

Check Point Survey Report

“NE Illinois and SE Wisconsin FEMA Region 6 LiDAR”

USGS Contract

Task Order Number: G16PD00498 & G17PD00315

Prepared for:

United States Geological Survey (USGS)



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	Including: a) Point Documentation Report & Photos of Survey Points	
	b) Final Coordinate List in Excel Format	
	c) NGS Data Sheets for Project Controls	

1. INTRODUCTION

1.1 *Project Summary*

Dewberry Consultants LLC is under contract to the United States Geological Survey to provide 53 Check Points in the States of Wisconsin and Illinois. Under the above referenced USGS Task Order, Dewberry is tasked to complete the quality assurance of LiDAR products. As part of this work Dewberry staff will complete Check Point surveys that will be used to evaluate vertical and horizontal accuracy. The ground survey was conducted June 24 thru June 26, 2017.

Existing NGS Control Points were located and surveyed to check the accuracy of the RTK/GPS survey equipment with the results shown in Section 2.4 of this Report.

As an internal QA/QC procedure and to verify that the Check Points meet the 95% confidence level approximately 50% of the points were re-observed and are shown in Section 5 of this report.

Final horizontal coordinates are referenced to South Wisconsin SPCS, NAD83 (2011) and East Illinois SPCS, NAD83 (2011), both in feet. Final Vertical elevations are referenced to NAVD88 in meters using Geoid model 2012B (Geoid12B).

1.2 *Points of Contact*

Questions regarding the technical aspects of this report should be addressed to:

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PROJECT DETAILS

2.1 *Survey Equipment*

In performing the GPS observations Trimble R-10 GNSS receiver/antenna attached to a two meter fixed height pole with a Trimble TSC3 Data Collector to collect GPS raw data were used to perform the field surveys.

2.2 *Survey Point Detail*

The 53 LiDAR Check Points were well distributed throughout the project area.

A sketch was made for each location and a nail was set at the point where possible or at an identifiable point. The Check Point locations are detailed on the “Check Point Documentation Report” sheets attached to this report.

2.3 *Network Design*

The GPS survey performed by Dewberry Consultants LLC office located in Lanham, MD was tied to a Real Time Network operated by VRSNow RTK and WISCORS RTN. The network is a series of “real-time” continuously operating, high precision GPS reference stations. All of the reference stations have been linked together using Trimble GPSNet software, creating a Virtual Reference Station System (VRS).

The Trimble NetR5 Reference Station is a multi-channel, multi-frequency GNSS (Global Navigation Satellite System) receiver designed for use as a stand-alone reference station or as part of a GNSS infrastructure solution. Trimble R-Track technology in the NetR5 receiver supports the modernized GPS L2C and L5 signals as well as GLONASS L1/L2 signals.

2.4 Field Survey Procedures and Analysis

Dewberry field surveyors used Trimble R-10 GNSS receivers, which is a geodetic quality dual frequency GPS receiver, to collect data at each surveyed location.

All locations were occupied once with approximately 50% of the locations being re-observed. All re-observations matched the initially derived station positions within the allowable tolerance of $\pm 5\text{cm}$ or within the 95% confidence level. Each occupation which utilized the VRS network was occupied for approximately three (3) minutes in duration and measured to 180 epochs.

Each occupation which utilized OPUS (if used) was occupied between 20 and 30 minutes.

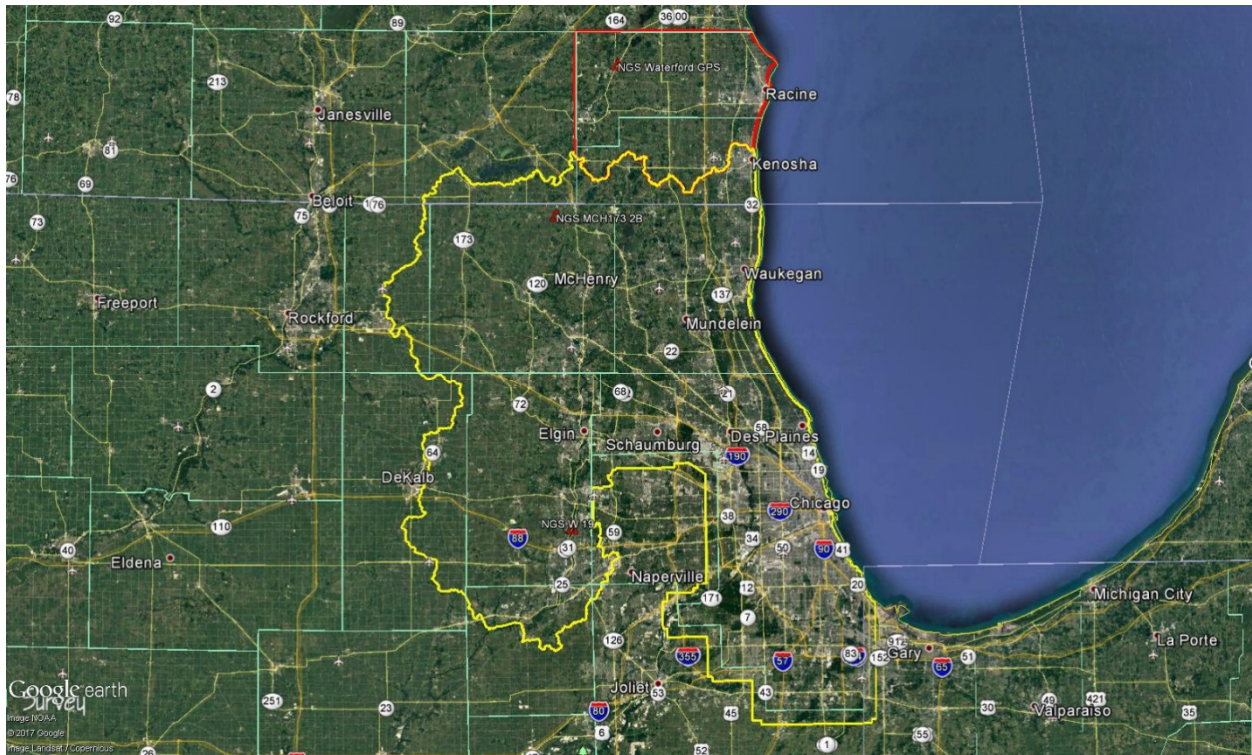
Field GPS observations are detailed on the “Check Point Documentation Reports” submitted as part of this report.

Three (3) existing NGS monument listed in the NSRS database were located as an additional QA/QC method to check the horizontal and vertical accuracy of the VRS network as well as being the primary project control monuments designated as AJ2903, MFO016 and DF9489. The results are as follows:

PT. #	Observed Values			Data Sheet Values			ΔX	ΔY	ΔZ
	NORTHING	EASTING	ELEVS.	NORTHING	EASTING	ELEVS.			
NGS-MCH1732B	2114620.94	977051.72	902.50	2114621.07	977051.71	902.59	-0.13	0.01	-0.10
NGS-W19	1884208.59	989513.98	717.79	1884208.59	989513.97	717.73	0.00	0.01	0.06
NGS-WATERFORD	288697.98	2454108.42	794.23	288698.07	2454108.47	794.30	-0.09	-0.05	-0.07

The above results indicate that the VRS network is providing positional values within the 5cm parameters for this survey.

NGS Monuments



2.5 *Adjustment*

The survey data was collected using Virtual Reference Stations (VRS) methodology within a Virtual Reference System (VRS).

The system is designed to provide a true Network RTK performance, the RTKNet software enables high-accuracy positioning in real time across a geographic region. The RTKNet software package uses real-time data streams from the VRSNow RTK and WISCORS RTN systems user and generates correction models for high-accuracy RTK GPS corrections throughout the network. Therefore, corrections were applied to the points as they were being collected, thus negating the need for a post process adjustment.

2.6 *Data Processing Procedures*

After field data is collected the information is downloaded from the data collectors into the office software. The Software program used is called TBC or Trimble Business Center.

Downloaded data is run through the TBC program to obtain the following reports; points report, point comparison report and a point detail report. The reports are reviewed for point accuracy and precision.

After review of the point data an “ASCII” or “txt” file which is the industry standard is created. Point files are loaded into our CADD program (Carlson Survey 2014) to make a visual check of the point data (Pt. #, Coordinates, Elev. and Description). The data can now be imported into the final product.

3. FINAL COORDINATES

NVA			
POINT ID	NORTHING (ft)	EASTING (ft)	ELEV. (ft)
South Wisconsin SPCS NAD83 (2011), NAVD88 Feet			
NVA-1	286641.67	2441631.09	816.58
NVA-2	282649.66	2517703.92	770.39
NVA-3	244692.74	2435123.62	774.80
NVA-4	229128.33	2493011.99	735.43
NVA-5	245764.88	2553274.75	608.26
NVA-6	187479.74	2538411.28	707.21
NVA-8	203439.14	2393023.88	880.56
East Illinois SPCS NAD83 (2011), NAVD88 Feet			
NVA-7	2098618.73	1025897.55	741.36
NVA-9	2067526.60	883664.49	837.43
NVA-10	2052880.31	998861.56	819.40
NVA-11	2046010.37	1081473.39	702.57
NVA-12	1981181.72	1127023.03	636.29
NVA-13	1978237.09	1036587.32	863.61
NVA-14	1987539.67	973737.88	897.61
NVA-15	1992923.01	914997.17	835.06
NVA-16	1939080.72	948465.03	1002.86
NVA-17	1935067.50	1080465.26	714.52
NVA-18	1888653.92	1145263.03	602.77
NVA-19	1832701.72	1185344.78	589.20
NVA-20	1751424.00	1173208.15	712.21
NVA-21	1812708.41	1105023.03	733.51
NVA-22	1908446.60	995130.72	758.42
NVA-23	1899011.91	905982.68	860.12
NVA-24	1866673.42	988973.17	664.75
NVA-25	1819179.12	957215.18	642.93
NVA-26	2056698.76	926916.81	849.77
NVA-27 (Harris Pt 63A)	1760782.87	1164780.54	698.94
VVA			
POINT ID	NORTHING (ft)	EASTING (ft)	ELEV. (ft)
East Illinois SPCS NAD83 (2011), NAVD88 Feet			
VVA-1	1758548.12	1202032.93	645.66

VVA-2	1812319.59	1136308.20	643.21
VVA-3	1826694.27	1083015.68	612.39
VVA-4	1885533.16	1114787.01	622.82
VVA-5	1823050.23	990881.25	681.66
VVA-6	1869395.94	900321.48	764.27
VVA-7	1900916.54	959636.03	799.64
VVA-8	1937885.24	905789.83	902.05
VVA-9	1927748.99	1009037.12	752.18
VVA-10	1956437.93	1074654.17	724.44
VVA-11	1964882.50	1137112.88	621.80
VVA-12	1995601.98	1054723.62	826.52
VVA-13	1981109.60	962284.22	908.92
VVA-14	2016076.60	918925.47	895.36
VVA-15	2051836.40	878180.48	797.25
VVA-16	2047569.34	945431.45	887.31
VVA-17	2051042.76	1035176.56	792.65
VVA-18	2022713.12	1094806.36	648.05
VVA-19	2121566.37	1096546.14	675.78
VVA-20	2096286.58	987700.83	803.96
VVA-21	1826736.65	1154528.46	616.40
South Wisconsin SPCS NAD83 (2011), NAVD88 Feet			
VVA-22	192839.34	2383017.38	993.36
VVA-23	222120.89	2443593.10	784.01
VVA-24	250822.83	2516918.90	752.97
VVA-25	295266.86	2465120.75	772.29
VVA-26	301700.76	2540766.54	679.00

4. GPS OBSERVATIONS

POINT ID	OBSERV. DATE	JULIAN DATE	TIME OF DAY (AST)	RE-OBSERV. DATE	RE-OBSERV. TIME
NVA					
Wisconsin					
NVA-1	6/25/2017	75	18:08	6/26/2017	15:43
NVA-2	6/25/2017	75	19:28	6/26/2017	16:41
NVA-3	6/25/2017	75	17:31	6/26/2017	15:21
NVA-4	6/25/2017	75	21:51	N/A	N/A
NVA-5	6/25/2017	75	20:51	6/26/2017	17:41
NVA-6	6/25/2017	75	22:52	N/A	N/A
NVA-8	6/25/2017	75	16:32	N/A	N/A
Illinois					
NVA-7	6/25/2017	75	14:17	6/26/2017	11:33
NVA-9	6/25/2017	75	11:05	6/26/2017	13:51
NVA-10	6/25/2017	75	12:57	6/26/2017	11:52
NVA-11	6/25/2017	75	23:55	6/26/2017	11:06
NVA-12	6/26/2017	76	10:04	6/26/2017	10:08
NVA-13	6/24/2017	74	16:28	6/25/2017	8:10
NVA-14	6/25/2017	75	8:51	N/A	N/A
NVA-15	6/25/2017	75	9:41	6/26/2017	12:37
NVA-16	6/25/2017	75	7:17	N/A	N/A
NVA-17	6/24/2017	74	14:35	6/25/2017	7:08
NVA-18	6/24/2017	74	13:32	N/A	N/A
NVA-19	6/24/2017	74	9:14	N/A	N/A
NVA-20	6/24/2017	74	7:57	6/25/2017	5:49
NVA-21	6/24/2017	74	10:41	N/A	N/A
NVA-22	6/24/2017	74	16:37	6/24/2017	22:47
NVA-23	6/24/2017	74	9:32	N/A	N/A
NVA-24	6/24/2017	74	18:39	N/A	N/A
NVA-25	6/24/2017	74	19:49	N/A	N/A
NVA-26	6/25/2017	75	11:29	N/A	N/A
NVA-27	6/24/2017	74	7:31	N/A	N/A
VVA's					
Illinois					
VVA-1	6/24/2017	74	8:32	6/25/2017	5:27

VVA-2	6/24/2017	74	10:07	N/A	N/A
VVA-3	6/24/2017	74	11:08	N/A	N/A
VVA-4	6/24/2017	74	11:55	6/25/2017	6:37
VVA-5	6/24/2017	74	19:20	6/24/2017	19:25
VVA-6	6/24/2017	74	20:45	N/A	N/A
VVA-7	6/24/2017	74	22:29	6/25/2017	7:26
VVA-8	6/24/2017	74	7:45	N/A	N/A
VVA-9	6/24/2017	74	17:10	6/24/2017	23:10
VVA-10	6/24/2017	74	15:06	6/24/2017	15:10
VVA-11	6/26/2017	76	10:39	N/A	N/A
VVA-12	6/24/2017	74	15:50	N/A	N/A
VVA-13	6/25/2017	75	8:29	6/26/2017	12:18
VVA-14	6/25/2017	75	10:07	6/26/2017	12:58
VVA-15	6/25/2017	75	10:44	6/26/2017	14:16
VVA-16	6/25/2017	75	11:49	N/A	N/A
VVA-17	6/25/2017	75	13:31	N/A	N/A
VVA-18	6/26/2017	76	9:28	6/26/2017	9:33
VVA-19	6/25/2017	75	22:31	N/A	N/A
VVA-20	6/25/2017	75	14:58	N/A	N/A
VVA-21	6/26/2017	76	13:23	N/A	N/A
Wisconsin					
VVA-22	6/25/2017	75	16:03	N/A	N/A
VVA-23	6/25/2017	75	15:08	N/A	N/A
VVA-24	6/25/2017	75	21:24	6/26/2017	18:10
VVA-25	6/25/2017	75	18:58	6/26/2017	16:16
VVA-26	6/25/2017	75	20:00	6/26/2017	17:01

5. POINT COMPARISON

Point ID	Point CK	Delta North (ft)	Delta East (ft)	Vertical Difference (ft)
NVA's				
NVA-1	NVA-1CK	-0.01	-0.01	0.01
NVA-2	NVA-2CK	-0.01	0.03	-0.01
NVA-3	NVA-3CK	0.00	-0.01	-0.01
NVA-5	NVA-5CK	-0.01	-0.03	-0.02
NVA-7	NVA-7CK	0.02	-0.01	0.01
NVA-9	NVA-9CK	0.01	-0.01	-0.01
NVA-10	NVA-10CK	-0.01	0.01	-0.01
NVA-11	NVA-11CK	0.01	0.01	-0.02
NVA-12	NVA-12CK	0.03	0.01	0.00
NVA-13	NVA-13CK	0.01	0.00	0.02
NVA-15	NVA-15CK	-0.01	0.02	0.02
NVA-17	NVA-17CK	-0.01	0.00	-0.02
NVA-20	NVA-20CK	0.00	0.03	-0.01
NVA-22	NVA-22CK	0.00	0.00	0.03
VVA's				
VVA-1	VVA-1CK	0.04	0.00	0.00
VVA-4	VVA-4CK	-0.01	0.04	0.03
VVA-5	VVA-5CK	-0.02	0.01	-0.01
VVA-7	VVA-7CK	0.01	0.01	0.01
VVA-9	VVA-9CK	0.02	-0.03	0.02
VVA-10	VVA-10CK	0.00	0.03	-0.01
VVA-13	VVA-13CK	0.00	-0.01	-0.02
VVA-14	VVA-14CK	0.01	-0.03	0.03
VVA-15	VVA-15CK	0.00	0.04	-0.04
VVA-18	VVA-18CK	-0.02	0.01	0.04
VVA-24	VVA-24CK	-0.01	0.00	-0.01
VVA-25	VVA-25CK	0.00	-0.01	-0.02
VVA-26	VVA-26CK	0.01	0.00	0.04