

AYRES

Ground Control Report

Wisconsin WROC - 3DEP

Sauk County Lidar 2020

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1.1 Ground Control Design and Methodology

The ground control network and design used for the Sauk 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 22 locations in and around the Sauk 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-Sauk 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 27 and May 6, 2020.

Control Summary and Methodology

Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), Wisconsin Geoid 12B
Rectangular Coordinate System:	WISCRS-Sauk County
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	OM0472, DH5700, DH5199, DH5447, DH5109, DH5386, DH5136
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) Data Collector Trimble TSC3 S/N RSONC10833 (Ayres #75.21) 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 County Coordinate System-Sauk Zone in U.S. Survey Feet.

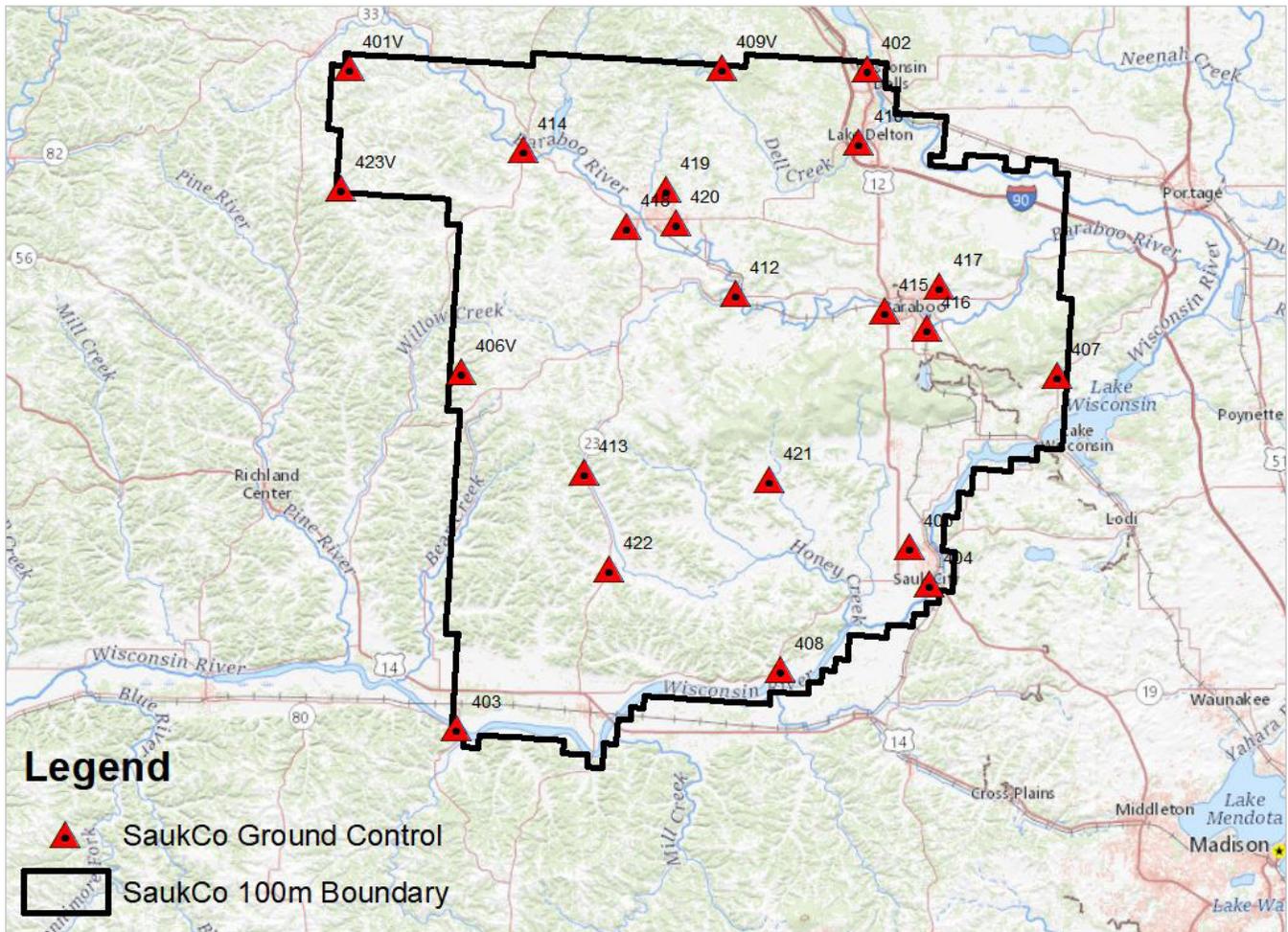
Established horizontal and vertical coordinate values on the points by a minimum of two – 90 epoch observations with separate initializations using RTK GPS and the WISCORS network. The resultant coordinates and elevations provided in the deliverables are an average of the two observations. Check shots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



1.1.3 Sauk 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 0.043'. 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
402	2024415.23	598005.95	902.81	902.77	-0.04
403	1916664.66	424112.21	717.49	717.56	0.07
404	2041133.23	462186.00	752.19	752.19	0.00
405	2035794.84	472068.24	813.96	813.99	0.02
407	2074527.34	517238.88	908.86	908.92	0.05
408	2001854.89	439857.29	736.80	736.87	0.06
410	2022381.21	578649.78	894.28	894.21	-0.07
412	1989919.26	538614.77	882.64	882.71	0.07
413	1950163.88	491482.89	868.57	868.52	-0.06
414	1934112.06	576739.66	893.20	893.22	0.02
415	2029020.00	534312.20	943.60	943.60	-0.01
416	2040334.96	529639.42	876.82	876.84	0.02
417	2043572.76	540729.53	939.26	939.21	-0.05
418	1961154.76	556265.35	907.24	907.25	0.01
419	1971617.46	566175.18	975.44	975.43	-0.02
420	1974249.08	557199.20	900.43	900.42	-0.01
421	1998891.00	489854.67	802.87	802.83	-0.04
422	1956799.08	466119.88	801.16	801.03	-0.14
401V	1888054.71	598265.93	1029.40	1029.31	-0.10
406V	1917862.16	518053.69	916.74	916.68	-0.06
409V	1986344.50	598071.34	935.29	935.27	-0.02
423V	1886036.08	566547.91	1303.47	1303.43	-0.05

Average Dz	0.03
Minimum Dz	-0.002
Maximum Dz	0.070
Root Mean Square	0.043
Std Deviation	0.028

1.1.4 Field Notes

402	CP	ZM	✓	INTERIOR
CORNER OF NB PARK AREA YELLOW STRIPING				
@ WILD BOAT JET BOAT DOCK PARKING				
LOT				

403	CP	ZM	✓	E OF FOG LINE
FOR WB HWY 130 @ INTERSECTION W/				
HWY 133. END OF FOG LINE IS IN THE				
EAST CORNER OF SAID INTERSECTION				

404	CP	ZM	✓	(MOVED)
SE CORNER OF CB IN NW CORNER OF				
MONROE ST + J. Q. ADAMS ST INTERSECTION				

405	CP	ZM	✓	E NH E OF
HANKSFIELD PL + 21ST ST INTERSECTION				

407	CP	ZM	✓	SE CORNER OF
S'LY E STRIPE @ INTERSECTION OF HWY 78				
+ HWY "DL". SAID STRIPE IS E OF HWY "DL"				

408	CP	ZM	✓	(MOVED)
CENTER OF FOG LINE, NB HWY 60, JUST				
NORTH OF HWY 60 + CASSEL RD INTERSECTION				

410	CP	ZM	✓	NE CORNER
OF E'LY TENNIS COURT @ MATHEW ST +				
S OR BURRITT AVE				

1.1.4 Field Notes (Continued)

412 CP 2M ✓ (MOVED)
 SW CORNER OF STOP LINE ON PARK ST @
 BROADWAY ST (HWY 154) INTERSECTION

413 CP 2M ✓ CENTER OF END
 OF FOG LINE, NB HWY 23 @ INTERSECTION
 W/ HIGHLAND RD. SOUTH OF SAID INTERSECTION

414 CP 2M ✓ 4 MH IN
 NE CORNER OF E MAIN ST + UNION ST
 INTERSECTION, IN FRONT OF RE/MAX

415 CP 2M ✓ E CB IN
 SOUTH DRIVEWAY OF ALLIANT ENERGY BARABOO
 OPS PARKING LOT

416 CP 2M ✓ (MOVED)
 OPPOSITE CORNER OF SAME STOP LINE.
 NE CORNER OF STOP LINE ON W'LY SIDE OF
 TRAIN TRACKS @ MATTS FERRY RD CROSSING

417 CP 2M ✓ SE CORNER OF
 SIDEWALK + DRIVEWAY INTERSECTION @ 1400
 16TH ST

1.1.4 Field Notes (Continued)

418 CP 2M ✓ (MOVED)
 @ MH IN @ OF EXHIBIT CIR IN BETWEEN
 915 + 919 EXHIBIT CIR

419 CP 2M ✓ E'LY INTERIOR
 CORNER OF SIDEWALK IN E CORNER OF
 WINDFIELD DR + 21ST ST INTERSECTION

420 CP 2M ✓ @ MH @
 ZINGA DR SOUTH OF RAY ZOBEL + SONS

421 CP 2M ✓ (MOVED)
 EASTERLY END OF FIRST DASHED CENTERLINE
 STRIPE. SAID STRIPE IS FIRST DASH
 WHEN MOVING EAST FROM ~~THE~~ CTH "C" +
 DENZER ROAD INTERSECTION

422 CP 2M ✓ @ MANHOLE IN
 NE CORNER OF MAIN ST (CTH B) + HWY 23
 INTERSECTION

401V CP 2M ✓ @ SANTAS
 LOOP @ @ OF TRAIL INTERSECTION

1.1.4 Field Notes (Continued)

406 V	CP	—	✓	E W HILLPOINT
ROAD IN LINE WITH POWER POLE				

409 V	CP	5.00 FT	✓	E HWY "HH"
@ CULVERT CROSSING				

423 V	CP	5.00'	✓	E HWY "U" IN
LINE W/ POWER POLE @ HWY "U" & HOLLOWAY				
ROAD				

1.1.5 Field Photos



Point 402



Point 403



Point 404



Point 405

1.1.5 Field Photos (Continued)



Point 407



Point 408



Point 410



Point 412

1.1.5 Field Photos (Continued)



Point 413



Point 414



Point 415



Point 416

1.1.5 Field Photos (Continued)



Point 417



Point 418



Point 419



Point 420

1.1.5 Field Photos (Continued)



Point 421



Point 422



Point 401V



Point 406V

1.1.5 Field Photos (Continued)



Point 409V



Point 423V