DPH-11 Report on Absolute Vertical Accuracy

The USGS Lidar Base Specification 2022 rev. A states: "Absolute vertical accuracy of the lidar data and the derived DEM will be assessed and reported in accordance with ASPRS (2014). Vegetated and nonvegetated land cover types shall be assessed for absolute vertical accuracy. Federal Emergency Management Agency (2003) identifies seven land cover types; National Digital Elevation Program (2004) and ASPRS (2004) reiterate the first five of those types. The way in which each of the seven classes was reported under the previous standards and how they are reported under the new ASPRS standards and by this specification are shown in table 3. Four absolute accuracy values shall be assessed and reported:

1. NVA for the point data
2. VVA for the point data
3. NVA for the DEM
4. 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. NVA for the point data shall be assessed by comparing check points surveyed for NVA assessment to a triangulated irregular network (TIN) constructed from ground-classified lidar points in those areas. VVA for the point data shall be assessed by comparing check points surveyed for VVA assessment to a triangulated irregular network (TIN) constructed from ground-classified lidar points in those areas. NVA and VVA for the DEM are assessed by comparing check points to the final bare-earth surface. The minimum required thresholds for absolute and relative accuracy may be increased by the USGS–NGP when any of the following conditions are met:

- A demonstrable, substantial, and prohibitive increase in cost is needed to obtain this accuracy, which is often the case in heavily vegetated project areas.
- An alternate specification is needed to conform to previously contracted phases of a single larger overall collection effort such as for multiyear statewide collections
- The USGS–NGP agrees that the use of an alternate specification is reasonable and in the best interest of all stakeholders."

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; ≤, 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	≤0.050	≤0.098	≤0.15
QL1	≤0.100	≤0.196	≤0.30
QL2	≤0.100	≤0.196	≤0.30
QL3	≤0.200	≤0.392	≤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 - X:\Mapping\Projects\65221305_NV_ClarkCounty\Survey_Control\02_Laser_Control\01_FINAL\NVA_VVA_NV_East_nad2011_g18_usFeet.shp

Units: Meter (/US Survey Feet)

Vertical Accuracy Class tested: 10-cm

Check Points in defined project area (DPA):	82
Check Points with Lidar Coverage	82
Check Points with Lidar Coverage (NVA)	46
Check Points with Lidar Coverage (VVA)	36
Average Z Error (NVA)	-0.008/-0.027
Maximum Z Error (NVA)	0.092/0.301
Median Z Error (NVA)	-0.009/-0.031
Minimum Z Error (NVA)	-0.099/-0.324
Standard deviation of Vertical Error (NVA)	0.040/0.131
Skewness of Vertical Error (NVA)	0.014
Kurtosis of Vertical Error (NVA)	0.051
Non-vegetated Vertical Accuracy (NVA) RMSE(z) [1]	0.040/0.132 PASS
Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/- [1]	0.079/0.259 PASS
FGDC/NSSDA Vertical Accuracy at the 95% Confidence Level +/-	0.079/0.259
Non-vegetated Vertical Accuracy (NVA) RMSE(z) (DEM) [2]	0.039/0.128 PASS
Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level (DEM) +/- [2]	0.076/0.076 PASS
Vegetated Vertical Accuracy (VVA) at the 95th Percentile (TIN) +/- [1]	0.190/0.624 PASS
Vegetated Vertical Accuracy (VVA) at the 95th Percentile (DEM) +/- [2]	0.192/0.628 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 = 4.0cm, equating to +/- 7.9cm at the 95% confidence level. Actual VVA accuracy was found to be +/- 19.2cm at the 95th percentile.

[1] This value is calculated from TIN-based testing of the lidar point cloud data.

[2] 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 2022 rev. A (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
2001	957287.31	26410887.46	Yes	613.13	613.049	-0.081	613.02	613.04	613.13	1050	383	1,1,1	LIPT	
2015	714732.2	26562952.1	Yes	2627.31	2627.611	0.301	2627.59	2627.646	2627.65	1295	-2040	1,1,1	LIPT	
2015A	714470.64	26560713.64	Yes	2611.87	2612.084	0.214	2612.044	2612.091	2612.106	1091	-143	1,1,1	LIPT	
2020	937839.3	26408827.1	Yes	1527.45	1527.214	-0.236	1527.148	1527.302	1527.375	389	-1949	1,1,1	LIPT	
2022	740194.46	26633469.06	Yes	3011.98	3012.016	0.036	3012.011	3012.047	3012.082	1291	1441	1,1,1	LIPT	
2023	745505.17	26791355.87	Yes	2410.02	2410.036	0.016	2409.879	2410.029	2410.08	565	835	1,1,1	LIPT	
2024	804540.02	26807971.84	Yes	2133.37	2133.125	-0.245	2133.066	2133.081	2133.215	574	2065	1,1,1	LIPT	
2024A	800232.13	26804876.84	Yes	2047.31	2047.335	0.025	2047.268	2047.343	2047.345	995	-1616	1,1,1	LIPT	
2025	712532.55	26846125.87	Yes	2882.68	2882.772	0.092	2882.748	2882.76	2882.784	1484	142	1,1,1	LIPT	
2026	758918.5	26764136.91	Yes	2348.26	2348.152	-0.108	2348.089	2348.137	2348.192	1205	1692	1,1,1	LIPT	
2027	823305.72	26777345.22	Yes	1980.78	1980.833	0.053	1980.78	1980.839	1980.861	986	-790	1,1,1	LIPT	
2028	765784.85	26818648.68	Yes	2357.71	2357.628	-0.082	2357.606	2357.639	2357.687	1049	-277	1,1,1	LIPT	
2029	770956.88	26674648.68	Yes	2746.17	2746.148	-0.022	2746.137	2746.14	2746.195	1270	-1104	1,1,1	LIPT	
2029A	777760.48	26687744.82	Yes	2496.97	2496.958	-0.012	2496.952	2496.979	2497.02	2161	-1275	1,1,1	LIPT	
2031	622041.99	26649596.34	Yes	2700.41	2700.38	-0.030	2700.36	2700.39	2700.396	1502	-778	1,1,1	LIPT	
2032	789445.58	26699870.34	Yes	2328.66	2328.576	-0.084	2328.563	2328.59	2328.634	618	1168	1,1,1	LIPT	
2032A	787910.05	26700322.94	Yes	2312.74	2312.703	-0.037	2312.699	2312.732	2312.734	415	-1845	1,1,1	LIPT	
2034	780499.74	26742483.74	Yes	2070.95	2070.891	-0.059	2070.847	2070.893	2070.904	868	-351	1,1,1	LIPT	
2035	841230.28	26857446.59	Yes	2600.15	2600.2	0.050	2600.137	2600.184	2600.238	901	893	1,1,1	LIPT	
2035A	857302.6	26840006.56	Yes	2213.43	2213.346	-0.084	2213.338	2213.339	2213.386	1658	-1748	1,1,1	LIPT	
2039	803761.73	26751344.4	Yes	1792.3	1792.24	-0.060	1792.162	1792.193	1792.282	1079	1110	1,1,1	LIPT	
2039A	796435.13	26749307.14	Yes	1877.05	1877.153	0.103	1877.076	1877.128	1877.172	1727	-1002	1,1,1	LIPT	
2040	586305.52	26680924.54	Yes	2803.31	2803.484	0.174	2803.462	2803.483	2803.578	1724	648	1,1,1	LIPT	
2042	678110.79	26709453.79	Yes	5365.68	5365.741	0.061	5365.681	5365.744	5365.745	1068	1315	1,1,1	LIPT	
2045	703263.01	26808592.79	Yes	4130.49	4130.635	0.145	4130.625	4130.649	4130.651	1685	2489	1,1,1	LIPT	
2046	722229.64	26766712.16	Yes	3412.61	3412.49	-0.120	3412.403	3412.463	3412.507	1051	771	1,1,1	LIPT	
2046A	721122.28	26758117.66	Yes	3227.34	3227.093	-0.247	3227.052	3227.094	3227.108	1553	-2551	1,1,1	LIPT	
2049	714908.63	26719444.61	Yes	3302.13	3302.297	0.167	3302.259	3302.264	3302.382	1267	1241	1,1,1	LIPT	
2051	720411.7	26817570.6	Yes	3367.81	3367.911	0.101	3367.89	3367.918	3368.013	1837	197	1,1,1	LIPT	
2052	856928.09	26818286.9	Yes	2581.79	2581.726	-0.064	2581.705	2581.734	2581.742	1057	-1131	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
2053	805601.03	26675833.84	Yes	3179.76	3179.623	-0.137	3179.572	3179.617	3179.651	297	77	1,1,1	LIPT	
2054	846502.74	26704162.78	Yes	2142	2142.057	0.057	2142.007	2142.034	2142.102	538	1038	1,1,1	LIPT	
2056	937131.55	26381972.05	Yes	513.53	513.353	-0.177	513.335	513.359	513.362	1013	1042	1,1,1	LIPT	
2057	885956.33	26685370.76	Yes	2318.27	2318.011	-0.259	2317.974	2318.027	2318.075	991	630	1,1,1	LIPT	
2058	780819.79	26782526.01	Yes	2132.17	2132.108	-0.062	2132.053	2132.061	2132.131	795	972	1,1,1	LIPT	
2059	697404.78	26696491.67	Yes	4354.5	4354.492	-0.008	4354.481	4354.488	4354.555	1949	-261	1,1,1	LIPT	
2060	819849.1	26719093.23	Yes	1797.45	1797.578	0.128	1797.499	1797.745	1797.771	540	1217	1,1,1	LIPT	
2062	895460.98	26706880.43	Yes	1705.15	1705.076	-0.074	1704.908	1705.04	1705.097	1730	696	1,2,1	LIPT	
2063	865648.5	26749223.09	Yes	1278.39	1278.328	-0.062	1278.264	1278.342	1278.348	979	-471	1,1,1	LIPT	
2064	751389.7	26697550.79	Yes	2652.96	2652.928	-0.032	2652.925	2652.965	2652.973	830	-1713	1,1,1	LIPT	
2065	874567.28	26681708.09	Yes	2142.92	2142.836	-0.084	2142.812	2142.829	2142.909	1396	2955	1,1,1	LIPT	
2068	634375.01	26681793.33	Yes	3418.6	3418.637	0.037	3418.609	3418.723	3418.775	2022	-1060	1,1,1	LIPT	
2068A	629524.89	26666986.79	Yes	3103.47	3103.477	0.007	3103.467	3103.484	3103.498	1905	-1086	1,1,1	LIPT	
2070	881845.39	26726750.44	Yes	1307.75	1307.426	-0.324	1307.392	1307.484	1307.495	1724	-297	1,1,1	LIPT	
2072	634106.75	26670156.7	Yes	3327.4	3327.383	-0.017	3327.31	3327.452	3327.527	1608	532	1,1,1	LIPT	
2073	732670.94	26736156.48	Yes	2805.68	2805.486	-0.194	2805.449	2805.487	2805.501	1044	-442	1,1,1	LIPT	

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 VVA (vegetated vertical accuracy) check points. All XY coordinates and Z values reported are in the selected data units.

VVA (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
3001	957227.58	26410738.09	Yes	603.98	603.992	0.012	603.987	603.994	604.032	1193	914	1,1,1	LIPT	
3014	714735.58	26561961.72	Yes	2619.35	2619.628	0.278	2619.529	2619.636	2619.649	777	-171	2,2,2	LIPT	
3014A	715410.29	26567283.25	Yes	2628.43	2628.906	0.476	2628.902	2628.904	2628.913	1637	-1047	1,1,1	LIPT	
3018	938873.98	26408883.51	Yes	1471.36	1471.488	0.128	1471.465	1471.523	1471.62	2159	169	1,1,1	LIPT	
3020	740051.28	26633576.93	Yes	3016.57	3016.715	0.145	3016.655	3016.66	3016.738	1827	1323	1,1,1	LIPT	
3021	745091.48	26791450.16	Yes	2413.95	2413.989	0.039	2413.849	2413.93	2414.048	1045	264	2,2,1	LIPT	
3022	800247.09	26804887.36	Yes	2048.35	2048.279	-0.071	2048.148	2048.316	2048.402	855	1040	2,2,2	LIPT	
3022A	796467.92	26803257.69	Yes	2036.27	2036.407	0.137	2036.33	2036.417	2036.429	1407	-848	2,1,1	LIPT	
3023	712519.73	26846043.19	Yes	2884.8	2884.93	0.130	2884.911	2884.959	2884.969	1921	1405	1,1,1	LIPT	
3024	759214.77	26764341.51	Yes	2344.15	2343.084	-1.066	2343.042	2343.082	2343.112	2835	1137	1,1,1	LIPT	
3025	823309.68	26777396.36	Yes	1982.84	1983.209	0.369	1983.184	1983.214	1983.291	2770	1536	1,1,1	LIPT	
3026	765851.97	26818333.53	Yes	2359.35	2359.674	0.324	2359.659	2359.685	2359.704	2999	-1333	1,1,1	LIPT	
3027A	777655.25	26686232.14	Yes	2520.04	2519.878	-0.162	2519.842	2519.879	2519.927	2020	-970	1,1,1	LIPT	
3029	623319.62	26649859.12	Yes	2702.36	2702.257	-0.103	2702.247	2702.256	2702.27	1805	261	1,1,1	LIPT	
3029A	629484.29	26667055.09	Yes	3104.33	3104.472	0.142	3104.425	3104.492	3104.514	1493	-1105	1,1,1	LIPT	
3030	788669	26700352.29	Yes	2313.46	2313.729	0.269	2313.712	2313.737	2313.769	1620	-310	1,1,1	LIPT	
3032	781443.28	26742594.12	Yes	2063.67	2063.645	-0.025	2063.571	2063.622	2063.685	1397	-1018	1,1,1	LIPT	
3033	841197.82	26857512.17	Yes	2601.91	2602.112	0.202	2602.095	2602.098	2602.181	1706	-197	1,1,1	LIPT	
3033A	857202.1	26839985.92	Yes	2213.25	2213.316	0.066	2213.268	2213.308	2213.345	2003	-875	1,1,1	LIPT	
3036	803767.73	26751306.36	Yes	1792.77	1792.865	0.095	1792.831	1792.873	1792.878	1410	940	1,1,1	LIPT	
3036A	797269.55	26748571.81	Yes	1884.34	1884.369	0.029	1884.287	1884.368	1884.39	1902	-550	2,1,1	LIPT	
3037	586355.83	26680943.7	Yes	2803.57	2803.682	0.112	2803.671	2803.694	2803.716	1633	761	1,1,1	LIPT	
3039	678469.72	26709856.06	Yes	5390.48	5389.141	-1.339	5389.11	5389.116	5389.27	853	1642	3,1,2	LIPT	
3041	699530.38	26805263.69	Yes	4350.93	4350.687	-0.243	4350.643	4350.668	4350.734	1668	1636	1,1,1	LIPT	
3042	722234.66	26766644.93	Yes	3410.46	3410.449	-0.011	3410.382	3410.43	3410.527	2392	253	1,1,1	LIPT	
3042A	721355.43	26758232.39	Yes	3216.26	3216.219	-0.041	3216.108	3216.19	3216.291	1555	1688	1,1,1	LIPT	
3045	714894.04	26719435.13	Yes	3301.43	3301.778	0.348	3301.638	3301.754	3302.183	1499	1035	1,1,1	LIPT	
3047	720365	26817567.26	Yes	3369.96	3369.94	-0.020	3369.932	3369.943	3369.965	1688	230	1,1,1	LIPT	
3048	856815.85	26818256.07	Yes	2582.66	2582.551	-0.109	2582.544	2582.553	2582.605	1761	1369	1,1,1	LIPT	
3049	802226.33	26676305.63	Yes	3045.15	3045.08	-0.070	3045.044	3045.056	3045.182	1359	-1803	1,1,1	LIPT	

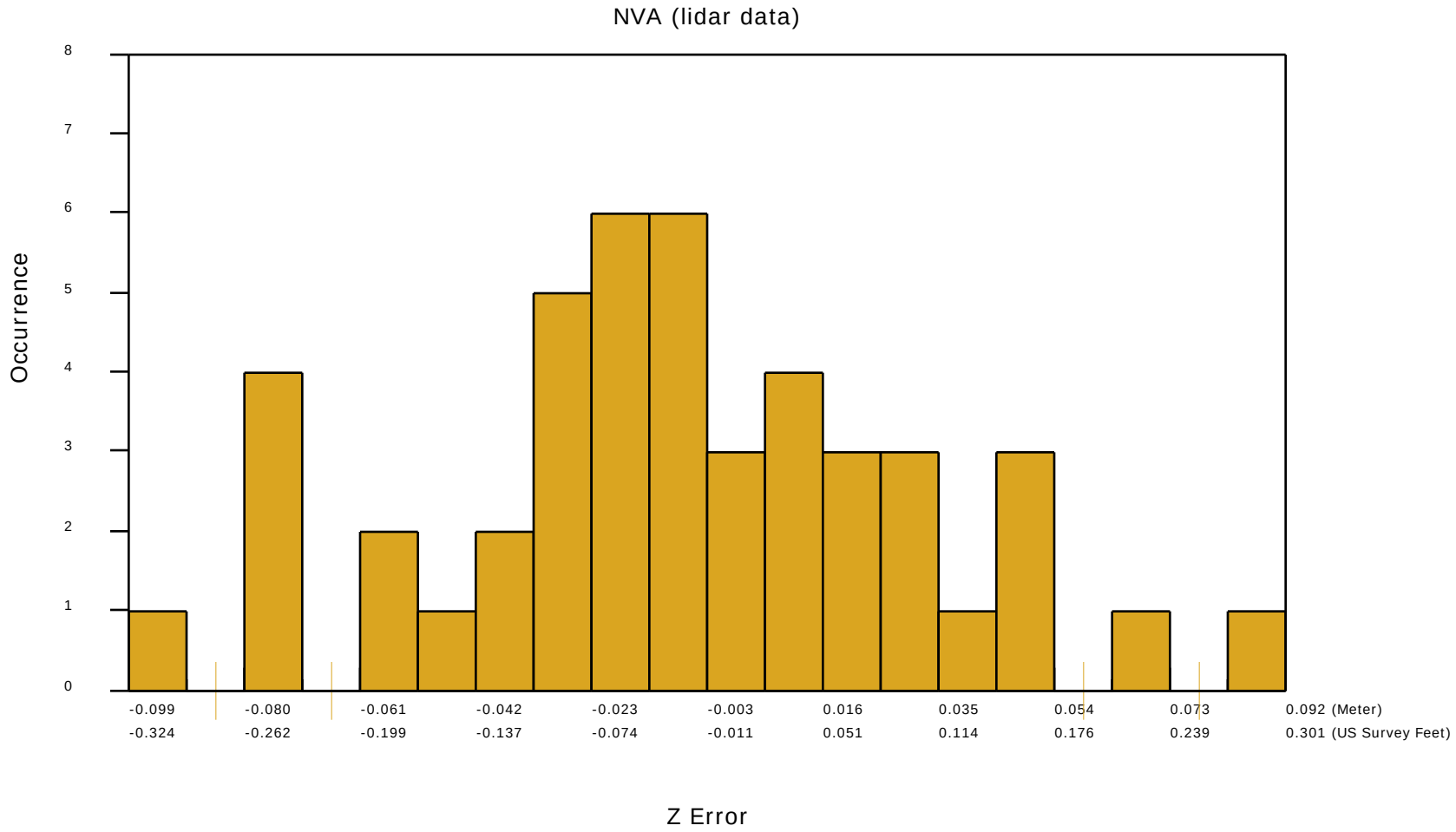
Check Points Vertical Accuracy - continued

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Minimum Z	Median Z	Maximum Z	Intensity	Scan Angle Rank	Returns	Description	Comments
3050	846758.27	26703347.09	Yes	2156.05	2156.117	0.067	2155.967	2156.104	2156.191	1194	-258	1,1,1	LIPT	
3051	937320.08	26381964.74	Yes	511.39	511.723	0.333	511.524	511.723	511.752	1413	-2091	2,1,1	LIPT	
3052	697572.31	26696408.08	Yes	4336.58	4336.635	0.055	4336.618	4336.671	4336.77	1864	29	1,1,1	LIPT	
3054	896924.85	26706979.89	Yes	1784.53	1784.634	0.104	1784.594	1784.642	1784.765	1856	626	1,1,1	LIPT	
3055	865552.19	26749259.33	Yes	1279.34	1279.284	-0.056	1279.208	1279.3	1279.321	816	153	1,2,2	LIPT	
3057	881689.45	26727001.59	Yes	1310.93	1310.924	-0.006	1310.835	1310.974	1310.981	1153	-826	1,2,1	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.

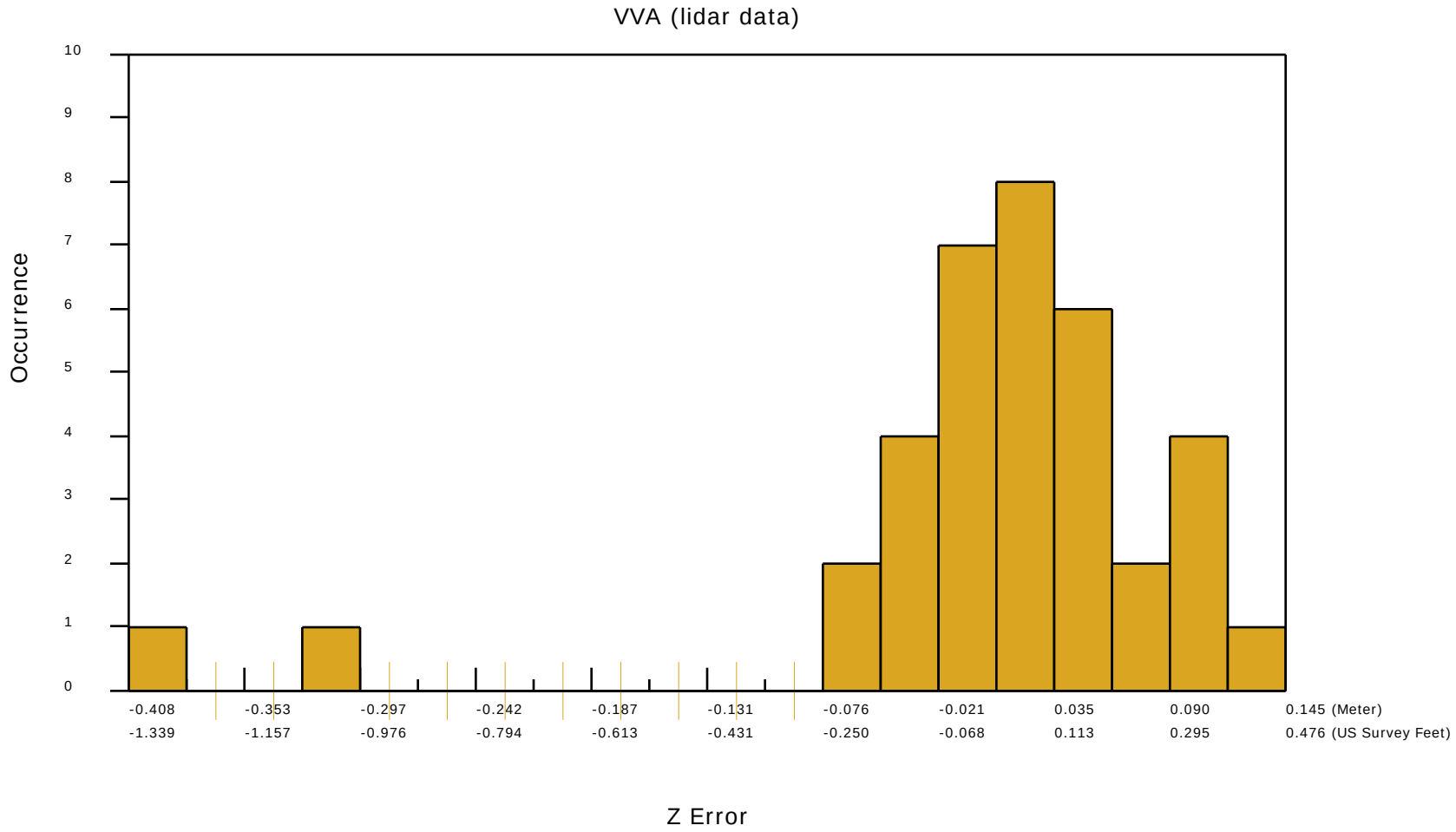
Data Source - C:\00_Nevada\QL1_Temp_Client_Tiles



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 lidar point cloud data measured against surveyed ground check points.

Data Source - C:\00_Nevada\QL1_Temp_Client_Tiles



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
2001	957287.31	26410887.46	Yes	613.13	613.055	-0.075	LIPT	
2015	714732.2	26562952.1	Yes	2627.31	2627.595	0.285	LIPT	
2015A	714470.64	26560713.64	Yes	2611.87	2612.070	0.200	LIPT	
2020	937839.3	26408827.1	Yes	1527.45	1527.260	-0.190	LIPT	
2022	740194.46	26633469.06	Yes	3011.98	3011.999	0.019	LIPT	
2023	745505.17	26791355.87	Yes	2410.02	2410.026	0.006	LIPT	
2024	804540.02	26807971.84	Yes	2133.37	2133.116	-0.254	LIPT	
2024A	800232.13	26804876.84	Yes	2047.31	2047.305	-0.005	LIPT	
2025	712532.55	26846125.87	Yes	2882.68	2882.773	0.093	LIPT	
2026	758918.5	26764136.91	Yes	2348.26	2348.151	-0.109	LIPT	
2027	823305.72	26777345.22	Yes	1980.78	1980.829	0.049	LIPT	
2028	765784.85	26818648.68	Yes	2357.71	2357.640	-0.070	LIPT	
2029	770956.88	26674648.68	Yes	2746.17	2746.146	-0.024	LIPT	
2029A	777760.48	26687744.82	Yes	2496.97	2496.975	0.005	LIPT	
2031	622041.99	26649596.34	Yes	2700.41	2700.377	-0.033	LIPT	
2032	789445.58	26699870.34	Yes	2328.66	2328.576	-0.084	LIPT	
2032A	787910.05	26700322.94	Yes	2312.74	2312.716	-0.024	LIPT	
2034	780499.74	26742483.74	Yes	2070.95	2070.897	-0.053	LIPT	
2035	841230.28	26857446.59	Yes	2600.15	2600.243	0.093	LIPT	
2035A	857302.6	26840006.56	Yes	2213.43	2213.351	-0.079	LIPT	
2039	803761.73	26751344.4	Yes	1792.3	1792.212	-0.088	LIPT	
2039A	796435.13	26749307.14	Yes	1877.05	1877.080	0.030	LIPT	
2040	586305.52	26680924.54	Yes	2803.31	2803.483	0.173	LIPT	
2042	678110.79	26709453.79	Yes	5365.68	5365.692	0.012	LIPT	
2045	703263.01	26808592.79	Yes	4130.49	4130.640	0.150	LIPT	
2046	722229.64	26766712.16	Yes	3412.61	3412.520	-0.090	LIPT	
2046A	721122.28	26758117.66	Yes	3227.34	3227.114	-0.226	LIPT	
2049	714908.63	26719444.61	Yes	3302.13	3302.290	0.160	LIPT	
2051	720411.7	26817570.6	Yes	3367.81	3367.927	0.117	LIPT	
2052	856928.09	26818286.9	Yes	2581.79	2581.734	-0.056	LIPT	

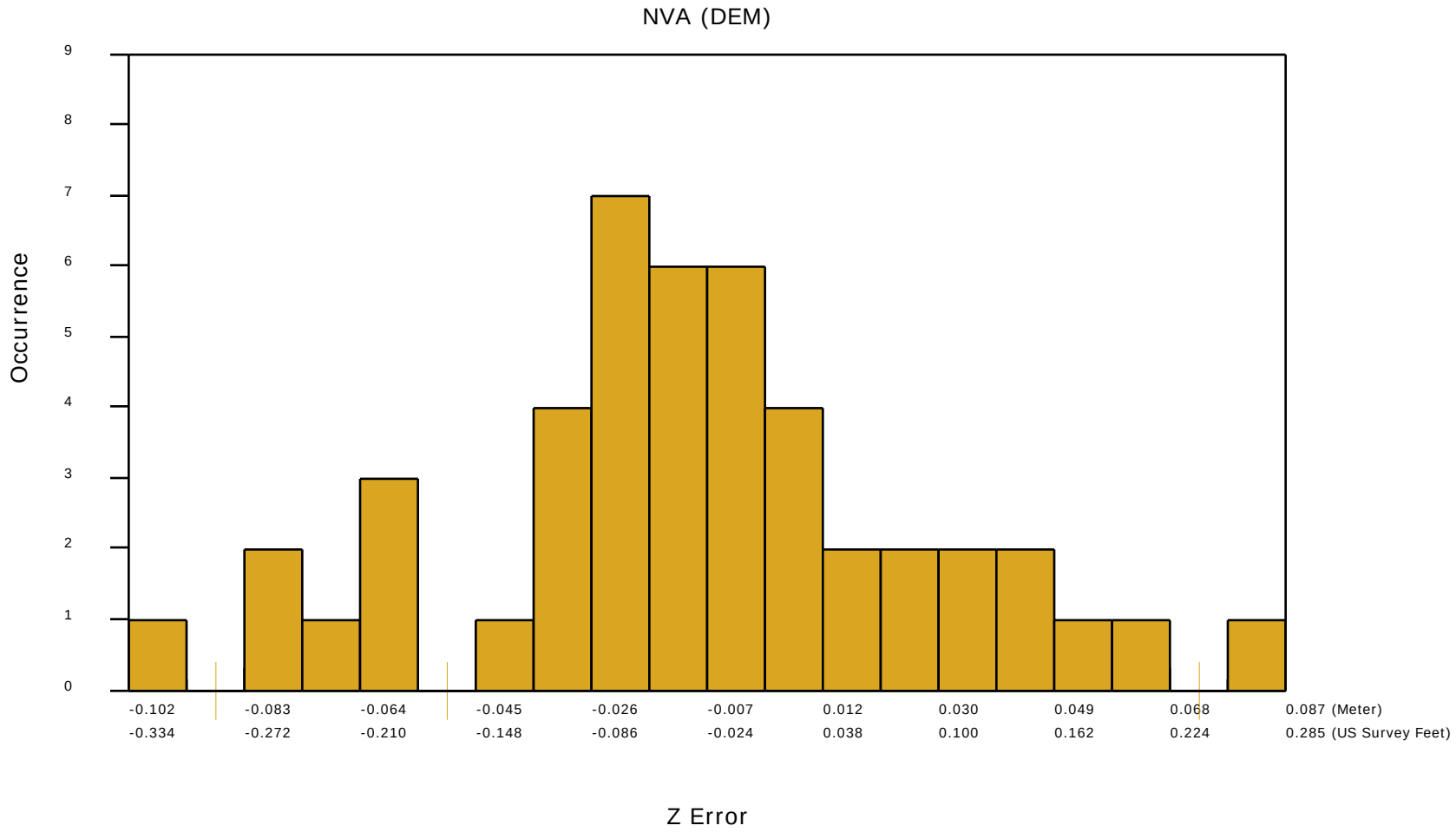
Check Points Vertical Accuracy - continued

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Description	Comments
2053	805601.03	26675833.84	Yes	3179.76	3179.625	-0.135	LIPT	
2054	846502.74	26704162.78	Yes	2142	2142.039	0.039	LIPT	
2056	937131.55	26381972.05	Yes	513.53	513.347	-0.183	LIPT	
2057	885956.33	26685370.76	Yes	2318.27	2318.021	-0.249	LIPT	
2058	780819.79	26782526.01	Yes	2132.17	2132.126	-0.044	LIPT	
2059	697404.78	26696491.67	Yes	4354.5	4354.495	-0.005	LIPT	
2060	819849.1	26719093.23	Yes	1797.45	1797.567	0.117	LIPT	
2062	895460.98	26706880.43	Yes	1705.15	1705.102	-0.048	LIPT	
2063	865648.5	26749223.09	Yes	1278.39	1278.291	-0.099	LIPT	
2064	751389.7	26697550.79	Yes	2652.96	2652.920	-0.040	LIPT	
2065	874567.28	26681708.09	Yes	2142.92	2142.862	-0.058	LIPT	
2068	634375.01	26681793.33	Yes	3418.6	3418.626	0.026	LIPT	
2068A	629524.89	26666986.79	Yes	3103.47	3103.455	-0.015	LIPT	
2070	881845.39	26726750.44	Yes	1307.75	1307.416	-0.334	LIPT	
2072	634106.75	26670156.7	Yes	3327.4	3327.332	-0.068	LIPT	
2073	732670.94	26736156.48	Yes	2805.68	2805.482	-0.198	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 - C:\00_Nevada\QL1_Temp_Client_Tiles



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
3001	957227.58	26410738.09	Yes	603.98	604.024	0.044	LIPT	
3014	714735.58	26561961.72	Yes	2619.35	2619.600	0.250	LIPT	
3014A	715410.29	26567283.25	Yes	2628.43	2628.908	0.478	LIPT	
3018	938873.98	26408883.51	Yes	1471.36	1471.551	0.191	LIPT	
3020	740051.28	26633576.93	Yes	3016.57	3016.717	0.147	LIPT	
3021	745091.48	26791450.16	Yes	2413.95	2413.953	0.003	LIPT	
3022	800247.09	26804887.36	Yes	2048.35	2048.368	0.018	LIPT	
3022A	796467.92	26803257.69	Yes	2036.27	2036.368	0.098	LIPT	
3023	712519.73	26846043.19	Yes	2884.8	2884.918	0.118	LIPT	
3024	759214.77	26764341.51	Yes	2344.15	2343.071	-1.079	LIPT	
3025	823309.68	26777396.36	Yes	1982.84	1983.190	0.350	LIPT	
3026	765851.97	26818333.53	Yes	2359.35	2359.668	0.318	LIPT	
3027A	777655.25	26686232.14	Yes	2520.04	2519.873	-0.167	LIPT	
3029	623319.62	26649859.12	Yes	2702.36	2702.271	-0.089	LIPT	
3029A	629484.29	26667055.09	Yes	3104.33	3104.503	0.173	LIPT	
3030	788669	26700352.29	Yes	2313.46	2313.704	0.244	LIPT	
3032	781443.28	26742594.12	Yes	2063.67	2063.569	-0.101	LIPT	
3033	841197.82	26857512.17	Yes	2601.91	2602.134	0.224	LIPT	
3033A	857202.1	26839985.92	Yes	2213.25	2213.287	0.037	LIPT	
3036	803767.73	26751306.36	Yes	1792.77	1792.879	0.109	LIPT	
3036A	797269.55	26748571.81	Yes	1884.34	1884.386	0.046	LIPT	
3037	586355.83	26680943.7	Yes	2803.57	2803.701	0.131	LIPT	
3039	678469.72	26709856.06	Yes	5390.48	5389.129	-1.351	LIPT	
3041	699530.38	26805263.69	Yes	4350.93	4350.671	-0.259	LIPT	
3042	722234.66	26766644.93	Yes	3410.46	3410.425	-0.035	LIPT	
3042A	721355.43	26758232.39	Yes	3216.26	3216.185	-0.075	LIPT	
3045	714894.04	26719435.13	Yes	3301.43	3301.618	0.188	LIPT	
3047	720365	26817567.26	Yes	3369.96	3369.900	-0.060	LIPT	
3048	856815.85	26818256.07	Yes	2582.66	2582.543	-0.117	LIPT	
3049	802226.33	26676305.63	Yes	3045.15	3045.089	-0.061	LIPT	

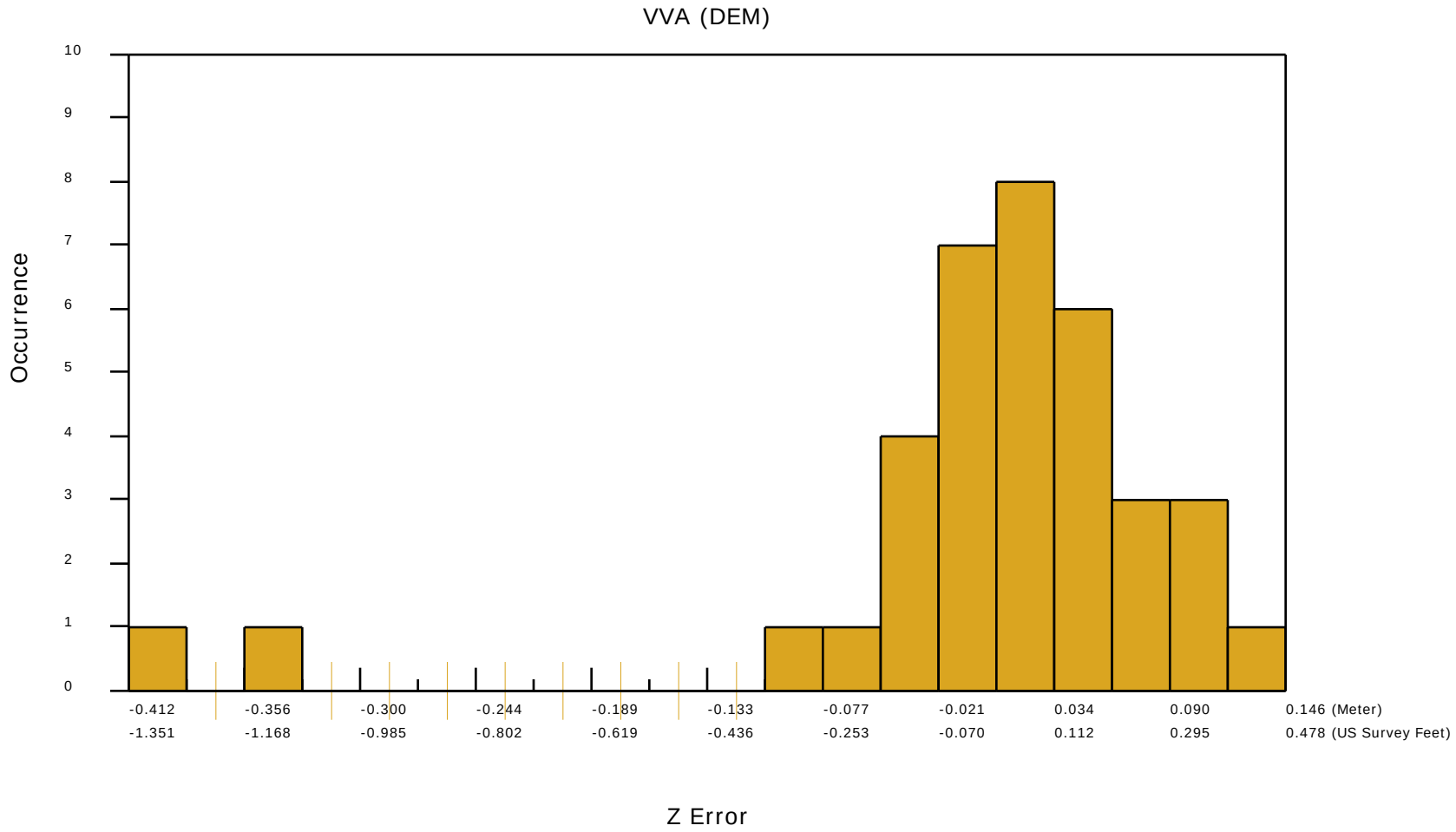
Check Points Vertical Accuracy - continued

ID	X	Y	Coverage	Z	Z From Lidar	Z Error	Description	Comments
3050	846758.27	26703347.09	Yes	2156.05	2156.072	0.022	LIPT	
3051	937320.08	26381964.74	Yes	511.39	511.686	0.296	LIPT	
3052	697572.31	26696408.08	Yes	4336.58	4336.607	0.027	LIPT	
3054	896924.85	26706979.89	Yes	1784.53	1784.565	0.035	LIPT	
3055	865552.19	26749259.33	Yes	1279.34	1279.308	-0.032	LIPT	
3057	881689.45	26727001.59	Yes	1310.93	1310.923	-0.007	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.

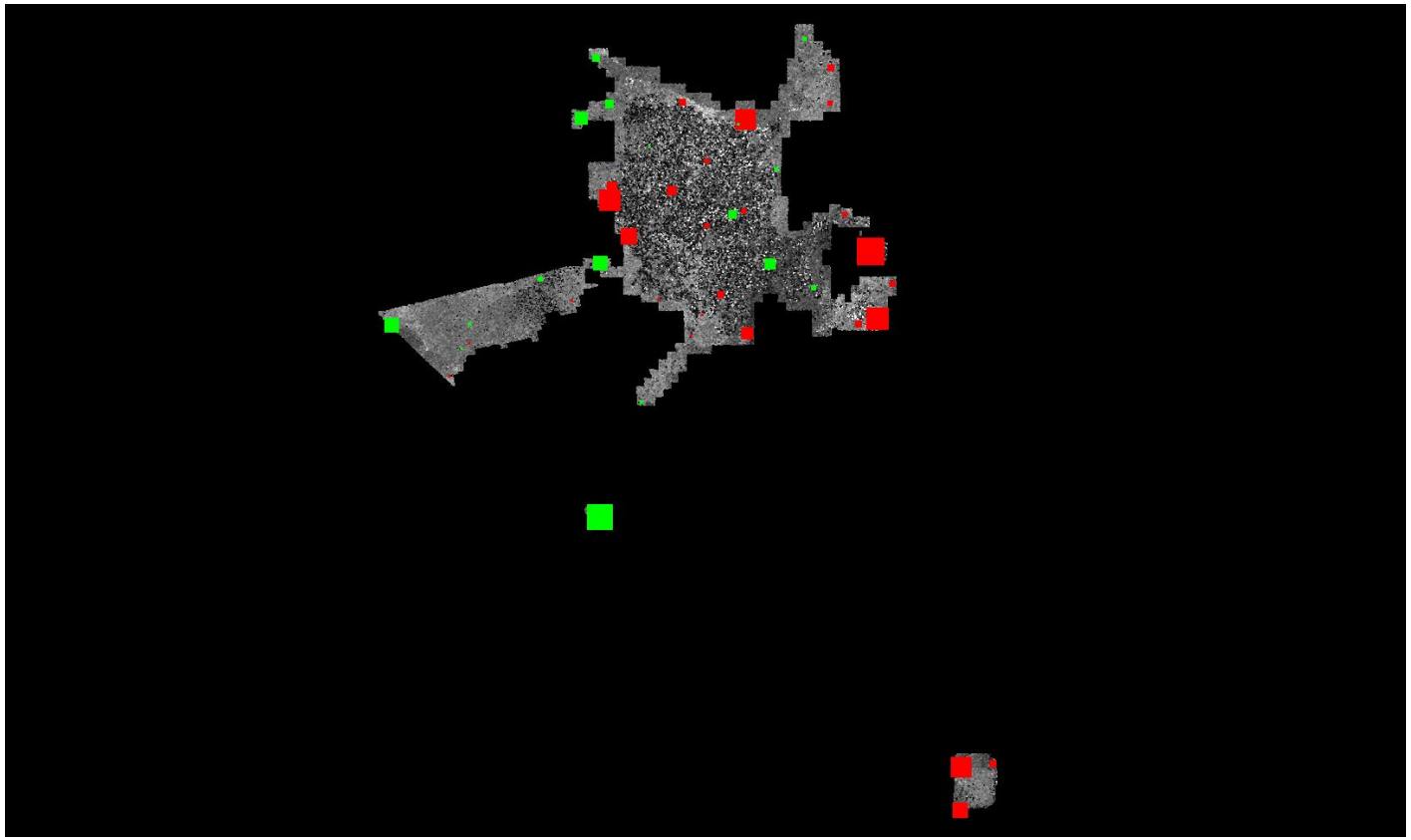
Data Source - C:\00_Nevada\QL1_Temp_Client_Tiles



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 - C:\00_Nevada\Client_LAS
Result Path - D:\00_Nevada\Nevada_QL1_QC\DPH_11\ColorByIntensity_CheckPoints_NVA.jpg



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

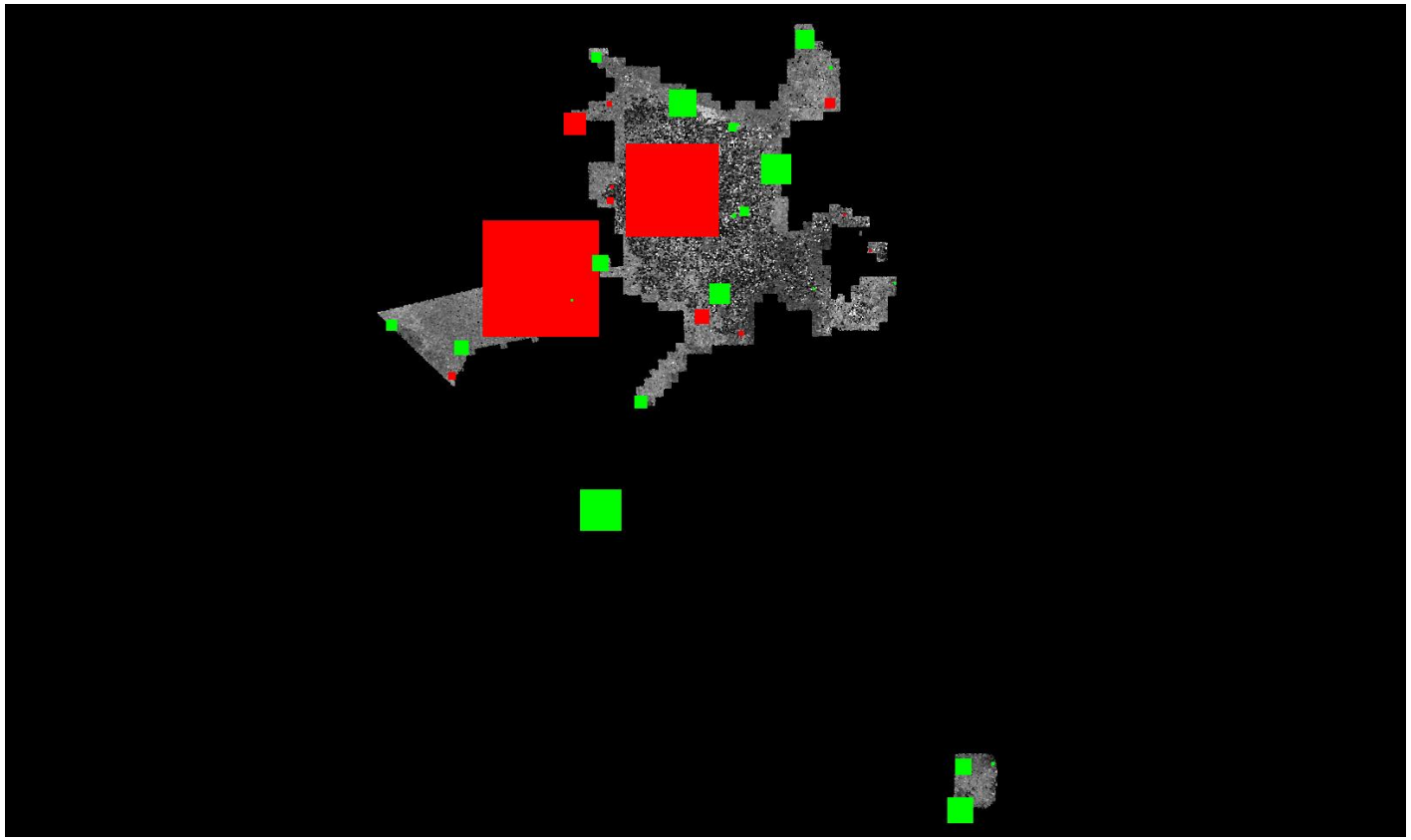
Red represents where the lidar surface is below the check point (negative elevation error).

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 - C:\00_Nevada\Client_LAS
Result Path - D:\00_Nevada\Nevada_QL1_QC\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.