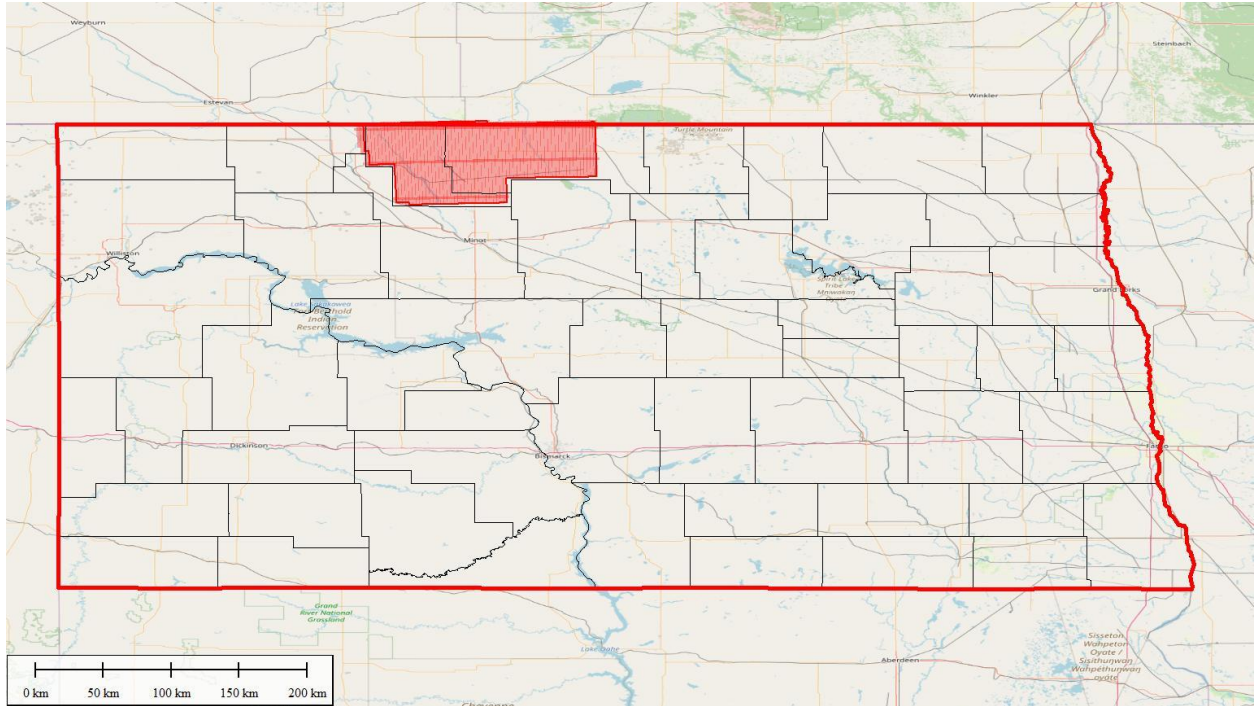


REPORT OF LIDAR SURVEY

Ground Control Report

North Dakota

Phase 10-Block A



Performed by:

TerraSurv

For:

Fugro Geospatial

Terrasurv Project Number: 22010

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REPORT OF SURVEY

NORTH DAKOTA PHASE 10

INTRODUCTION

Terrasurv, Inc of Pittsburgh, PA was tasked by Fugro Geospatial with performing a control survey in support of LiDAR data collection covering Renville County and the western portion of Bottineau County in northern North Dakota. The phase 10 project consists of four blocks: A, B, C, and D. The current project includes Block A only, Blocks B, C, and D were previously surveyed. The project consisted of two parts: 15 ground control (calibration) points (GCP) and 82 quality control (QC: NVA/VVA/VVA-F), for a total of 97 new stations. The map in figure 1 shows the location of the Ground Control (GCP) and figure 2 shows the location of the QC points. The control symbology for figures 1 and 2 are listed in table 1. Also shown are the Continuously Operating Reference Stations used in the project via the Trimble VRSNow VRS/RTN Network.

Table 1 - Map Symbology and Control Quantity

Type	Symbol	VA Quantity
Ground Control (GCP)	Green Dot	15
Non-Vegetated (NVA)	Red Dot	45
Vegetated (VVA)	Red X	35
Woods (VVA-F)	Yellow X	2
CORS	White square with red "+"	5

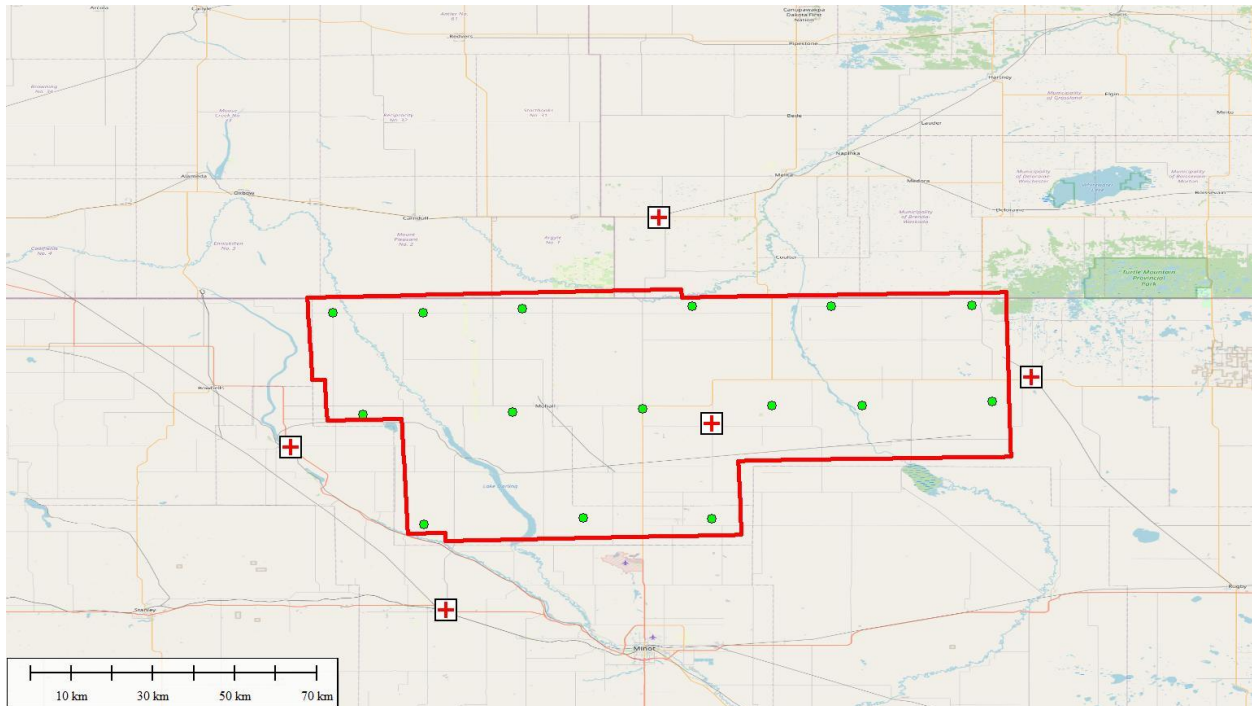


Figure 1 – GCP stations and CORS

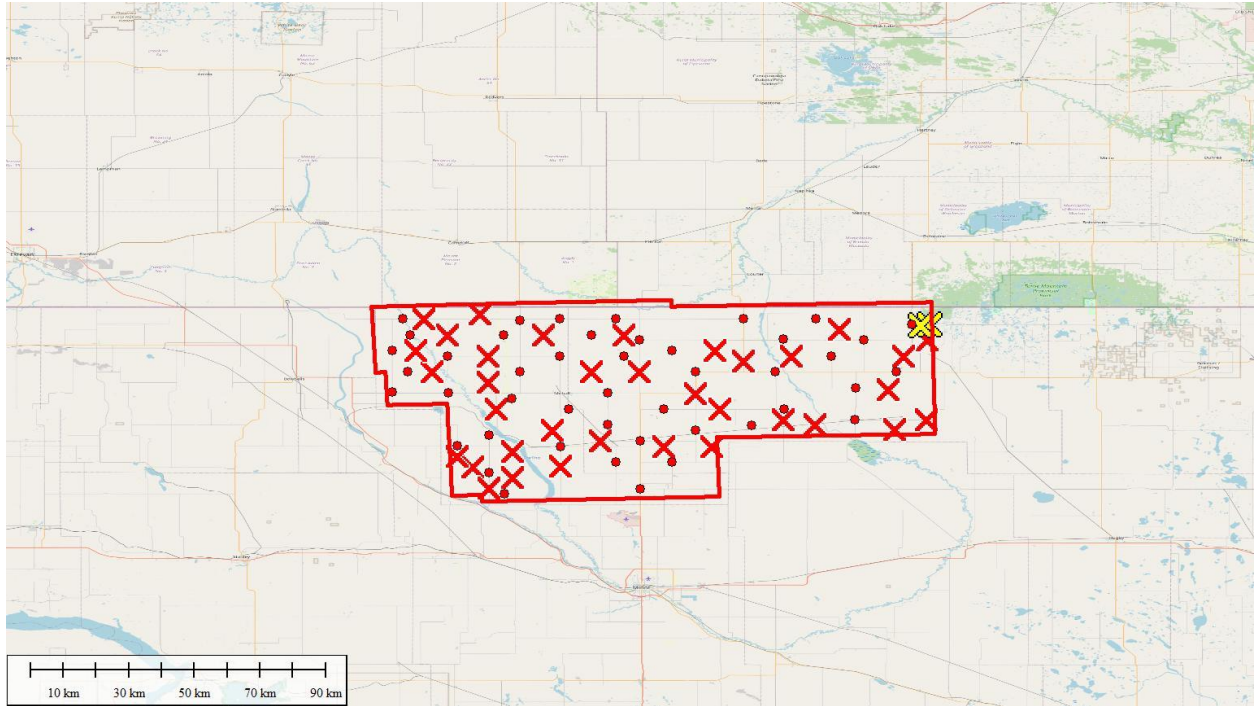


Figure 2 – Checkpoints

CONTROL

The National Spatial Reference System (NSRS) was used to provide control for the network. The Trimble [VRSNow](#) real time network (RTN) was utilized. The horizontal datum for processing was the North American Datum of 1983 – NAD83 (2011), epoch 2010.0. The vertical datum was the North American Vertical Datum of 1988 (NAVD88), realized with the GEOID12B geoid model from the National Geodetic Survey (NGS). This superseded geoid model was used at the request of the client.

STATIONS

Table 2 lists the GCP and CP stations established in this survey, including the GCP, NVA, VVA, and VVA-F, as well as the CORS.

Table 2 - Station List

Station Name	GPSID	USGS Quadrangle	Description
NDMS	PRS645051777	MAXBASS	CORS
????	PRS678095360		CORS in Canada
NDBO	PRS831144553	BOTTINEAU	CORS
NDBR	PRS976698893	BERTHOLD	CORS
NDKE	PRS384356447	KENMARE	CORS
GCP14	22010AA	GRANO NE	dirt centerline of 92nd Street NW and the west edge of 40th Avenue NW.
GCP36	22010AB	MOUSE RIVER PARK NW	dirt centerline of 58th Avenue NW and the north edge of CR2.
GCP37	22010AC	MOHALL NE	dirt centerline of a private drive to the east of 39th Avenue NW.
GCP38	22010AD	KUROKI	dirt centerline of 22nd Avenue NW and the north edge of 108th Street NW.
GCP39	22010AE	LANDA	dirt northwest quadrant of the intersection of 8th Avenue NW and 108th Street NW.

Station Name	GPSID	USGS Quadrangle	Description
GCP40	22010AF	NORMA	dirt centerline of a private drive to the west of 55th Avenue NW.
GCP41	22010AG	MOUSE RIVER PARK NE	asphalt centerline of 49th Avenue NW and the north edge of CR2.
GCP42	22010AH	RENVILLE	asphalt centerline of a field access on the east edge of US 83.
GCP43	22010AI	SOURIS SE	east side of 8th Avenue NE at a field access.
GCP44	22010AJ	CARBURY	dirt centerline of a well pad site on the east edge of 6th Avenue NE.
GCP45	22010AK	GLENBURN	dirt centerline of 20th Avenue NW and the north side of 76th Street NW.
GCP46	22010AL	TOLLEY SE	dirt centerline of 49th Avenue NW and the north edge of 75th Street NW.
GCP48	22010AM	WESTHOPE SE	dirt centerline of 93rd Street NW and the west edge of 14th Avenue NW.
GCP56	22010AN	LANDA SE	dirt centerline of a field access on the east edge of 5th Avenue NW.
GCP57	22010AO	LANSFORD SW	dirt centerline of 33rd Avenue NW and the south edge of 76th Street NW.
NVA001	22010AP	MOUSE RIVER PARK NW	southwest quadrant of the intersection of CR2 and River Road.
NVA002	22010AQ	MOUSE RIVER PARK NW	dirt centerline of 104th Street NW and the east edge of River Road.
NVA003	22010AR	MOUSE RIVER PARK	dirt centerline of CR4 and the west edge of 51st Avenue NW.
NVA004	22010AS	MOUSE RIVER PARK	asphalt centerline of 51st Avenue NW and on the north edge of 93rd Street NW.
NVA005	22010AT	GREENE	asphalt centerline of 85th Street NW and on the west edge of SD28.
NVA006	22010AU	GRANO SW	dirt centerline of a well access on the north edge of 78th Street NW.
NVA007	22010AV	LANSFORD SE	asphalt centerline of 75th Street NW and the west side of 27th Avenue NW.
NVA008	22010AW	LANSFORD SE	dirt northwest quadrant of the intersection of 30th Avenue NW and 80th Street NW.
NVA009	22010AX	LANSFORD NE	asphalt centerline of 84th Street NW and the east edge of US83.
NVA010	22010AY	ANTLER SW	asphalt centerline of 31st Avenue NW and on the north edge of 93rd Street NW.
NVA011	22010AZ	SHERWOOD	gravel centerline of an exit from the Cenex Gas station on the east edge of SD28 and opposite 4th Avenue E.
NVA012	22010BA	MOHALL NE	asphalt centerline of 37th Avenue NW and the north edge of 107th Street NW.
NVA013	22010BB	MOHALL	asphalt centerline of 37th Avenue NW and on the north edge of 100th Street NW.
NVA014	22010BC	ANTLER	asphalt centerline of 30th Avenue NW and the north edge of 107th Street NW.
NVA015	22010BD	ANTLER	dirt centerline of 103rd Street NW and the west edge of SD256.
NVA016	22010BE	WESTHOPE SW	dirt centerline of 97th Street NW and the east edge of 20th Avenue NW.
NVA017	22010BF	GRANO	dirt centerline of a field access on the west edge of 37th Avenue NW just south from the intersection with 83rd Street NW.
NVA018	22010BG	NEWBURG	dirt centerline of 13th Avenue NW and north edge of 87th Street NW.
NVA019	22010BH	KRAMER	asphalt centerline of a drive to the west of ND14.
NVA020	22010BI	SOURIS SE	asphalt centerline of 5th Avenue NE and on the north side of 97th Street NE.
NVA021	22010BJ	SOURIS	dirt centerline of a substation and cell tower access drive on the west edge of 1st Avenue NE.
NVA022	22010BK	CARBURY	dirt centerline of 106th Street NE and west from ND14.

Station Name	GPSID	USGS Quadrangle	Description
NVA023	22010BL	LANDA SW	dirt centerline of 10th Avenue NW and north from 97th Street NW.
NVA024	22010BM	SOURIS SW	asphalt centerline of 94th Street NW and the east edge of SD14.
NVA025	22010BN	NEWBURG	dirt centerline of 9th Avenue NW and the north edge of 90th Street NW.
NVA026	22010BO	WESTHOPE	asphalt centerline of 107th Street NW and the west edge of US83.
NVA027	22010BP	ROTH	dirt northwest quadrant of the intersection of 107th Street NW and 5th Avenue NW.
NVA028	22010BQ	MOHALL SW	asphalt centerline of 97th Street NW and the east side of 42th Avenue NW.
NVA029	22010BR	MOUSE RIVER PARK NW	northeast quadrant of the intersection of 101st Street NW and 58th Avenue NW.
NVA030	22010BS	MOUSE RIVER PARK SW	southwest quadrant of the intersection of 97th Street NW and 57th Avenue NW.
NVA031	22010BT	MAXBASS	dirt centerline of 24th Avenue NW and on the south edge of 90th Street NW.
NVA032	22010BU	MAXBASS	asphalt centerline of 86th Street NW and the west side of 20th Avenue NW.
NVA033	22010BV	GLENBURN	asphalt centerline of 23rd Avenue NW and the north side of CR 530.
NVA034	22010BW	TOLLEY SE	dirt centerline of 50th Avenue NW and on the south edge of CR26.
NVA035	22010BX	CARPIO	dirt centerline of 44th Avenue NW and the north edge of 74th Street NW.
NVA036	22010BY	LANSFORD NW	centerline of a dirt pull off on the north edge of 87th Street NW and just west from 31st Avenue NW.
NVA037	22010BZ	LANSFORD NW	dirt centerline of 36th Avenue NW and the south edge of 90th Street NW.
NVA038	22010CA	RENVILLE	dirt centerline of 29th Avenue NW and the south edge of 100th Street NW.
NVA039	22010CB	MOUSE RIVER PARK SW	asphalt centerline of a field access on the east edge of CR1 and north from CR5.
NVA040	22010CC	SHERWOOD	dirt centerline of 44th Avenue NW and on the south edge of 104th Street NW.
NVA041	22010CD	ANTLER NW	dirt centerline of 104th Street NW and the east edge of 33rd Avenue NW.
NVA042	22010CE	LANDA	dirt centerline of a well site access drive on the west edge of 9th Avenue NW and 475 feet north of 103rd Street NW.
NVA043	22010CF	LANDA SE	dirt centerline of 100th Street NW and the west edge of 3rd Avenue NW.
NVA044	22010CG	GREENE	dirt centerline of 92nd Street NW and the west edge of 43rd Avenue NW.
NVA045	22010CH	KUROKI	dirt centerline of 100th Street NW and the east edge of 23rd Avenue NW.
VVA001	22010CI	MOUSE RIVER PARK NE	southwest from the intersection of 104th Street NW and 51st Avenue NW.
VVA002	22010CJ	MOHALL SW	northeast from the intersection of SD28 and 90th Street NW.
VVA003	22010CK	MOUSE RIVER PARK	north from the intersection of 53rd Avenue NW and 97th Street NW just west from a small barn.
VVA004	22010CL	GREENE	northeast from the intersection of SD28 and 90th Street NW.
VVA005	22010CM	GRANO NE	southwest from the intersection of 38th Avenue NW and 86th Street NW.
VVA006	22010CN	LANSFORD NW	field on the south side of 84th Street NW and west from 32nd Avenue NW.
VVA007	22010CO	ECKMAN	northwest from the intersection of CR520 and 17th Avenue NW.
VVA008	22010CP	UPHAM NE	northeast corner of a field on the southwest quadrant of the intersection of CR20 NE and 9th Avenue NE.

Station Name	GPSID	USGS Quadrangle	Description
VVA009	22010CQ	DEEP	northeast from the intersection of 87th Street NW and 5th Avenue NW.
VVA010	22010CR	NEWBURG	center of a field access on the east side of 9th Avenue NW and north from 88th Street NW.
VVA011	22010CS	ECKMAN SE	northwest from the intersection of 83rd Street NW and 18th Avenue NW.
VVA012	22010CT	GLENBURN	west side of 24th Avenue NW and south from 83rd Street NW.
VVA013	22010CU	GRANO	west shoulder of 37th Avenue NW and just south of a field access.
VVA014	22010CV	GRANO SW	southwest from the intersection of 82nd Street NW and 43rd Avenue NW.
VVA015	22010CW	TOLLEY SE	northwest quadrant from the intersection of 79th Street NW and 48th Avenue NW.
VVA016	22010CX	GRANO SW	south side of 77th Street NW and west from the intersection with 43rd Avenue NW.
VVA017	22010CY	GRANO SW	east shoulder of SD28 and just north from 75th Street NW.
VVA018	22010CZ	TOLLEY SE	southwest quadrant from the intersection of 81st Street NW and 50th Avenue NW.
VVA019	22010DA	MOHALL SW	northeast from the intersection of 95th Street NW and 46th Avenue NW and on the west side of St Johns Cemetery.
VVA020	22010DB	ANTLER SW	northwest from the intersection of 97th Street NW and 33rd Avenue NW.
VVA021	22010DC	ANTLER	south side of 104th Street NW and east from 29th Avenue NW and on the north side of a well site.
VVA022	22010DD	RENVILLE	northwest from the intersection of 97th Street NW and 27th Avenue NW.
VVA023	22010DE	MOHALL NE	southwest from the intersection of 104th Street NW and 39th Avenue NW.
VVA024	22010DF	SHERWOOD	southeast from the intersection of 108th Street NW and 47th Avenue NW.
VVA025	22010DG	MOUSE RIVER PARK NW	northwest from the intersection of 54th Avenue NW and CR2.
VVA026	22010DH	MOUSE RIVER PARK NW	north shoulder of 101st Street NW and east of 55th Avenue NW.
VVA027	22010DI	WESTHOPE	south side of 101st Street NW at a field split.
VVA028	22010DJ	ROTH	southeast from the intersection of 105th Street NW and 2nd Avenue NW.
VVA029	22010DK	CARBURY	north side of CR6 NE and west from the intersection with 9th Avenue NE.
VVA030	22010DL	SOURIS SE	field on the west side of 6th Avenue NE and south from the intersection with 100th Street NE.
VVA031	22010DM	SOURIS SE	centerline of a field access on the west side of 4th Avenue NE.
VVA032	22010DN	UPHAM NE	southeast corner of a plot with silos on the west side of 5th Avenue NE and on the north of a drive.
VVA033	22010DO	LANDA SW	northeast from the intersection of 100th Street NW and 8th Avenue NW. At the southwest corner of a field.
VVA034	22010DP	WESTHOPE SE	southwest from the intersection of US83 and 99th Street NW.
VVA035	22010DQ	WESTHOPE SW	centerline of an old road (93rd Street NW and west of 20th Avenue NW.
VVAF01	22010DR	CARBURY	north side of 106th Street NE and west of a forest road to the north,
VVAF02	22010DS	CARBURY	north side of 106th Street NE.

The stations were not permanently marked.

METHODOLOGY

The field survey was done by using a Trimble R10-2 multi-frequency, multi-constellation GNSS receiver in a real time (RTK/VRS) mode. Corrections were obtained from the VRSNow network with corrections delivered over the cellular network. These corrections are applied in real time and used by the rover receiver to converge to a cm level solution. Each station was occupied once for a minimum of 2 minutes (120 epochs), then re-initialized and occupied a second time immediately after the first occupation. Additional observations were made if necessary to ensure agreement at the 0.033 m level. The solutions are stored as vectors from the nearest physical CORS. Table 3 summarizes the VRS/RTK occupations (precisions in meters).

Table 3 – VRS Occupation Summary

GPS BASE	GPSID	UTC Start	UTC End	Horz Prec	Vert Prec	# of SV's	PDOP
PRS645051777291	22010AA	04/05/2022 21:58:02	22:00:01	0.011	0.015	17	1.4
PRS645051777291	22010AA	04/05/2022 22:00:37	22:02:36	0.013	0.017	17	1.4
PRS38435644749	22010AB	04/05/2022 17:30:36	17:32:35	0.019	0.028	20	1.2
PRS38435644749	22010AB	04/05/2022 17:33:36	17:35:35	0.017	0.028	20	1.2
PRS67809536024	22010AC	04/05/2022 20:23:43	20:25:42	0.014	0.022	14	2.0
PRS67809536024	22010AC	04/05/2022 20:26:27	20:28:26	0.013	0.015	16	1.5
PRS67809536024	22010AD	04/06/2022 16:42:07	16:44:06	0.010	0.012	18	1.3
PRS67809536024	22010AD	04/06/2022 16:44:37	16:46:36	0.009	0.013	18	1.3
PRS645051777291	22010AE	04/06/2022 19:33:05	19:35:04	0.012	0.015	17	1.2
PRS645051777291	22010AE	04/06/2022 19:35:37	19:37:36	0.012	0.016	18	1.2
PRS38435644749	22010AF	04/05/2022 15:34:44	15:36:43	0.016	0.018	17	1.4
PRS38435644749	22010AF	04/05/2022 15:37:11	15:39:12	0.016	0.018	18	1.4
PRS67809536024	22010AG	04/05/2022 19:46:27	19:48:26	0.014	0.018	15	1.3
PRS67809536024	22010AG	04/05/2022 19:49:57	19:51:56	0.011	0.017	16	1.3
PRS645051777291	22010AH	04/06/2022 13:50:00	13:51:59	0.009	0.011	18	1.3
PRS645051777291	22010AH	04/06/2022 13:52:28	13:54:27	0.009	0.010	19	1.2
PRS831144553155	22010AI	04/07/2022 12:44:57	12:46:56	0.008	0.009	17	1.3
PRS831144553155	22010AI	04/07/2022 12:47:18	12:49:17	0.009	0.010	13	1.5
PRS831144553155	22010AJ	04/06/2022 21:00:37	21:02:36	0.010	0.015	15	1.3
PRS831144553155	22010AJ	04/06/2022 21:03:16	21:05:16	0.010	0.014	16	1.3
PRS645051777291	22010AK	04/07/2022 18:20:32	18:22:32	0.008	0.011	19	1.3
PRS645051777291	22010AK	04/07/2022 18:24:12	18:26:12	0.008	0.011	19	1.3
PRS976698893895	22010AL	04/05/2022 12:55:35	12:57:34	0.008	0.010	17	1.2
PRS976698893895	22010AL	04/05/2022 12:58:15	13:00:15	0.009	0.011	18	1.2
PRS645051777291	22010AM	04/07/2022 16:05:35	16:07:34	0.008	0.009	19	1.3
PRS645051777291	22010AM	04/07/2022 16:08:15	16:10:15	0.009	0.009	19	1.2
PRS645051777291	22010AN	04/07/2022 14:14:33	14:16:32	0.010	0.016	18	1.2
PRS645051777291	22010AN	04/07/2022 14:17:01	14:19:00	0.012	0.018	17	1.2
PRS645051777291	22010AO	04/05/2022 23:30:08	23:32:07	0.010	0.014	20	1.2
PRS645051777291	22010AO	04/05/2022 23:33:07	23:35:07	0.009	0.013	20	1.2
PRS38435644749	22010AP	04/05/2022 17:13:16	17:17:21	0.015	0.030	19	1.2
PRS38435644749	22010AP	04/05/2022 17:23:04	17:25:03	0.021	0.030	18	1.3
PRS38435644749	22010AQ	04/05/2022 17:01:37	17:03:36	0.014	0.021	18	1.4
PRS38435644749	22010AQ	04/05/2022 17:04:17	17:06:22	0.015	0.022	18	1.4
PRS38435644749	22010AR	04/05/2022 18:21:47	18:23:47	0.014	0.019	17	1.6
PRS38435644749	22010AR	04/05/2022 18:25:47	18:27:46	0.012	0.015	17	1.6
PRS38435644749	22010AS	04/05/2022 15:19:10	15:21:09	0.016	0.022	16	1.8
PRS38435644749	22010AS	04/05/2022 15:21:59	15:23:58	0.015	0.020	17	1.6
PRS38435644749	22010AT	04/05/2022 14:47:27	14:49:26	0.013	0.025	17	1.5
PRS38435644749	22010AT	04/05/2022 14:50:55	14:52:54	0.013	0.023	18	1.5
PRS976698893895	22010AU	04/05/2022 13:32:32	13:34:32	0.011	0.015	17	1.4
PRS976698893895	22010AU	04/05/2022 13:35:17	13:37:17	0.010	0.013	18	1.3
PRS645051777291	22010AV	04/05/2022 23:45:40	23:47:39	0.009	0.013	20	1.2
PRS645051777291	22010AV	04/05/2022 23:50:15	23:52:14	0.009	0.014	19	1.3
PRS645051777291	22010AW	04/06/2022 12:21:47	12:23:46	0.009	0.013	18	1.4

GPS BASE	GPSID	UTC Start	UTC End	Horz Prec	Vert Prec	# of SV's	PDOP
PRS645051777291	22010AW	04/06/2022 12:24:30	12:26:29	0.008	0.011	15	1.5
PRS645051777291	22010AX	04/06/2022 12:37:25	12:39:24	0.009	0.012	18	1.2
PRS645051777291	22010AX	04/06/2022 12:40:18	12:42:17	0.010	0.013	16	1.3
PRS645051777291	22010AY	04/06/2022 14:05:06	14:07:05	0.010	0.014	19	1.3
PRS645051777291	22010AY	04/06/2022 14:09:01	14:11:00	0.009	0.012	19	1.3
PRS67809536024	22010AZ	04/05/2022 19:16:24	19:18:24	0.014	0.016	17	1.2
PRS67809536024	22010AZ	04/05/2022 19:20:52	19:22:52	0.011	0.012	17	1.2
PRS67809536024	22010BA	04/05/2022 20:35:42	20:37:41	0.013	0.016	17	1.4
PRS67809536024	22010BA	04/05/2022 20:38:49	20:40:48	0.012	0.016	17	1.4
PRS645051777291	22010BB	04/05/2022 20:53:31	20:55:30	0.010	0.012	16	1.5
PRS645051777291	22010BB	04/05/2022 20:57:02	20:59:01	0.010	0.014	17	1.3
PRS67809536024	22010BC	04/06/2022 16:21:51	16:23:50	0.010	0.014	20	1.2
PRS67809536024	22010BC	04/06/2022 16:24:12	16:26:11	0.011	0.013	18	1.4
PRS645051777291	22010BD	04/06/2022 15:37:59	15:40:23	0.010	0.013	20	1.1
PRS645051777291	22010BD	04/06/2022 15:41:05	15:43:04	0.012	0.017	20	1.2
PRS645051777291	22010BE	04/07/2022 16:26:29	16:28:28	0.008	0.010	19	1.2
PRS645051777291	22010BE	04/07/2022 16:28:47	16:30:46	0.008	0.012	18	1.2
PRS645051777291	22010BF	04/05/2022 23:00:48	23:02:47	0.010	0.016	20	1.1
PRS645051777291	22010BF	04/05/2022 23:04:21	23:06:21	0.010	0.014	19	1.2
PRS645051777291	22010BG	04/07/2022 15:42:02	15:44:01	0.008	0.010	17	1.5
PRS645051777291	22010BG	04/07/2022 15:44:46	15:46:45	0.008	0.010	18	1.4
PRS831144553155	22010BH	04/07/2022 14:38:02	14:40:01	0.010	0.014	18	1.4
PRS831144553155	22010BH	04/07/2022 14:40:47	14:42:46	0.010	0.014	18	1.4
PRS831144553155	22010BI	04/06/2022 22:55:34	22:57:33	0.010	0.018	12	2.0
PRS831144553155	22010BI	04/06/2022 22:57:59	22:59:58	0.011	0.016	11	2.3
PRS831144553155	22010BJ	04/06/2022 20:22:18	20:24:17	0.011	0.014	15	1.7
PRS831144553155	22010BJ	04/06/2022 20:26:58	20:28:57	0.010	0.012	14	1.6
PRS831144553155	22010BK	04/06/2022 20:44:04	20:46:03	0.010	0.013	14	1.3
PRS831144553155	22010BK	04/06/2022 20:47:52	20:49:51	0.009	0.011	14	1.3
PRS645051777291	22010BL	04/06/2022 18:11:01	18:13:00	0.008	0.010	18	1.4
PRS645051777291	22010BL	04/06/2022 18:13:26	18:15:25	0.009	0.012	12	1.8
PRS831144553155	22010BM	04/07/2022 13:58:41	14:00:40	0.013	0.021	15	1.5
PRS831144553155	22010BM	04/07/2022 14:01:14	14:03:13	0.012	0.019	16	1.4
PRS645051777291	22010BN	04/07/2022 15:21:35	15:23:34	0.010	0.012	19	1.3
PRS645051777291	22010BN	04/07/2022 15:24:23	15:26:22	0.009	0.012	20	1.3
PRS645051777291	22010BO	04/06/2022 17:02:27	17:04:26	0.010	0.014	19	1.3
PRS645051777291	22010BO	04/06/2022 17:04:55	17:06:55	0.011	0.015	19	1.3
PRS831144553155	22010BP	04/06/2022 19:47:46	19:49:45	0.012	0.016	16	1.4
PRS831144553155	22010BP	04/06/2022 19:51:22	19:53:21	0.011	0.015	16	1.4
PRS831144553155	22010BP	04/06/2022 19:54:06	19:56:05	0.013	0.018	15	1.6
PRS38435644749	22010BQ	04/05/2022 21:09:13	21:11:12	0.011	0.016	19	1.3
PRS38435644749	22010BQ	04/05/2022 21:13:58	21:15:57	0.010	0.016	19	1.3
PRS38435644749	22010BR	04/05/2022 16:46:19	16:48:18	0.019	0.023	19	1.3
PRS38435644749	22010BR	04/05/2022 16:49:24	16:51:25	0.016	0.022	19	1.3
PRS38435644749	22010BS	04/05/2022 16:02:49	16:04:48	0.011	0.014	18	1.5
PRS38435644749	22010BS	04/05/2022 16:06:27	16:08:26	0.019	0.018	17	1.6
PRS645051777291	22010BT	04/06/2022 13:36:01	13:38:00	0.007	0.009	19	1.1
PRS645051777291	22010BT	04/06/2022 13:38:58	13:40:57	0.007	0.008	18	1.3
PRS645051777291	22010BU	04/07/2022 17:14:25	17:16:24	0.007	0.010	20	1.3
PRS645051777291	22010BU	04/07/2022 17:16:46	17:18:45	0.007	0.008	18	1.5
PRS645051777291	22010BV	04/07/2022 18:04:11	18:06:10	0.007	0.010	22	1.2
PRS645051777291	22010BV	04/07/2022 18:06:52	18:08:51	0.007	0.010	22	1.2
PRS38435644749	22010BW	04/05/2022 14:12:36	14:14:35	0.010	0.017	19	1.3
PRS38435644749	22010BW	04/05/2022 14:15:47	14:17:46	0.010	0.019	19	1.3
PRS976698893895	22010BX	04/05/2022 12:31:05	12:33:05	0.007	0.011	16	1.4
PRS976698893895	22010BX	04/05/2022 12:33:28	12:35:27	0.010	0.015	14	1.5
PRS645051777291	22010BY	04/06/2022 13:04:22	13:06:21	0.010	0.011	18	1.2
PRS645051777291	22010BY	04/06/2022 13:07:39	13:09:38	0.011	0.012	17	1.2
PRS645051777291	22010BZ	04/05/2022 22:16:37	22:18:36	0.009	0.012	19	1.2
PRS645051777291	22010BZ	04/05/2022 22:20:22	22:22:21	0.008	0.013	19	1.2
PRS645051777291	22010CA	04/06/2022 14:55:33	14:57:32	0.010	0.016	19	1.3
PRS645051777291	22010CA	04/06/2022 14:58:14	15:00:13	0.010	0.016	19	1.3
PRS38435644749	22010CB	04/05/2022 15:47:24	15:49:23	0.013	0.015	15	1.7
PRS38435644749	22010CB	04/05/2022 15:50:30	15:52:29	0.013	0.013	16	1.5

GPS BASE	GPSID	UTC Start	UTC End	Horz Prec	Vert Prec	# of SV's	PDOP
PRS38435644749	22010CC	04/05/2022 18:53:59	18:55:58	0.014	0.018	19	1.2
PRS38435644749	22010CC	04/05/2022 18:57:31	18:59:30	0.015	0.021	18	1.2
PRS645051777291	22010CD	04/06/2022 16:06:15	16:08:14	0.011	0.016	19	1.4
PRS645051777291	22010CD	04/06/2022 16:08:43	16:10:42	0.012	0.017	19	1.2
PRS645051777291	22010CE	04/06/2022 19:15:55	19:17:55	0.010	0.012	18	1.2
PRS645051777291	22010CE	04/06/2022 19:19:31	19:21:30	0.010	0.012	18	1.2
PRS831144553155	22010CF	04/06/2022 18:56:33	18:58:32	0.008	0.012	19	1.3
PRS831144553155	22010CF	04/06/2022 18:58:58	19:00:57	0.009	0.012	18	1.3
PRS38435644749	22010CG	04/05/2022 21:42:43	21:44:42	0.012	0.016	18	1.4
PRS38435644749	22010CG	04/05/2022 21:45:27	21:47:26	0.010	0.015	18	1.4
PRS645051777291	22010CH	04/06/2022 15:20:09	15:22:08	0.011	0.017	17	1.6
PRS645051777291	22010CH	04/06/2022 15:24:30	15:26:29	0.011	0.019	18	1.5
PRS38435644749	22010CI	04/05/2022 18:09:08	18:11:08	0.018	0.029	18	1.6
PRS38435644749	22010CI	04/05/2022 18:12:10	18:14:09	0.017	0.019	18	1.6
PRS38435644749	22010CJ	04/05/2022 18:36:28	18:38:28	0.016	0.019	17	1.5
PRS38435644749	22010CJ	04/05/2022 18:39:55	18:41:57	0.013	0.017	18	1.4
PRS38435644749	22010CK	04/05/2022 16:16:12	16:18:12	0.021	0.019	16	1.6
PRS38435644749	22010CK	04/05/2022 16:19:07	16:21:06	0.019	0.019	17	1.4
PRS38435644749	22010CL	04/05/2022 15:02:45	15:04:44	0.017	0.030	17	1.7
PRS38435644749	22010CL	04/05/2022 15:05:16	15:07:15	0.015	0.025	17	1.7
PRS645051777291	22010CM	04/05/2022 22:48:40	22:50:40	0.011	0.019	16	1.7
PRS645051777291	22010CM	04/05/2022 22:51:33	22:53:32	0.018	0.022	13	1.8
PRS645051777291	22010CN	04/06/2022 12:52:14	12:54:13	0.011	0.015	17	1.4
PRS645051777291	22010CN	04/06/2022 12:54:41	12:56:40	0.012	0.015	17	1.4
PRS645051777291	22010CO	04/07/2022 16:56:03	16:58:03	0.006	0.008	19	1.3
PRS645051777291	22010CO	04/07/2022 16:58:56	17:00:55	0.007	0.008	19	1.4
PRS831144553155	22010CP	04/07/2022 13:02:17	13:04:16	0.010	0.013	18	1.2
PRS831144553155	22010CP	04/07/2022 13:04:58	13:06:57	0.009	0.012	18	1.2
PRS645051777291	22010CQ	04/07/2022 14:53:11	14:55:10	0.011	0.015	20	1.2
PRS645051777291	22010CQ	04/07/2022 14:55:38	14:57:37	0.010	0.015	18	1.5
PRS645051777291	22010CR	04/07/2022 15:08:48	15:10:47	0.010	0.013	19	1.4
PRS645051777291	22010CR	04/07/2022 15:11:48	15:13:47	0.009	0.012	17	1.7
PRS645051777291	22010CS	04/07/2022 17:31:33	17:33:32	0.008	0.010	23	1.3
PRS645051777291	22010CS	04/07/2022 17:33:55	17:35:54	0.007	0.009	22	1.3
PRS645051777291	22010CT	04/07/2022 17:49:04	17:51:03	0.008	0.010	23	1.2
PRS645051777291	22010CT	04/07/2022 17:52:13	17:54:13	0.007	0.009	22	1.2
PRS976698893895	22010CU	04/05/2022 23:14:51	23:16:50	0.010	0.017	19	1.3
PRS976698893895	22010CU	04/05/2022 23:17:56	23:19:55	0.008	0.014	19	1.3
PRS38435644749	22010CV	04/05/2022 14:31:17	14:33:16	0.013	0.025	18	1.5
PRS38435644749	22010CV	04/05/2022 14:35:31	14:37:30	0.013	0.025	17	1.6
PRS38435644749	22010CW	04/05/2022 13:45:12	13:47:11	0.010	0.015	18	1.3
PRS38435644749	22010CW	04/05/2022 13:49:14	13:51:13	0.009	0.014	18	1.4
PRS976698893895	22010CX	04/05/2022 13:18:42	13:20:41	0.011	0.014	19	1.1
PRS976698893895	22010CX	04/05/2022 13:21:27	13:23:26	0.009	0.013	19	1.1
PRS976698893895	22010CY	04/05/2022 12:44:39	12:46:38	0.007	0.011	12	1.6
PRS976698893895	22010CY	04/05/2022 12:47:29	12:49:28	0.010	0.013	16	1.3
PRS38435644749	22010CZ	04/05/2022 14:01:08	14:03:07	0.011	0.018	18	1.5
PRS38435644749	22010CZ	04/05/2022 14:04:29	14:06:29	0.011	0.019	19	1.3
PRS38435644749	22010DA	04/05/2022 21:27:25	21:29:24	0.012	0.015	19	1.3
PRS38435644749	22010DA	04/05/2022 21:30:28	21:32:27	0.010	0.014	19	1.2
PRS645051777291	22010DB	04/06/2022 14:20:18	14:22:17	0.010	0.014	20	1.2
PRS645051777291	22010DB	04/06/2022 14:23:59	14:25:58	0.010	0.013	19	1.3
PRS645051777291	22010DC	04/06/2022 15:52:12	15:54:11	0.015	0.026	17	1.5
PRS645051777291	22010DC	04/06/2022 15:54:59	15:56:58	0.017	0.026	18	1.4
PRS645051777291	22010DD	04/06/2022 14:40:43	14:42:42	0.007	0.012	20	1.2
PRS645051777291	22010DD	04/06/2022 14:43:35	14:45:34	0.009	0.015	20	1.2
PRS67809536024	22010DE	04/05/2022 20:09:27	20:11:26	0.013	0.024	14	1.9
PRS67809536024	22010DE	04/05/2022 20:12:08	20:14:07	0.012	0.021	14	1.9
PRS67809536024	22010DF	04/05/2022 19:34:47	19:36:46	0.013	0.016	16	1.2
PRS67809536024	22010DF	04/05/2022 19:37:21	19:39:20	0.014	0.017	16	1.2
PRS38435644749	22010DG	04/05/2022 17:46:05	17:48:04	0.016	0.024	18	1.3
PRS67809536024	22010DG	04/05/2022 17:53:18	17:55:17	0.016	0.028	15	1.6
PRS38435644749	22010DH	04/05/2022 16:33:56	16:35:55	0.017	0.021	19	1.2
PRS38435644749	22010DH	04/05/2022 16:36:46	16:38:45	0.016	0.024	19	1.2

GPS BASE	GPSID	UTC Start	UTC End	Horz Prec	Vert Prec	# of SV's	PDOP
PRS645051777291	22010DI	04/06/2022 17:33:10	17:35:09	0.008	0.012	19	1.4
PRS645051777291	22010DI	04/06/2022 17:36:08	17:38:07	0.008	0.012	19	1.4
PRS831144553155	22010DJ	04/06/2022 20:07:24	20:09:24	0.012	0.016	15	1.7
PRS831144553155	22010DJ	04/06/2022 20:10:10	20:12:09	0.012	0.015	15	1.7
PRS831144553155	22010DK	04/06/2022 22:21:16	22:23:15	0.010	0.014	11	1.6
PRS831144553155	22010DK	04/06/2022 22:25:10	22:27:09	0.008	0.012	11	1.6
PRS831144553155	22010DL	04/06/2022 22:39:22	22:41:21	0.008	0.013	13	1.5
PRS831144553155	22010DL	04/06/2022 22:41:52	22:43:51	0.007	0.011	12	1.8
PRS831144553155	22010DM	04/07/2022 13:38:07	13:40:06	0.011	0.018	16	1.5
PRS831144553155	22010DM	04/07/2022 13:40:34	13:42:33	0.011	0.017	16	1.5
PRS831144553155	22010DN	04/07/2022 13:18:23	13:20:22	0.012	0.015	18	1.2
PRS831144553155	22010DN	04/07/2022 13:22:02	13:24:01	0.010	0.013	18	1.2
PRS645051777291	22010DO	04/06/2022 18:36:47	18:38:46	0.009	0.012	20	1.3
PRS645051777291	22010DO	04/06/2022 18:42:00	18:43:59	0.008	0.010	21	1.2
PRS645051777291	22010DP	04/06/2022 17:49:49	17:51:50	0.008	0.011	18	1.4
PRS645051777291	22010DP	04/06/2022 17:54:07	17:56:07	0.010	0.013	18	1.4
PRS645051777291	22010DQ	04/07/2022 16:41:18	16:43:17	0.007	0.008	19	1.4
PRS645051777291	22010DQ	04/07/2022 16:43:50	16:45:49	0.007	0.009	19	1.4
PRS831144553155	22010DR	04/06/2022 21:44:21	21:46:20	0.012	0.018	14	1.7
PRS831144553155	22010DR	04/06/2022 21:47:24	21:49:23	0.009	0.014	14	1.7
PRS831144553155	22010DS	04/06/2022 22:02:09	22:04:09	0.018	0.021	14	1.5
PRS831144553155	22010DS	04/06/2022 22:05:16	22:07:32	0.015	0.021	13	1.6

As mentioned, each station was occupied twice (or more if needed) in succession. The Earth Centered Earth Fixed (ECEF) vector differences were rotated into a local horizon system (N, E, Up) for analysis. Stations which had observations that differed by more than 0.033 m in the vertical component were re-observed until agreement was achieved. Figure 3 summarizes the repeat baseline analysis.

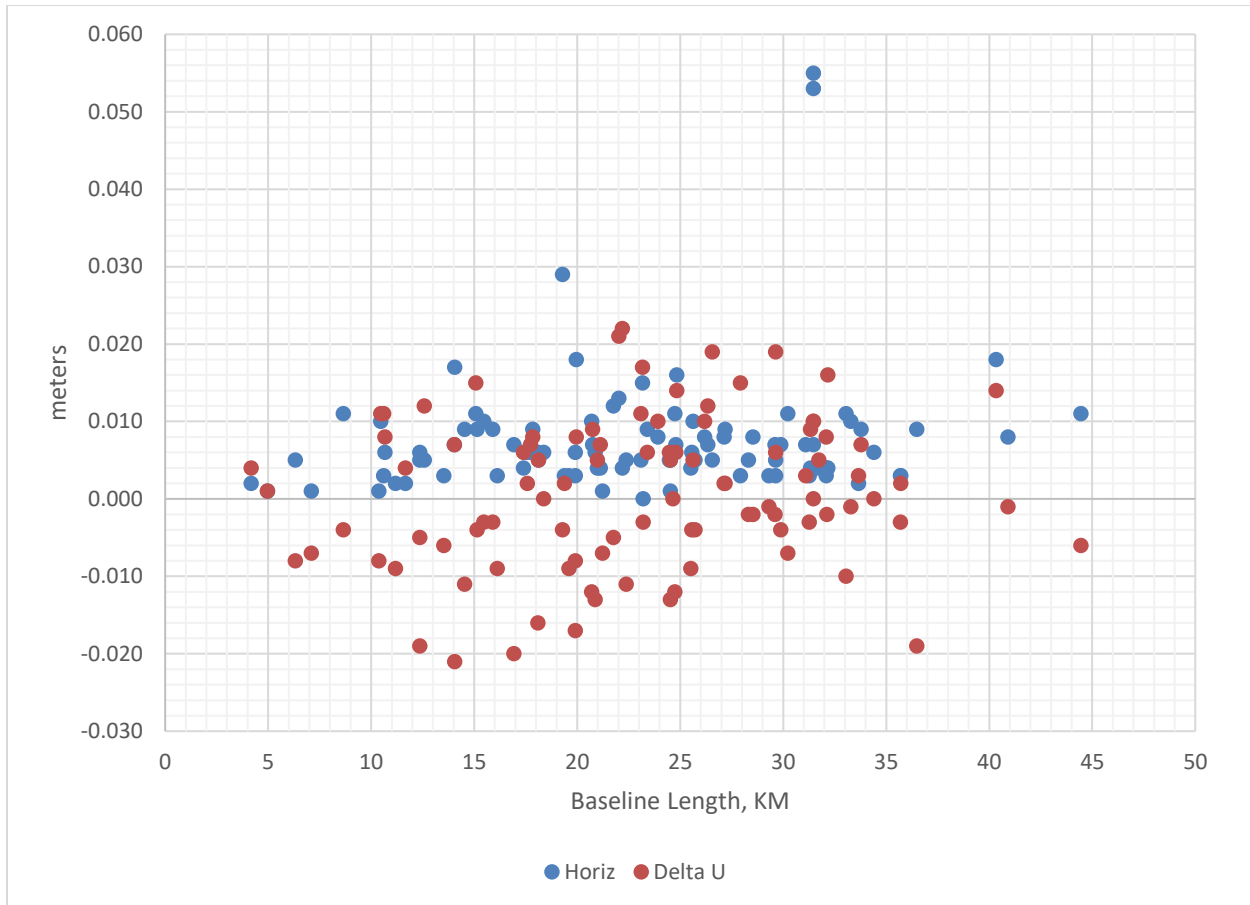


Figure 3 - Repeat Baseline Analysis

LEAST SQUARES ADJUSTMENTS

Geolab was used to adjust the VRS vectors. No scaling of the a priori GPS statistics was done. Station errors (centering, HI and HT) of 0.005 m were input. The GEOID12B model was used.

The adjustment constrained the VRS CORS positions (as computed and broadcast by the network) in all three dimensions (NAD83 (2011) latitude, longitude, and ellipsoidal height). The error factor was 0.19. This adjustment provided the adjusted positions (NAD83 (2011) epoch 2010.0) and GPS derived orthometric heights (NAVD88) for the stations in the network. The adjusted latitude/longitudes were transformed to UTM Zone 14 grid coordinates. At the request of the client, the positions were also transformed to NAD83 (NSRS2007) using the NGS Coordinate Conversion and Transformation (NCAT) tool, and NAVD88 GPS derived orthometric heights were also computed for this datum realization using GEOID12B. Table 4 lists the error ellipses at the 95% level.

Table 4 - Station Error Ellipses - 95% meters

Station Name	Semi-Major Axis	Azimuth	Semi-Minor Axis	Vertical
22010AA	0.009	154	0.007	0.011
22010AB	0.012	28	0.009	0.017
22010AC	0.010	19	0.008	0.011
22010AD	0.008	163	0.006	0.009
22010AE	0.009	20	0.008	0.010
22010AF	0.012	146	0.008	0.012
22010AG	0.009	24	0.008	0.012
22010AH	0.008	0	0.007	0.008
22010AI	0.007	141	0.007	0.007
22010AJ	0.008	173	0.007	0.010
22010AK	0.007	9	0.006	0.008
22010AL	0.007	49	0.007	0.008
22010AM	0.008	158	0.006	0.007
22010AN	0.009	171	0.007	0.011
22010AO	0.008	144	0.007	0.009
22010AP	0.012	22	0.009	0.018
22010AQ	0.010	167	0.008	0.014
22010AR	0.010	19	0.007	0.011
22010AS	0.011	150	0.008	0.014
22010AT	0.010	167	0.007	0.015
22010AU	0.008	148	0.007	0.010
22010AV	0.008	150	0.007	0.009
22010AW	0.007	173	0.007	0.008
22010AX	0.008	152	0.007	0.009
22010AY	0.008	160	0.007	0.009
22010AZ	0.009	178	0.008	0.009
22010BA	0.010	7	0.007	0.011
22010BB	0.008	8	0.007	0.009
22010BC	0.009	165	0.007	0.009
22010BD	0.009	173	0.007	0.010
22010BE	0.007	169	0.006	0.008
22010BF	0.008	149	0.007	0.010
22010BG	0.007	154	0.006	0.008
22010BH	0.008	156	0.007	0.009
22010BI	0.008	173	0.007	0.011
22010BJ	0.008	30	0.007	0.009
22010BK	0.008	22	0.007	0.008
22010BL	0.008	170	0.006	0.008
22010BM	0.009	170	0.008	0.013
22010BN	0.008	169	0.007	0.009
22010BO	0.009	3	0.007	0.010
22010BP	0.007	16	0.006	0.009
22010BQ	0.008	170	0.007	0.010
22010BR	0.013	155	0.008	0.014
22010BS	0.011	146	0.007	0.010
22010BT	0.007	156	0.006	0.007
22010BU	0.007	7	0.006	0.007
22010BV	0.007	175	0.006	0.008
22010BW	0.008	153	0.007	0.012
22010BX	0.007	36	0.007	0.009
22010BY	0.008	174	0.007	0.008
22010BZ	0.008	154	0.006	0.009
22010CA	0.008	5	0.007	0.011
22010CB	0.010	149	0.007	0.010
22010CC	0.010	21	0.008	0.012
22010CD	0.009	168	0.007	0.011
22010CE	0.008	179	0.007	0.008
22010CF	0.008	163	0.007	0.008
22010CG	0.009	157	0.007	0.010
22010CH	0.008	171	0.007	0.012
22010CI	0.013	28	0.008	0.014
22010CJ	0.011	12	0.008	0.012
22010CK	0.015	145	0.008	0.012

Station Name	Semi-Major Axis	Azimuth	Semi-Minor Axis	Vertical
22010CL	0.011	154	0.009	0.017
22010CM	0.011	150	0.008	0.013
22010CN	0.009	175	0.008	0.010
22010CO	0.007	13	0.006	0.006
22010CP	0.008	146	0.007	0.009
22010CQ	0.008	173	0.007	0.010
22010CR	0.008	165	0.007	0.009
22010CS	0.007	14	0.006	0.007
22010CT	0.007	8	0.006	0.007
22010CU	0.008	148	0.007	0.010
22010CV	0.009	141	0.008	0.016
22010CW	0.008	173	0.007	0.010
22010CX	0.008	150	0.007	0.009
22010CY	0.007	39	0.007	0.008
22010CZ	0.008	167	0.008	0.012
22010DA	0.009	144	0.007	0.010
22010DB	0.008	162	0.007	0.009
22010DC	0.013	169	0.007	0.016
22010DD	0.007	164	0.007	0.009
22010DE	0.009	16	0.008	0.014
22010DF	0.010	17	0.008	0.011
22010DG	0.012	37	0.008	0.016
22010DH	0.013	144	0.007	0.014
22010DI	0.008	3	0.006	0.008
22010DJ	0.009	78	0.008	0.010
22010DK	0.008	174	0.007	0.009
22010DL	0.007	12	0.007	0.008
22010DM	0.009	166	0.008	0.012
22010DN	0.009	147	0.007	0.009
22010DO	0.007	173	0.007	0.008
22010DP	0.008	177	0.006	0.008
22010DQ	0.007	1	0.006	0.007
22010DR	0.008	162	0.007	0.010
22010DS	0.012	152	0.008	0.013

SUMMARY

A LiDAR ground control network was established in northcentral North Dakota. The estimated accuracy of the control network is ± 0.03 m with respect to the NAD83 (2011) epoch 2010.0 reference frame and the NAVD88 vertical datum (using GEOID18). Table 6 lists the adjusted NAD83(2011) epoch 2010.0 UTM Zone 14 coordinates, the transformed NAD83 (NSRS2007) UTM Zone 14 coordinates and the NAVD88 GPS derived orthometric heights based on the NAD83(NSRS2007) ellipsoidal heights and the GEOID12B model.

Horizontal Datum: NAD83 (2011) epoch 2010.0 and transformed NAD83(NSRS2007)

Vertical Datum: NAVD88=NAD83(NSRS2007) Ellipsoidal Heights-GEOID12B

UTM Zone: 14

Units: meters

Table 5– Adjusted Coordinates and Elevations (meters)

Station Name	GPSID	NAD83 (2011) epoch 2010.0		NAD83 (NSRS2007)			Geoid12B
		UTM14 North	UTM14 East	UTM14 North	UTM14 East	Ellip Hgt	NAVD88
GCP14	22010AA	5402773.672	310045.693	5402773.673	310045.673	491.653	512.250
GCP36	22010AB	5427983.295	282071.656	5427983.294	282071.631	531.508	551.739
GCP37	22010AC	5427840.686	312487.421	5427840.687	312487.397	474.964	495.814
GCP38	22010AD	5427586.526	339709.662	5427586.527	339709.637	439.514	460.913
GCP39	22010AE	5427061.523	362086.083	5427061.523	362086.062	437.875	459.617
GCP40	22010AF	5403042.294	285919.148	5403042.294	285919.123	544.641	564.659
GCP41	22010AG	5427412.476	296468.674	5427412.477	296468.650	509.795	530.341
GCP42	22010AH	5402869.544	330964.460	5402869.545	330964.439	449.474	470.535
GCP43	22010AI	5403338.356	387328.518	5403338.356	387328.499	439.562	461.106
GCP44	22010AJ	5426730.804	384598.333	5426730.804	384598.313	521.152	542.815
GCP45	22010AK	5375943.275	341448.089	5375943.276	341448.069	445.797	466.854
GCP46	22010AL	5375933.942	294815.296	5375933.942	294815.273	556.756	576.488
GCP48	22010AM	5403074.901	351846.895	5403074.902	351846.874	433.115	454.572
GCP56	22010AN	5402830.709	366359.179	5402830.710	366359.158	425.190	446.815
GCP57	22010AO	5376610.398	320563.588	5376610.399	320563.568	487.038	507.504
NVA001	22010AP	5427886.029	284192.188	5427886.029	284192.163	479.001	499.285
NVA002	22010AQ	5423011.244	285452.894	5423011.243	285452.870	477.450	497.705
NVA003	22010AR	5416266.789	292840.377	5416266.788	292840.352	523.347	543.712
NVA004	22010AS	5405031.488	292434.002	5405031.488	292433.977	537.053	557.287
NVA005	22010AT	5391840.880	300236.672	5391840.880	300236.648	522.785	543.011
NVA006	22010AU	5380584.063	299870.892	5380584.063	299870.869	540.249	560.224
NVA007	22010AV	5374684.117	330142.214	5374684.118	330142.193	461.735	482.466
NVA008	22010AW	5382897.417	325587.785	5382897.418	325587.764	471.950	492.654
NVA009	22010AX	5389169.639	330608.020	5389169.640	330607.999	452.974	473.897
NVA010	22010AY	5403883.397	324558.574	5403883.398	324558.553	456.119	477.037
NVA011	22010AZ	5426557.673	307671.748	5426557.673	307671.724	479.089	499.844
NVA012	22010BA	5426741.907	315667.095	5426741.908	315667.071	472.607	493.507
NVA013	22010BB	5415487.169	315300.055	5415487.170	315300.034	474.041	494.867
NVA014	22010BC	5426352.356	326865.165	5426352.357	326865.141	457.277	478.387
NVA015	22010BD	5419764.326	331456.054	5419764.326	331456.033	447.969	469.142
NVA016	22010BE	5409780.840	342425.688	5409780.841	342425.667	435.899	457.264
NVA017	22010BF	5388077.510	314512.866	5388077.511	314512.845	494.072	514.556

Station Name	GPSID	NAD83 (2011) epoch 2010.0		NAD83 (NSRS2007)			Geoid12B
		UTM14 North	UTM14 East	UTM14 North	UTM14 East	Ellip Hgt	NAVD88
NVA018	22010BG	5393366.139	353187.284	5393366.140	353187.264	432.465	453.873
NVA019	22010BH	5394548.229	374047.823	5394548.229	374047.803	423.474	445.094
NVA020	22010BI	5408788.982	382616.644	5408788.982	382616.624	442.136	463.756
NVA021	22010BJ	5418683.238	376366.995	5418683.238	376366.975	439.897	461.630
NVA022	22010BK	5423221.929	386083.294	5423221.929	386083.274	510.399	532.010
NVA023	22010BL	5409383.985	358438.765	5409383.986	358438.744	425.996	447.580
NVA024	22010BM	5404126.622	374464.879	5404126.622	374464.859	428.521	450.181
NVA025	22010BN	5398022.471	359808.944	5398022.472	359808.923	424.090	445.620
NVA026	22010BO	5425685.135	352418.995	5425685.136	352418.974	433.431	455.055
NVA027	22010BP	5425294.968	366837.154	5425294.968	366837.134	442.750	464.520
NVA028	22010BQ	5410923.447	307120.809	5410923.447	307120.784	493.767	514.389
NVA029	22010BR	5418329.772	281691.018	5418329.771	281690.994	545.515	565.609
NVA030	22010BS	5411760.768	284643.279	5411760.767	284643.254	543.129	563.228
NVA031	22010BT	5398696.849	335708.186	5398696.850	335708.166	444.726	465.872
NVA032	22010BU	5392038.776	341899.594	5392038.777	341899.573	437.667	458.899
NVA033	22010BV	5382531.449	336838.495	5382531.449	336838.475	451.454	472.475
NVA034	22010BW	5388869.734	293684.690	5388869.733	293684.665	546.635	566.628
NVA035	22010BX	5374015.194	302787.465	5374015.193	302787.442	538.587	558.491
NVA036	22010BY	5394217.468	324312.553	5394217.469	324312.532	468.453	489.264
NVA037	22010BZ	5399335.728	316500.439	5399335.729	316500.418	479.193	499.878
NVA038	22010CA	5415031.270	328104.094	5415031.271	328104.073	447.069	468.148
NVA039	22010CB	5405720.687	281199.478	5405720.686	281199.453	551.730	571.642
NVA040	22010CC	5422289.476	304284.597	5422289.476	304284.572	488.767	509.425
NVA041	22010CD	5421688.381	321896.222	5421688.382	321896.202	461.921	482.913
NVA042	22010CE	5419174.793	360283.686	5419174.793	360283.665	432.753	454.426
NVA043	22010CF	5413917.763	369810.123	5413917.763	369810.103	434.170	455.883
NVA044	22010CG	5402940.673	305225.421	5402940.672	305225.396	509.214	529.714
NVA045	22010CH	5416354.721	337775.402	5416354.722	337775.381	440.881	462.180
VVA001	22010CI	5422682.812	293046.058	5422682.811	293046.033	520.211	540.639
VVA002	22010CJ	5415955.858	300838.538	5415955.858	300838.514	502.509	523.047
VVA003	22010CK	5411596.461	289437.897	5411596.460	289437.873	530.639	550.871
VVA004	22010CL	5399849.931	301977.282	5399849.930	301977.258	512.886	533.277
VVA005	22010CM	5392968.756	313058.580	5392968.757	313058.559	488.966	509.494
VVA006	22010CN	5389428.779	322530.457	5389428.779	322530.436	466.701	487.406
VVA007	22010CO	5398401.582	346908.754	5398401.583	346908.733	435.546	456.908
VVA008	22010CP	5394126.477	388375.077	5394126.476	388375.057	426.661	448.184
VVA009	22010CQ	5393085.509	366035.174	5393085.510	366035.154	418.957	440.531
VVA010	22010CR	5394899.138	359620.912	5394899.139	359620.891	424.605	446.117

Station Name	GPSID	NAD83 (2011) epoch 2010.0		NAD83 (NSRS2007)			Geoid12B
		UTM14 North	UTM14 East	UTM14 North	UTM14 East	Ellip Hgt	NAVD88
VVA011	22010CS	5387131.180	344978.993	5387131.181	344978.973	435.815	457.058
VVA012	22010CT	5387353.531	335354.646	5387353.532	335354.626	450.229	471.262
VVA013	22010CU	5382064.928	314304.836	5382064.927	314304.813	498.694	519.070
VVA014	22010CV	5386828.770	304830.891	5386828.769	304830.867	509.860	530.098
VVA015	22010CW	5382326.746	296657.318	5382326.745	296657.294	543.436	563.366
VVA016	22010CX	5378852.266	304542.633	5378852.265	304542.610	521.615	541.674
VVA017	22010CY	5375763.572	299656.452	5375763.571	299656.429	543.750	563.608
VVA018	22010CZ	5385643.389	293554.919	5385643.389	293554.894	550.422	570.341
VVA019	22010DA	5407962.114	300587.631	5407962.114	300587.606	515.698	536.153
VVA020	22010DB	5410445.068	321524.566	5410445.069	321524.545	464.689	485.599
VVA021	22010DC	5421453.082	328317.512	5421453.083	328317.491	452.031	473.147
VVA022	22010DD	5410131.377	331138.951	5410131.378	331138.931	444.150	465.265
VVA023	22010DE	5421997.800	312275.534	5421997.801	312275.510	472.264	493.073
VVA024	22010DF	5428878.733	299710.067	5428878.734	299710.042	497.747	518.372
VVA025	22010DG	5427741.227	288471.967	5427741.227	288471.942	524.792	545.167
VVA026	22010DH	5418140.745	286523.471	5418140.744	286523.446	528.347	548.571
VVA027	22010DI	5416108.460	346526.836	5416108.461	346526.815	435.360	456.836
VVA028	22010DJ	5421939.229	371636.023	5421939.229	371636.003	438.039	459.805
VVA029	22010DK	5418325.848	389099.805	5418325.848	389099.785	511.471	532.999
VVA030	22010DL	5413470.175	384290.562	5413470.174	384290.542	454.574	476.184
VVA031	22010DM	5403568.335	380871.115	5403568.335	380871.095	426.993	448.618
VVA032	22010DN	5391446.980	381967.918	5391446.980	381967.898	427.341	448.926
VVA033	22010DO	5414124.191	361797.776	5414124.192	361797.755	430.757	452.411
VVA034	22010DP	5412749.305	352053.991	5412749.306	352053.970	433.355	454.888
VVA035	22010DQ	5403303.820	342213.435	5403303.821	342213.414	435.142	456.463
VVAF01	22010DR	5422977.426	389595.256	5422977.425	389595.236	650.486	672.000
VVAF02	22010DS	5422955.245	387919.283	5422955.245	387919.263	585.124	606.685