



AYRES

Ground Control Report

Wisconsin WROC - 3DEP

Rock County Lidar 2020

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1.1 Ground Control Design and Methodology

The ground control network and design used for the Rock 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 24 locations in and around the Rock 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-Rock 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 27, 2020, and March 3, 2020.

Control Summary and Methodology

Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), GEOID12B (CONUS)
Rectangular Coordinate System:	WISCRS-Rock County
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	DF9761, DF9826, DF9891, DG4844, DQ4929, NH1283
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:	GPS Trimble R10 GNSS S/N 5410456448 (Ayres #74.95) Data Collector Trimble TSC 7 S/N DAD184200341 Total Station Trimble S6 S/N 93410054 (Ayres #75.20)

Survey Methods (continued)

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

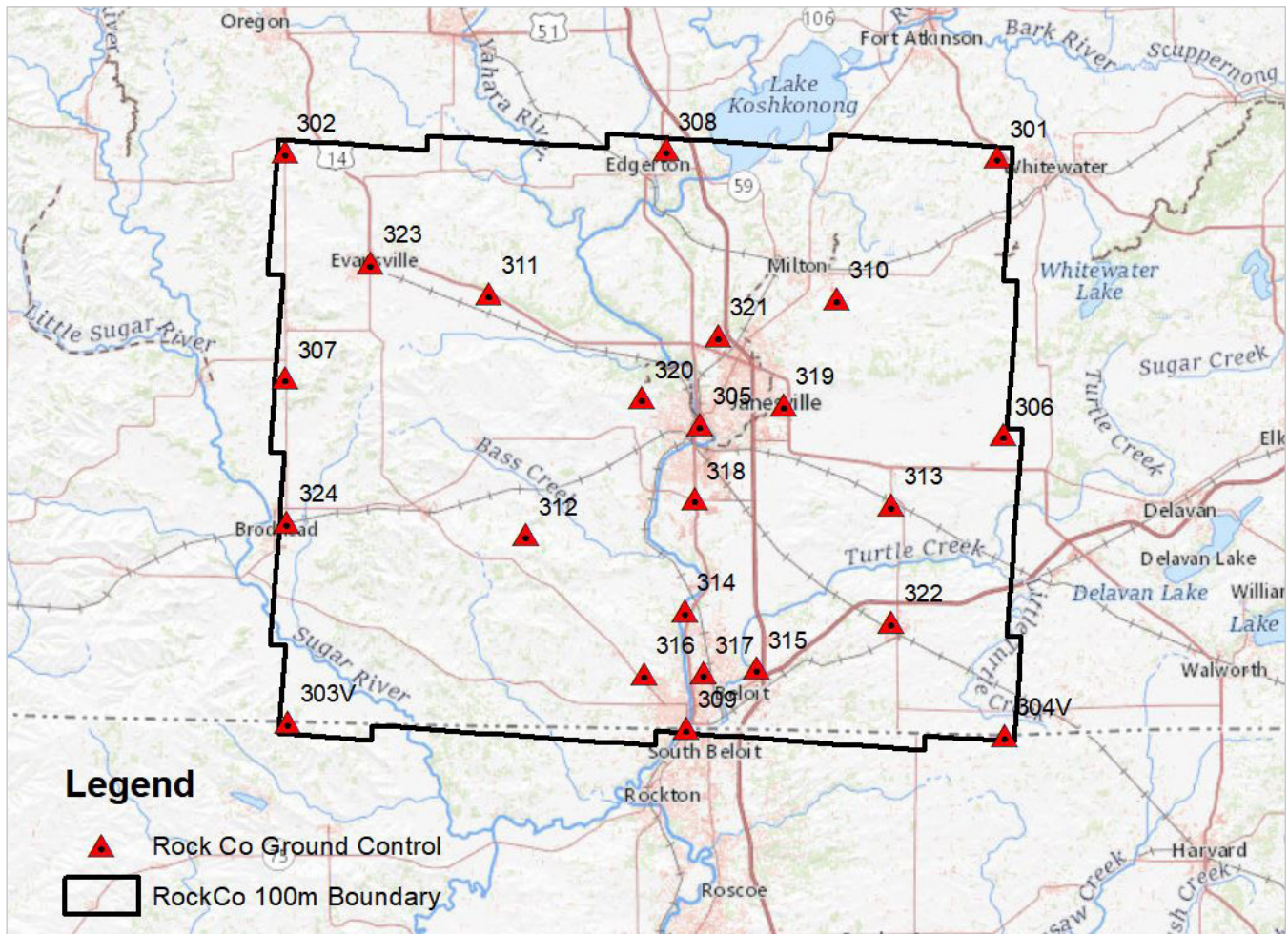
Check shots were taken on numerous NGS control points (see above and field notes) to verify that the values obtained are consistent with the datum/adjustment as described herein and meet the ± 3 centimeter vertical accuracy requirement at the 95% confidence level.

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 Rock County Calibration Points



1.1.3 Rock 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 0.096'. 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
301	558060.361	327532.336	848.468	848.52	0.052
302	400379.243	328732.193	958.603	958.72	0.117
303V	401143.536	202627.129	824.757	824.81	0.053
304V	559767.366	199658.236	966.538	966.51	-0.028
305	492232.058	268444.848	788.594	788.62	0.026
306	559278.459	266130.925	948.728	948.66	-0.068
307	400495.347	278640.991	862.54	862.55	0.01
308	484783.124	329130.182	839.098	839.01	-0.088
309	489123.674	201193.288	740.746	740.5	-0.246
310	522540.681	296324.654	888.556	888.54	-0.016
311	445613.394	297399.008	928.37	928.42	0.05
312	453806.933	243980.041	885.479	885.37	-0.109
313	534608.396	250722.408	953.985	953.87	-0.115
314	488878.958	227122.108	748.745	748.71	-0.035
315	504751.009	214448.885	813.923	813.84	-0.083
316	479838.822	213264.126	865.607	865.67	0.063
317	492963.707	213419.976	798.85	798.82	-0.03
318	491095.924	251956.836	804.376	804.37	-0.006
319	510703.758	272843.228	862.149	862.25	0.101
320	479393.895	274276.187	950.138	950.26	0.122
321	496220.162	288140.609	904.312	904.37	0.058
322	534644.125	224740.031	966.996	967.09	0.094
323	419354.638	304257.407	900.215	900.19	-0.025
324	400722.041	246807.915	796.265	796.49	0.225

Average Dz	0.005
Minimum Dz	-0.246
Maximum Dz	0.225
Average Magnitude	0.076
Root Mean Square	0.096
Std Deviation	0.098

1.1.4 Field Notes

301	CP	2M	✓	NE CORNER OF STOP LINE FOR TRI COUNTY LINE ROAD (W'LY SIDE) INTERSECTION W/ HWY 12
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302	CP	2M	✓	(MOVED) CORNER OF STOP LINE @ HOLT RD + HWY 104 INTERSECTION, @ NE CORNER INTERSECTION, SE CORNER OF ^{NEW} FOG LINE
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303V	CP	2M	✓	@ E STATE LINE ROAD, CENTERED ON CULVERT CROSSING
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304V	CP	2M	✓	@ E STATE LINE RD @ CULVERT CROSSING, ~1780' WEST OF STATE LINE RD + SHADON RD INTERSECTION
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305	CP	2M	✓	@ MH SB S JACKSON ST NEAR 14 S JACKSON ST
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306	CP	2M	✓	(MOVED) NE CORNER OF @ SOLID FOG LINE @ N'LY AREA OF COUNTY LINE ROAD + S CO. RD. M INTERSECTION.
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1.1.4 Field Notes (Continued)

307	CP	ZM	✓	NB HWY 104 FOG LINE ALONG NORTH OF HWY A + HWY 104 INTERSECTION, SE CORNER OF SAID FOG LINE
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308	CP	ZM	✓	E OF MH IN E E SAVANNAH WOODS DR + THRONSON DR INTERSECTION
-----	----	----	---	----------------------------------------------------------------

309	CP	ZM	✓	(MOVED) NE CORNER CB, W'LY CURB CUT FOR SUBWAY DRIVEWAY
-----	----	----	---	------------------------------------------------------------

310	CP	ZM	✓	NORTH CORNER OF FOG LINE, NB COUNTY RD M, SE CORNER CORDM + M-H TOWN LINE ROAD INTERSECTION
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311	CP	ZM	✓	(MOVED) SE CORNER OF ^N FELLOWS ROAD + HWY 14 INTERSECTION, SW CORNER OF FOG LINE, EB HWY 14
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312	CP	ZM	✓	(MOVED) SE CORNER OF SEAL COATED AC PAVING, WEST EDGE OF W STUART RD + HWY + INTERSECTION
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1.1.4 Field Notes (Continued)

313	CP	ZM	✓	NE CORNER OF CONC DRIVEWAY @ 3118 S SCOTT ST
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314	CP	ZM	✓	(MOVED) AT NE CORNER CONC DRIVEWAY @ 34 E AUBURN DR
-----	----	----	---	-------------------------------------------------------------------

315	CP	ZM	✓	♀ MH, N'LY OF Z MH'S, GROVE ST + WINCHESTER DR INTERSECTION
-----	----	----	---	----------------------------------------------------------------

316	CP	ZM	✓	♀ MH ♀ E STABORN DR + CHRISTILLA DR INTERSECTION
-----	----	----	---	-----------------------------------------------------

317	CP	ZM	✓	♀ MH ♀ WISCONSIN AVE @ 2114 WISCONSIN AVE
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318	CP	ZM	✓	♀ TRAFFIC MH IN CONC ISLAND, N'LY SIDE HWY 51 + 11 INTERSECTION
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1.1.4 Field Notes (Continued)

319	CP	ZM	✓	♀ MH IN NW
CORNER OF BEDFORD DR + NANTUCKET DR. INTERSECTION				

320	CP	ZM	✓	NW CORNER OF ADA
RAMP WARNING PVD, NE CORNER OF SUNRISE				
LN + PROMINENCE DR (MOVED) ♀ H₂O MANHOLE,				
NE CORNER OF SUNRISE LN + PROMINENCE DR				

321	CP	ZM	✓	♀ MH IN TERAPIN
TRAIL, SE CORNER TERAPIN TRAIL + HOYA LN INTERSECTION				

322	CP	ZM	✓	♀ MH ♀♀
HIGH ST + WESTVIEW AVE INTERSECTION				

323	CP	ZM	✓	♀ MH, ♀♀
E CHURCH ST + MAPLE ST INTERSECTION				

324	CP	ZM	✓	NW CORNER OF
NLY PARKING STRIPE @ (IN FRONT OF BLDG) ♀				
COUNTY LINE BEVERAGE				

1.1.5 Field Photos



Point 301



Point 302



Point 303V

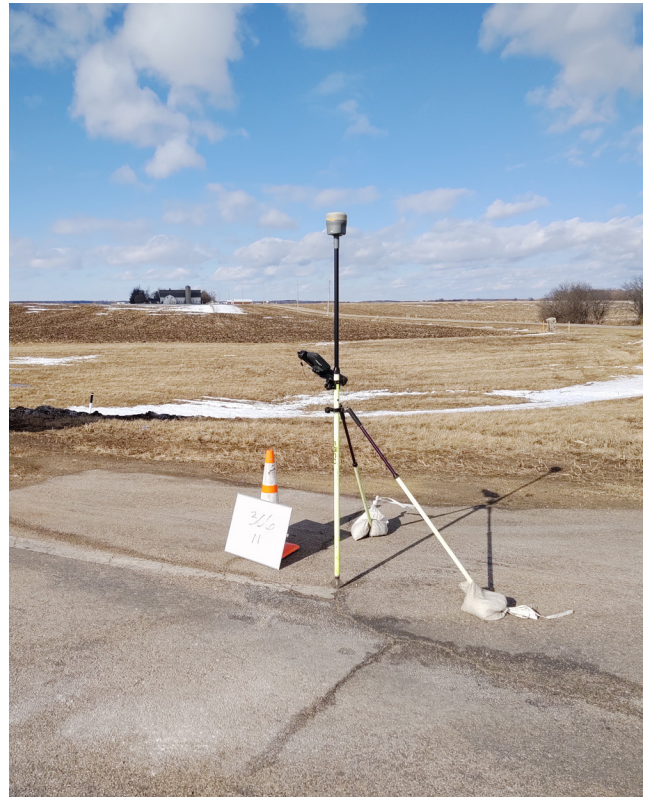


Point 304V

1.1.5 Field Photos (Continued)



Point 305



Point 306



Point 307



Point 308

1.1.5 Field Photos (Continued)



Point 309



Point 310



Point 311



Point 312

1.1.5 Field Photos (Continued)



Point 313



Point 314



Point 315



Point 316

1.1.5 Field Photos (Continued)



Point 317



Point 318



Point 319



Point 320

1.1.5 Field Photos (Continued)



Point 321



Point 322



Point 323



Point 324