

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 | ≤ 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 - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\metadata\shapefiles\TX_WestTexas_Lot9_106NVA_100VVA_pts_u13.shp](#)

Units: Meter (/Feet)

Vertical Accuracy Class tested: 10-cm

| | |
|--|------------------|
| Check Points in defined project area (DPA): | 206 |
| Check Points with Lidar Coverage | 206 |
| Check Points with Lidar Coverage (NVA) | 106 |
| Check Points with Lidar Coverage (VVA) | 100 |
| Average Z Error (NVA) | -0.014/-0.045 |
| Maximum Z Error (NVA) | 0.144/0.471 |
| Median Z Error (NVA) | -0.015/-0.049 |
| Minimum Z Error (NVA) | -0.269/-0.883 |
| Standard deviation of Vertical Error (NVA) | 0.060/0.197 |
| Skewness of Vertical Error (NVA) | -0.511 |
| Kurtosis of Vertical Error (NVA) | 3.100 |
| Non-vegetated Vertical Accuracy (NVA) RMSE(z) ¹ | 0.061/0.201 PASS |
| Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level +/- ¹ | 0.120/0.395 PASS |
| FGDC/NSSDA Vertical Accuracy at the 95% Confidence Level +/- | 0.120/0.395 |
| Non-vegetated Vertical Accuracy (NVA) RMSE(z) (DEM) ² | 0.063/0.207 PASS |
| Non-vegetated Vertical Accuracy (NVA) at the 95% Confidence Level (DEM) +/- ² | 0.124/0.406 PASS |
| Vegetated Vertical Accuracy (VVA) at the 95th Percentile (DEM) +/- ² | 0.185/0.607 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 = 6.1cm, equating to +/- 12.0cm at the 95% confidence level. Actual VVA accuracy was found to be +/- 18.5cm 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 Version 1.3 (page 24, Table 6).

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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 |
|-------|------------|-------------|----------|----------|--------------|---------|-----------|----------|-----------|-----------|-----------------|---------|-------------|----------|
| 1004 | 658479.864 | 3240043.379 | Yes | 1112.147 | 1112.119 | -0.028 | 1112.107 | 1112.135 | 1112.147 | 3167 | -241 | 1,1,1 | | |
| 1006 | 628366.402 | 3359058.829 | Yes | 1367.001 | 1366.87 | -0.131 | 1366.866 | 1366.879 | 1366.886 | 2713 | -2136 | 1,1,1 | | |
| 1007 | 607516.467 | 3349821.71 | Yes | 1494.228 | 1494.161 | -0.067 | 1494.154 | 1494.16 | 1494.179 | 2644 | -1594 | 1,1,1 | | |
| 1011 | 665037.202 | 3239093.257 | Yes | 1641.018 | 1640.749 | -0.269 | 1640.74 | 1640.744 | 1640.791 | 3706 | 3240 | 1,1,1 | | |
| 1013 | 619824.002 | 3374515.642 | Yes | 1351.838 | 1351.756 | -0.082 | 1351.752 | 1351.785 | 1351.787 | 3835 | 1460 | 1,1,1 | | |
| 1020 | 650473.134 | 3377094.501 | Yes | 1204.628 | 1204.58 | -0.048 | 1204.572 | 1204.586 | 1204.598 | 8038 | -1756 | 1,1,1 | | |
| 1022 | 559562.486 | 3270239.897 | Yes | 784.431 | 784.487 | 0.056 | 784.453 | 784.484 | 784.499 | 3252 | 1562 | 1,1,1 | | |
| 1023 | 592973.378 | 3394827.268 | Yes | 1891.471 | 1891.438 | -0.033 | 1891.429 | 1891.438 | 1891.485 | 3802 | -3011 | 1,1,1 | | |
| 1024 | 601055.845 | 3260481.567 | Yes | 1266.677 | 1266.701 | 0.024 | 1266.699 | 1266.701 | 1266.704 | 5404 | -2588 | 1,1,1 | | |
| 1027 | 642457.042 | 3246108.726 | Yes | 800.354 | 800.293 | -0.061 | 800.285 | 800.298 | 800.302 | 4528 | 1185 | 1,1,1 | | |
| 1028 | 590251.625 | 3378246.25 | Yes | 1648.947 | 1648.983 | 0.036 | 1648.973 | 1648.987 | 1648.987 | 4721 | -1333 | 1,1,1 | | |
| 1029 | 607965.347 | 3336789.666 | Yes | 1442.539 | 1442.531 | -0.008 | 1442.487 | 1442.517 | 1442.542 | 6194 | -2354 | 1,1,1 | | |
| 1029A | 607965.52 | 3336792.719 | Yes | 1442.52 | 1442.486 | -0.034 | 1442.476 | 1442.479 | 1442.499 | 5600 | -2309 | 1,1,1 | | |
| 1032 | 658178.473 | 3261575.974 | Yes | 1043.441 | 1043.393 | -0.048 | 1043.392 | 1043.395 | 1043.41 | 5476 | -3011 | 1,1,1 | | |
| 1033 | 642382.896 | 3360521.222 | Yes | 1366.27 | 1366.318 | 0.048 | 1366.308 | 1366.325 | 1366.341 | 2865 | 1152 | 1,1,1 | | |
| 1042 | 639318.577 | 3274484.762 | Yes | 1019.583 | 1019.595 | 0.012 | 1019.573 | 1019.598 | 1019.607 | 8305 | 1876 | 1,1,1 | | |
| 1045 | 642589.561 | 3261570.641 | Yes | 1009.726 | 1009.645 | -0.081 | 1009.643 | 1009.648 | 1009.673 | 3309 | -830 | 1,1,1 | | |
| 1046 | 615947.17 | 3238147.524 | Yes | 714.36 | 714.333 | -0.027 | 714.303 | 714.325 | 714.355 | 1756 | 1395 | 1,1,1 | | |
| 1047 | 608140.872 | 3387438.826 | Yes | 1460.563 | 1460.575 | 0.012 | 1460.557 | 1460.58 | 1460.589 | 3677 | 2876 | 1,1,1 | | |
| 1055 | 636485.051 | 3326659.88 | Yes | 1333.893 | 1333.845 | -0.048 | 1333.83 | 1333.844 | 1333.876 | 2686 | 318 | 1,1,1 | | |
| 1056 | 612586.64 | 3270771.752 | Yes | 1338.704 | 1338.713 | 0.009 | 1338.658 | 1338.669 | 1338.717 | 4471 | 2305 | 1,1,1 | | |
| 1057 | 594370.113 | 3244690.4 | Yes | 823.082 | 823.09 | 0.008 | 823.081 | 823.094 | 823.104 | 4262 | 1249 | 1,1,1 | | |
| 1060A | 577656.981 | 3268580.515 | Yes | 872.165 | 872.208 | 0.043 | 872.202 | 872.211 | 872.218 | 4879 | -628 | 1,1,1 | | |
| 1074 | 647821.166 | 3243024.986 | Yes | 865.23 | 865.17 | -0.060 | 865.14 | 865.175 | 865.175 | 3478 | 424 | 1,1,1 | | |
| 1077 | 650330.846 | 3218935.06 | Yes | 697.832 | 697.872 | 0.040 | 697.807 | 697.86 | 697.876 | 4146 | 1139 | 1,1,1 | | |
| 1081 | 679672.767 | 3239332.562 | Yes | 951.759 | 951.682 | -0.077 | 951.648 | 951.657 | 951.697 | 7205 | 2504 | 1,1,1 | | |
| 1085 | 584758.221 | 3397179.771 | Yes | 1815.306 | 1815.257 | -0.049 | 1815.238 | 1815.294 | 1815.397 | 2186 | 1873 | 1,1,1 | | |
| 1090 | 594052.054 | 3329639.16 | Yes | 1303.246 | 1303.213 | -0.033 | 1303.208 | 1303.215 | 1303.218 | 3225 | -42 | 1,1,1 | | |
| 1090A | 594041.678 | 3329635.498 | Yes | 1303.058 | 1303.095 | 0.037 | 1303.076 | 1303.078 | 1303.099 | 5815 | -11 | 1,1,1 | | |
| 1095 | 677685.97 | 3286038.667 | Yes | 857.89 | 857.865 | -0.025 | 857.846 | 857.847 | 857.878 | 4782 | 1096 | 1,1,1 | | |

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 |
|----------|------------|-------------|----------|----------|--------------|---------|-----------|----------|-----------|-----------|-----------------|---------|-------------|----------|
| 1096A | 616547.583 | 3400574.953 | Yes | 1320.155 | 1320.14 | -0.015 | 1320.132 | 1320.161 | 1320.17 | 3761 | -1159 | 1,1,1 | | |
| 1112 | 679968.802 | 3253263.704 | Yes | 867.813 | 867.757 | -0.056 | 867.753 | 867.754 | 867.763 | 2984 | 1782 | 1,1,1 | | |
| 1117 | 583655.977 | 3251405.48 | Yes | 758.079 | 758.053 | -0.026 | 758.009 | 758.029 | 758.079 | 3762 | 2127 | 1,1,1 | | |
| 1118 | 595824.269 | 3294608.995 | Yes | 1090.988 | 1090.983 | -0.005 | 1090.97 | 1090.985 | 1091.007 | 5971 | 841 | 1,1,1 | | |
| 1119 | 600108.746 | 3373933.007 | Yes | 1540.635 | 1540.723 | 0.088 | 1540.68 | 1540.699 | 1540.732 | 2914 | -875 | 1,1,1 | | |
| 1121 | 665285.209 | 3248528.108 | Yes | 1121.34 | 1121.365 | 0.025 | 1121.359 | 1121.365 | 1121.367 | 6171 | -180 | 1,1,1 | | |
| 1127 | 643913.594 | 3255034.582 | Yes | 955.806 | 955.76 | -0.046 | 955.748 | 955.753 | 955.762 | 6054 | -111 | 1,1,1 | | |
| 1127VOID | 643913.595 | 3255034.579 | Yes | 955.716 | 955.76 | 0.044 | 955.748 | 955.753 | 955.762 | 6050 | -111 | 1,1,1 | | |
| 1132 | 629863.025 | 3367980.037 | Yes | 1298.89 | 1298.947 | 0.057 | 1298.921 | 1298.961 | 1298.982 | 4480 | 2438 | 1,1,1 | | |
| 1136 | 570713.176 | 3266083.883 | Yes | 780.725 | 780.706 | -0.019 | 780.691 | 780.702 | 780.738 | 5580 | -383 | 1,1,1 | | |
| 1153 | 684917.516 | 3236866.548 | Yes | 784.943 | 784.866 | -0.077 | 784.862 | 784.863 | 784.874 | 4585 | 340 | 1,1,1 | | |
| 1161 | 603803.046 | 3381434.82 | Yes | 1497.495 | 1497.602 | 0.107 | 1497.583 | 1497.602 | 1497.611 | 3126 | -640 | 1,1,1 | | |
| 1165 | 593926.387 | 3323470.869 | Yes | 1278.056 | 1278.023 | -0.033 | 1278.01 | 1278.023 | 1278.027 | 3425 | 643 | 1,1,1 | | |
| 1165A | 593920.847 | 3323465.902 | Yes | 1277.994 | 1277.986 | -0.008 | 1277.974 | 1277.987 | 1277.992 | 5200 | 660 | 1,1,1 | | |
| 1168 | 659153.542 | 3284832.036 | Yes | 1116.321 | 1116.358 | 0.037 | 1116.357 | 1116.357 | 1116.373 | 4557 | 1162 | 1,1,1 | | |
| 1172 | 637364.551 | 3293992.679 | Yes | 1197.428 | 1197.395 | -0.033 | 1197.351 | 1197.386 | 1197.423 | 2660 | -1007 | 1,1,1 | | |
| 1173 | 616552.629 | 3378606.737 | Yes | 1387.924 | 1387.896 | -0.028 | 1387.859 | 1387.908 | 1387.918 | 4384 | 915 | 1,1,1 | | |
| 1177 | 680482.139 | 3272986.408 | Yes | 824.455 | 824.384 | -0.071 | 824.364 | 824.393 | 824.397 | 2816 | -498 | 1,1,1 | | |
| 1186 | 674205.73 | 3245694.553 | Yes | 1137.03 | 1136.969 | -0.061 | 1136.924 | 1137.002 | 1137.038 | 2887 | 1075 | 1,1,1 | | |
| 1195 | 612186.919 | 3241520.688 | Yes | 767.852 | 767.814 | -0.038 | 767.781 | 767.813 | 767.818 | 5342 | 1372 | 1,1,1 | | |
| 1198 | 622883.898 | 3261732.982 | Yes | 1190.755 | 1190.786 | 0.031 | 1190.747 | 1190.777 | 1190.797 | 10192 | 367 | 1,1,1 | | |
| 1201 | 636876.088 | 3310476.698 | Yes | 1213.825 | 1213.845 | 0.020 | 1213.827 | 1213.855 | 1213.856 | 4234 | 696 | 1,1,1 | | |
| 1203 | 678466.052 | 3279968.768 | Yes | 812.911 | 812.864 | -0.047 | 812.833 | 812.838 | 812.885 | 2849 | -1001 | 1,1,1 | | |
| 1205 | 606887.036 | 3338475.046 | Yes | 1438.029 | 1437.833 | -0.196 | 1437.805 | 1437.825 | 1437.845 | 5739 | 669 | 1,1,1 | | |
| 1205A | 602285.403 | 3335506.437 | Yes | 1412.543 | 1412.466 | -0.077 | 1412.458 | 1412.461 | 1412.481 | 6907 | 911 | 1,1,1 | | |
| 1208 | 636586.353 | 3284555.03 | Yes | 1109.461 | 1109.446 | -0.015 | 1109.434 | 1109.456 | 1109.477 | 7445 | 1396 | 1,1,1 | | |
| 1211 | 688791.395 | 3278684.436 | Yes | 769.002 | 768.986 | -0.016 | 768.983 | 768.987 | 768.999 | 6995 | 1781 | 1,1,1 | | |
| 1216 | 641083.475 | 3268317.311 | Yes | 1048.904 | 1048.84 | -0.064 | 1048.834 | 1048.844 | 1048.877 | 5383 | 1240 | 1,1,1 | | |
| 1217 | 622244.454 | 3361719.799 | Yes | 1411.552 | 1411.535 | -0.017 | 1411.515 | 1411.539 | 1411.547 | 2963 | 65 | 1,1,1 | | |
| 1219 | 693115.625 | 3236930.106 | Yes | 694.247 | 694.233 | -0.014 | 694.218 | 694.245 | 694.254 | 8248 | 981 | 1,1,1 | | |
| 1225 | 604011.484 | 3343252.691 | Yes | 1433.957 | 1433.923 | -0.034 | 1433.902 | 1433.918 | 1433.948 | 6315 | -1272 | 1,1,1 | | |
| 1232 | 625451.239 | 3371171.705 | Yes | 1313.554 | 1313.558 | 0.004 | 1313.554 | 1313.558 | 1313.559 | 6493 | -274 | 1,1,1 | | |
| 1234 | 637619.134 | 3298025.46 | Yes | 1153.712 | 1153.706 | -0.006 | 1153.689 | 1153.706 | 1153.708 | 2604 | 2360 | 1,1,1 | | |
| 1235 | 607865.573 | 3339155.721 | Yes | 1443.462 | 1443.397 | -0.065 | 1443.389 | 1443.402 | 1443.411 | 6473 | -2291 | 1,1,1 | | |
| 1242 | 652604.796 | 3401870.213 | Yes | 1076.313 | 1076.457 | 0.144 | 1076.444 | 1076.46 | 1076.463 | 8157 | 1888 | 1,1,1 | | |

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 |
|---------|------------|-------------|----------|----------|--------------|---------|-----------|----------|-----------|-----------|-----------------|---------|-------------|----------|
| 1257A | 594225.244 | 3353505.696 | Yes | 1429.499 | 1429.637 | 0.138 | 1429.617 | 1429.654 | 1429.666 | 2038 | -1261 | 1,1,1 | | |
| 1271 | 637951.429 | 3345039.285 | Yes | 1577.423 | 1577.415 | -0.008 | 1577.378 | 1577.414 | 1577.424 | 5187 | -284 | 1,1,1 | | |
| 1272 | 637371.309 | 3305199.265 | Yes | 1158.444 | 1158.468 | 0.024 | 1158.445 | 1158.449 | 1158.47 | 5332 | 2737 | 1,1,1 | | |
| 1278 | 636539.759 | 3335338.79 | Yes | 1436.994 | 1436.962 | -0.032 | 1436.941 | 1436.95 | 1437.005 | 3353 | 815 | 1,1,1 | | |
| 1285 | 597152.251 | 3366036.419 | Yes | 1528.324 | 1528.417 | 0.093 | 1528.361 | 1528.383 | 1528.432 | 2437 | -2067 | 1,1,1 | | |
| 1289 | 592758.18 | 3309425.897 | Yes | 1212.725 | 1212.651 | -0.074 | 1212.648 | 1212.65 | 1212.653 | 4282 | 672 | 1,1,1 | | |
| 1289A | 592779.768 | 3309392.406 | Yes | 1211.992 | 1211.999 | 0.007 | 1211.996 | 1212.006 | 1212.016 | 4096 | 734 | 1,1,1 | | |
| 1292 | 613542.791 | 3349126.451 | Yes | 1547.09 | 1547.081 | -0.009 | 1547.076 | 1547.094 | 1547.114 | 2682 | 689 | 1,1,1 | | |
| 1293 | 635758.844 | 3227438.239 | Yes | 678.174 | 678.264 | 0.090 | 678.237 | 678.259 | 678.271 | 5583 | -526 | 1,1,1 | | |
| 1294 | 639336.263 | 3319383.853 | Yes | 1271.664 | 1271.656 | -0.008 | 1271.642 | 1271.649 | 1271.664 | 4749 | -1578 | 1,1,1 | | |
| 1296 | 606013.853 | 3300143.485 | Yes | 1257.208 | 1257.174 | -0.034 | 1257.159 | 1257.16 | 1257.195 | 7880 | 569 | 1,1,1 | | |
| 1299 | 613977.513 | 3246700.271 | Yes | 850.692 | 850.625 | -0.067 | 850.62 | 850.624 | 850.626 | 7805 | -1478 | 1,1,1 | | |
| 1300 | 589854 | 3342572.043 | Yes | 1375.64 | 1375.612 | -0.028 | 1375.59 | 1375.617 | 1375.625 | 3737 | 1905 | 1,1,1 | | |
| 1300A | 589893.301 | 3342553.19 | Yes | 1375.105 | 1375.103 | -0.002 | 1375.084 | 1375.101 | 1375.107 | 5710 | 1787 | 1,1,1 | | |
| 1308 | 654916.069 | 3347135.304 | Yes | 1335.585 | 1335.633 | 0.048 | 1335.595 | 1335.629 | 1335.673 | 2541 | -258 | 1,1,1 | | |
| 1313 | 653520.258 | 3232254.279 | Yes | 977.059 | 977.094 | 0.035 | 977.073 | 977.084 | 977.121 | 3344 | 2442 | 1,1,1 | | |
| 1314 | 647158.205 | 3225520.645 | Yes | 725.416 | 725.454 | 0.038 | 725.441 | 725.446 | 725.473 | 5438 | 1554 | 1,1,1 | | |
| 1327 | 631136.847 | 3281758.345 | Yes | 1040.532 | 1040.542 | 0.010 | 1040.54 | 1040.542 | 1040.543 | 8196 | 1461 | 1,1,1 | | |
| 1335 | 634665.685 | 3243377.267 | Yes | 826.496 | 826.49 | -0.006 | 826.477 | 826.494 | 826.496 | 2885 | -1139 | 1,1,1 | | |
| 1345 | 629144.574 | 3277598.309 | Yes | 1069.544 | 1069.561 | 0.017 | 1069.554 | 1069.568 | 1069.571 | 7388 | 1075 | 1,1,1 | | |
| 1346 | 595563.745 | 3360973.217 | Yes | 1478.979 | 1479.106 | 0.127 | 1479.1 | 1479.107 | 1479.121 | 3901 | 2627 | 1,1,1 | | |
| 1348 | 681095.422 | 3263060.386 | Yes | 898.883 | 898.85 | -0.033 | 898.839 | 898.841 | 898.859 | 2374 | 1356 | 1,1,1 | | |
| 110103 | 599896.724 | 3322235.582 | Yes | 1268.629 | 1268.579 | -0.050 | 1268.566 | 1268.569 | 1268.608 | 5588 | 1430 | 1,1,1 | | |
| 110104 | 602430.176 | 3315608.047 | Yes | 1303.886 | 1303.914 | 0.028 | 1303.912 | 1303.913 | 1303.918 | 6056 | 784 | 1,1,1 | | |
| 112103 | 646338.53 | 3274925.14 | Yes | 1001.666 | 1001.554 | -0.112 | 1001.526 | 1001.538 | 1001.592 | 6686 | 2195 | 1,1,1 | | |
| 115101 | 609374.214 | 3264881.361 | Yes | 1371.412 | 1371.407 | -0.005 | 1371.401 | 1371.402 | 1371.412 | 3949 | -72 | 1,1,1 | | |
| 115102 | 588415.489 | 3262927.564 | Yes | 1116.967 | 1116.911 | -0.056 | 1116.884 | 1116.895 | 1116.932 | 3830 | -1700 | 1,1,1 | | |
| 116103 | 588325.397 | 3284853.254 | Yes | 1082.412 | 1082.281 | -0.131 | 1082.272 | 1082.283 | 1082.288 | 4855 | -2061 | 1,1,1 | | |
| 116105 | 585605.887 | 3285671.583 | Yes | 1055.873 | 1055.903 | 0.030 | 1055.898 | 1055.901 | 1055.923 | 6717 | -797 | 1,1,1 | | |
| 117101 | 631651.572 | 3255800.796 | Yes | 896.482 | 896.47 | -0.012 | 896.433 | 896.462 | 896.48 | 6663 | 2415 | 1,1,1 | | |
| 117102 | 648607.037 | 3243758.943 | Yes | 876.677 | 876.637 | -0.040 | 876.611 | 876.635 | 876.64 | 4308 | -1597 | 1,1,1 | | |
| 117105 | 652435.229 | 3215422.221 | Yes | 643.109 | 643.127 | 0.018 | 643.108 | 643.132 | 643.145 | 6393 | 1416 | 1,1,1 | | |
| 118102 | 646031.968 | 3284241.107 | Yes | 1112.535 | 1112.513 | -0.022 | 1112.508 | 1112.509 | 1112.524 | 5959 | 38 | 1,1,1 | | |
| 118105 | 636894.437 | 3310445.187 | Yes | 1213.846 | 1213.795 | -0.051 | 1213.782 | 1213.793 | 1213.8 | 1960 | 747 | 1,1,1 | | |
| 1051001 | 634610.091 | 3352893.627 | Yes | 1568.224 | 1568.215 | -0.009 | 1568.149 | 1568.237 | 1568.241 | 2824 | -910 | 1,1,1 | | |

Check Points Vertical Accuracy - continued

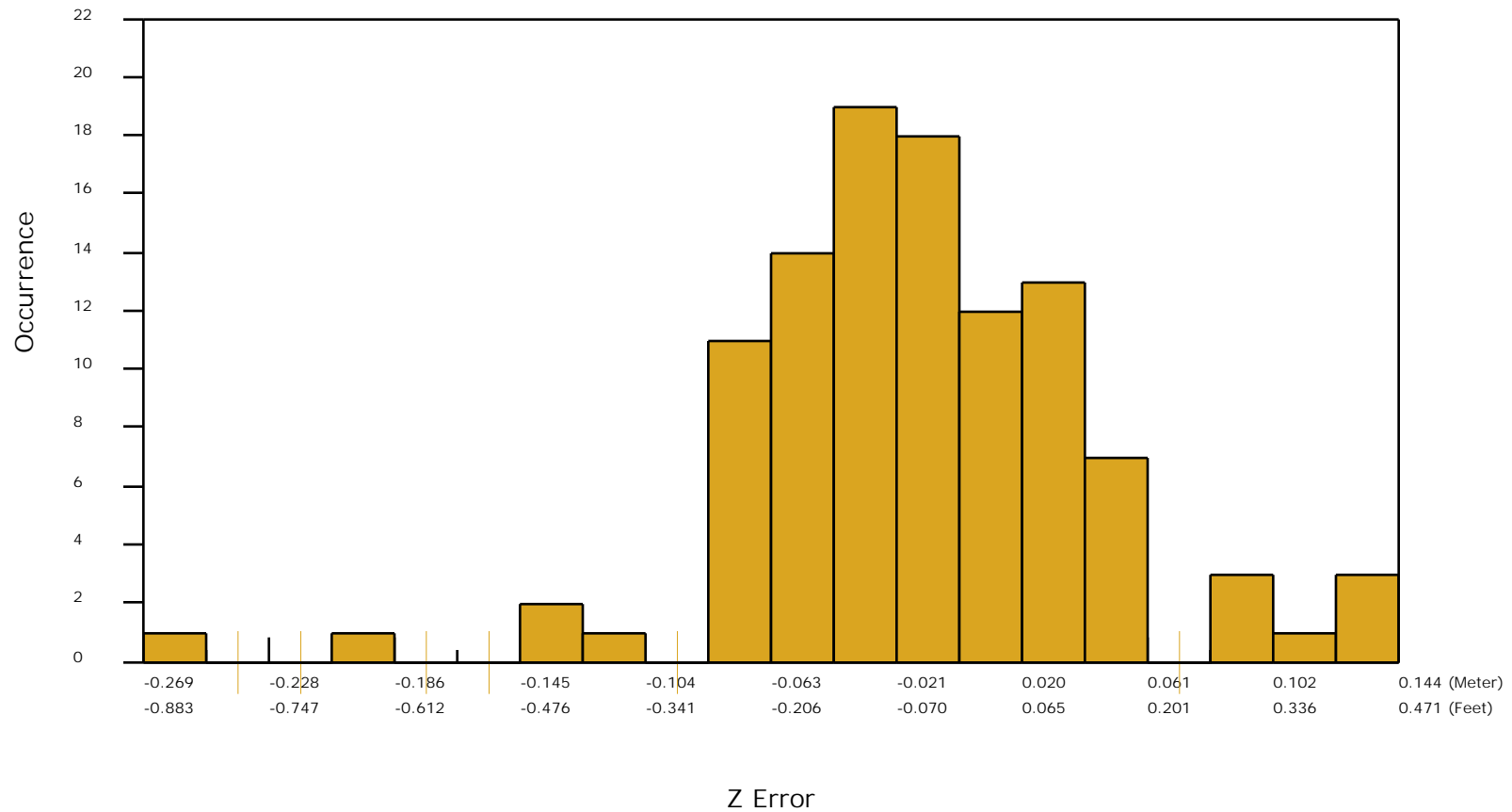
| ID | X | Y | Coverage | Z | Z From Lidar | Z Error | Minimum Z | Median Z | Maximum Z | Intensity | Scan Angle Rank | Returns | Description | Comments |
|---------|------------|-------------|----------|----------|--------------|---------|-----------|----------|-----------|-----------|-----------------|---------|-------------|----------|
| 1051007 | 633836.334 | 3342329.815 | Yes | 1503.331 | 1503.379 | 0.048 | 1503.368 | 1503.386 | 1503.403 | 4164 | 2187 | 1,1,1 | | |
| 1051013 | 651634.063 | 3268611.842 | Yes | 1038.287 | 1038.264 | -0.023 | 1038.261 | 1038.27 | 1038.28 | 6622 | 845 | 1,1,1 | | |
| 1051017 | 656398.971 | 3266191.15 | Yes | 1013.424 | 1013.452 | 0.028 | 1013.445 | 1013.453 | 1013.464 | 5950 | 2682 | 1,1,1 | | |
| 1051020 | 660089.407 | 3276152.236 | Yes | 975.786 | 975.798 | 0.012 | 975.78 | 975.799 | 975.815 | 6598 | -905 | 1,1,1 | | |
| 1061003 | 601455.237 | 3335007.262 | Yes | 1406.659 | 1406.663 | 0.004 | 1406.659 | 1406.662 | 1406.669 | 4769 | -1501 | 1,1,1 | | |
| 1061009 | 592684.887 | 3335568.002 | Yes | 1324.959 | 1324.912 | -0.047 | 1324.904 | 1324.915 | 1324.917 | 5761 | 1271 | 1,1,1 | | |

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 - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\tilecls](#)

NVA (lidar data)



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 |
|-------|------------|-------------|----------|----------|--------------|---------|-------------|----------|
| 1004 | 658479.864 | 3240043.379 | Yes | 1112.147 | 1112.088 | -0.059 | | |
| 1006 | 628366.402 | 3359058.829 | Yes | 1367.001 | 1366.898 | -0.103 | | |
| 1007 | 607516.467 | 3349821.71 | Yes | 1494.228 | 1494.157 | -0.071 | | |
| 1011 | 665037.202 | 3239093.257 | Yes | 1641.018 | 1640.770 | -0.248 | | |
| 1013 | 619824.002 | 3374515.642 | Yes | 1351.838 | 1351.743 | -0.095 | | |
| 1020 | 650473.134 | 3377094.501 | Yes | 1204.628 | 1204.587 | -0.041 | | |
| 1022 | 559562.486 | 3270239.897 | Yes | 784.431 | 784.469 | 0.038 | | |
| 1023 | 592973.378 | 3394827.268 | Yes | 1891.471 | 1891.446 | -0.025 | | |
| 1024 | 601055.845 | 3260481.567 | Yes | 1266.677 | 1266.673 | -0.004 | | |
| 1027 | 642457.042 | 3246108.726 | Yes | 800.354 | 800.284 | -0.070 | | |
| 1028 | 590251.625 | 3378246.25 | Yes | 1648.947 | 1648.987 | 0.040 | | |
| 1029 | 607965.347 | 3336789.666 | Yes | 1442.539 | 1442.539 | 0.000 | | |
| 1029A | 607965.52 | 3336792.719 | Yes | 1442.52 | 1442.489 | -0.031 | | |
| 1032 | 658178.473 | 3261575.974 | Yes | 1043.441 | 1043.377 | -0.064 | | |
| 1033 | 642382.896 | 3360521.222 | Yes | 1366.27 | 1366.324 | 0.054 | | |
| 1042 | 639318.577 | 3274484.762 | Yes | 1019.583 | 1019.605 | 0.022 | | |
| 1045 | 642589.561 | 3261570.641 | Yes | 1009.726 | 1009.640 | -0.086 | | |
| 1046 | 615947.17 | 3238147.524 | Yes | 714.36 | 714.305 | -0.055 | | |
| 1047 | 608140.872 | 3387438.826 | Yes | 1460.563 | 1460.584 | 0.021 | | |
| 1055 | 636485.051 | 3326659.88 | Yes | 1333.893 | 1333.829 | -0.064 | | |
| 1056 | 612586.64 | 3270771.752 | Yes | 1338.704 | 1338.676 | -0.028 | | |
| 1057 | 594370.113 | 3244690.4 | Yes | 823.082 | 823.100 | 0.018 | | |
| 1060A | 577656.981 | 3268580.515 | Yes | 872.165 | 872.213 | 0.048 | | |
| 1074 | 647821.166 | 3243024.986 | Yes | 865.23 | 865.176 | -0.054 | | |
| 1077 | 650330.846 | 3218935.06 | Yes | 697.832 | 697.894 | 0.062 | | |
| 1081 | 679672.767 | 3239332.562 | Yes | 951.759 | 951.666 | -0.093 | | |
| 1085 | 584758.221 | 3397179.771 | Yes | 1815.306 | 1815.226 | -0.080 | | |
| 1090 | 594052.054 | 3329639.16 | Yes | 1303.246 | 1303.213 | -0.033 | | |
| 1090A | 594041.678 | 3329635.498 | Yes | 1303.058 | 1303.101 | 0.043 | | |
| 1095 | 677685.97 | 3286038.667 | Yes | 857.89 | 857.878 | -0.012 | | |

Check Points Vertical Accuracy - continued

| ID | X | Y | Coverage | Z | Z From Lidar | Z Error | Description | Comments |
|----------|------------|-------------|----------|----------|--------------|---------|-------------|----------|
| 1096A | 616547.583 | 3400574.953 | Yes | 1320.155 | 1320.156 | 0.001 | | |
| 1112 | 679968.802 | 3253263.704 | Yes | 867.813 | 867.758 | -0.055 | | |
| 1117 | 583655.977 | 3251405.48 | Yes | 758.079 | 758.036 | -0.043 | | |
| 1118 | 595824.269 | 3294608.995 | Yes | 1090.988 | 1090.968 | -0.020 | | |
| 1119 | 600108.746 | 3373933.007 | Yes | 1540.635 | 1540.716 | 0.081 | | |
| 1121 | 665285.209 | 3248528.108 | Yes | 1121.34 | 1121.358 | 0.018 | | |
| 1127 | 643913.594 | 3255034.582 | Yes | 955.806 | 955.758 | -0.048 | | |
| 1127VOID | 643913.595 | 3255034.579 | Yes | 955.716 | 955.758 | 0.042 | | |
| 1132 | 629863.025 | 3367980.037 | Yes | 1298.89 | 1298.979 | 0.089 | | |
| 1136 | 570713.176 | 3266083.883 | Yes | 780.725 | 780.687 | -0.038 | | |
| 1153 | 684917.516 | 3236866.548 | Yes | 784.943 | 784.865 | -0.078 | | |
| 1161 | 603803.046 | 3381434.82 | Yes | 1497.495 | 1497.607 | 0.112 | | |
| 1165 | 593926.387 | 3323470.869 | Yes | 1278.056 | 1278.030 | -0.026 | | |
| 1165A | 593920.847 | 3323465.902 | Yes | 1277.994 | 1277.958 | -0.036 | | |
| 1168 | 659153.542 | 3284832.036 | Yes | 1116.321 | 1116.356 | 0.035 | | |
| 1172 | 637364.551 | 3293992.679 | Yes | 1197.428 | 1197.393 | -0.035 | | |
| 1173 | 616552.629 | 3378606.737 | Yes | 1387.924 | 1387.915 | -0.009 | | |
| 1177 | 680482.139 | 3272986.408 | Yes | 824.455 | 824.393 | -0.062 | | |
| 1186 | 674205.73 | 3245694.553 | Yes | 1137.03 | 1136.993 | -0.037 | | |
| 1195 | 612186.919 | 3241520.688 | Yes | 767.852 | 767.818 | -0.034 | | |
| 1198 | 622883.898 | 3261732.982 | Yes | 1190.755 | 1190.795 | 0.040 | | |
| 1201 | 636876.088 | 3310476.698 | Yes | 1213.825 | 1213.849 | 0.024 | | |
| 1203 | 678466.052 | 3279968.768 | Yes | 812.911 | 812.840 | -0.071 | | |
| 1205 | 606887.036 | 3338475.046 | Yes | 1438.029 | 1437.817 | -0.212 | | |
| 1205A | 602285.403 | 3335506.437 | Yes | 1412.543 | 1412.462 | -0.081 | | |
| 1208 | 636586.353 | 3284555.03 | Yes | 1109.461 | 1109.457 | -0.004 | | |
| 1211 | 688791.395 | 3278684.436 | Yes | 769.002 | 768.989 | -0.013 | | |
| 1216 | 641083.475 | 3268317.311 | Yes | 1048.904 | 1048.838 | -0.066 | | |
| 1217 | 622244.454 | 3361719.799 | Yes | 1411.552 | 1411.545 | -0.007 | | |
| 1219 | 693115.625 | 3236930.106 | Yes | 694.247 | 694.238 | -0.009 | | |
| 1225 | 604011.484 | 3343252.691 | Yes | 1433.957 | 1433.915 | -0.042 | | |
| 1232 | 625451.239 | 3371171.705 | Yes | 1313.554 | 1313.555 | 0.001 | | |
| 1234 | 637619.134 | 3298025.46 | Yes | 1153.712 | 1153.707 | -0.005 | | |
| 1235 | 607865.573 | 3339155.721 | Yes | 1443.462 | 1443.403 | -0.059 | | |
| 1242 | 652604.796 | 3401870.213 | Yes | 1076.313 | 1076.463 | 0.150 | | |

Check Points Vertical Accuracy - continued

| ID | X | Y | Coverage | Z | Z From Lidar | Z Error | Description | Comments |
|---------|------------|-------------|----------|----------|--------------|---------|-------------|----------|
| 1257A | 594225.244 | 3353505.696 | Yes | 1429.499 | 1429.635 | 0.136 | | |
| 1271 | 637951.429 | 3345039.285 | Yes | 1577.423 | 1577.423 | 0.000 | | |
| 1272 | 637371.309 | 3305199.265 | Yes | 1158.444 | 1158.462 | 0.018 | | |
| 1278 | 636539.759 | 3335338.79 | Yes | 1436.994 | 1436.938 | -0.056 | | |
| 1285 | 597152.251 | 3366036.419 | Yes | 1528.324 | 1528.416 | 0.092 | | |
| 1289 | 592758.18 | 3309425.897 | Yes | 1212.725 | 1212.652 | -0.073 | | |
| 1289A | 592779.768 | 3309392.406 | Yes | 1211.992 | 1211.995 | 0.003 | | |
| 1292 | 613542.791 | 3349126.451 | Yes | 1547.09 | 1547.083 | -0.007 | | |
| 1293 | 635758.844 | 3227438.239 | Yes | 678.174 | 678.266 | 0.092 | | |
| 1294 | 639336.263 | 3319383.853 | Yes | 1271.664 | 1271.650 | -0.014 | | |
| 1296 | 606013.853 | 3300143.485 | Yes | 1257.208 | 1257.152 | -0.056 | | |
| 1299 | 613977.513 | 3246700.271 | Yes | 850.692 | 850.630 | -0.062 | | |
| 1300 | 589854 | 3342572.043 | Yes | 1375.64 | 1375.598 | -0.042 | | |
| 1300A | 589893.301 | 3342553.19 | Yes | 1375.105 | 1375.103 | -0.002 | | |
| 1308 | 654916.069 | 3347135.304 | Yes | 1335.585 | 1335.628 | 0.043 | | |
| 1313 | 653520.258 | 3232254.279 | Yes | 977.059 | 977.077 | 0.018 | | |
| 1314 | 647158.205 | 3225520.645 | Yes | 725.416 | 725.463 | 0.047 | | |
| 1327 | 631136.847 | 3281758.345 | Yes | 1040.532 | 1040.565 | 0.033 | | |
| 1335 | 634665.685 | 3243377.267 | Yes | 826.496 | 826.499 | 0.003 | | |
| 1345 | 629144.574 | 3277598.309 | Yes | 1069.544 | 1069.557 | 0.013 | | |
| 1346 | 595563.745 | 3360973.217 | Yes | 1478.979 | 1479.104 | 0.125 | | |
| 1348 | 681095.422 | 3263060.386 | Yes | 898.883 | 898.852 | -0.031 | | |
| 110103 | 599896.724 | 3322235.582 | Yes | 1268.629 | 1268.567 | -0.062 | | |
| 110104 | 602430.176 | 3315608.047 | Yes | 1303.886 | 1303.904 | 0.018 | | |
| 112103 | 646338.53 | 3274925.14 | Yes | 1001.666 | 1001.559 | -0.107 | | |
| 115101 | 609374.214 | 3264881.361 | Yes | 1371.412 | 1371.403 | -0.009 | | |
| 115102 | 588415.489 | 3262927.564 | Yes | 1116.967 | 1116.910 | -0.057 | | |
| 116103 | 588325.397 | 3284853.254 | Yes | 1082.412 | 1082.286 | -0.126 | | |
| 116105 | 585605.887 | 3285671.583 | Yes | 1055.873 | 1055.901 | 0.028 | | |
| 117101 | 631651.572 | 3255800.796 | Yes | 896.482 | 896.456 | -0.026 | | |
| 117102 | 648607.037 | 3243758.943 | Yes | 876.677 | 876.629 | -0.048 | | |
| 117105 | 652435.229 | 3215422.221 | Yes | 643.109 | 643.133 | 0.024 | | |
| 118102 | 646031.968 | 3284241.107 | Yes | 1112.535 | 1112.499 | -0.036 | | |
| 118105 | 636894.437 | 3310445.187 | Yes | 1213.846 | 1213.800 | -0.046 | | |
| 1051001 | 634610.091 | 3352893.627 | Yes | 1568.224 | 1568.228 | 0.004 | | |

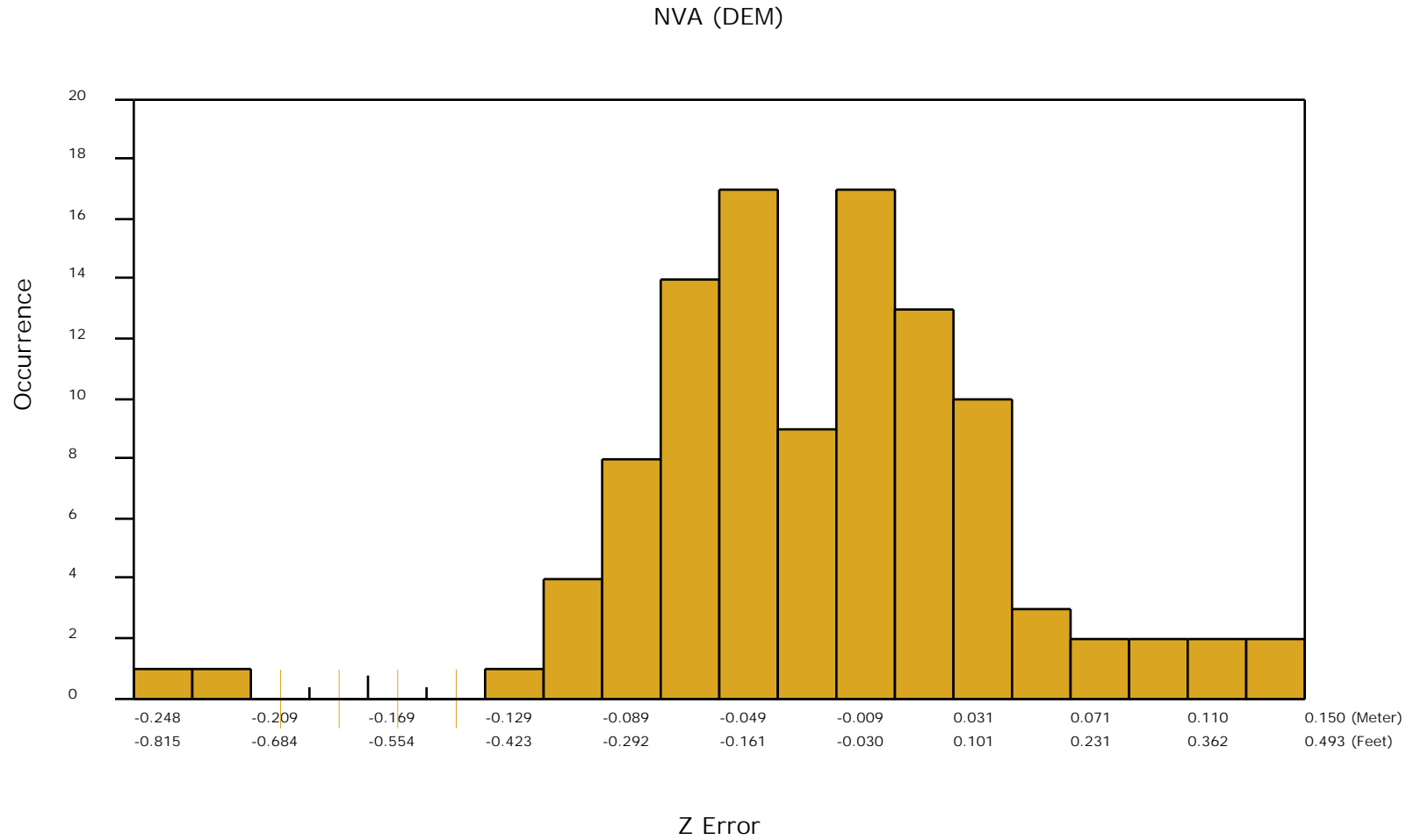
Check Points Vertical Accuracy - continued

| ID | X | Y | Coverage | Z | Z From Lidar | Z Error | Description | Comments |
|---------|------------|-------------|----------|----------|--------------|---------|-------------|----------|
| 1051007 | 633836.334 | 3342329.815 | Yes | 1503.331 | 1503.384 | 0.053 | | |
| 1051013 | 651634.063 | 3268611.842 | Yes | 1038.287 | 1038.279 | -0.008 | | |
| 1051017 | 656398.971 | 3266191.15 | Yes | 1013.424 | 1013.452 | 0.028 | | |
| 1051020 | 660089.407 | 3276152.236 | Yes | 975.786 | 975.813 | 0.027 | | |
| 1061003 | 601455.237 | 3335007.262 | Yes | 1406.659 | 1406.664 | 0.005 | | |
| 1061009 | 592684.887 | 3335568.002 | Yes | 1324.959 | 1324.920 | -0.039 | | |

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 - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\tilecls](Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\tilecls)



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 |
| 2001 | 631104.631 | 3281672.349 | Yes | 1041.545 | 1041.638 | 0.093 | | |
| 2003 | 658410.25 | 3240033.375 | Yes | 1108.988 | 1109.058 | 0.070 | | |
| 2005 | 628347.761 | 3359013.286 | Yes | 1368.398 | 1368.318 | -0.080 | | |
| 2006 | 607527.79 | 3349802.12 | Yes | 1493.98 | 1493.959 | -0.021 | | |
| 2010 | 665035.26 | 3239169.559 | Yes | 1639.138 | 1638.984 | -0.154 | | |
| 2012 | 619908.587 | 3374237.933 | Yes | 1353.907 | 1353.930 | 0.023 | | |
| 2019 | 650478.508 | 3377073.839 | Yes | 1206.711 | 1206.788 | 0.077 | | |
| 2021 | 559531.847 | 3270209.993 | Yes | 785.002 | 785.168 | 0.166 | | |
| 2022 | 592937.096 | 3394813.434 | Yes | 1890.674 | 1890.800 | 0.126 | | |
| 2023 | 601083.917 | 3260560.899 | Yes | 1265.332 | 1265.374 | 0.042 | | |
| 2026 | 642428.75 | 3246093.394 | Yes | 799.15 | 799.072 | -0.078 | | |
| 2027 | 589738.594 | 3378343.067 | Yes | 1661.522 | 1661.524 | 0.002 | | |
| 2028 | 607944.148 | 3336784.89 | Yes | 1442.559 | 1442.614 | 0.055 | | |
| 2028A | 607925.486 | 3336796.286 | Yes | 1442.523 | 1442.521 | -0.002 | | |
| 2031 | 658166.573 | 3261569.026 | Yes | 1043.747 | 1043.763 | 0.016 | | |
| 2032 | 642380.213 | 3360547.825 | Yes | 1365.512 | 1365.639 | 0.127 | | |
| 2040 | 639305.042 | 3274494.315 | Yes | 1019.632 | 1019.696 | 0.064 | | |
| 2043 | 615921.465 | 3238128.754 | Yes | 715.081 | 715.110 | 0.029 | | |
| 2044 | 608138.581 | 3387455.089 | Yes | 1459.577 | 1459.817 | 0.240 | | |
| 2052 | 636485.531 | 3326633.544 | Yes | 1333.262 | 1333.343 | 0.081 | | |
| 2053 | 612584.391 | 3270688.543 | Yes | 1338.21 | 1338.203 | -0.007 | | |
| 2054 | 594308.747 | 3244610.37 | Yes | 816.65 | 816.750 | 0.100 | | |
| 2057 | 577700.513 | 3268559.858 | Yes | 876.606 | 876.663 | 0.057 | | |
| 2065 | 616798.896 | 3400693.789 | Yes | 1317.194 | 1317.301 | 0.107 | | |
| 2072 | 650336.562 | 3218895.624 | Yes | 697.926 | 698.005 | 0.079 | | |
| 2076 | 679694.832 | 3239353.395 | Yes | 952.105 | 952.068 | -0.037 | | |
| 2080 | 584745.472 | 3397187.322 | Yes | 1815.484 | 1815.481 | -0.003 | | |
| 2085 | 594050.631 | 3329619.585 | Yes | 1303.1 | 1303.128 | 0.028 | | |
| 2085A | 594053.404 | 3329700.013 | Yes | 1302.597 | 1302.678 | 0.081 | | |
| 2090 | 677658.375 | 3286068.445 | Yes | 858.316 | 858.320 | 0.004 | | |

Check Points Vertical Accuracy - continued

| ID | X | Y | Coverage | Z | Z From Lidar | Z Error | Description | Comments |
|--------|------------|-------------|----------|----------|--------------|---------|-------------|----------|
| 2107 | 679931.02 | 3253154.325 | Yes | 868.198 | 868.132 | -0.066 | | |
| 2112 | 583745.751 | 3251367.526 | Yes | 758.154 | 758.148 | -0.006 | | |
| 2113 | 595886.991 | 3294603.603 | Yes | 1092.076 | 1092.077 | 0.001 | | |
| 2114 | 600098.477 | 3373940.127 | Yes | 1540.051 | 1540.235 | 0.184 | | |
| 2116 | 662957.305 | 3246527.529 | Yes | 1126.654 | 1126.718 | 0.064 | | |
| 2122 | 643925.788 | 3255100.543 | Yes | 956.513 | 956.498 | -0.015 | | |
| 2127 | 630035.323 | 3367734.125 | Yes | 1298.609 | 1298.740 | 0.131 | | |
| 2131 | 570747.81 | 3266024.072 | Yes | 779.307 | 779.206 | -0.101 | | |
| 2147 | 684873.09 | 3236871.633 | Yes | 781.616 | 781.584 | -0.032 | | |
| 2153 | 603982.239 | 3381797.745 | Yes | 1497.228 | 1497.439 | 0.211 | | |
| 2156 | 593911.976 | 3323515.663 | Yes | 1278.184 | 1278.271 | 0.087 | | |
| 2159 | 659263.267 | 3285351.548 | Yes | 1134.856 | 1134.851 | -0.005 | | |
| 2162 | 637345.984 | 3294002.201 | Yes | 1196.176 | 1196.199 | 0.023 | | |
| 2163 | 616567.273 | 3378586.018 | Yes | 1387.615 | 1387.660 | 0.045 | | |
| 2165A | 593937.228 | 3323476.26 | Yes | 1277.59 | 1277.705 | 0.115 | | |
| 2167 | 680520.842 | 3272951.528 | Yes | 825.294 | 825.294 | 0.000 | | |
| 2175 | 674235.549 | 3245709.912 | Yes | 1135.508 | 1135.515 | 0.007 | | |
| 2184 | 612149.14 | 3241469.588 | Yes | 766.576 | 766.533 | -0.043 | | |
| 2187 | 622931.926 | 3261854.174 | Yes | 1187.953 | 1187.950 | -0.003 | | |
| 2190 | 636879.429 | 3310493.875 | Yes | 1213.976 | 1214.063 | 0.087 | | |
| 2193 | 606899.095 | 3338472.843 | Yes | 1438.173 | 1437.961 | -0.212 | | |
| 2193A | 602396.759 | 3335541.774 | Yes | 1413.216 | 1413.176 | -0.040 | | |
| 2196 | 636588.473 | 3284543.036 | Yes | 1109.27 | 1109.326 | 0.056 | | |
| 2199 | 688807.698 | 3278733.32 | Yes | 768.382 | 768.410 | 0.028 | | |
| 2204 | 641033.07 | 3268342.441 | Yes | 1047.671 | 1047.781 | 0.110 | | |
| 2205 | 622143.129 | 3361888.134 | Yes | 1409.324 | 1409.373 | 0.049 | | |
| 2207 | 693127.929 | 3237005.533 | Yes | 697.664 | 697.710 | 0.046 | | |
| 2213 | 603954.274 | 3343246.152 | Yes | 1433.567 | 1433.522 | -0.045 | | |
| 2214 | 613548.179 | 3349125.439 | Yes | 1547.008 | 1547.038 | 0.030 | | |
| 2220 | 625468.013 | 3371142.678 | Yes | 1313.602 | 1313.687 | 0.085 | | |
| 2222 | 637621.129 | 3297995.394 | Yes | 1153.372 | 1153.381 | 0.009 | | |
| 2223 | 607887.271 | 3339227.853 | Yes | 1443.453 | 1443.415 | -0.038 | | |
| 2231 | 595163.214 | 3353684.915 | Yes | 1434.526 | 1434.762 | 0.236 | | |
| 2234 | 654925.476 | 3347120.733 | Yes | 1335.107 | 1335.280 | 0.173 | | |
| 108101 | 613571.807 | 3349119.991 | Yes | 1547.04 | 1547.062 | 0.022 | | |

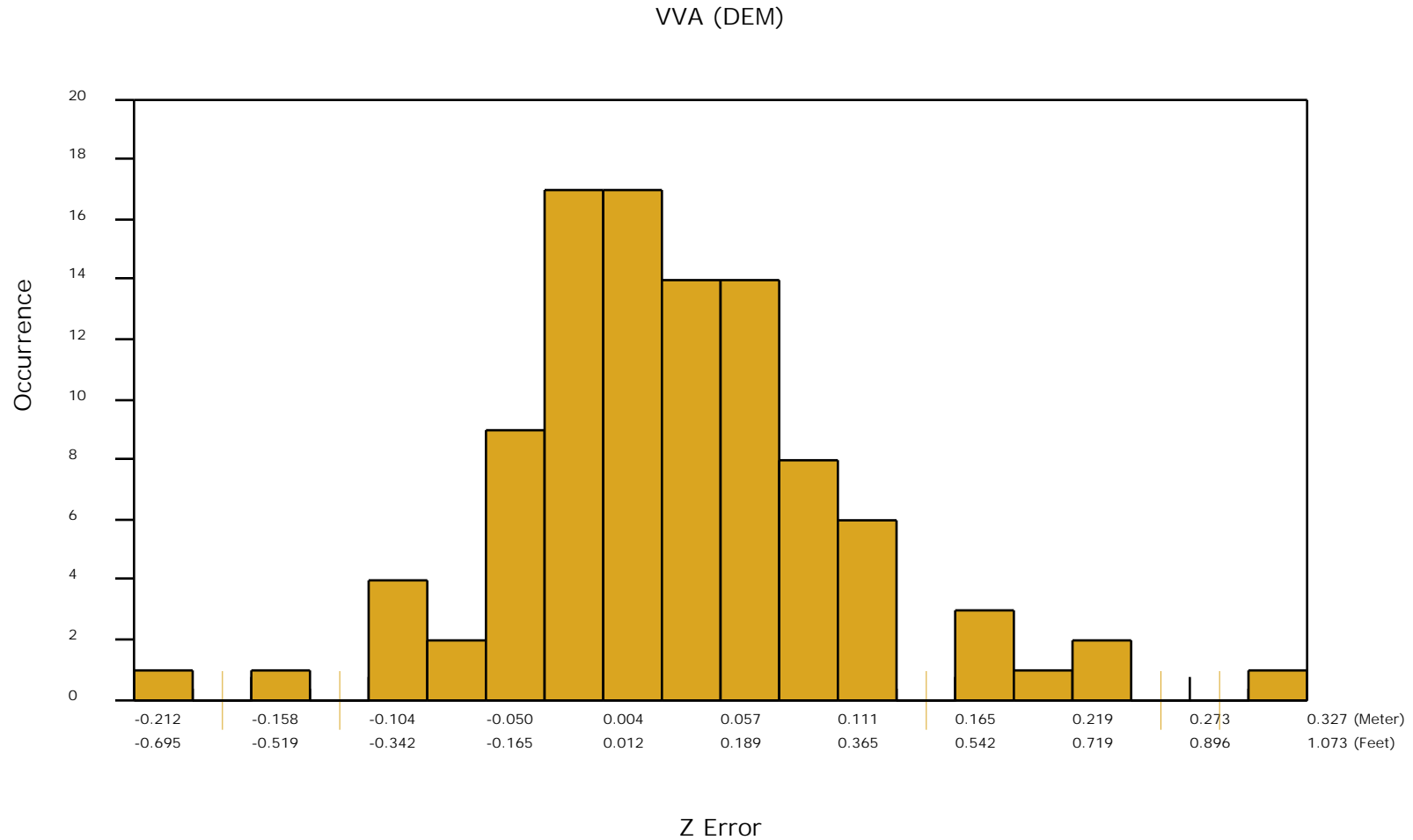
Check Points Vertical Accuracy - continued

| ID | X | Y | Coverage | Z | Z From Lidar | Z Error | Description | Comments |
|---------|------------|-------------|----------|----------|--------------|---------|-------------|----------|
| 110101 | 589892.566 | 3342505.516 | Yes | 1374.566 | 1374.623 | 0.057 | | |
| 110102 | 599913.036 | 3322187.129 | Yes | 1269.889 | 1269.860 | -0.029 | | |
| 110105 | 602462.13 | 3315655.516 | Yes | 1303.79 | 1303.837 | 0.047 | | |
| 110106 | 592806.186 | 3309423.279 | Yes | 1212.214 | 1212.215 | 0.001 | | |
| 110107 | 605998.783 | 3300107.408 | Yes | 1259.141 | 1259.139 | -0.002 | | |
| 112100 | 629179.435 | 3277557.145 | Yes | 1069.756 | 1069.828 | 0.072 | | |
| 112102 | 646396.736 | 3274909.766 | Yes | 1001.554 | 1001.615 | 0.061 | | |
| 112104 | 642571.531 | 3261490.108 | Yes | 1007.186 | 1007.235 | 0.049 | | |
| 112105 | 647822.678 | 3242987.9 | Yes | 864.757 | 864.799 | 0.042 | | |
| 115100 | 609366.744 | 3264842.921 | Yes | 1372.07 | 1372.026 | -0.044 | | |
| 115103 | 588446.732 | 3262937.845 | Yes | 1117.967 | 1117.971 | 0.004 | | |
| 116100 | 614808.225 | 3246616.132 | Yes | 876.62 | 876.649 | 0.029 | | |
| 116104 | 588319.407 | 3284904.794 | Yes | 1082.509 | 1082.525 | 0.016 | | |
| 117100 | 631635.341 | 3255836.546 | Yes | 897.462 | 897.490 | 0.028 | | |
| 117103 | 648669.712 | 3243769.989 | Yes | 876.832 | 876.822 | -0.010 | | |
| 117104 | 635179.491 | 3227374.101 | Yes | 659.723 | 659.859 | 0.136 | | |
| 117106 | 652462.581 | 3215415.816 | Yes | 642.319 | 642.348 | 0.029 | | |
| 118100 | 646086.484 | 3284226.006 | Yes | 1114.367 | 1114.322 | -0.045 | | |
| 118104 | 636880.673 | 3310512.057 | Yes | 1214.407 | 1214.430 | 0.023 | | |
| 991005 | 594349.78 | 3394683.952 | Yes | 2021.094 | 2021.166 | 0.072 | | |
| 1001001 | 595566.557 | 3360990.027 | Yes | 1478.864 | 1479.191 | 0.327 | | |
| 1001003 | 597144.229 | 3366016.104 | Yes | 1527.745 | 1527.880 | 0.135 | | |
| 1051002 | 634596.721 | 3352870.227 | Yes | 1568.905 | 1568.988 | 0.083 | | |
| 1051004 | 637937.221 | 3345040.075 | Yes | 1578.275 | 1578.329 | 0.054 | | |
| 1051008 | 633851.198 | 3342327.571 | Yes | 1503.933 | 1504.020 | 0.087 | | |
| 1051009 | 636545.339 | 3335332.445 | Yes | 1436.89 | 1436.962 | 0.072 | | |
| 1051011 | 637371.041 | 3305224.081 | Yes | 1158.609 | 1158.684 | 0.075 | | |
| 1051014 | 651623.575 | 3268611.841 | Yes | 1038.062 | 1038.049 | -0.013 | | |
| 1051018 | 656411.056 | 3266194.329 | Yes | 1013.226 | 1013.228 | 0.002 | | |
| 1051021 | 660066.451 | 3276153.463 | Yes | 976.008 | 976.065 | 0.057 | | |
| 1061004 | 601457.671 | 3335027.418 | Yes | 1406.662 | 1406.677 | 0.015 | | |
| 1061006 | 590034.867 | 3342242.378 | Yes | 1374.766 | 1374.846 | 0.080 | | |
| 1061007 | 592665.609 | 3335562.819 | Yes | 1324.887 | 1324.929 | 0.042 | | |
| 1061013 | 593781.749 | 3315622.269 | Yes | 1231.071 | 1231.004 | -0.067 | | |
| 1061014 | 592772.687 | 3309435.674 | Yes | 1212.827 | 1212.741 | -0.086 | | |

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 - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\tilecls](#)

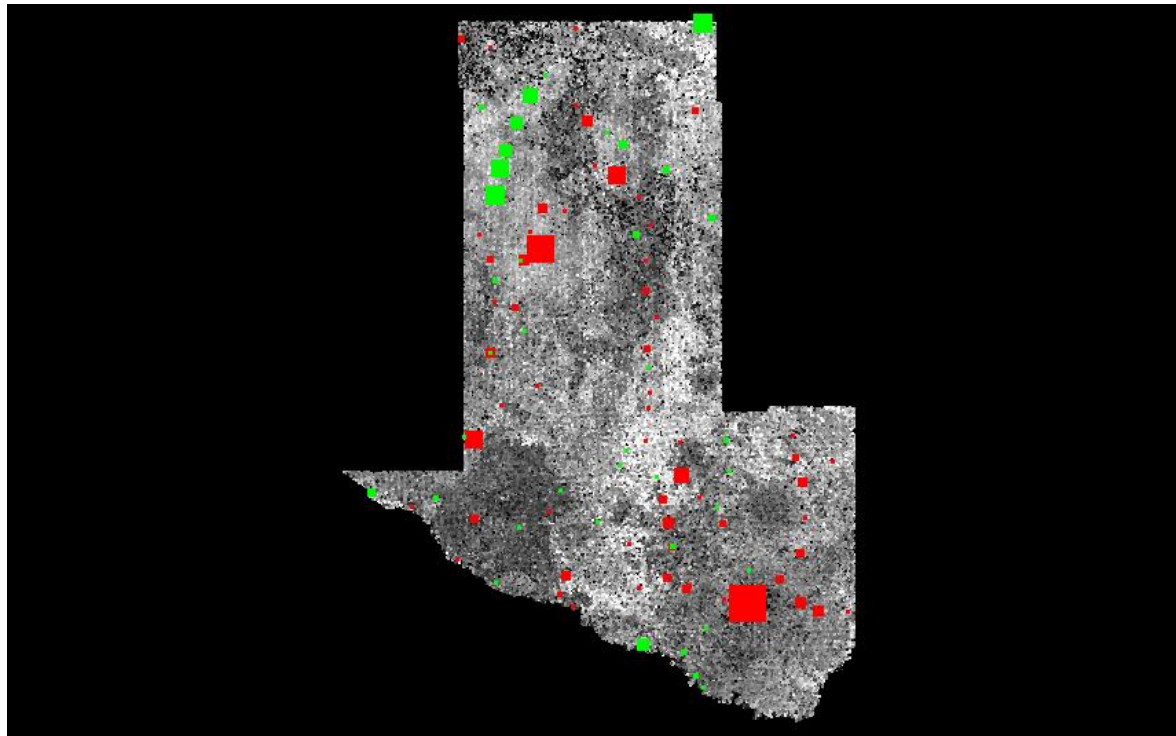


DPH-11 Report on Absolute Vertical Accuracy - continued

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 - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\tilecls](Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\tilecls)

[Result Path - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Admin\OA_OC\Lot9\DPH_11\ColorByIntensity_CheckPoints_NVA.jpg](Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Admin\OA_OC\Lot9\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).

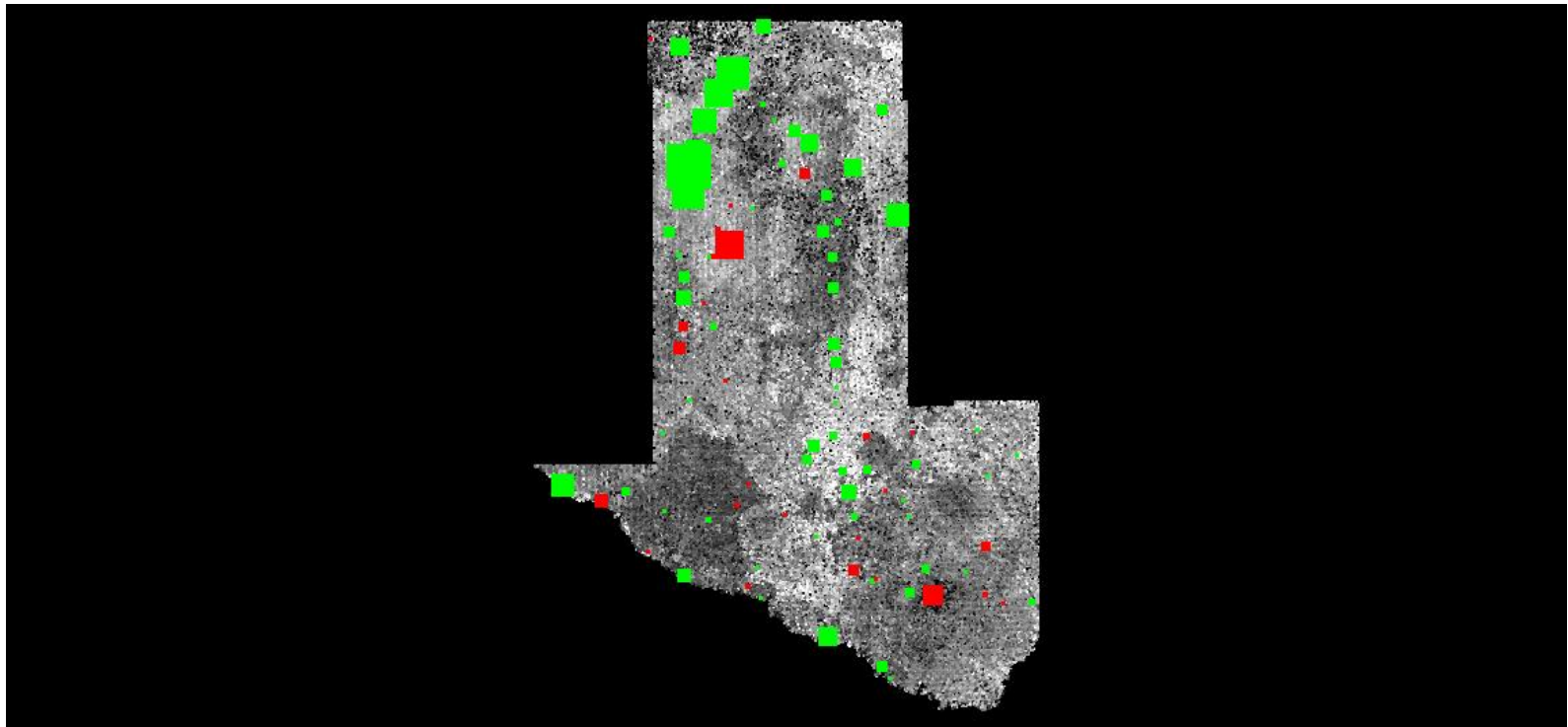
The size of the square symbol represents the absolute value magnitude of error.

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 - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\tilecls](Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Production\Final_Client_Deliverables\Lot9_utm13\point_cloud\tilecls)

[Result Path - Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Admin\OA_OC\Lot9\DPH_11\ColorByIntensity_CheckPoints_VVA.jpg](Y:\Mapping\Projects\65220171_USGS-TX_West_Texas\Admin\OA_OC\Lot9\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.