

Ground Control Report

Wisconsin WROC - 3DEP | Portage County LiDAR 2016-17

1.1 Ground Control Design and Methodology

The ground control network and design used for the Portage 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 18 locations in and around the Portage 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 WISCRS Portage County, NAD83 (2011), US survey feet; NAVD88 (Geoid 12A), 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 GEOID12A
Rectangular Coordinate System:	Wisconsin Coordinate Reference System (WISCRS)-Portage County
Used NGS Control?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

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 GNSS Base and 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. (Survey Methods continued below)
Equipment Used:	GPS Trimble R8-3 GNSS S/N 5220487835 – (Ayres #75.37), Base-GPS Trimble R8-3 GNSS S/N 5126468515 – (Ayres #75.23), Robotic Total Station Trimble S6 S/N 93410505 - (Ayres #75.53), Data Collector Trimble TSC3 S/N RS17C22013

Survey Methods

All work was performed in and referenced to NAD83 (2011), NAVD 88(2012), Geoid 12A, Wisconsin Coordinate Reference System (WISCRS) Portage County in US Survey Feet.

Established horizontal and vertical coordinate values on the points by a minimum of two – 180 epoch observations with separate initializations using RTK GNSS BASE or RTK GPS and the WISCORS network. The resultant coordinates and elevations provided in the deliverables are an average of the two observations.

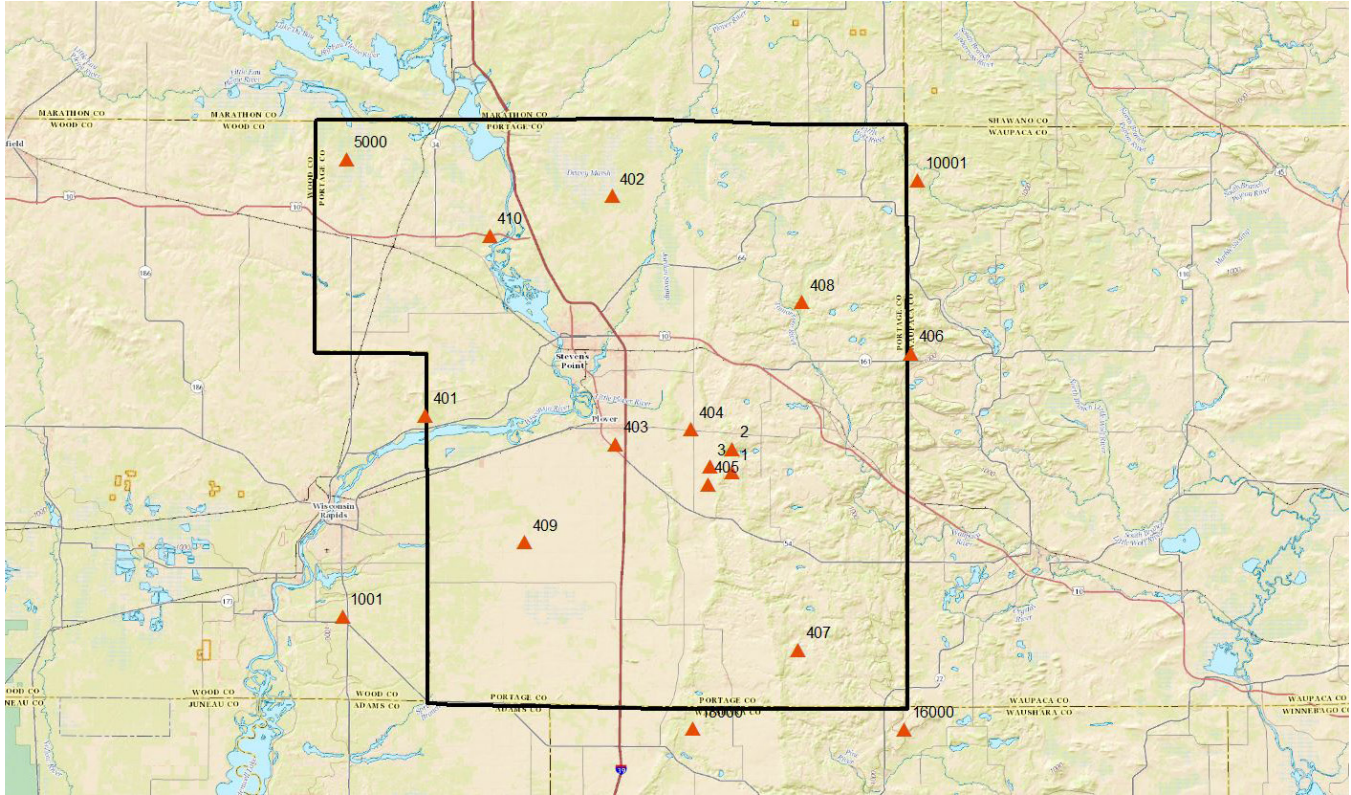
Check shots were taken on numerous NGS control points (see field notes) to verify that the values obtained are consistent with the datum/adjustment as described herein and meet the ± 3 centimeter vertical accuracy requirement at the 95% confidence level.

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 Portage County Calibration Points



1.1.3 Portage 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 0.127'. 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
401	125183.23	181273.6	1090.3	1090.67	0.37
5000	103569.961	251725.026	987.009	987.16	0.151
410	142875.56	230758.46	1087.49	1087.64	0.15
403	177442.17	173388.22	1076.55	1076.65	0.1
406	258793.11	198372.6	1163.82	1163.84	0.02
10001	260595.409	245936.28	1142.837	1142.84	0.003
16000	256898.706	95039.959	1172.118	1172.12	0.002
402	176543.44	241665.19	1039.16	1039.16	0
409	152511.41	146384.75	1056.89	1056.87	-0.02
408	228697.06	212444.76	1209.35	1209.29	-0.06
404	198176.2	177444.49	1094.38	1094.31	-0.07
18000	198821.333	95115.463	1135.596	1135.52	-0.076
1001	102536.381	126070.583	1033.008	1032.93	-0.078
1	209492.352	165736.451	1119.337	1119.24	-0.097
405	202986.96	162282.58	1091.32	1091.22	-0.1
3	203354.938	167203.926	1092.571	1092.44	-0.131
2	209584.926	172085.25	1096.14	1096	-0.14
407	227685.75	116906.71	1149.92	1149.77	-0.15

Average Dz -0.007 ft
Minimum Dz -0.150 ft
Maximum Dz +0.370 ft
Average Magnitude 0.095 ft
Root Mean Square 0.127 ft

1.1.4 Field Notes

2

3-9-2015
PORTAGE CO PID Survey

BASE WISCONSIN NETWORK
Rover Trimble R-8 GNSS 75.40
collector Trimble 74.11
S-6 TOTAL STATION 74.11

3-11-2015 Sunny
check pt PN 1348 NGS PP

1000
 $\Delta N: -0.010$ $\Delta E: 0.007$
 $\Delta U: \text{COT } 0.073$

408

PORTAGE CO PID Survey 3
3-11-2015

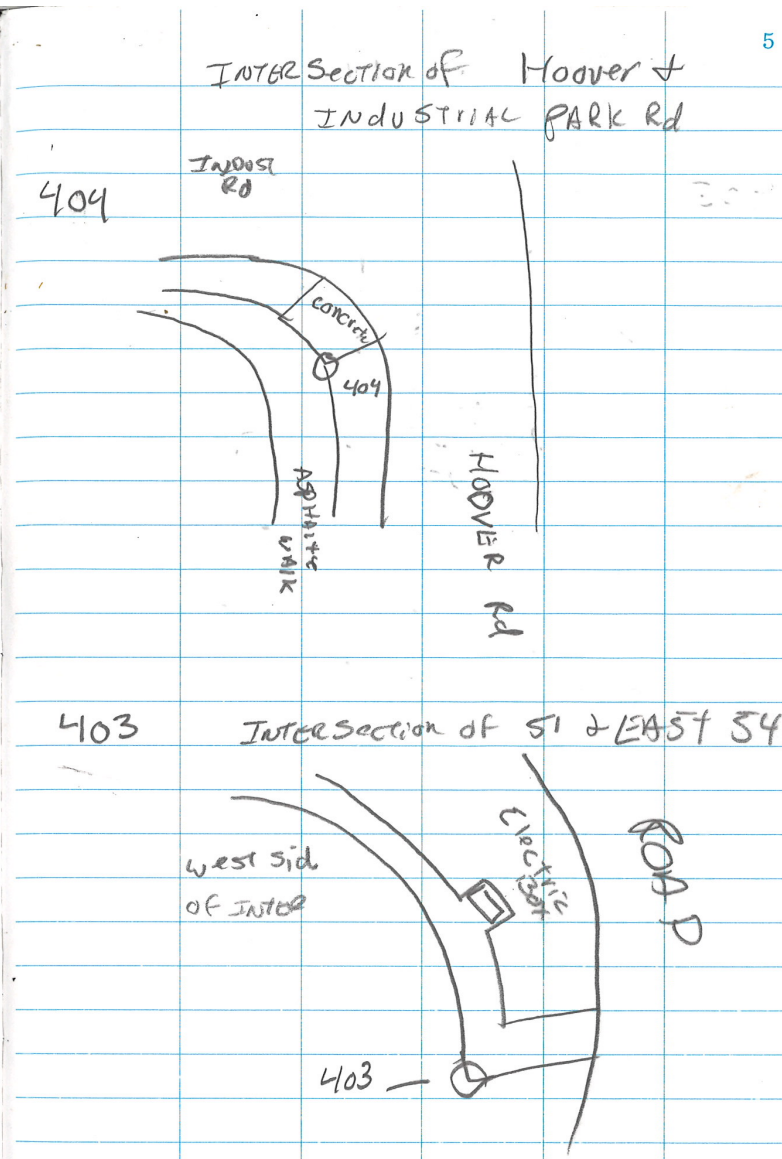
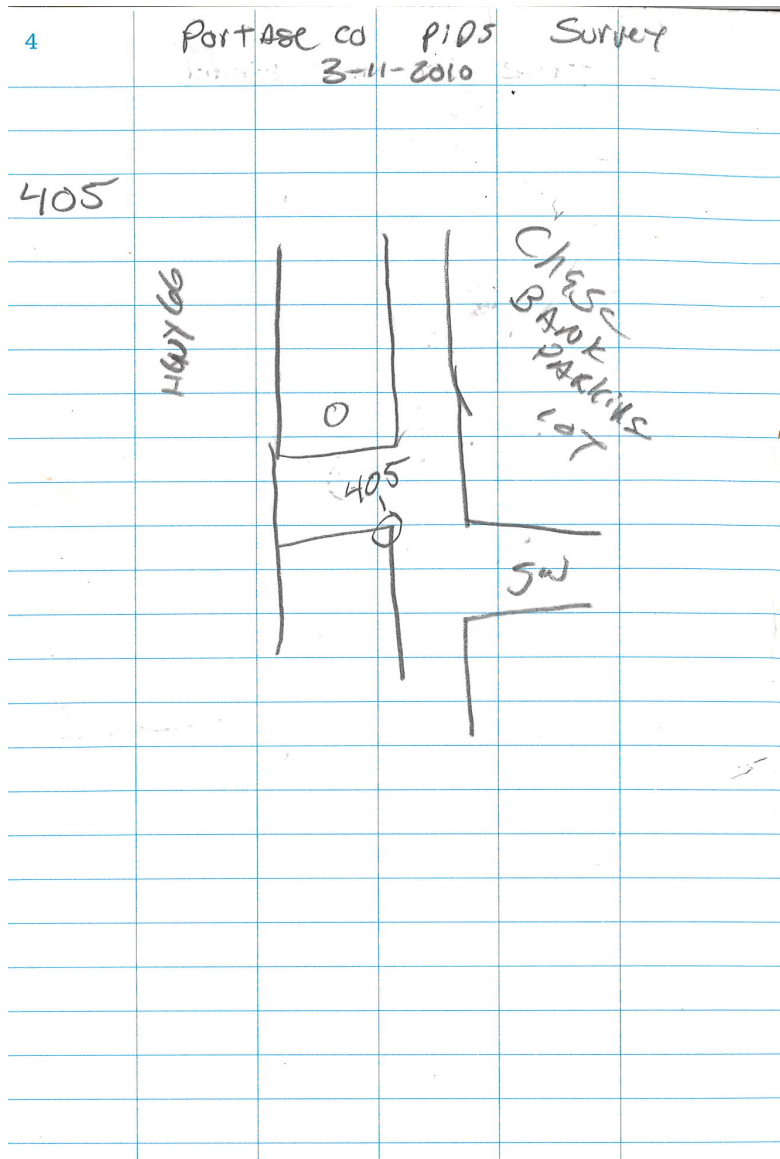
406

check pt DJ4412 NGS pt

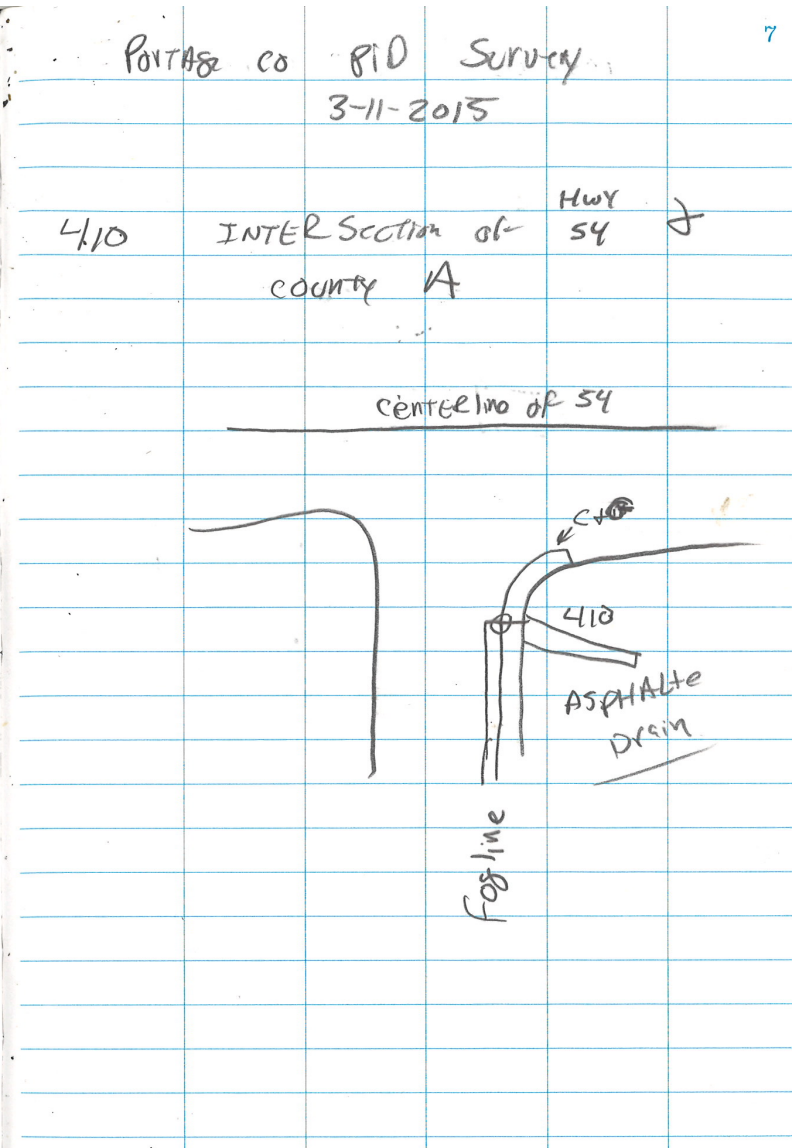
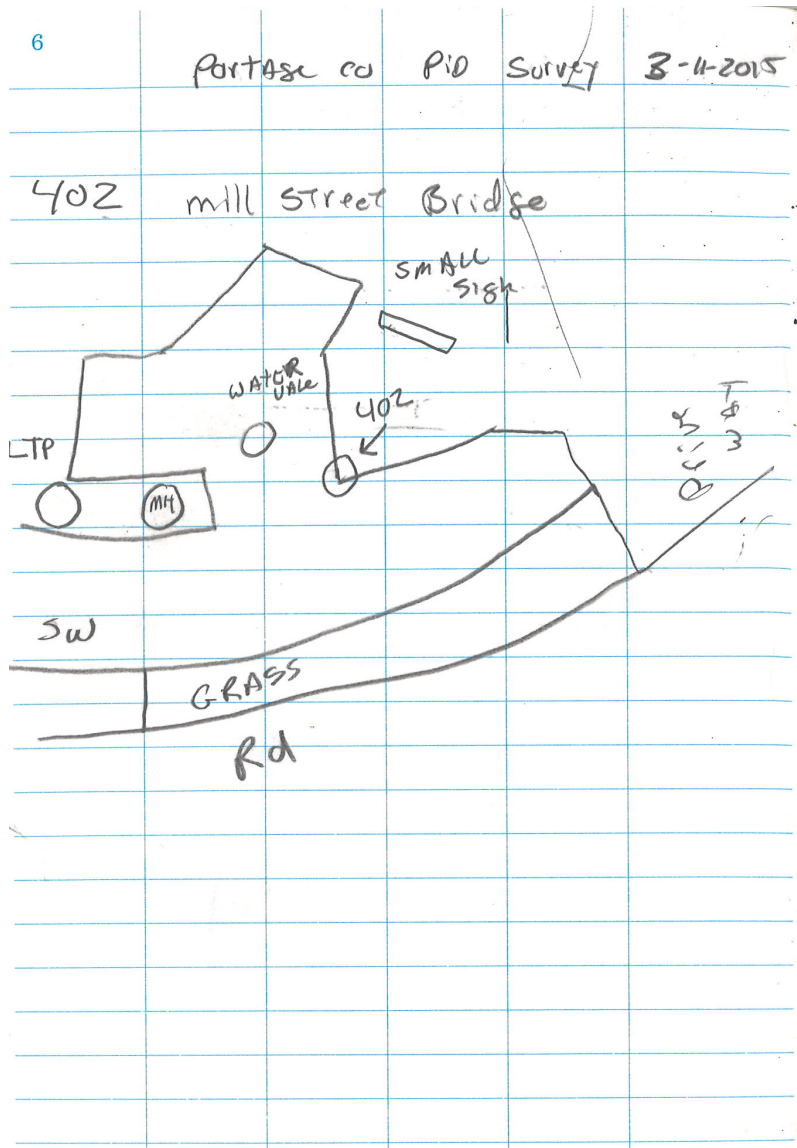
1001 $\Delta N: 0.005$ $\Delta E: -0.024$
 $\Delta U: \text{COT } 0.015$

407 IN FRONT OF U.S. BANK

Field Notes (Continued)



Field Notes (Continued)



Field Notes (Continued)

8

PORTAGE CO Pio Survey
3-11-2015

409 measured

Hwy F.

FOOTLINE

409

COUNTRY TRUCK

401 measured

9

PORTAGE CO Pio Survey
3-11-2015

OK PT 1002
DH 5534 NGS

$\Delta N: -0.037$ $\Delta E: -0.028$

$\Delta V: \text{cut } 0.021$

Field Notes (Continued)

NGS MON- DH5636 PLAINFIELD N GPS AZ MK			
$\Delta N: 0.009$ $\Delta E: -0.008$ $\Delta Z: C$ $DATA 0.044$			
<u>Site 1</u>			
<u>PNT</u>	<u>CODE</u>	<u>TH</u>	<u>LOCATION</u>
1001	CP	2M	♀ HWY U, 29' N. of ♀ HWY 73

Field Notes (Continued)

10001	CP	2m	E N. Wigwam Rd. 30' E of E Hwy 49 <i>Note in the Rain.</i>
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Field Notes (Continued)

	<u>Site 16</u>			
GPS 16000	CP	2M	E DEER RUN DR	
			5066' E E Hwy 5	
			169° W. Curve DEER RUN DR	

Field Notes (Continued)

<u>Site 18</u>			
<u>PNT</u>	<u>CODE</u>	<u>TA</u>	<u>LOCATION</u>
^{FIGS} 18000	CP	ZM	Intersection County LINE & Hwy S