,1	LIPT	
1366	221945.86	3312055.375	Yes	547.053	547.084	0.031	547.079	547.083	547.093	28883	2197	1,1,1	LIPT	
1368	294462.567	3327125.522	Yes	499.199	499.192	-0.007	499.181	499.192	499.196	5787	2672	1,1,1	LIPT	
1376	321347.845	3290917.65	Yes	537.752	537.742	-0.010	537.738	537.742	537.743	11056	-1165	1,1,1	LIPT	
1382	251723.21	3300877.921	Yes	427.244	427.329	0.085	427.319	427.328	427.338	7092	1232	1,1,1	LIPT	
1387	252487.699	3333832.671	Yes	487.6	487.612	0.012	487.61	487.612	487.623	19952	841	1,1,1	LIPT	
1389	240353.67	3305319.331	Yes	511.359	511.379	0.020	511.357	511.38	511.382	21231	1956	1,1,1	LIPT	
1391	271030.267	3344424.054	Yes	677.551	677.503	-0.048	677.495	677.518	677.54	22383	-2221	1,1,1	LIPT	
1398	320367.159	3327390.248	Yes	566.034	566.063	0.029	566.055	566.066	566.068	16878	1033	1,1,1	LIPT	
1399	264365.954	3297568.71	Yes	446.031	446.063	0.032	446.061	446.061	446.084	16620	2366	1,1,1	LIPT	
1401	307444.656	3309801.886	Yes	427.76	427.79	0.030	427.779	427.8	427.82	15857	2971	1,1,1	LIPT	
1404	220134.131	3300140.775	Yes	417.689	417.705	0.016	417.703	417.704	417.72	20738	229	1,1,1	LIPT	
1405	289712.503	3327461.297	Yes	493.331	493.316	-0.015	493.31	493.316	493.318	6808	496	1,1,1	LIPT	
1410	225454.65	3346525.6	Yes	683.276	683.296	0.020	683.296	683.297	683.305	24000	1040	1,1,1	LIPT	
1412	296473.217	3298496.117	Yes	526.228	526.207	-0.021	526.197	526.213	526.219	16973	-1741	1,1,1	LIPT	
1413	251596.181	3324700.611	Yes	566.175	566.196	0.021	566.195	566.195	566.201	15832	1458	1,1,1	LIPT	
1418	290397.91	3267490.906	Yes	349.518	349.521	0.003	349.512	349.528	349.536	9714	-243	1,1,1	LIPT	
1419	239899.387	3326706.232	Yes	605.963	606.078	0.115	606.073	606.075	606.081	19650	-3358	1,1,1	LIPT	
1422	210471.677	3317712.889	Yes	615.803	615.853	0.050	615.839	615.854	615.855	12571	1781	1,1,1	LIPT	
1423	228996.705	3334118.003	Yes	642.587	642.564	-0.023	642.542	642.563	642.58	28858	2310	1,1,1	LIPT	
1425	332032.731	3321381.686	Yes	539.839	539.837	-0.002	539.829	539.846	539.865	10802	175	1,1,1	LIPT	
1426	267318.686	3313365.94	Yes	525.461	525.499	0.038	525.494	525.506	525.512	16497	1174	1,1,1	LIPT	
1432	289058.636	3285646.191	Yes	479.444	479.451	0.007	479.437	479.455	479.457	13410	-1662	1,1,1	LIPT	
1432A	288286.169	3286883.828	Yes	470.394	470.379	-0.015	470.367	470.376	470.401	14478	1002	1,1,1	LIPT	
1436	292162.795	3309189.533	Yes	480.683	480.694	0.011	480.692	480.695	480.706	16121	2342	1,1,1	LIPT	

## Check Points Vertical Accuracy - continued

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Minimum Z	Median Z	Maximum Z	Intensity	Scan Angle Rank	Returns	Description	Comments
1440	308601.373	3317426.607	Yes	478.335	478.344	0.009	478.334	478.347	478.348	11240	-3063	1,1,1	LIPT	
1441	272543.909	3326881.762	Yes	623.58	623.614	0.034	623.613	623.613	623.62	18520	-2302	1,1,1	LIPT	
1442	326602.51	3305334.113	Yes	537.711	537.662	-0.049	537.652	537.666	537.67	15145	-1014	1,1,1	LIPT	
1446	267616.68	3322304.246	Yes	583.637	583.75	0.113	583.73	583.735	583.756	19375	433	1,1,1	LIPT	
1447	293625.658	3269785.231	Yes	391.611	391.593	-0.018	391.579	391.594	391.599	14455	-1208	1,1,1	LIPT	
1449	254311.848	3342128.582	Yes	505.079	505.09	0.011	505.061	505.075	505.098	18388	811	1,1,1	LIPT	
1450	283170.551	3345827.191	Yes	570.1	570.115	0.015	570.108	570.113	570.124	13255	1327	1,1,1	LIPT	
1451	328912.713	3311469.843	Yes	603.762	603.788	0.026	603.776	603.791	603.815	12776	1264	1,1,1	LIPT	
1460	299469.163	3267722.7	Yes	359.134	359.146	0.012	359.139	359.142	359.185	5687	-3567	1,1,1	LIPT	
1460A	299463.564	3267734.995	Yes	358.917	358.926	0.009	358.893	358.898	358.939	16922	-2873	1,1,1	LIPT	
1467	310274.398	3274818.28	Yes	366.706	366.677	-0.029	366.668	366.688	366.694	7484	487	1,1,1	LIPT	
1469	269245.566	3296123.581	Yes	433.429	433.443	0.014	433.426	433.436	433.449	19525	697	1,1,1	LIPT	
1473	321826.292	3319805.47	Yes	643.518	643.505	-0.013	643.499	643.509	643.51	14390	-3143	1,1,1	LIPT	
1475	285749.957	3291696.912	Yes	513.003	513.044	0.041	513.038	513.045	513.047	17669	-507	1,1,1	LIPT	
1479	275049.028	3288323.245	Yes	435.667	435.692	0.025	435.689	435.693	435.704	12826	-224	1,1,1	LIPT	
1480	210322.727	3314900.627	Yes	629.989	630.059	0.070	630.055	630.059	630.06	22904	2179	1,1,1	LIPT	
1482	264515.599	3345999.596	Yes	575.161	575.228	0.067	575.223	575.227	575.228	6623	-2288	1,1,1	LIPT	
1485	283672.565	3312199.531	Yes	541.48	541.494	0.014	541.476	541.49	541.504	13662	-1148	1,1,1	LIPT	
1486	233488.761	3302814.992	Yes	527.245	527.291	0.046	527.286	527.289	527.298	21222	-497	1,1,1	LIPT	
1488	284508.795	3301676.379	Yes	465.545	465.591	0.046	465.591	465.591	465.599	15197	1615	1,1,1	LIPT	
1494	235989.227	3315578.091	Yes	552.6	552.583	-0.017	552.571	552.58	552.592	16376	-802	1,1,1	LIPT	
1496	218399.573	3316549.649	Yes	569.509	569.446	-0.063	569.427	569.447	569.448	22545	0	1,1,1	LIPT	
1500	290360.445	3285776.961	Yes	466.339	466.326	-0.013	466.302	466.326	466.337	11901	-725	1,1,1	LIPT	
1500A	289671.133	3285779.917	Yes	470.63	470.617	-0.013	470.601	470.607	470.625	10765	-798	1,1,1	LIPT	
1507	250838.26	3312946.792	Yes	491.054	491.041	-0.013	491.028	491.038	491.051	19143	-1461	1,1,1	LIPT	
1516	325582.611	3298583.151	Yes	509.257	509.253	-0.004	509.245	509.248	509.267	2981	1888	1,1,1	LIPT	
1519	315140.681	3267745.061	Yes	357.101	357.068	-0.033	357.061	357.102	357.115	12184	-2294	1,1,1	LIPT	
1520	281506.571	3322500.868	Yes	591.79	591.842	0.052	591.825	591.833	591.844	13112	-2292	1,1,1	LIPT	
1520A	279033.196	3328386.641	Yes	620.858	620.972	0.114	620.962	620.967	620.997	13831	-1889	1,1,1	LIPT	
1524	324452.151	3294209.734	Yes	503.508	503.504	-0.004	503.491	503.491	503.528	5613	-2146	1,1,1	LIPT	
1526	276299.464	3336874.734	Yes	643.291	643.255	-0.036	643.241	643.26	643.261	5518	2359	1,1,1	LIPT	
1530	335040.26	3329586.446	Yes	583.011	583.013	0.002	582.981	583.003	583.026	10591	-3017	1,1,1	LIPT	
1531	258516.59	3300058.554	Yes	444.224	444.317	0.093	444.312	444.317	444.327	14930	7	1,1,1	LIPT	
1536	292582.736	3317218.635	Yes	461.491	461.507	0.016	461.502	461.505	461.52	11395	682	1,1,1	LIPT	
1537	317436.438	3276093.137	Yes	415.22	415.184	-0.036	415.174	415.181	415.192	9442	-2214	1,1,1	LIPT	

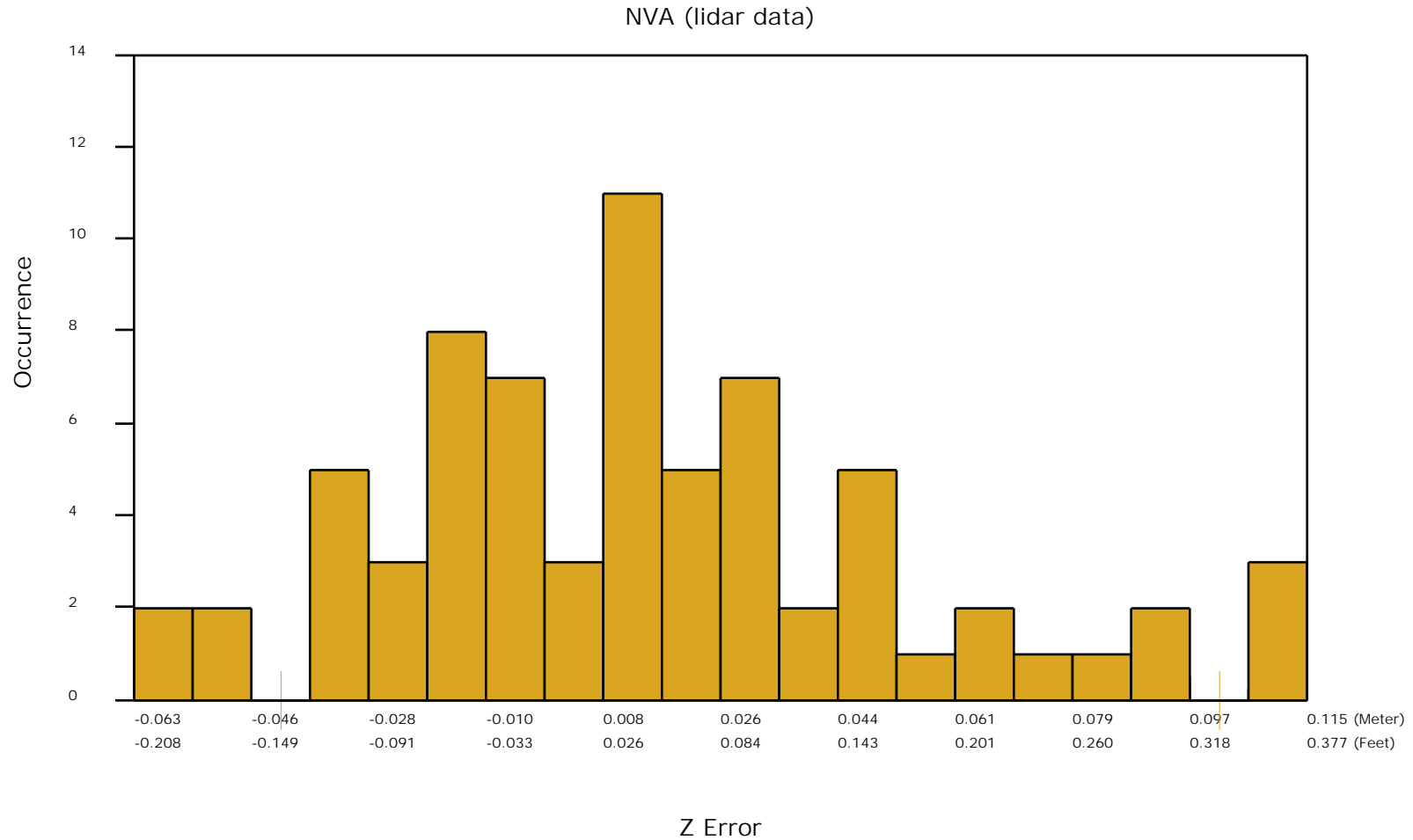
## Check Points Vertical Accuracy - continued

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Minimum Z	Median Z	Maximum Z	Intensity	Scan Angle Rank	Returns	Description	Comments
1544	283402.034	3288792.578	Yes	483.263	483.313	0.050	483.305	483.308	483.327	10462	3126	1,1,1	LIPT	
801001	234602.618	3304660.913	Yes	537.432	537.412	-0.020	537.393	537.405	537.421	23325	494	1,1,1	LIPT	
801003	218211.499	3302934.147	Yes	517.734	517.725	-0.009	517.724	517.727	517.743	21365	712	1,1,1	LIPT	
801005	212313.059	3331077.61	Yes	606.922	606.957	0.035	606.949	606.955	606.973	21786	763	1,1,1	LIPT	
801007	212325.132	3331059.541	Yes	607.192	607.284	0.092	607.272	607.277	607.286	22066	834	1,1,1	LIPT	

## 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.

[Data Source - Z:\MARS\\_OC\2900112\\_Lot\\_7\Classified\\_LAS\\_Files](#)



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

The purpose of this section is to report the results of measuring the DEM data against surveyed ground NVA (nonvegetated vertical accuracy) check points. All XY coordinates and Z values reported are in the selected data units.

### NVA (DEM)

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Description	Comments
1143	210808.951	3331570.848	Yes	617.009	617.082	0.073	LIPT	
1355	233461.977	3311931.162	Yes	545.302	545.321	0.019	LIPT	
1357	313219.01	3292455.333	Yes	533.781	533.806	0.025	LIPT	
1357A	319569.076	3293463.942	Yes	485.624	485.565	-0.059	LIPT	
1361	312816.333	3297570.866	Yes	434.413	434.385	-0.028	LIPT	
1365	296552.164	3278212.842	Yes	433.018	433.058	0.040	LIPT	
1366	221945.86	3312055.375	Yes	547.053	547.088	0.035	LIPT	
1368	294462.567	3327125.522	Yes	499.199	499.193	-0.006	LIPT	
1376	321347.845	3290917.65	Yes	537.752	537.737	-0.015	LIPT	
1382	251723.21	3300877.921	Yes	427.244	427.311	0.067	LIPT	
1387	252487.699	3333832.671	Yes	487.6	487.611	0.011	LIPT	
1389	240353.67	3305319.331	Yes	511.359	511.381	0.022	LIPT	
1391	271030.267	3344424.054	Yes	677.551	677.471	-0.080	LIPT	
1398	320367.159	3327390.248	Yes	566.034	566.067	0.033	LIPT	
1399	264365.954	3297568.71	Yes	446.031	446.074	0.043	LIPT	
1401	307444.656	3309801.886	Yes	427.76	427.784	0.024	LIPT	
1404	220134.131	3300140.775	Yes	417.689	417.706	0.017	LIPT	
1405	289712.503	3327461.297	Yes	493.331	493.316	-0.015	LIPT	
1410	225454.65	3346525.6	Yes	683.276	683.296	0.020	LIPT	
1412	296473.217	3298496.117	Yes	526.228	526.220	-0.008	LIPT	
1413	251596.181	3324700.611	Yes	566.175	566.203	0.028	LIPT	
1418	290397.91	3267490.906	Yes	349.518	349.540	0.022	LIPT	
1419	239899.387	3326706.232	Yes	605.963	606.071	0.108	LIPT	
1422	210471.677	3317712.889	Yes	615.803	615.841	0.038	LIPT	
1423	228996.705	3334118.003	Yes	642.587	642.563	-0.024	LIPT	
1425	332032.731	3321381.686	Yes	539.839	539.850	0.011	LIPT	
1426	267318.686	3313365.94	Yes	525.461	525.503	0.042	LIPT	
1432	289058.636	3285646.191	Yes	479.444	479.454	0.010	LIPT	
1432A	288286.169	3286883.828	Yes	470.394	470.368	-0.026	LIPT	
1436	292162.795	3309189.533	Yes	480.683	480.695	0.012	LIPT	

## Check Points Vertical Accuracy - continued

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Description	Comments
1440	308601.373	3317426.607	Yes	478.335	478.347	0.012	LIPT	
1441	272543.909	3326881.762	Yes	623.58	623.617	0.037	LIPT	
1442	326602.51	3305334.113	Yes	537.711	537.659	-0.052	LIPT	
1446	267616.68	3322304.246	Yes	583.637	583.736	0.099	LIPT	
1447	293625.658	3269785.231	Yes	391.611	391.603	-0.008	LIPT	
1449	254311.848	3342128.582	Yes	505.079	505.092	0.013	LIPT	
1450	283170.551	3345827.191	Yes	570.1	570.109	0.009	LIPT	
1451	328912.713	3311469.843	Yes	603.762	603.813	0.051	LIPT	
1460	299469.163	3267722.7	Yes	359.134	359.151	0.017	LIPT	
1460A	299463.564	3267734.995	Yes	358.917	358.933	0.016	LIPT	
1467	310274.398	3274818.28	Yes	366.706	366.669	-0.037	LIPT	
1469	269245.566	3296123.581	Yes	433.429	433.438	0.009	LIPT	
1473	321826.292	3319805.47	Yes	643.518	643.487	-0.031	LIPT	
1475	285749.957	3291696.912	Yes	513.003	513.044	0.041	LIPT	
1479	275049.028	3288323.245	Yes	435.667	435.719	0.052	LIPT	
1480	210322.727	3314900.627	Yes	629.989	630.058	0.069	LIPT	
1482	264515.599	3345999.596	Yes	575.161	575.227	0.066	LIPT	
1485	283672.565	3312199.531	Yes	541.48	541.497	0.017	LIPT	
1486	233488.761	3302814.992	Yes	527.245	527.275	0.030	LIPT	
1488	284508.795	3301676.379	Yes	465.545	465.585	0.040	LIPT	
1494	235989.227	3315578.091	Yes	552.6	552.588	-0.012	LIPT	
1496	218399.573	3316549.649	Yes	569.509	569.442	-0.067	LIPT	
1500	290360.445	3285776.961	Yes	466.339	466.309	-0.030	LIPT	
1500A	289671.133	3285779.917	Yes	470.63	470.610	-0.020	LIPT	
1507	250838.26	3312946.792	Yes	491.054	491.045	-0.009	LIPT	
1516	325582.611	3298583.151	Yes	509.257	509.247	-0.010	LIPT	
1519	315140.681	3267745.061	Yes	357.101	357.081	-0.020	LIPT	
1520	281506.571	3322500.868	Yes	591.79	591.859	0.069	LIPT	
1520A	279033.196	3328386.641	Yes	620.858	620.963	0.105	LIPT	
1524	324452.151	3294209.734	Yes	503.508	503.513	0.005	LIPT	
1526	276299.464	3336874.734	Yes	643.291	643.256	-0.035	LIPT	
1530	335040.26	3329586.446	Yes	583.011	583.034	0.023	LIPT	
1531	258516.59	3300058.554	Yes	444.224	444.316	0.092	LIPT	
1536	292582.736	3317218.635	Yes	461.491	461.509	0.018	LIPT	
1537	317436.438	3276093.137	Yes	415.22	415.187	-0.033	LIPT	



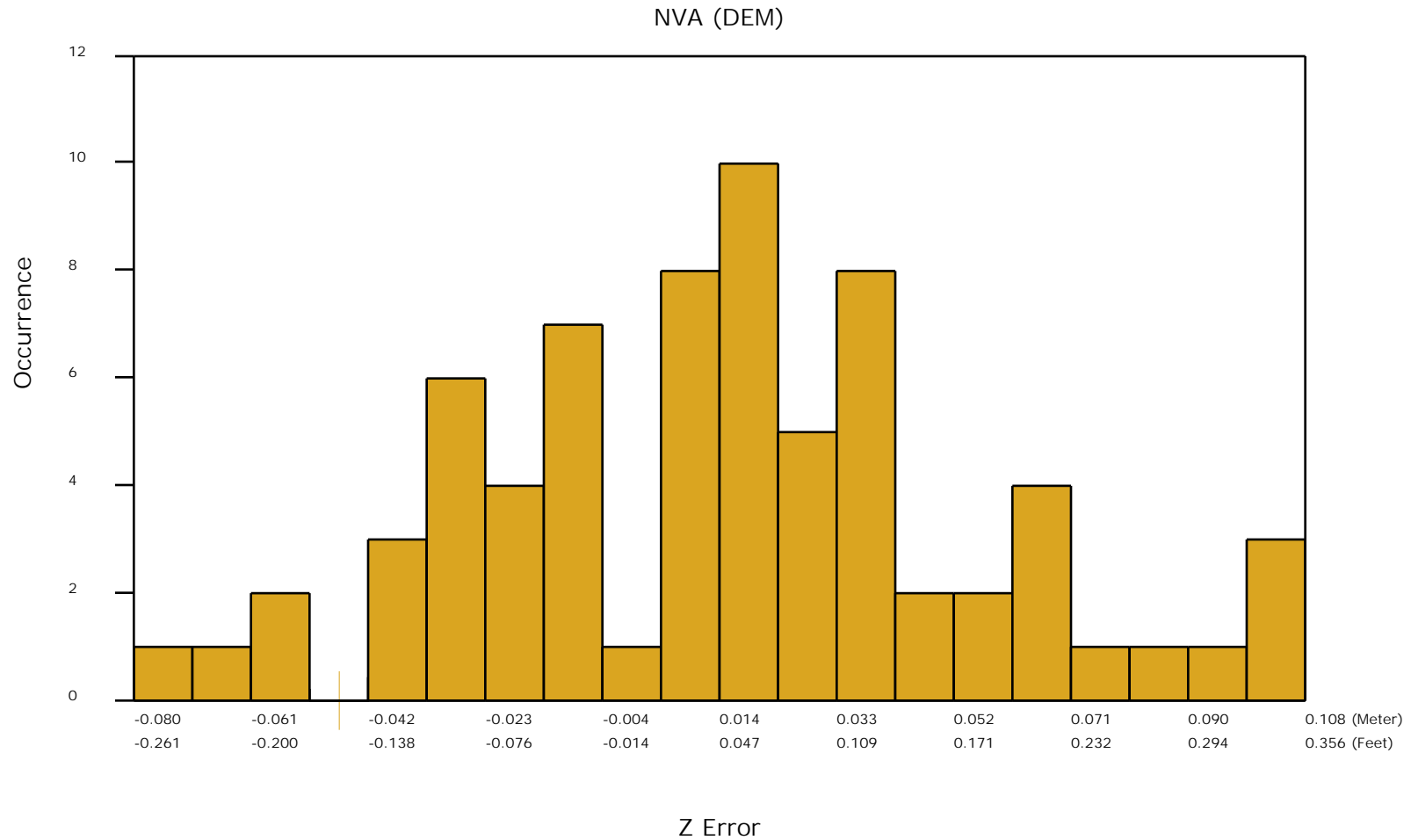
## Check Points Vertical Accuracy - continued

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Description	Comments
1544	283402.034	3288792.578	Yes	483.263	483.322	0.059	LIPT	
801001	234602.618	3304660.913	Yes	537.432	537.401	-0.031	LIPT	
801003	218211.499	3302934.147	Yes	517.734	517.728	-0.006	LIPT	
801005	212313.059	3331077.61	Yes	606.922	606.957	0.035	LIPT	
801007	212325.132	3331059.541	Yes	607.192	607.277	0.085	LIPT	

## 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.

[Data Source - Z:\MARS\\_OC\2900112\\_Lot\\_7\Classified\\_LAS\\_Files](#)



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

The purpose of this section is to report the results of measuring the DEM data against surveyed ground VVA (vegetated vertical accuracy) check points. All XY coordinates and Z values reported are in the selected data units.

### VVA (DEM)

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Description	Comments
2138	210920.088	3331540.189	Yes	616.979	617.037	0.058	LIPT	
2240	233434.146	3311979.533	Yes	546.36	546.416	0.056	LIPT	
2241	238819.444	3339829.782	Yes	605.158	605.157	-0.001	LIPT	
2242	313209.598	3292471.012	Yes	533.73	533.882	0.152	LIPT	
2246	312821.168	3297628.436	Yes	433.42	433.412	-0.008	LIPT	
2246A	319564.133	3293457.37	Yes	485.885	485.920	0.035	LIPT	
2249	296560.016	3278165.023	Yes	432.816	432.849	0.033	LIPT	
2250	221992.756	3312075.278	Yes	546.742	546.854	0.112	LIPT	
2252	294558.978	3327174.732	Yes	498.029	498.295	0.266	LIPT	
2260	321357.43	3290911.954	Yes	537.963	538.005	0.042	LIPT	
2265	251737.44	3300865.402	Yes	426.995	427.157	0.162	LIPT	
2270	252476.288	3333754.174	Yes	489.155	489.134	-0.021	LIPT	
2271	240494.419	3305259.47	Yes	511.298	511.380	0.082	LIPT	
2273	271029.531	3344619.266	Yes	665.515	665.560	0.045	LIPT	
2279	320353.078	3327236.371	Yes	566.833	566.896	0.063	LIPT	
2280	264503.7	3297494.819	Yes	447.558	447.626	0.068	LIPT	
2282	307532.62	3309693.92	Yes	427.147	427.124	-0.023	LIPT	
2284	220336.775	3300041.379	Yes	406.74	406.735	-0.005	LIPT	
2285	289666.972	3327451.077	Yes	491.936	491.949	0.013	LIPT	
2289	225456.826	3346535.531	Yes	683.249	683.361	0.112	LIPT	
2291	296516.017	3298509.75	Yes	527.894	527.910	0.016	LIPT	
2292	251535.546	3324665.372	Yes	567.688	567.716	0.028	LIPT	
2296	239902.124	3326699.512	Yes	605.866	606.078	0.212	LIPT	
2298	210361.376	3317817.859	Yes	615.04	615.147	0.107	LIPT	
2299	228982.963	3334108.357	Yes	643.638	643.666	0.028	LIPT	
2301	332042.31	3321377.106	Yes	539.168	539.280	0.112	LIPT	
2302	267479.557	3313574.392	Yes	525.641	525.798	0.157	LIPT	
2308	289053.476	3285680.662	Yes	479.48	479.537	0.057	LIPT	
2312	292181.125	3309188.081	Yes	480.475	480.560	0.085	LIPT	
2316	308542.749	3317497.472	Yes	478.885	478.932	0.047	LIPT	

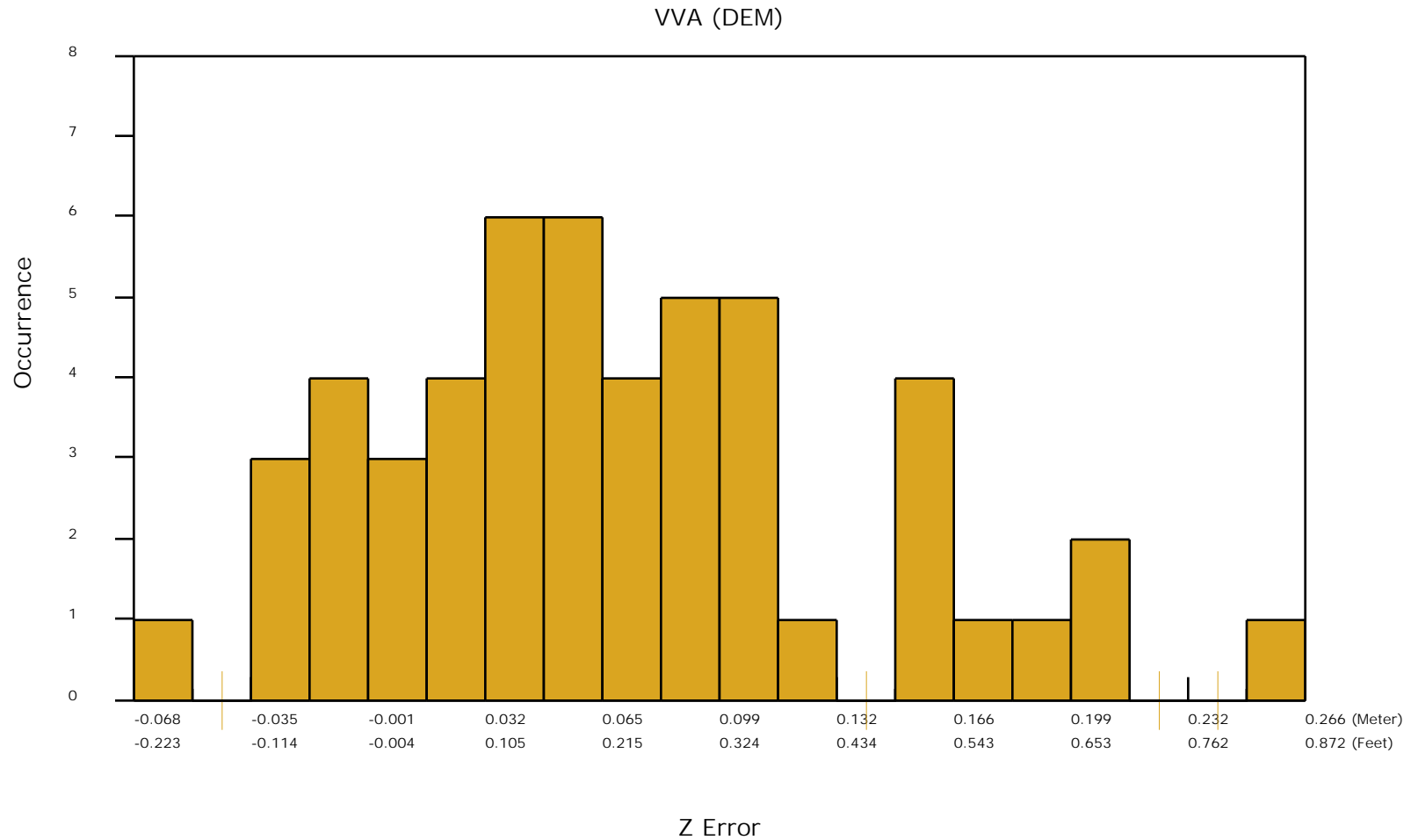
## Check Points Vertical Accuracy - continued

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Description	Comments
2317	273007.858	3326782.368	Yes	613.419	613.471	0.052	LIPT	
2317A	276287.021	3336831.735	Yes	642.941	643.105	0.164	LIPT	
2321	267571.007	3322289.681	Yes	581.246	581.375	0.129	LIPT	
2322	293642.82	3269769.394	Yes	391.026	391.051	0.025	LIPT	
2324	254332.908	3342079.304	Yes	504.944	504.876	-0.068	LIPT	
2325	283460.313	3345821.456	Yes	567.389	567.477	0.088	LIPT	
2326	328851.495	3311445.29	Yes	606.998	607.081	0.083	LIPT	
2335	299448.372	3267698.678	Yes	359.917	359.908	-0.009	LIPT	
2343	269278.214	3296158.394	Yes	434.359	434.432	0.073	LIPT	
2347	321850.321	3319799.539	Yes	641.987	641.971	-0.016	LIPT	
2349	285717.725	3291731.906	Yes	513.944	514.149	0.205	LIPT	
2353	275024.656	3288314.864	Yes	434.848	434.949	0.101	LIPT	
2354	210251.799	3314960.181	Yes	630.003	630.081	0.078	LIPT	
2355	264571.414	3345997.287	Yes	575.863	576.045	0.182	LIPT	
2358	283665.433	3312279.512	Yes	542.312	542.363	0.051	LIPT	
2359	233478.854	3302805.246	Yes	526.985	527.084	0.099	LIPT	
2370	324454.493	3294174.222	Yes	503.603	503.610	0.007	LIPT	
2371	317449.818	3276081.833	Yes	415.083	415.060	-0.023	LIPT	
801002	234596.898	3304664.378	Yes	537.357	537.431	0.074	LIPT	
801004	218207.856	3302943.115	Yes	517.836	517.878	0.042	LIPT	
801006	212324.487	3331071.763	Yes	606.994	607.163	0.169	LIPT	

# 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.

[Data Source - Z:\MARS\\_OC\2900112\\_Lot\\_7\Classified\\_LAS\\_Files](#)

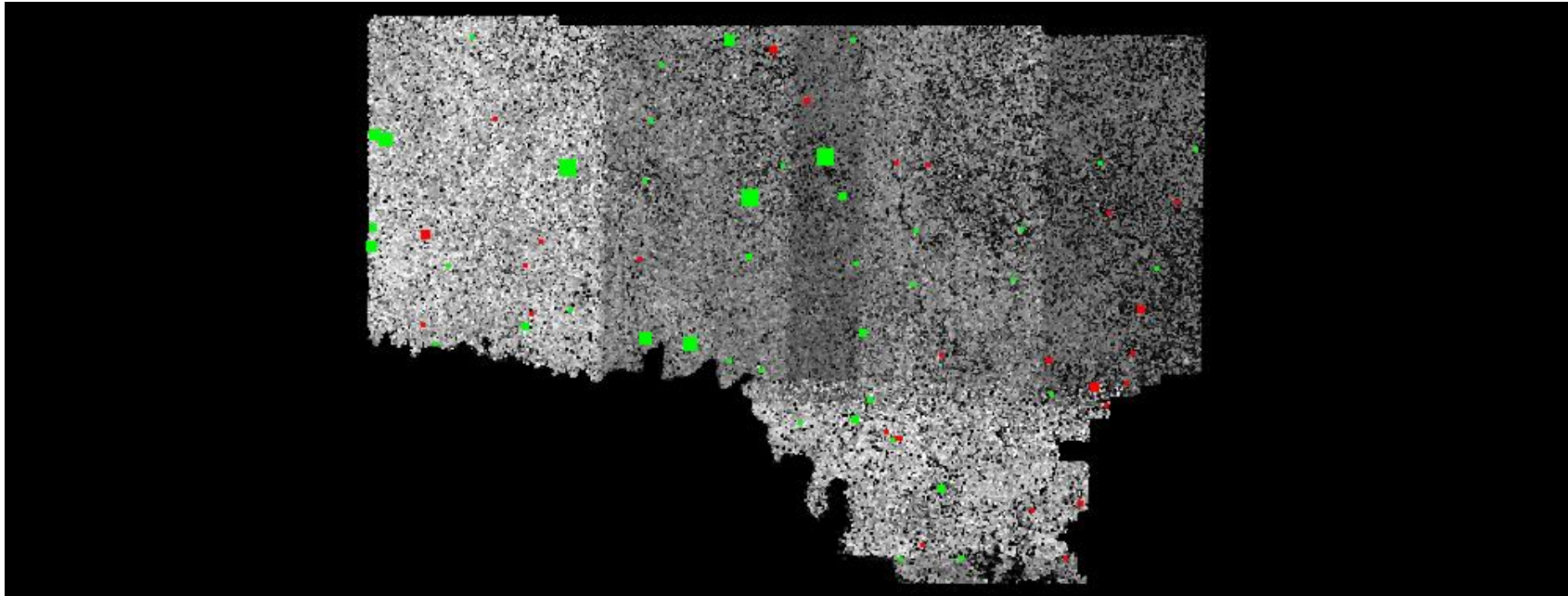


## *DPH-11 Report on Absolute Vertical Accuracy - continued*

The purpose of this section is to show a graphic of lidar data points colored by intensity with NVA check points rendered "thematically" showing the green and red squares sized by Z error.

[Data Source - Z:\MARS\\_OC\2900112\\_Lot\\_7\Classified\\_LAS\\_Files](Z:\MARS_OC\2900112_Lot_7\Classified_LAS_Files)

[Result Path - Z:\MARS\\_OC\2900112\\_Lot\\_7\Output\DPH\\_11\ColorByIntensity\\_CheckPoints\\_NVA.jpg](Z:\MARS_OC\2900112_Lot_7\Output\DPH_11\ColorByIntensity_CheckPoints_NVA.jpg)



■ Green represents where the lidar surface is above the check point (positive elevation error).

■ Red represents where the lidar surface is below the check point (negative elevation error).

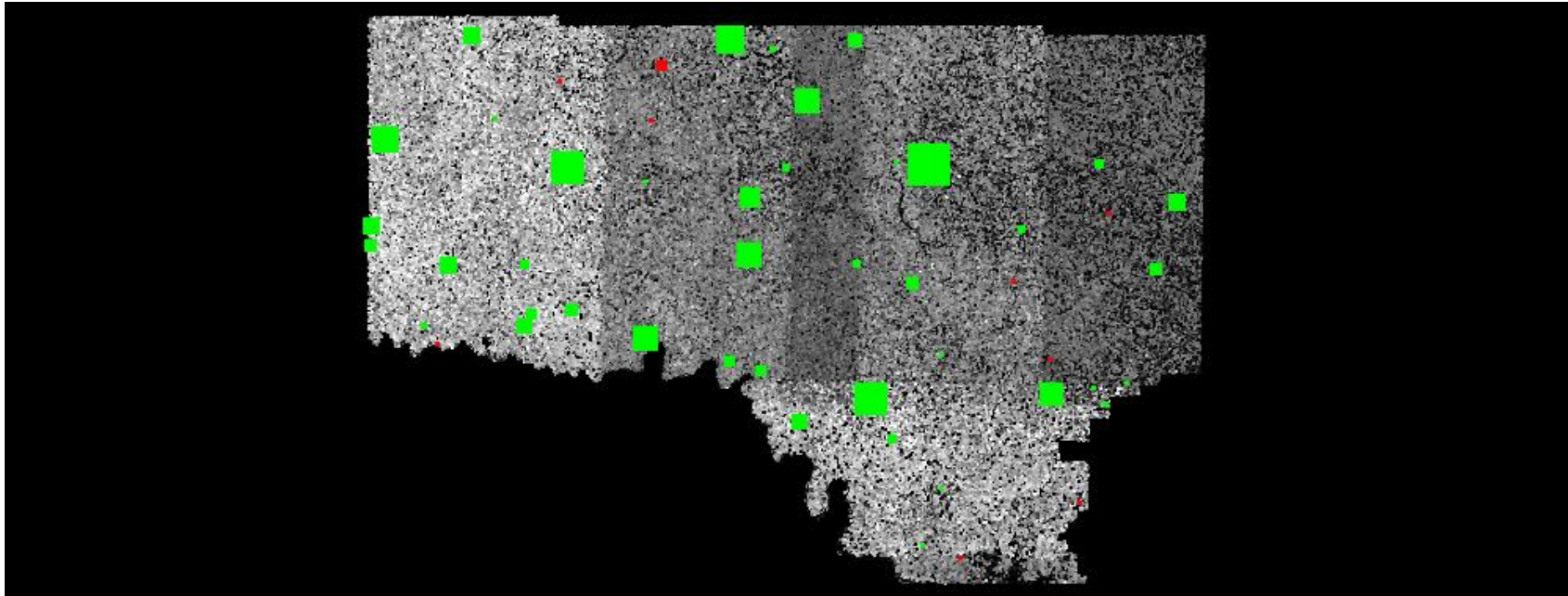
The size of the square symbol represents the absolute value magnitude of error.

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

The purpose of this section is to show a graphic of lidar data points colored by intensity with VVA check points rendered "thematically" showing the green and red squares sized by Z error.

[Data Source - Z:\MARS\\_OC\2900112\\_Lot\\_7\Classified\\_LAS\\_Files](#)

[Result Path - Z:\MARS\\_OC\2900112\\_Lot\\_7\Output\DPH\\_11\ColorByIntensity\\_CheckPoints\\_VVA.jpg](#)



■ Green represents where a DEM of the lidar surface is above the check point (positive elevation error).

■ Red represents where a DEM of the lidar surface is below the check point (negative elevation error).

The size of the square symbol represents the absolute value magnitude of error.