

# Ground Control Report

## WISCONSIN WROC - 3DEP | FOND DU LAC COUNTY LIDAR 2018

### 1.1 GROUND CONTROL DESIGN AND METHODOLOGY

The ground control network and design used for the Fond du Lac 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 17 locations in and around the Fond du Lac 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-Fond du Lac County, NAD83 (2011), US survey feet; NAVD88 (Geoid 12B), US survey feet. The field work was conducted by Ayres Associates surveyors. All field work was completed between April 17, 2018, and May 16, 2018.

### CONTROL SUMMARY AND METHODOLOGY

#### Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), Wisconsin GEOID12B
Rectangular Coordinate System:	Wisconsin County Coordinate System-Fond Du Lac County
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	AI5970,AI5977,AI6070,AI6098,AI9569,AI9572,AI9579,AJ4506,AJ4511,DE7519,DE7713,DE7769,DF6018,DH5607
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 under canopy, etc
Equipment Used:	GPS Trimble R6-4 75.64 Total station Trimble S 6 75.22 Data Collector Trimble TSC 3

#### Crew Chief Notes

Set PK nails or spikes at control points used for total station measurements and for calibration points.

Recorded appropriate: NVA (Bare Earth & Urban) and VVA (Forested, Swamp/Wetland, Tall Weed/Crop).  
Took (4) pictures of each point – one from each cardinal direction.

**Survey Methods (continued)**

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.

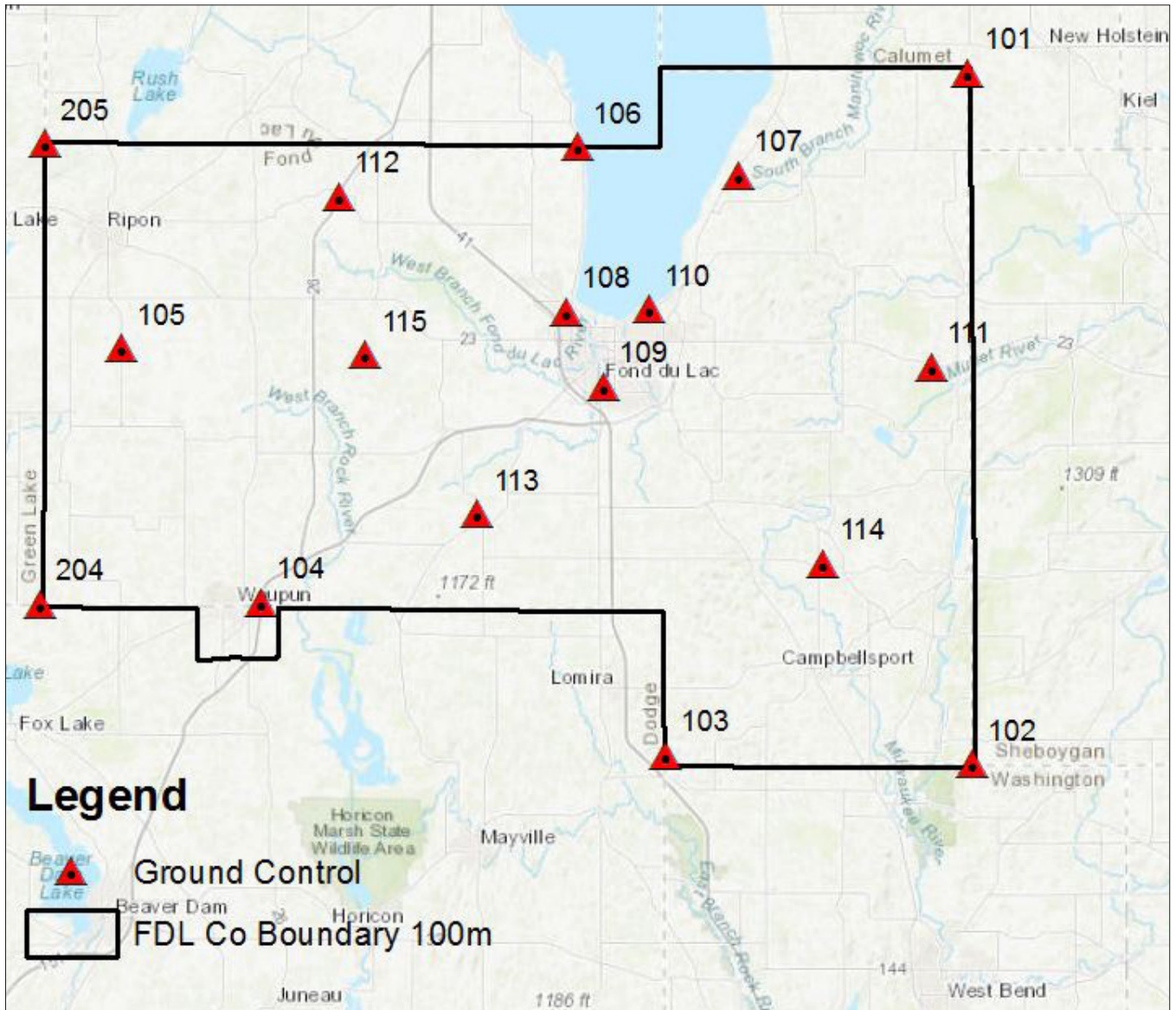
Check shots were taken on numerous NGS control points (see field notes) to verify that the values obtained are consistent with the datum/adjustment as described herein and meet the  $\pm 3$  centimeter vertical accuracy requirement at the 95% confidence level.

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 FOND DU LAC COUNTY CALIBRATION POINTS



### 1.1.3 FOND DU LAC 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 0.076'. 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	892123.642	443260.576	1000.746	1000.900	+0.154
102	892916.557	300349.901	1036.916	1036.940	+0.024
103	829393.332	302274.447	997.251	997.160	-0.091
104	745843.173	333796.906	881.526	881.520	-0.006
105	717087.826	386297.550	1022.974	1022.860	-0.114
106	811252.802	427943.496	751.304	751.290	-0.014
107	844525.060	422110.276	889.266	889.270	+0.004
108	809001.311	393879.631	754.818	754.890	+0.072
109	816679.975	378572.371	777.266	777.130	-0.136
110	826162.947	394493.113	750.857	750.960	+0.103
111	884622.446	382592.684	1034.192	1034.170	-0.022
112	762054.523	417804.855	897.640	897.590	-0.050
113	790708.609	352069.389	892.981	892.910	-0.071
114	862174.639	341944.901	1038.384	1038.470	+0.086
115	767587.774	384960.555	907.318	907.330	+0.012
204	700321.046	333422.392	961.470	961.440	-0.030
205	701334.922	428731.794	975.923	975.960	+0.037

<b>Average Dz</b>	-0.002
<b>Minimum Dz</b>	-0.136
<b>Maximum Dz</b>	+0.154
<b>Root Mean Square</b>	0.076
<b>Std Deviation</b>	0.078

1.1.4 FIELD NOTES

	4-17-18 MSL			
	FOND DU LAC RIDES			
	30° PPT CLOUDY			
	NAVD 83 (11) WCCS FOND DU LAC			
	NAVD 07 (2B)			
CHECK PT ID	ΔN	ΔE	ΔZ	ASSUMED
DE 759	0.009	0.052	0.054	1000
DF 608	0.031	0.055	0.065	1001
AI 608	9.976	-5.767	0.107	1000
102	NE CORN	SEC. CUTAWAY		
114	MOVED TO EAST D.W. TOO MUCH SNOW			
111	MAG @ FLAG PT SW COR. D/O/23			
101X1	2'0" E/W FACE POLE			
101V	MAGN. @ C/C			
107	SW COR. CB @ FLANGE			
110	NE COR. CB @ FLANGE			
109	SW COR. HC RAMP			
103	NW CORN. START NO PASSING LINE			

1.1.4 FIELD NOTES (CONTINUED)

4-18-18				
MOR 28°F Cloudy				
√ FT AIGTS	ΔN	ΔE	ΔZ	DT #
AIG7	-0.038	0.032	21.078	1003
A19569	VERTICAL ONLY		F0049	1004
DMS607	0.002	0.061	0.102	1005
A24511	-0.037	-0.010	-0.049	1006
P10				
113	E. WV			
104	NW COR. CB GRATE @ FLANGE			
204	MANHOLE NE CORNER STRIP			
105	SE COR. STRIPING			
205	NE COR. STRIPING			
112	SW COR. CURB @ FLANGE			
106	MOVED TO N C/S SE RAD. @ FLANGELINE DUE TO SNOW PILE			
108	NE COR. STRIPING GRATE			
115	CORNER STRIPING			

1.15 FIELD PHOTOS



**Point 101**



**Point 102**



**Point 103**



**Point 104**

FIELD PHOTOS (CONTINUED)



**Point 105**



**Point 106**



**Point 107**



**Point 108**



FIELD PHOTOS (CONTINUED)



**Point 109**



**Point 110**



**Point 111**



**Point 112**

FIELD PHOTOS (CONTINUED)



Point 113



Point 114



Point 115

FIELD PHOTOS (CONTINUED)



Point 204



Point 205