



Ground Control Report

Wisconsin WROC - 3DEP

Menominee County Lidar 2020

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1.1 Ground Control Design and Methodology

The ground control network and design used for the Menominee 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 21 locations in and around the Menominee 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-Menominee County, NAD83 (2011), U.S. survey feet; NAVD88 (Geoid 12B), U.S. survey feet. The field work was conducted by Ayres surveyors. All field work was completed between April 15 and April 20, 2020.

Control Summary and Methodology

Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), Wisconsin 12B
Rectangular Coordinate System:	WISCRS-Menominee County
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	DP8294, DP8868, DN6872, DP8880, DP8623
Summary of control checks and calibration (if applicable):	(See Field Notes for control checks on NGS monuments – A single point vertical calibration was used. Used point DP8880.)
Survey Methods Used:	RTK-GPS using WISCORS Network through VRS connection were used for direct observations
Equipment Used:	Data Collector: Trimble TSC3 RSONC10841 Ayres#: 75.20 GPS Rover: Trimble R8 5220487835 Ayres#: 75.36 Total Station: Trimble Robotic S6 93410182 Ayres#: 75.38

Survey Methods (continued)

All work was performed in and referenced to NAD83 (2011), NAVD 88(2012), Wisconsin 12B, Wisconsin Coordinate Reference System-Menominee Zone in U.S. Survey Feet

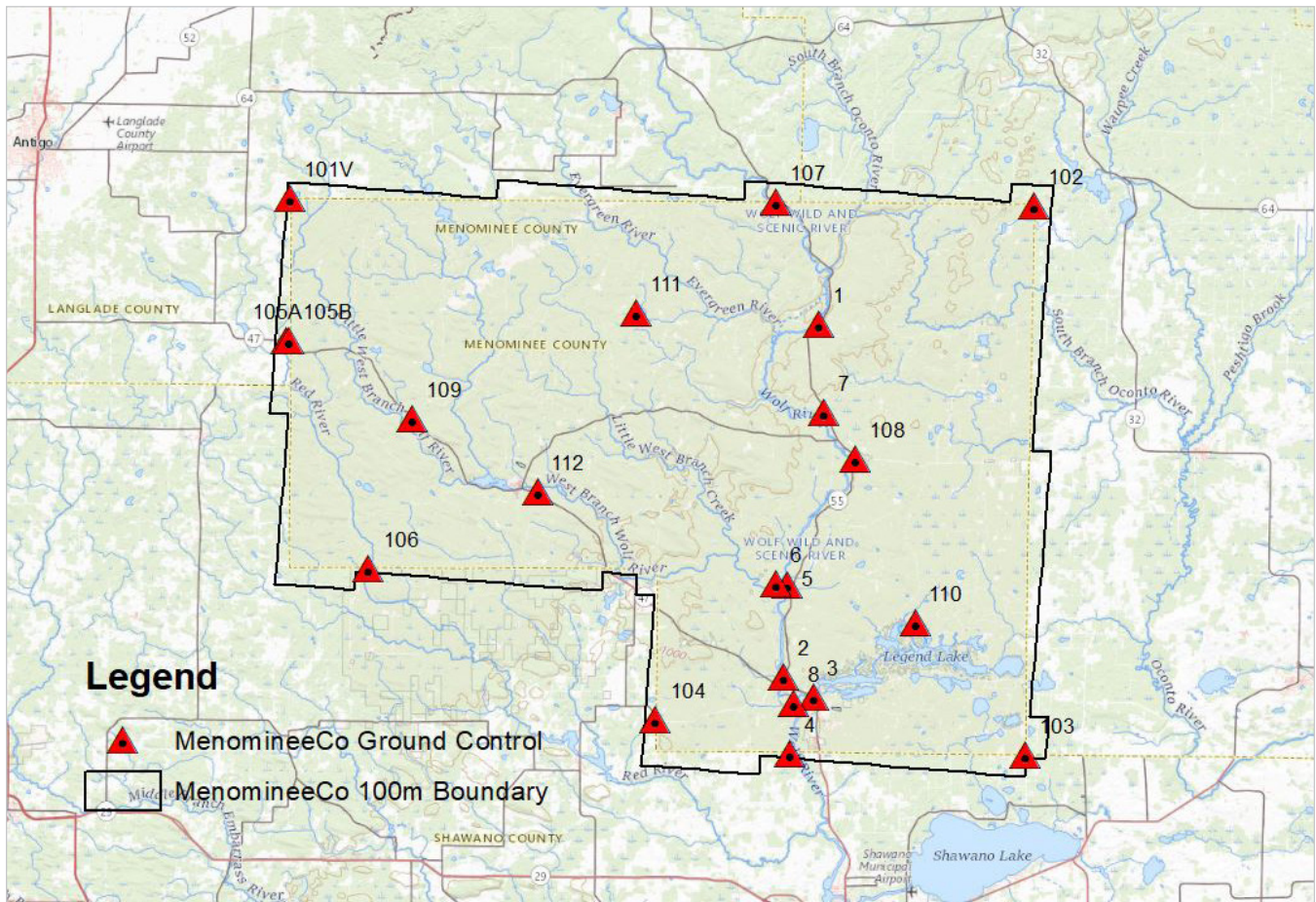
Established horizontal and vertical coordinate values on the points by a minimum of two – 90 epoch observations with separate initializations using RTK GPS and the WISCORS network. The resultant coordinates and elevations provided in the deliverables are an average of the two observations.

Check shots were taken on numerous NGS control points (see above and 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.

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 Menominee County Calibration Points



1.1.3 Menominee 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 following results indicate that the overall RMSEz of the calibration points is 0.101'. 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
1	291484.769	125146.217	997.689	997.66	-0.029
2	285306.6	64181.272	858.749	858.67	-0.079
3	290419.589	60549.577	847.311	847.22	-0.091
4	286416.866	50699.214	866.004	866.03	0.026
5	286022.468	79979.981	880.727	880.71	-0.017
6	284035.539	80269.025	877.488	877.51	0.022
7	292305.505	109849.03	960.858	960.78	-0.078
8	287021.664	59443.321	867.395	867.32	-0.075
101V	199818.302	146844.377	1430.921	1430.97	0.049
102	328580.624	145582.807	898.747	898.95	0.203
103	327089.426	50687.142	855.451	855.38	-0.071
104	263163.885	56724.209	909.285	909.38	0.095
105A	199228.115	122278.743	1291.979	1291.71	-0.269
105B	199698.423	122213.338	1284.085	1284.05	-0.035
106	213487.799	82934.721	1126.104	1126.11	0.006
107	283947.263	146176.602	1085.006	1084.95	-0.056
108	297633.908	101899.657	924.025	924.09	0.065
109	220947.253	108675.524	1214.529	1214.62	0.091
110	308101.797	73504.383	856.532	856.64	0.108
111	259800.917	126990.768	1141.444	1141.49	0.046
112	242751.073	96160.278	1049.16	1049.32	0.16

Average Dz	0.003
Minimum Dz	-0.269
Maximum Dz	0.203
Average Magnitude	0.080
Root Mean Square	0.101
Std Deviation	0.104

1.1.4 Field Notes

1				
(201)	CP	ZM	N, E, S, W	PK SET IN NE CORNER OF PAINTED "L" TARGET ON HWY 55.

2	CP	ZM	N, E, S, W	PK SET IN SW CORNER OF FOG LINE ON NORTH SIDE OF HWY 55, PK IS EAST OF KESHENA FALLS RD.
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3	CP	ZM	N, E, S, W	PK SET IN SW CORNER OF WESTERN MOST YELLOW PARKING STRIPE JUST SOUTH OF PARKING LOT ENTRANCE, ON THE NORTH SIDE OF CHURCH.
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PT#	CODE	RH	DIC	DESC.
4	CP	ZM	N, E, S, W	PK SET IN NE CORNER OF PAINTED "L" TARGET AT THE END OF BIRDSONG LN.

5	CP	ZM	N, E, S, W	PK SET IN SE CORNER OF PAINTED "L" TARGET AT THE INTERSECTION OF MIKE KESHENA FIELDS RD (80) AND (16) BEAR TRAP FALLS RD
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6	CP	ZM	N, E, S, W	PK SET IN SE CORNER OF PAINTED "L" TARGET ON (16) BEAR TRAP FALLS RD, WEST OF BRIDGE.
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1.1.4 Field Notes (Continued)

PT #	CODE	RH	PIC	DESC
7 (207)	CP	2M	N, E, S, W, CU	PK SET IN SW CORNER OF PAINTED "L" TARGET ON HWY 55, JUST SOUTH OF HOUSE N4571.

8 (208)	CP	2M	N, E, S, W, CU	CENTER OF MANHOLE THAT IS WEST OF THE WEST SIDE OF THE BUILDING, AND MANHOLE IS EAST OF THE ASPHALT ENTRANCE
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101V (101V)	CP	6.0	N, E, S, W, CU	PK SET IN E OF HILL RD, WEST OF MAYKING RD. PK IS SET ABOUT 100 FT WEST OF GRAVEL/ START OF ASPHALT.
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102V (1102)	CP	2M	N, E, S, W, W/ CAP	SET AT THE INTERSECTION OF 3 2-TRACK ROADS IN THE NE CORNER OF MENOMINEE COUNTY.
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103 (1103)	CP	2M	N, S, W, E, W/ PK	SET IN SE CORNER OF FOG LINE ON EAST SIDE OF EAST LINE RD. PK IS IN NE QUAD OF EAST LINE RD AND SOUTH LINE RD.
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104 (1104)	CP	2M	N, S, E, W, CU	PK SET IN SE CORNER OF FOG LINE ON WEST SIDE OF CTH VV, JUST NORTH OF CTH VV AND JUNIPER RD INTERSECTION.
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1.1.4 Field Notes (Continued)

105A (1105A)	CP	2M	N,S,CU	SE CORNER OF CONCRETE CULVERT ON NORTH SIDE OF HWY 47, JUST SOUTH OF GRAVEL DRIVE OF HOUSE W6766.
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105B (1105B)	CP	2M	N,S,CU	PK SET IN SW CORNER OF PAINTED "L" ON SOUTH SIDE OF HWY 47 ABOUT 200 FT WEST OF MENOMINEE CO. LINE.
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106 (1106)	CP	2M	N,E,S,CU	SE CORNER OF SOUTHERN FOG LINE ON BRIDGE NATIONAL GUARD RD, JUST EAST OF RED RIVER RD.
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107 (1107)	CP	2M	N,E,S,CU	PK SET IN PAINTED "L" TARGET ON THE NORTH SIDE OF HWY 55, JUST NORTH OF HOUSE N250.
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108 (1108)	CP	2M	N,E,S,CU	PK SET IN NW CORNER OF SOUTHERN STOP LINE AT HWY 55 AND CTH M
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109 (1109)	CP	2M	N,E,S,CU	PK SET IN SW CORNER OF STOP STRIPE AT THE INTERSECTION OF HWY 47 AND PLACE TO CUT WOOD.
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1.1.4 Field Notes (Continued)

110	CP	2M	N, S, E, W	PK SET IN
(1110)	NW CORNER OF FOG LINE ON SOUTH SIDE OF LONG MARSH RD. PK IS EAST OF S. BRANCH PATH.			

111	CP	2M	N, E, S, W	IP / W CAP
(1111)	SET AT THE INTERSECTION OF 137 (CAMP 21 RD) AND 171 (CAMP 19 RD)			

112	CP	2M	N, E, S, W	CENTER OF
(1112)	THE MIDDLE MANHOLE ON ROAD 414. WILD RICE CT. MANHOLE IS AT THE END OF THE ROAD.			

1.1.5 Field Photos



Point 1



Point 2



Point 3



Point 4

1.1.5 Field Photos (Continued)



Point 5



Point 6



Point 7



Point 8

1.1.5 Field Photos (Continued)



Point 101V



Point 102



Point 103



Point 104

1.1.5 Field Photos (Continued)



Point 105A



Point 105B



Point 106



Point 107

1.1.5 Field Photos (Continued)



Point 108



Point 109



Point 110



Point 111

1.1.5 Field Photos (Continued)



Point 112