

Ground Control Report

Wisconsin WROC - 3DEP | Monroe County Lidar 2019

1.1 Ground Control Design and Methodology

The ground control network and design used for the Monroe County lidar acquisition was made up of calibration points, GPS base stations, NGS base stations, and independent check points from the vertical accuracy ground control survey. This report will focus on the lidar calibration points that were collected at 14 locations in and around the Monroe County project area. The control points are used for QC checks and calibration of the raw point cloud and for additional vertical checks against the processed bare earth surface.

The ground control calibration survey was done in Wisconsin County Coordinate System-Monroe County, NAD83 (2011), US survey feet; NAVD88 (Geoid 12B), US survey feet. The field work was conducted by Ayres surveyors. All field work was completed between May 7, 2019, and May 20, 2019.

Control Summary and Methodology

Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), Wisconsin GEOID12B
Rectangular Coordinate System:	WISCRS – Monroe Zone
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	
Summary of control checks and calibration (if applicable):	(See Field Notes for control checks on NGS monuments – No calibration was needed)
Survey Methods Used:	WISCRS Network through VRS connection was the origination of the control used with checks and calibration as discussed. GPS methods were used where VRS connection and obstructions permitted. Other areas used control set by VRS RTK methods and robotic total station methods were used.
Equipment Used:	GPS Trimble R8-3 GNSS S/N 5239497193– (Ayres #72.22) Total station Trimble S6 S/N 93410052 – (Ayres #75.41) Data Collector Trimble TSC3 S/N RS17C22010 (Ayres #75.41)

Survey Methods (continued)

All work was performed in and referenced to NAD83 (2011), NAVD 88(2012), Geoid 12B, Wisconsin County Reference System, Monroe Zone in US Survey Feet.

Established horizontal and vertical coordinate values on the points by a minimum of two – 90 epoch observations with separate initializations using RTK GPS and the WISCRS network. The resultant coordinates and elevations provided in the deliverables are an average of the two observations.

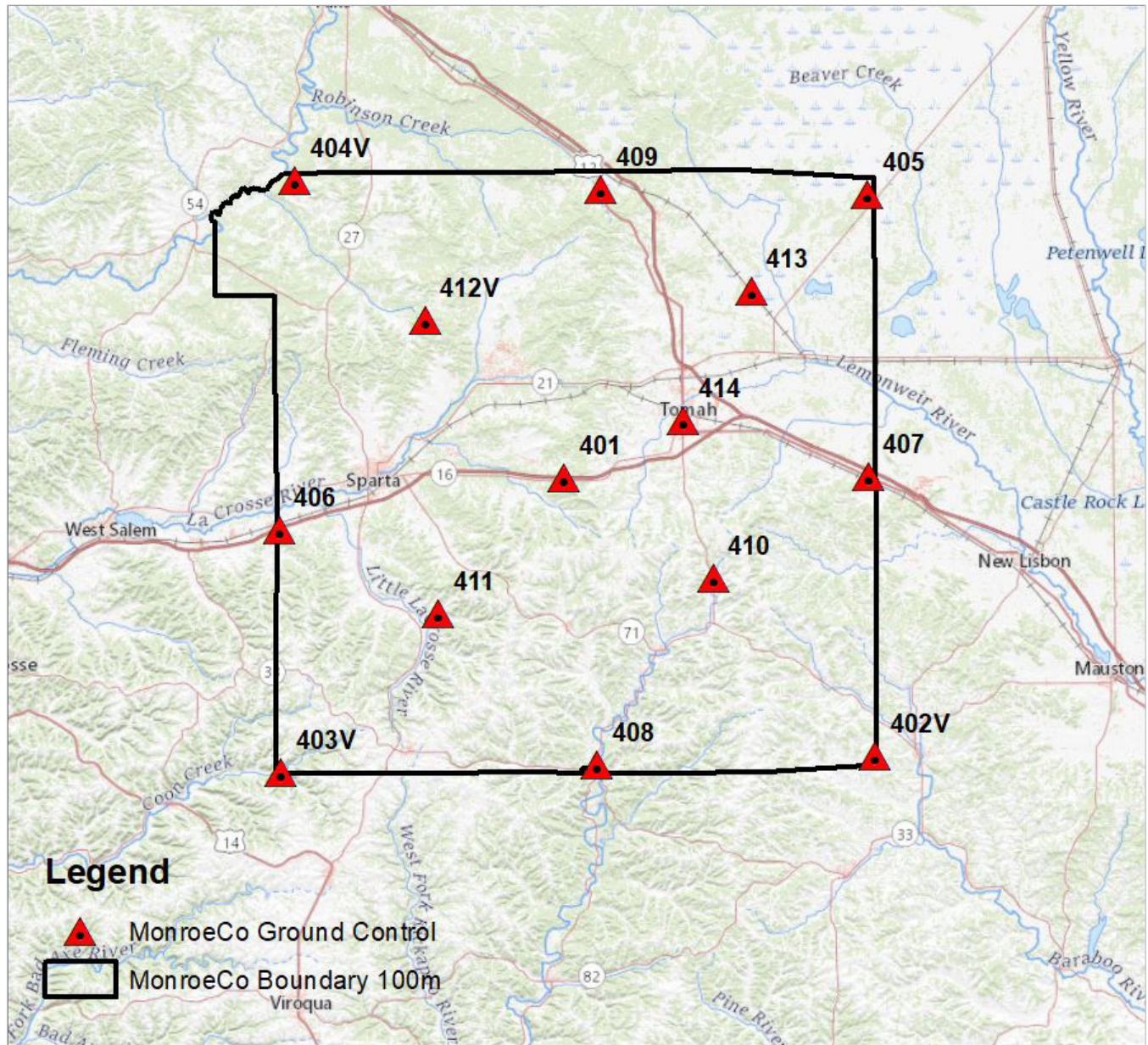
Check shots were taken on numerous NGS control points (see field notes) to verify that the values obtained are consistent with the datum/adjustment as described herein and meet the ± 3 centimeter vertical accuracy requirement at the 95% confidence level.

Points not able to be directly occupied by GPS means were measured using Total Station methods from control point pairs set utilizing GPS methods outlined above.

1.1.2 Control Layout

The locations were selected around the outer geometry of the project boundary and on major roads within the project area. This layout design is preferred when the calibration points will be used to check different areas across a large flight block. The control survey was conducted with a Trimble R-8 GPS receiver and a VRS connection with a TSC3 data collector.

1.1.2.1 Map of Monroe County Calibration Points



1.1.3 Monroe County Lidar, Calibration Point Statistics

The final step in using the calibration points is to run a statistical comparison against the bare earth ground surface to confirm that the vertical accuracy is within specification. The follow results indicate that the overall RMSEz of the calibration points is 0.108'. This is a separate check as compared to the Vertical Accuracy Survey QA/QC report. These points are used in the calibration of the raw point cloud, and therefore are not an independent set of checkpoints like those used in the vertical accuracy testing.

1.1.3.1 Statistical Report for Calibration Points

NUMBER	EASTING	NORTHING	KNOWN Z	LASER Z	DZ
401	675784.630	377649.215	1030.741	1030.730	-0.011
402V	758090.447	304191.593	1192.229	1192.330	0.101
403V	601014.091	299867.993	844.670	844.940	0.270
404V	604663.528	456405.159	850.090	849.930	-0.160
405	756041.014	452786.013	970.573	970.440	-0.133
406	600450.578	364162.874	780.459	780.490	0.031
407	756146.421	378033.219	941.253	941.230	-0.023
408	684637.987	301844.545	885.156	885.180	0.024
409	685520.610	454012.911	990.306	990.280	-0.026
410	715245.147	351403.299	1115.289	1115.300	0.011
411	642663.541	341908.766	865.313	865.380	0.067
412V	639001.354	419533.107	957.600	957.550	-0.050
413	725322.621	427196.006	953.228	953.140	-0.088
414	707274.649	392913.658	968.261	968.400	0.139

Average Dz	+0.011 ft
Minimum Dz	-0.160 ft
Maximum Dz	+0.270 ft
Average Magnitude	0.081 ft
Root Mean Square	0.108 ft
Std Deviation	0.112 ft

1.1.4 Field Notes

CALIBRATION POINTS				
PNT	CODE	TH	PK #	LOCATION
411	CA	2M	√5	SE END OF SOLID YELLOW LINE ON CTH XX, 878' SE 1/4 KATYDID AVE

PNT	CODE	TH	PK #	LOCATION
404V	CA	5.00	√5	E OF AARON AVE, 175' E 1/2 NE/SW PORTION OF AARON AVE.
406	CA	2M	√5	NE END OF FOG LINE OF CONVERGING LANES,

412V	CA	5.00	√5	E OF CTH I, 1935 1/2 E DELEWARE AVE
403V	CA	5.00	√5	E OF OAKDALE AVE, 74' NE 1/4 E CTH P

401	CA	2M	√5	WEST END OF FOG LINE, NE QUAD OF STH 16 + CINDER DR.
408	CA	2M	√5	NW END OF SOLID YELLOW LINE, STH 131, 700' NW 1/4 PARK ST.

410	CA	2M	√5	NORTH END OF FOG LINE STH 131, SE QUAD OF STH 131 + KILN AVE
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PNT	CODE	TH	PK #	LOCATION
402V	CA	5.00	√5	E OF CTH O, 726' SW 1/4 MOHNS RD.
409	CA	2M	√5	NW END OF FOG LINE, E QUAD OF STH 12 + ARIZONA RD.

414	CA	2M	√5	CENTER OF MH, E OF E SARATOGA ST + ALLEY
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407	CA	2M	√5	SE END OF TURN LANE, NE QUAD OF STH 16 + FUNNEL RD
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413	CA	2M	√5	NORTH END OF SOLID YELLOW LINE ON CTH N, 380' N 1/2 RR CROSSING
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405	CA	2M	√5	WEST END OF SOLID YELLOW LINE ON CTH EE, 1264' 1/4 CTH HH
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1.1.5 Field Photos



Point 401



Point 402V



Point 403V



Point 404V



Point 405



Point 406

1.1.5 Field Photos (Continued)



Point 407



Point 408



Point 409



Point 410



Point 411



Point 412V

1.1.5 Field Photos (Continued)



Point 413



Point 414