TUS 250-23.46

PID # 102408

***Report Submitted by:***

***Kyle Ince, P.E., S.I.***

***Mapping Performed by:***

***CADD and Mapping Services***

***Mapping Checked by:***

***Kyle Ince, P.E., S.I.***

***Surveying Performed by:***

***CADD and Mapping Services Survey***

***Survey Checked by:***

***CADD and Mapping Services Survey***

**General Comments**

Attached is the quality control report for the mapping and survey work for this project.

The mapping was compiled for design engineering use.

Project control is not included with this report.

**Hard Surface is only accurate from date of flight** (01/10/2021)

**Datum and Coordinate Systems**

**Vertical**

Orthometric Height Datum: NAVD88

Geoid Model: GEOID18

**Horizontal**

Coordinate System: Ohio State Plane, North Zone

Map Projection: Lambert Conformal Conic

Reference Frame: NAD83 (2011)

Ellipsoid: GRS80

Combined Scale Factor: 0.999970500

Project Adjustment Factor: 1.00002950

**Units**

All units are US Survey Feet.

**Digital Terrain Model**

**Methodology & Equipment Used**

LiDAR points were collected using an Airborne LiDAR sensor with GPS/IMU navigation system.

**The entire DTM was vertically adjusted to the Check Points by:** 0.0365 feet

**DTM Accuracy Class A – Paved Surfaces**

Average Dz: 0.01‘

RMSE 0.05‘

**DTM Accuracy Class B – Vegetated Surfaces**

Average Dz: 0.18‘

RMSE 0.22‘

**Data Used for Statistical Analysis is attached.**

**Additional DTM Notes:**

* Project is mapped for DTM Accuracy Class A on the pavement and DTM Accuracy Class B off the pavement.
* All subsurface drainage, ditch inverts, or channel inverts, curb and gutter, catch basins require field collection and inclusion into the furnished existing surface model.
* Areas with dense brush or heavy vegetation require field collection and inclusion into the existing surface model.
* Retaining walls and bridges require field collection and inclusion into the existing surface model.

**Digital Mapping**

**Methodology & Equipment Used**

Survey points were collected using digital camera with a GPS/IMU navigation system, aerotriangulation, and Photogrammetric 3D stereo planimetric collection.

**Additional Digital Mapping Notes:**

* Project is mapped for Planimetric Accuracy Class I.
* All subsurface utilities require field collection.

**Data:**

**DTM Accuracy Class A Survey Points & Check Points (GRID)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Survey Check Point | Point Easting | Point Northing | Survey Check Point Elevation | LiDAR Elevation | Dz |
| 110 | 2309309.4240 | 270122.5940 | 871.8280 | 871.8000 | -0.0280 |
| 111 | 2309312.4920 | 270120.3580 | 871.6830 | 871.6600 | -0.0230 |
| 112 | 2309316.6650 | 270117.4020 | 871.4900 | 871.4900 | 0.0000 |
| 113 | 2309320.9010 | 270114.7200 | 871.2950 | 871.2900 | -0.0050 |
| 114 | 2309324.9890 | 270111.9370 | 871.1240 | 871.1000 | -0.0240 |
| 115 | 2309328.3980 | 270109.5470 | 870.9470 | 870.9300 | -0.0170 |
| 122 | 2310455.4130 | 269351.7010 | 864.9560 | 865.0200 | 0.0640 |
| 123 | 2310452.2870 | 269353.7420 | 864.8680 | 864.9300 | 0.0620 |
| 124 | 2310449.0110 | 269355.8260 | 864.8140 | 864.8800 | 0.0660 |
| 125 | 2310446.2100 | 269357.6780 | 864.7430 | 864.8200 | 0.0770 |
| 126 | 2310444.0980 | 269359.0940 | 864.6830 | 864.7900 | 0.1070 |
| 127 | 2310439.8220 | 269361.8400 | 864.5810 | 864.6300 | 0.0490 |
| 146 | 2305075.8990 | 273025.0270 | 861.6410 | 861.6300 | -0.0110 |
| 147 | 2305072.8800 | 273023.7950 | 861.6310 | 861.7100 | 0.0790 |
| 148 | 2305069.4930 | 273022.6660 | 861.6360 | 861.6600 | 0.0240 |
| 149 | 2305066.4800 | 273021.6480 | 861.6220 | 861.6800 | 0.0580 |
| 150 | 2305062.5080 | 273020.1350 | 861.6330 | 861.7100 | 0.0770 |
| 151 | 2305059.9410 | 273019.2020 | 861.6400 | 861.6600 | 0.0200 |
| 158 | 2306913.6010 | 272660.6310 | 871.9850 | 872.0200 | 0.0350 |
| 159 | 2306909.2020 | 272662.5590 | 871.8990 | 871.8600 | -0.0390 |
| 160 | 2306905.8250 | 272663.9740 | 871.7750 | 871.7400 | -0.0350 |
| 161 | 2306902.1470 | 272665.9050 | 871.6330 | 871.6100 | -0.0230 |
| 162 | 2306898.7080 | 272667.5260 | 871.4890 | 871.5100 | 0.0210 |
| 163 | 2306894.6200 | 272669.2030 | 871.3850 | 871.3400 | -0.0450 |
| 180 | 2300136.7440 | 271874.8180 | 891.9950 | 891.9200 | -0.0750 |
| 181 | 2300139.0460 | 271872.0790 | 891.9940 | 891.9200 | -0.0740 |
| 182 | 2300141.4760 | 271869.0450 | 891.9810 | 891.9400 | -0.0410 |
| 183 | 2300144.0300 | 271865.6720 | 891.9700 | 891.9300 | -0.0400 |
| 184 | 2300146.6000 | 271862.5450 | 891.9740 | 891.8800 | -0.0940 |
| 185 | 2300149.2090 | 271859.6000 | 891.9520 | 891.9500 | -0.0020 |
| 192 | 2300714.9960 | 271090.6150 | 864.1220 | 864.1200 | -0.0020 |
| 193 | 2300711.8870 | 271094.6470 | 864.1960 | 864.2300 | 0.0340 |
| 194 | 2300708.8080 | 271098.3630 | 864.2340 | 864.2400 | 0.0060 |
| 195 | 2300705.7770 | 271102.6870 | 864.2920 | 864.3100 | 0.0180 |
| 196 | 2300702.8740 | 271106.3720 | 864.3410 | 864.3700 | 0.0290 |
| 197 | 2300699.6570 | 271110.3640 | 864.3900 | 864.4500 | 0.0600 |
| 205 | 2295795.4000 | 269784.6070 | 859.9000 | 859.9400 | 0.0400 |
| 206 | 2295797.6700 | 269787.8040 | 859.9130 | 859.8900 | -0.0230 |
| 207 | 2295799.9140 | 269791.3720 | 859.9610 | 859.9700 | 0.0090 |
| 208 | 2295802.2170 | 269794.8800 | 860.0090 | 860.0000 | -0.0090 |
| 209 | 2295804.5280 | 269798.3630 | 860.0490 | 860.0300 | -0.0190 |
| 210 | 2295807.5380 | 269802.9880 | 860.0860 | 860.0800 | -0.0060 |
| 228 | 2296898.8660 | 270669.8540 | 857.2690 | 857.3400 | 0.0710 |
| 229 | 2296893.5240 | 270665.0900 | 857.1500 | 857.2500 | 0.1000 |
| 230 | 2296888.9930 | 270663.4870 | 857.0860 | 857.1700 | 0.0840 |
| 231 | 2296884.4800 | 270662.0400 | 857.0130 | 857.1300 | 0.1170 |
| 232 | 2296880.6180 | 270660.7810 | 856.9900 | 857.0700 | 0.0800 |
| 233 | 2296876.1700 | 270658.5570 | 856.9310 | 857.0200 | 0.0890 |

**DTM Accuracy Class B Survey Points & Check Points (GRID)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Survey Check Point | Point Easting | Point Northing | Survey Check Point Elevation | LiDAR Elevation | Dz |
| 116 | 2309328.4350 | 270114.7420 | 870.8150 | 870.9000 | 0.0850 |
| 117 | 2309330.9710 | 270118.0990 | 870.2740 | 870.5300 | 0.2560 |
| 118 | 2309333.1550 | 270121.3850 | 869.5680 | 869.9500 | 0.3820 |
| 119 | 2309335.0130 | 270124.4450 | 870.7070 | 870.7100 | 0.0030 |
| 120 | 2309337.6390 | 270128.1200 | 871.3490 | 871.3600 | 0.0110 |
| 121 | 2309339.8700 | 270131.0490 | 871.8390 | 871.8600 | 0.0210 |
| 128 | 2310436.6260 | 269357.6860 | 864.2460 | 864.4500 | 0.2040 |
| 130 | 2310433.3690 | 269353.2340 | 862.8480 | 863.1800 | 0.3320 |
| 131 | 2310431.7530 | 269350.9690 | 861.8890 | 862.0700 | 0.1810 |
| 132 | 2310430.3260 | 269349.7000 | 860.9550 | 861.1700 | 0.2150 |
| 133 | 2310429.9130 | 269348.4460 | 860.0250 | 860.5400 | 0.5150 |
| 134 | 2310427.3950 | 269345.9300 | 859.2880 | 859.4800 | 0.1920 |
| 135 | 2310425.1890 | 269342.5970 | 858.9640 | 859.1600 | 0.1960 |
| 152 | 2305053.0320 | 273022.4110 | 861.6910 | 861.8300 | 0.1390 |
| 153 | 2305051.1550 | 273025.9520 | 860.9800 | 861.2600 | 0.2800 |
| 154 | 2305049.2040 | 273029.6710 | 861.0910 | 861.2900 | 0.1990 |
| 155 | 2305047.1460 | 273032.8920 | 861.1420 | 861.3200 | 0.1780 |
| 156 | 2305045.4800 | 273036.4890 | 861.2820 | 861.5400 | 0.2580 |
| 157 | 2305044.1030 | 273039.3760 | 861.4690 | 861.7000 | 0.2310 |
| 164 | 2306886.4590 | 272660.7550 | 870.0310 | 870.0200 | -0.0110 |
| 165 | 2306884.1140 | 272657.5380 | 871.7340 | 871.9200 | 0.1860 |
| 166 | 2306882.7020 | 272654.4930 | 873.2840 | 873.3300 | 0.0460 |
| 167 | 2306880.3940 | 272650.4270 | 874.7700 | 874.7900 | 0.0200 |
| 168 | 2306878.2240 | 272646.4410 | 875.2140 | 875.2400 | 0.0260 |
| 169 | 2306876.0050 | 272641.7230 | 875.3800 | 875.4200 | 0.0400 |
| 186 | 2300156.5170 | 271858.2200 | 891.7440 | 891.7700 | 0.0260 |
| 187 | 2300160.4430 | 271855.7710 | 891.5330 | 891.6700 | 0.1370 |
| 188 | 2300163.9000 | 271853.0100 | 891.4320 | 891.4800 | 0.0480 |
| 189 | 2300167.5680 | 271850.4720 | 891.3780 | 891.3700 | -0.0080 |
| 190 | 2300170.5680 | 271848.3540 | 890.9860 | 891.2600 | 0.2740 |
| 191 | 2300174.4360 | 271845.6400 | 890.8600 | 891.2700 | 0.4100 |
| 198 | 2300699.7580 | 271089.0650 | 862.8880 | 863.2600 | 0.3720 |
| 199 | 2300696.5860 | 271086.7500 | 864.8110 | 865.2000 | 0.3890 |
| 200 | 2300693.2720 | 271084.1560 | 867.4170 | 867.5700 | 0.1530 |
| 201 | 2300690.0830 | 271080.6780 | 869.1370 | 869.3500 | 0.2130 |
| 202 | 2300686.4460 | 271077.8830 | 870.1740 | 870.3800 | 0.2060 |
| 203 | 2300681.6810 | 271074.2240 | 871.3550 | 871.5600 | 0.2050 |
| 211 | 2295824.2750 | 269794.5480 | 859.9460 | 860.0700 | 0.1240 |
| 212 | 2295825.1280 | 269790.5550 | 859.9140 | 860.1200 | 0.2060 |
| 213 | 2295825.9340 | 269786.3610 | 859.7600 | 860.0600 | 0.3000 |
| 214 | 2295827.0780 | 269782.5210 | 859.8740 | 860.1200 | 0.2460 |
| 215 | 2295828.2910 | 269778.9640 | 859.7680 | 859.9800 | 0.2120 |
| 216 | 2295829.4590 | 269775.2210 | 859.8110 | 860.0100 | 0.1990 |
| 234 | 2296871.5580 | 270668.7420 | 856.0730 | 856.3600 | 0.2870 |
| 235 | 2296870.4510 | 270671.2640 | 855.7590 | 856.0000 | 0.2410 |
| 236 | 2296865.7200 | 270680.6380 | 855.7660 | 855.9100 | 0.1440 |
| 237 | 2296863.5550 | 270685.7540 | 856.3370 | 856.5600 | 0.2230 |
| 238 | 2296862.2250 | 270689.3890 | 856.8450 | 857.0300 | 0.1850 |
| 239 | 2296860.4580 | 270693.2290 | 857.2130 | 857.3700 | 0.1570 |