

Ground Control Report

Wisconsin WROC - 3DEP | La Crosse County LiDAR 2017

1.1 Ground Control Design and Methodology

The ground control network and design used for the La Crosse 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 12 locations in and around the La Crosse 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 State Plane Coordinate System-Wisconsin South Zone, NAD83 (2011), US survey feet; NAVD88 (Geoid 12B), US survey feet. The field work was conducted by Ayres Associates surveyors.

Control Summary and Methodology

Control Summary

Horizontal Datum:	NAD83 (2011)
Vertical Datum:	NAVD88 (2012), Wisconsin GEOID12B
Rectangular Coordinate System:	Wisconsin State Plane Coordinate System-Wisconsin South Zone
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
List any NGS control points used:	DJ4546, DH5380, DH4977, DJ4312, ON1302
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 R8-3 GNSS S/N 5239496998 – (Ayres #72.22) Total station Trimble S 6 S/N 93410052 – (Ayres #75.41) Data Collector Trimble TSC 3 S/N RS17C22010 (Ayres #75.41) GPS Trimble R8-4 (Ayres #75.59) Data Collector Trimble TSC3 (Ayres #75.38)

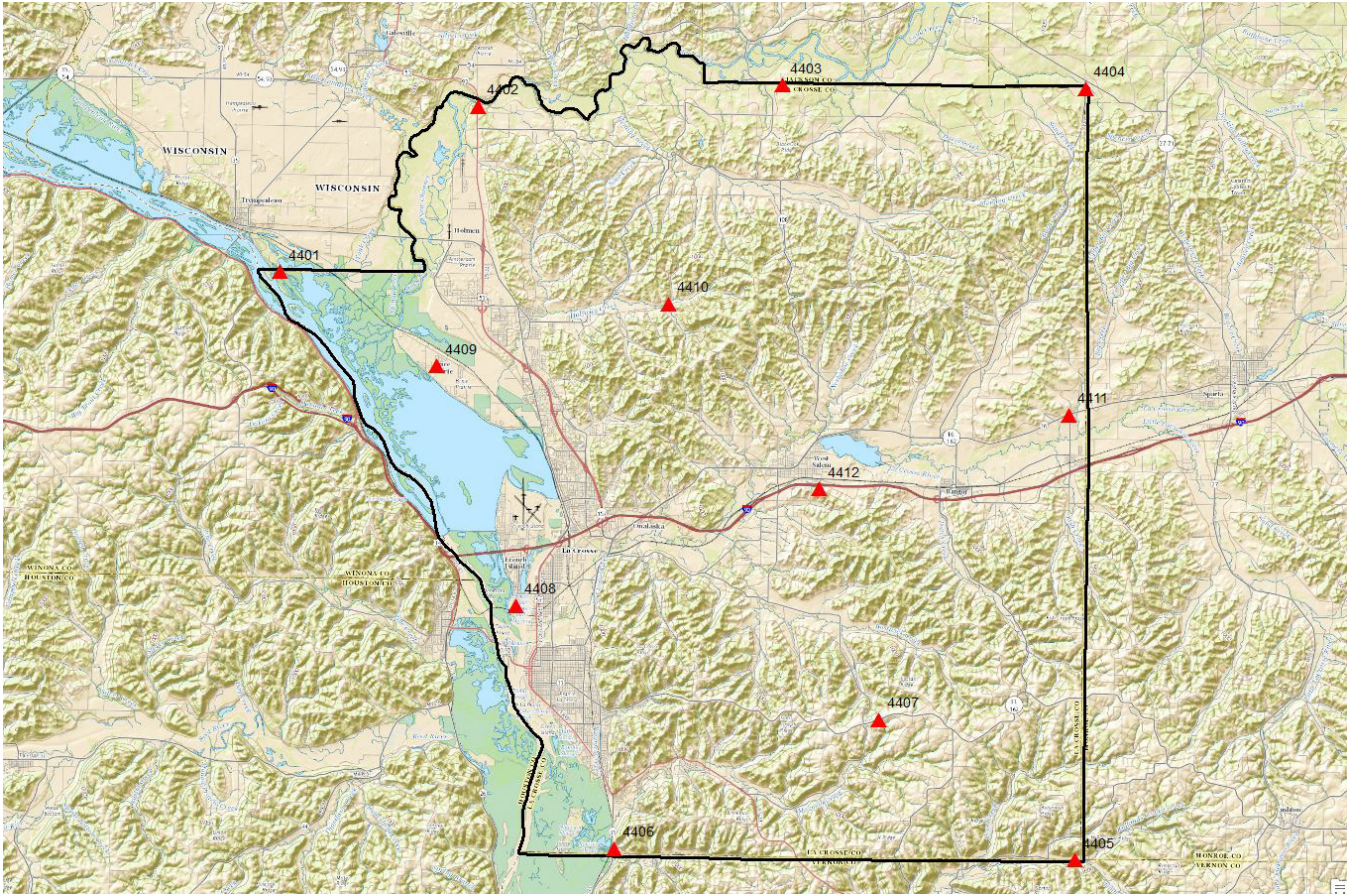
Survey Methods (continued)

<p>All work was performed in and referenced to NAD83 (2011), NAVD 88(2012), Geoid 12B, Wisconsin State Plane Coordinate System - Wisconsin South Zone in US Survey Feet.</p> <p>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.</p> <p>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 ± 3 centimeter vertical accuracy requirement at the 95% confidence level.</p> <p>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.</p>
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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 La Crosse County Calibration Points



1.1.3 La Crosse 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 0.084'. 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
4401	1596861.570	726358.990	644.680	644.790	+0.110
4402	1629188.910	753314.190	720.990	720.980	-0.010
4403	1678956.220	756799.320	781.560	781.480	-0.080
4404	1728547.390	756299.050	878.530	878.550	+0.020
4405	1726787.190	630170.100	833.030	832.980	-0.050
4406	1651499.470	632110.830	651.750	651.730	-0.020
4407	1694812.710	653131.810	1302.410	1302.520	+0.110
4408	1635470.500	671799.760	644.680	644.740	+0.060
4409	1622440.210	710932.510	665.620	665.690	+0.070
4410	1660422.700	721047.220	777.830	777.800	-0.030
4411	1725941.030	702905.260	781.510	781.490	-0.020
4412	1685058.160	690871.790	808.400	808.200	-0.200

Average Dz -0.003 ft
Minimum Dz -0.200 ft
Maximum Dz +0.110 ft
Average Magnitude 0.065 ft
Root Mean Square 0.084 ft
Std Deviation 0.087 ft

1.1.4 Field Notes

PROJECT: LACROSSE COUNTY LIDAR
 PROJECT #: 72-0204.00

HOR. DATUM: NAD 83(2011)
 VERT. DATUM: NAUD88
 COORD. SYSTEM: ~~LACROSSE COUNTY (NAD83)~~
 GEOD W1 12A STATE PLANE W1
 SOUTH GEOD 12B

DATE: 3/23/17

WEATHER: Cloudy 40°

CREW CHIEF: KEN CLARK

EQUIP: GPS: TRIMBLE R8-3-72.22
 TOTAL STATION-TRIMBLE 56-75.41
 DATA COLLECTOR-TSC 3-75.41

CHECKED INTO NGS MON. "HOLLAND WEST GPS"
 $\Delta N = 0.007'$ $\Delta E = 0.01'$ $\Delta Z = 0.034'$

Field Notes (Continued)

4401	CP	2.0M	CENTER OF TURN AROUND AREA @ END OF LAKE RD

4402	CP	2.0M	SW QUAD HWY 53 ¹ / ₂ COUNCIL BAY RD @ EDGE FLAG LINE ¹ / ₂ ASPHALT

4403	CP	2.0M	@ NW EDGE OF P.E. #3887 IN EDGE OF ASPHALT LOCKINGTON RD

Field Notes (Continued)

4404	CP	2.0 M	SW QUAD SOMMERS RD
			& HWY 162. @ NORTH END
			FOG LINE IN CENTER

4405	CP	2.0 M	@ SE COR OF PE W 176
			CTHP

4406	CP	2.0 M	@ SE CORNER PE W 588Z
			COTONWOOD DR. ~ 70' E OF
			E LITTLE AVE

Field Notes (Continued)

4407	CP	2.0M	CEMETARY PARKING LOT, N. SIDE - ST. JOSEPH

4408	CP	2.0M	NORTH EDGE OF CENTER HOLE OF STORM GRADE IN E OF BAINBRIDGE ST, NW OF BRENNAN OFFICE BLDG.

4409	CP	2.0M	@ SW CORNER OF P.E. IN ASPHALT TOWER ST. NW ROAD TOWER ST & JASON ST

Field Notes (Continued)

<u>PNT</u>	<u>CODE</u>	<u>TH</u>	<u>LOCATION</u>
4410	CP	2.0M	@ N. EDGE PAVED DRIVE #N6920 CTHW WHERE PE. MEETS CTH W.

4411	CP	2.0 M	SW QUAD CTH W & 5TH 1/4 @ END OF FLAGLINE IN BIT.
CHECKED "BURNS EAST GPS"			
$\Delta N = 0.045'$ $\Delta E = 0.033'$ $\Delta Z = 0.05'$			

<u>PNT</u>	<u>CODE</u>	<u>TH</u>	<u>LOCATION</u>
4412	CP	2.0 M	@ GAS STATION, NORTH OF PUMPS, @ CENTER & EAST END OF UNDERGROUND TANKS

1.1.5 Field Photos



Point 4401



Point 4402



Point 4403



Point 4404

Field Photos (Continued)



Point 4405



Point 4406



Point 4407



Point 4408

Field Photos (Continued)



Point 4409



Point 4410



Point 4411



Point 4412