

Check Point Survey Report
“FEMA Region 2 Great Lakes Area QL2 LiDAR”
USGS Contract: G10PC00013
Task Order Number: GP13PD00043

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 23 Check Points in the State of New York. Under the above referenced USGS Task Order, Dewberry is tasked to complete the quality assurance of Aerial Photography & Digital Orthophotography products. As part of this work Dewberry staff will complete Check Point surveys that will be used to evaluate horizontal accuracy.

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 UTM Zone 18, NAD83 (2011) in meters. Final Vertical elevations are referenced to NAVD88 in meters using Geoid model 2012A (Geoid12A).

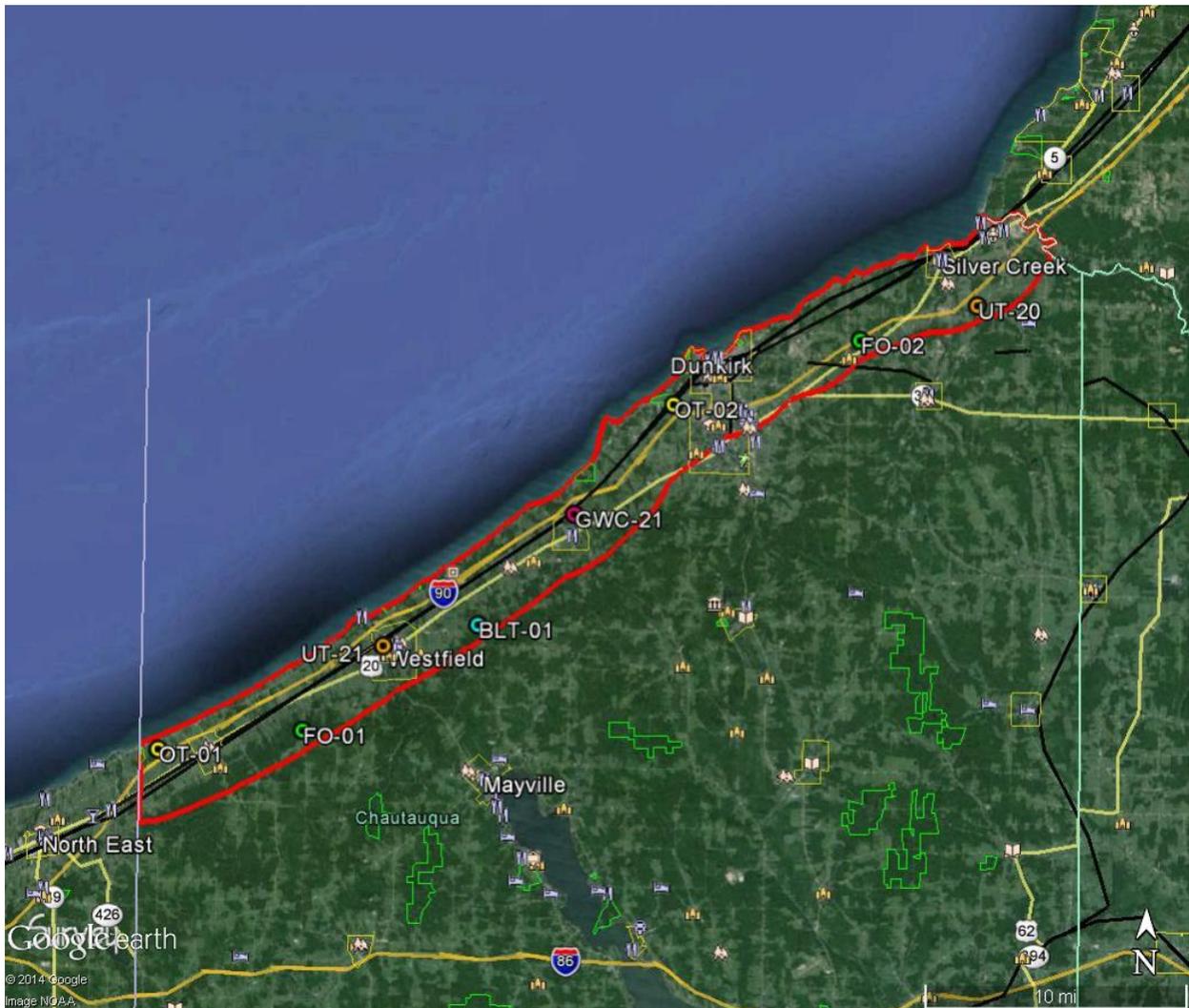
1.2 *Points of Contact*

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1.3 Project Area



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 23 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 “Ground Control 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 (RTN) managed by Pierce County, WA. 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 18 and 20 minutes.

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

Two (2) existing NGS monument listed in the NSRS database were located as an additional QA/QC method to check the accuracy of the VRS network as well as being the primary project control monuments designated as PID NC0616, OG1163. The results are as follows:

NGS PT. ID	As Surveyed (ft)			Published (ft)			Differences (ft)		
	Northing(ft)	Easting(ft)	Elev.(ft)	Northing(ft)	Easting(ft)	Elev.(ft)	ΔN	ΔE	$\Delta Elev.$
M56	4680025.144	606421.850	229.221	4680025.155	606421.841	229.260	0.011	0.009	0.039
PINEPORT	4783727.129	721874.544	202.578	4783727.142	721874.576	202.600	0.013	0.032	0.022

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

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 GPSNet system 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 2010) 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

Great Lakes - FEMA R2 LiDAR			
POINT #	NORTHING (M)	EASTING (M)	ELEV. (M)
BRUSH, LOW TREES POINTS (BLT'S)			
BLT-01	4697276.539	128451.638	293.652
BLT-02	4798770.031	233771.910	115.749
BLT-03	4784058.389	240386.585	196.544
BLT-04	4792944.077	245439.124	164.617
BLT-05	4802540.244	255521.679	97.771
FOREST POINTS (FO)			
FO-01	4691183.031	117392.116	339.369
FO-02	4713919.359	152702.623	219.335
FO-03	4784286.443	222818.707	195.150
FO-04	4799592.413	229072.363	111.923
FO-05	4797815.961	250495.047	121.061
GRASS, WEEDS, CROPS POINTS (GWC'S)			
GWC-18	4784119.320	250860.284	186.768
GWC-19	4789144.569	233263.340	192.086
GWC-20	4803987.245	220979.425	101.189
GWC-21	4703988.451	134829.106	211.179
OPEN TERRAIN POINTS (OT'S)			
OT-01	4690328.561	108376.061	195.672
OT-02	4710373.284	141013.056	184.912
OT-03	4793338.625	222272.698	137.445
OT-04	4803392.746	244684.261	97.756
URBAN TERRAIN POINTS (UT'S)			
UT-17	4790379.105	253018.840	173.781
UT-18	4806007.186	241675.864	89.629
UT-19	4789688.403	226225.267	168.099
UT-20	4715756.192	160015.186	240.170
UT-21	4696194.766	122546.882	220.639

4. GPS OBSERVATIONS

GREAT LAKES - FEMA R2 LiDAR					
POINT ID	OBSERV. DATE	JULIAN DATE	TIME OF DAY	RE-OBSERV. DATE	RE-OBSERV. TIME
BRUSH, LOW TREES POINTS (BLT'S)					
BLT-01	5/29/2014	149	16:47	N/A	N/A
BLT-02	5/30/2014	150	12:47	5/30/2014	20:55
BLT-03	5/30/2014	150	8:24	N/A	N/A
BLT-04	5/30/2014	150	15:02	5/31/2014	8:33
BLT-05	5/30/2014	150	15:27	5/31/2014	7:22
FOREST POINTS (FO)					
FO-01	5/29/2014	149	14:50	N/A	N/A
FO-02	5/29/2014	149	19:13	N/A	N/A
FO-03	5/30/2014	150	11:30	5/31/2014	5:56
FO-04	5/30/2014	150	12:26	5/31/2014	6:23
FO-05	5/30/2014	150	15:58	N/A	N/A
GRASS, WEEDS, CROPS POINTS (GWC'S)					
GWC-18	5/30/2014	150	17:51	5/31/2014	8:49
GWC-19	5/30/2014	150	10:00	5/30/2014	18:22
GWC-20	5/30/2014	150	13:18	5/30/2014	19:56
GWC-21	5/29/2014	149	17:24	N/A	N/A
OPEN TERRAIN POINTS (OT'S)					
OT-01	5/29/2014	149	13:25	N/A	N/A
OT-02	5/29/2014	149	17:55	N/A	N/A
OT-03	5/30/2014	150	11:55	5/30/2014	19:25
OT-04	5/30/2014	150	14:30	N/A	N/A
URBAN TERRAIN POINTS (UT'S)					
UT-17	5/30/2014	150	17:36	5/31/2014	8:02
UT-18	5/30/2014	150	15:05	5/31/2014	6:46
UT-19	5/30/2014	150	10:22	5/30/2014	18:44
UT-20	5/29/2014	149	20:04	N/A	N/A
UT-21	5/29/2014	149	15:44	N/A	N/A

5. POINT COMPARISON

LiDAR QA				
POINT ID	POINT CK	DELTA NORTH (M)	DELTA EAST (M)	VERT. DIFF (M)
BLT-02	BLT-02CK	0.002	0.009	0.014
BLT-04	BLT-04CK	0.003	0.004	0.006
BLT-05	BLT-05CK	0.001	0.001	0.008
FO-03	FO-03CK	0.004	0.005	0.008
FO-04	FO-04CK	0.004	0.009	0.011
GWC-18	GWC-18CK	0.010	0.000	0.017
GWC-19	GWC-19CK	0.029	0.009	0.037
GWC-20	GWC-20CK	0.002	0.001	0.013
OT-03	OT-03CK	0.002	0.008	0.035
UT-17	UT-17CK	0.005	0.001	0.019
UT-18	UT-18CK	0.007	0.000	0.002
UT-19	UT-19CK	0.002	0.002	0.005