



# Ground Control Report

Wisconsin WROC - 3DEP

Columbia County Lidar 2020

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# Ground Control Report

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### 1.1 Ground Control Design and Methodology

The ground control network and design used for the Columbia 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 16 locations in and around the Columbia 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-Columbia 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 7 and April 8, 2020.

### Control Summary and Methodology

#### Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), Wisconsin Geoid 12B
Rectangular Coordinate System:	WISCRS-Columbia County
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	OM0472, DH5677, DH5546, DH5568
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 where needed.
Equipment Used:	GPS Trimble R10 GNSS S/N 5410456448 (Ayres #74.95) Data Collector Trimble TSC7 S/N DAD184200341 (Seiler Loaner) Trimble S6 Total Station S/N 93410054 (Ayres #75.20)

**Survey Methods (continued)**

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

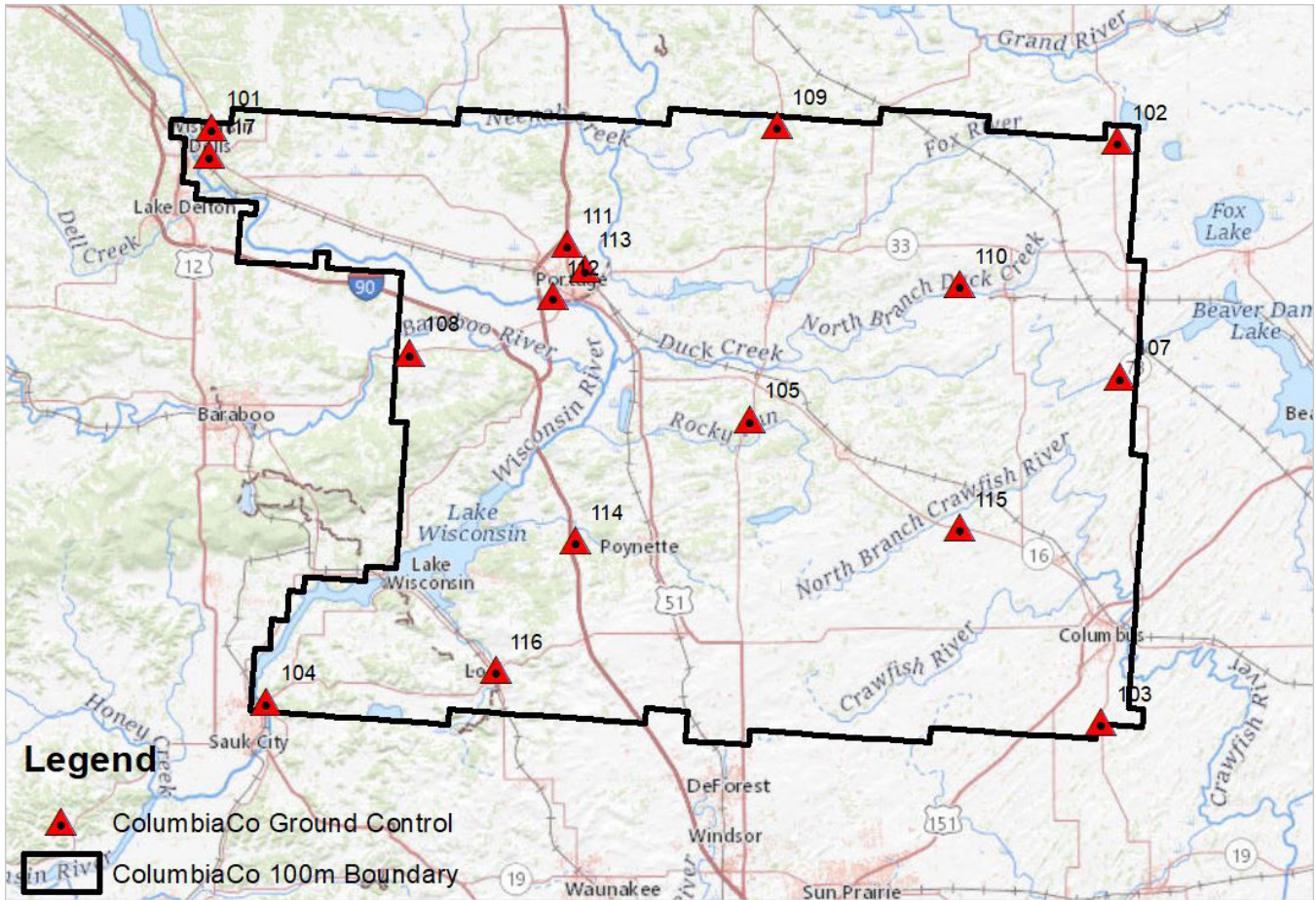
Established horizontal and vertical coordinate values on the points by a minimum of two – 90 epoch observations with separate initializations using RTK GPS and the WISCORS network. The resultant coordinates and elevations provided in the deliverables are an average of the two observations. Check shots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



### 1.1.3 Columbia 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 0.073'. 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.

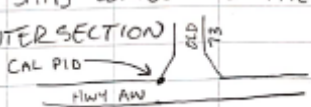
## 1.1.3.1 Statistical Report for Calibration Points

NUMBER	EASTING	NORTHING	KNOWN Z	LASER Z	DZ
101	2030949.193	598287.094	905.527	905.54	0.013
102	2229610.4	596761.612	965.845	965.82	-0.025
103	2226993.27	469431.807	905.239	905.29	0.051
104	2043948.447	472570.618	763.784	763.88	0.096
105	2149382.936	535288.223	931.543	931.66	0.117
107	2230584.123	545218.051	934	933.95	-0.05
108	2074700.013	549187.507	850.774	850.75	-0.024
109	2154985.378	599572.954	849.869	849.95	0.081
110	2195354.734	565013.289	844.691	844.75	0.059
111	2109083.149	573298.571	799.485	799.54	0.055
112	2106092.128	561796.74	835.1	835.1	0
113	2113080.57	568012.846	790.719	790.84	0.121
114	2111495.568	508337.723	810.853	810.86	0.007
115	2195747.713	511782.381	938.654	938.66	0.006
116	2094142.201	479834.366	813.471	813.31	-0.161
117	2030443.32	592219.377	910.563	910.62	0.057
Average Dz		0.025			
Minimum Dz		-0.161			
Maximum Dz		0.121			
Average Magnitude		0.058			
Root Mean Square		0.073			
Std Deviation		0.071			

1.1.4 Field Notes

PNT	CODE	RH	PICS	DESCRIPTION
101	CP	ZM	✓	INTERIOR CORNER OF MOST EASTERLY DIAGONAL STRIPE. SAID CORNER IS SOUTHERLY INTERIOR CORNER OF NORTH YELLOW STRIPE AND MOST EASTERLY YELLOW STRIPE INTERSECTION

102	CP	ZM	✓	(MOVED) NEW ROADWAY EXISTS COMPARED TO AERIAL NEW LOCATION IS CORNER OF AC <del>THOMAS</del> PAVING FOR HWY "AW" @ INTERSECTION W/ OLD WISCONSIN 73. SAID CORNER IS THE NW CORNER OF THE INTERSECTION
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103	CP	ZM	✓	END OF FOG LINE SB HWY 89 @ INTERSECTION W/ PRIEM RD. SOUTHWEST CORNER OF INTERSECTION
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PNT	CODE	RH	PICS	DESCRIPTION
104	CP	ZM	✓	NW CORNER OF STOP LINE E HWY 188 + HWY 60 INTERSECTION

105	CP	ZM	✓	(MOVED) END OF MOST WESTERLY FOG LINE, SB HWY 22 @ INTERSECTION W/ PHILLIPS ROAD. SAID FOGLINE IS IN THE NW CORNER OF THE INTERSECTION
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## 1.1.4 Field Notes (Continued)

107	CP	ZM	✓	(MOVED)
END OF FOG LINE, NB HWY CD + COURT ROAD INTERSECTION. NE CORNER OF INTERSECTION				

108	CP	ZM	✓	<del>SE</del> EASTERLY
END OF PASSING ZONE DASHED & STRIPE. SAID DASH IS FIRST DASH EAST OF PAVED APRON FOR FIELD DRIVE ON NORTH EDGE OF HWY 33 AND IS THE DASH DIRECTLY IN LINE W/ DRIVEWAY FOR <del>ABANDONED</del> ABANDONED HOUSE ON S'LY SIDE HWY 33				

109	CP	ZM	✓	(MOVED)
NO CELL RECEPTION IN VICINITY OF 109 PROPOSED NEW LOCATION IS ~1.3 MILES EAST. END OF FOG LINE, SB HWY 22. SW CORNER OF HWY 22 + BARRY RD INTERSECTION				

110	CP	ZM	✓	SE CORNER OF STOP LINE ON HWY "H" @ INTERSECTION W/ HWY "P"
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111	CP	ZM	✓	SE CORNER OF SOLID TURN LANE STRIPE, NB NEW PINERY RD @ INTERSECTION W/ HWY "CX". SAID STRIPE IS ON S'LY SIDE OF INTERSECTION
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112	CP	ZM	✓	(MOVED)
& MANHOLE AT & @ INTERSECTION OF W PLEASANT ST + SUNSET ST				

## 1.1.4 Field Notes (Continued)

113	CP	ZM	✓	NE CORNER OF ADT RAMP WARNING PAD, E'LY SIDE HAMILTON ST @ INTERSECTION W/ EVERGREEN TRAIL
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114	CP	ZM	✓	E VALVE COVER IN BANK OF VALVES SOUTH OF DIESEL PUMPS. SAID VALVE COVER IS MOST WESTERLY OF THEM ALL
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115	CP	ZM	✓	END OF FOG LINE, WB HWY 16 + CTH A INTERSECTION. (NE CORNER OF INTERSECTION)
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116	CP	ZM	✓	E MANHOLE E'LY SIDE OF N MAIN ST @ INTERSECTION WITH LOLUST ST + 2ND ST. SAID MANHOLE IS DIRECTLY <del>NEAR</del> NEAR DRIVEWAY EXIT FOR BANK DRIVE THROUGH
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117	CP	ZM	✓	(MOVED) <del>SW</del> SW CORNER OF STOP LINE FOR MINNESOTA AVE @ EAST SIDE OF MINNESOTA AVE + BOWMAN RD. INTERSECTION
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1.1.5 Field Photos



Point 101



Point 102



Point 103



Point 104

1.1.5 Field Photos (Continued)



**Point 105**



**Point 107**



**Point 108**



**Point 109**

1.1.5 Field Photos (Continued)



Point 110



Point 111



Point 112



Point 113

1.1.5 Field Photos (Continued)



Point 114



Point 115



Point 116



Point 117