



# Ground Control Report

Wisconsin WROC - 3DEP

Chippewa County Lidar 2020

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### 1.1 Ground Control Design and Methodology

The ground control network and design used for the Chippewa 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 20 locations in and around the Chippewa 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-Chippewa 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 February 25 and March 31, 2020.

### Control Summary and Methodology

#### Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), GEOID12B (CONUS)
Rectangular Coordinate System:	WISCRS-Chippewa County
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	DL4346
Summary of control checks and calibration (if applicable):	(See Field Notes for control checks on NGS monuments – No calibration was needed)
Survey Methods Used:	RTK-GPS using WISCORS Network through VRS connection were used for direct observations and to set control pairs for Robotic Total Station shots on power poles if needed.
Equipment Used:	Data Collector: Trimble TSC3 RS17C22036 Ayres#: 75.38 GPS Rover: Trimble R8-3 5239496998 Ayres#: 72.22 Total Station: Trimble S6 93410071 Ayres#: 74.11

**Survey Methods (continued)**

All work was performed in and referenced to NAD83 (2011), NAVD 88(2012), Geoid 12B, Wisconsin Coordinate Reference System-Chippewa 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.

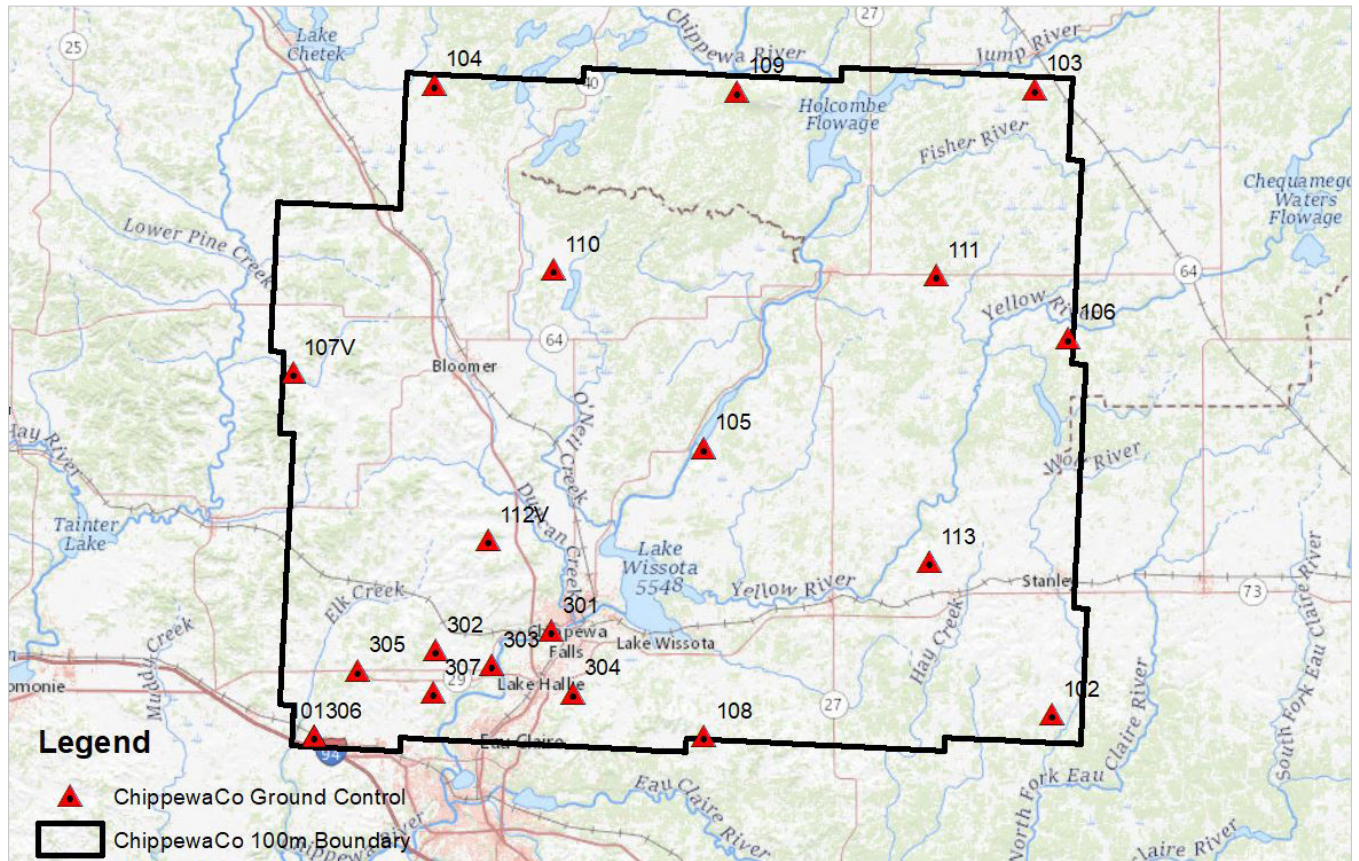
Check shots were taken on numerous NGS control points (see above and field notes) to verify that the values obtained are consistent with the datum/adjustment as described herein and meet the  $\pm 3$  centimeter vertical accuracy requirement at the 95% confidence level.

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 Chippewa County Calibration Points



### 1.1.3 Chippewa 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 0.103'. 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
101	109696.075	100961.496	893.906	893.970	+0.064
102	288243.108	106137.224	1099.630	1099.590	-0.040
103	284112.252	257405.448	1140.010	1139.900	-0.110
104	138913.513	258431.751	1072.332	1072.250	-0.082
105	204001.779	170618.702	952.091	952.000	-0.091
106	292143.960	197219.957	1144.747	1144.610	-0.137
107V	104770.394	188815.358	996.463	996.200	-0.263
108	204118.391	100947.396	1040.646	1040.650	0.004
109	212129.638	256748.786	1194.307	1194.180	-0.127
110	167654.089	213642.490	1049.906	1049.910	0.004
111	260239.668	212279.455	1115.831	1115.800	-0.031
112V	151972.943	148302.018	971.582	971.570	-0.012
113	258471.993	143027.032	1108.474	1108.470	-0.004
301	167155.886	126458.981	830.312	830.450	0.138
302	139052.517	121756.123	946.951	947.000	0.049
303	152682.466	118035.441	880.176	880.210	0.034
304	172468.041	111339.606	925.315	925.400	0.085
305	120375.307	116825.414	994.666	994.800	0.134
306	109696.012	100961.452	893.831	893.970	0.139
307	138622.947	111438.206	951.691	951.770	0.079

Average Dz	-0.008
Minimum Dz	-0.263
Maximum Dz	0.139
Average Magnitude	0.081
Root Mean Square	0.103
Std Deviation	0.105

## 1.1.4 Field Notes

101	2M	✓	PK NAIL, PROPOSED LINE NOT USABLE. MOVED ~ 100' SE TO END OF FOG LINE
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102	2M	✓	PK NAIL
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103	2M	✓	PK NAIL. NO USABLE LINE BREAKS @ PROPOSED LOCATION. MOVED ~ 1900' SOUTH TO NEAREST USABLE LINE BREAK.
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104	2M	✓	MOVED ~ 2700' E TO FOG LINE BREAK. PK NAIL.
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105	2M	✓	PK NAIL
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106	2M	✓	PK NAIL
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107V	5.00'	✓	PK NAIL
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## 1.1.4 Field Notes (Continued)

108	2M	✓	CORNER OF CONCRETE. PROPOSED FOG LINE END NO LONGER EXISTS. MOVED ~ 200' NORTH TO CORNER OF CONCRETE
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109	2M	✓	PK NAIL. NO USABLE LINE BREAKS @ PROPOSED LOCATION. MOVED ~ 2500' SOUTH TO NEAREST USABLE LINE BREAK
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110	2M	✓	MOVED TO FOG LINE BREAK ON W SIDE OF ROAD DUE TO TRAFFIC. PK NAIL.
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111	2M	✓	PK NAIL
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112V	5.00'	✓	PK NAIL
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113	2M	✓	PK NAIL
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## 1.1.4 Field Notes (Continued)

PNT	CODE	TH	PIC	LOCATION
301	CP	2M	TNS 4-20	SW END OF FOG LINE, NW SIDE OF OLD 29, WEST ENTRANCE TO CITY UTILITY BLDG
302	CP	2M	TNS 4-20	NE END OF FOG LINE, WEST QUAD OF CTH F & 50 <sup>th</sup> AVE,
303	CP	2M	TNS 4-20	SOUTH END OF FOG LINE, NW QUAD CTH X & 43 <sup>RD</sup> AVE
304	CP	2M	TNS 4-20	EAST END OF FOG LINE, NW QUAD, CTH 00 & CTH P
305	CP	2M	TNS 4-20	NW CORNER OF SOLID YELLOW E STRIPE, ON 40 <sup>th</sup> AVE. (P INT. W/ EB US 29
306	CP	2M	TNS 4-7	NW END OF FOG LINE, EAST QUAD. US 12 & 20 <sup>th</sup> ST
307	CP	2M	TNS	SOUTH END OF FOG LINE, NW QUAD, 30 <sup>th</sup> AVE & CTH F



1.1.5 Field Photos



Point 101



Point 102



Point 103



Point 104

1.1.5 Field Photos (Continued)



**Point 105**



**Point 106**



**Point 107V**



**Point 108**

1.1.5 Field Photos (Continued)



Point 109



Point 110



Point 111



Point 112V

1.1.5 Field Photos (Continued)



**Point 113**



**Point 301**



**Point 302**



**Point 303**

1.1.5 Field Photos (Continued)



Point 304



Point 305



Point 306



Point 307