Ground Control Point Survey Report

IA EasternIA 2019 B19 QL2 LDAR Project
USGS Contract: G16PC00020
Task Order Number: 140G0219F0101

Prepared for:
United States Geological Survey (USGS)

Prepared By:

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1. INTRODUCTION

1.1 *Project Summary*

Dewberry Engineers Inc. is under contract to the United States Geological Survey to provide 150 Ground Control Points in the state of Iowa. 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 Ground Control Point surveys that will be used to evaluate vertical and horizontal accuracy. The ground survey was conducted October 30, 2019 thru January 10, 2020.

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 Ground Control 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 Albers Equal Area, NAD83 (2011) in meters. 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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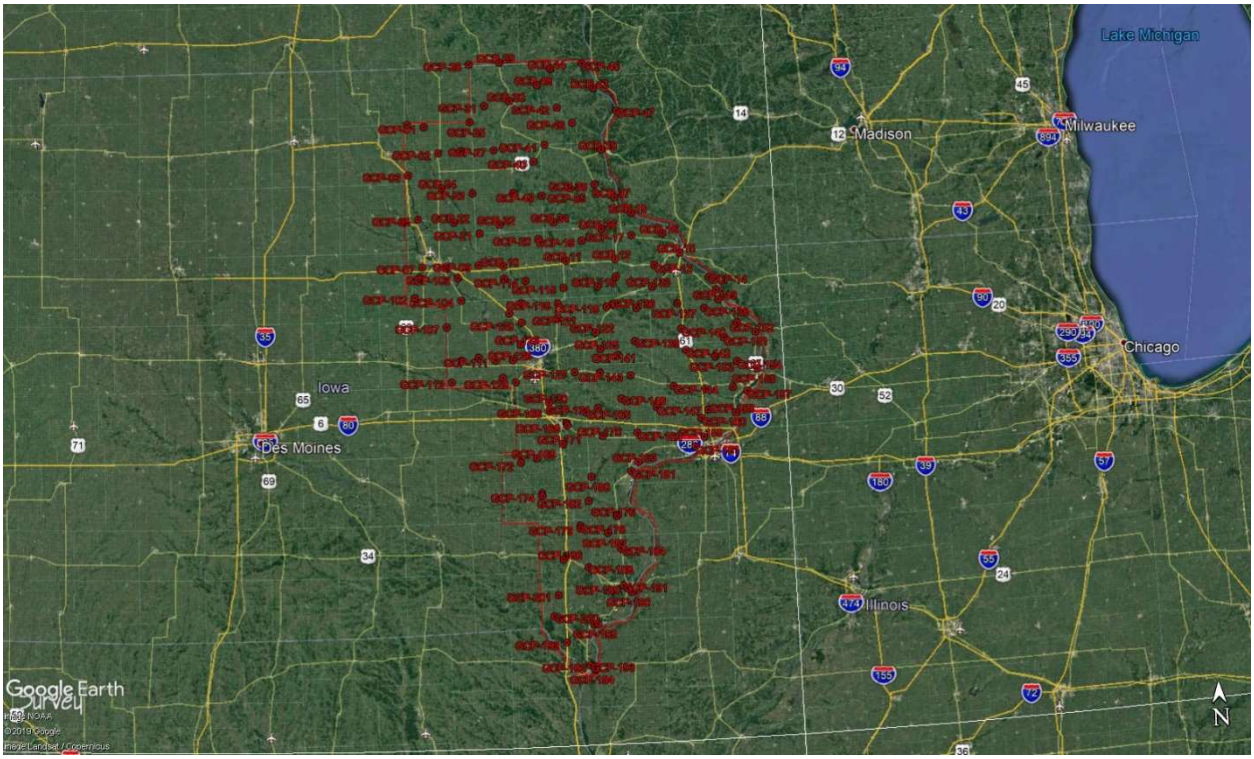
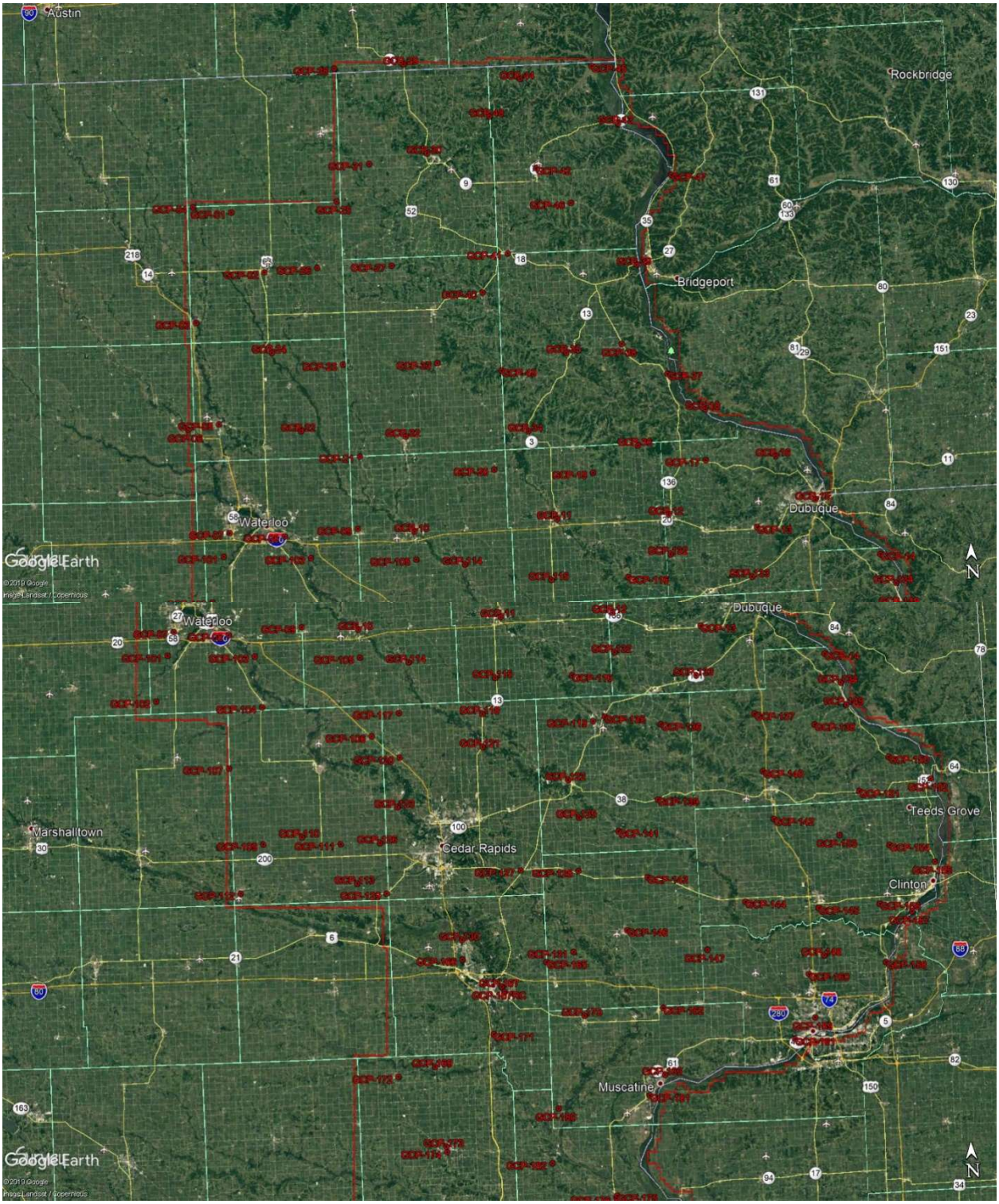
1.3 *Project Area*

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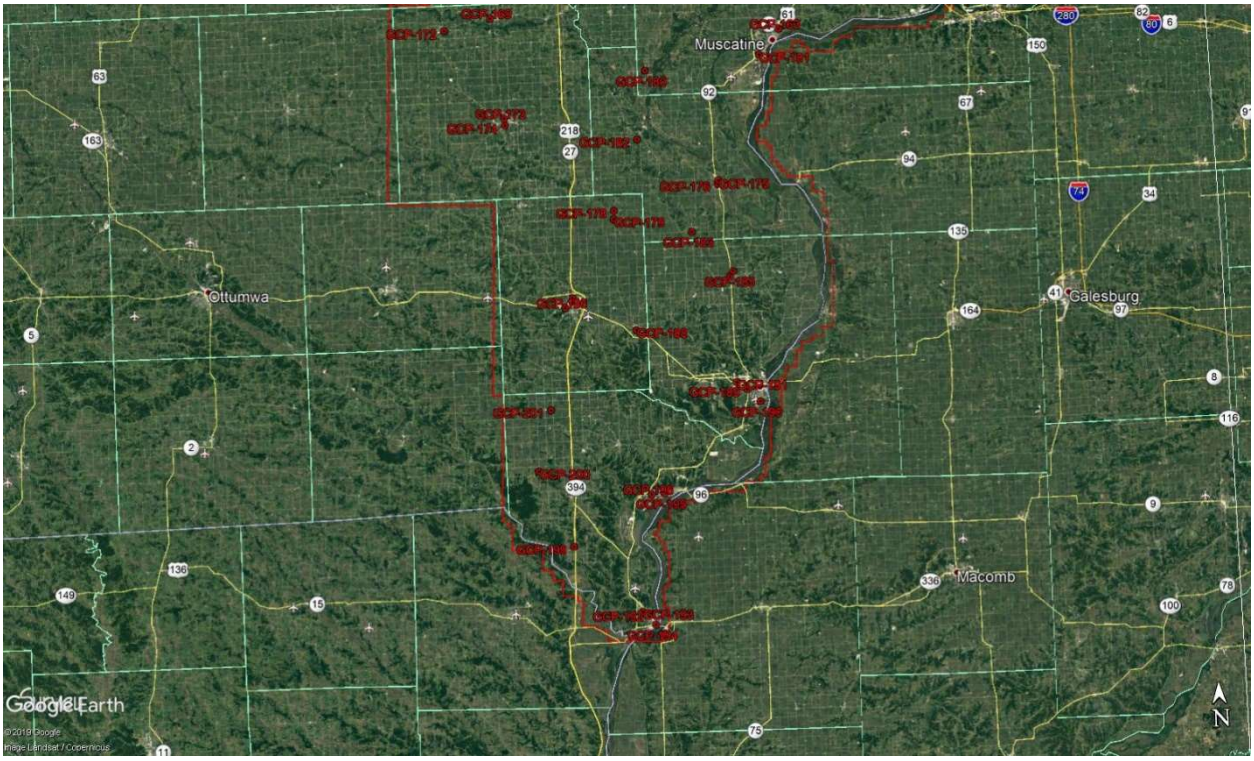
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PROJECT DETAILS

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 150 Ground Control 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 Ground Control Point locations are detailed on the "Control Point Documentation Report" sheets attached to this report.

2.3 *Network Design*

The GPS survey performed by Dewberry Engineers Inc. office located in Lanham, MD was tied to a Real Time Network operated by IaRTN. 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 ± 5cm 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.

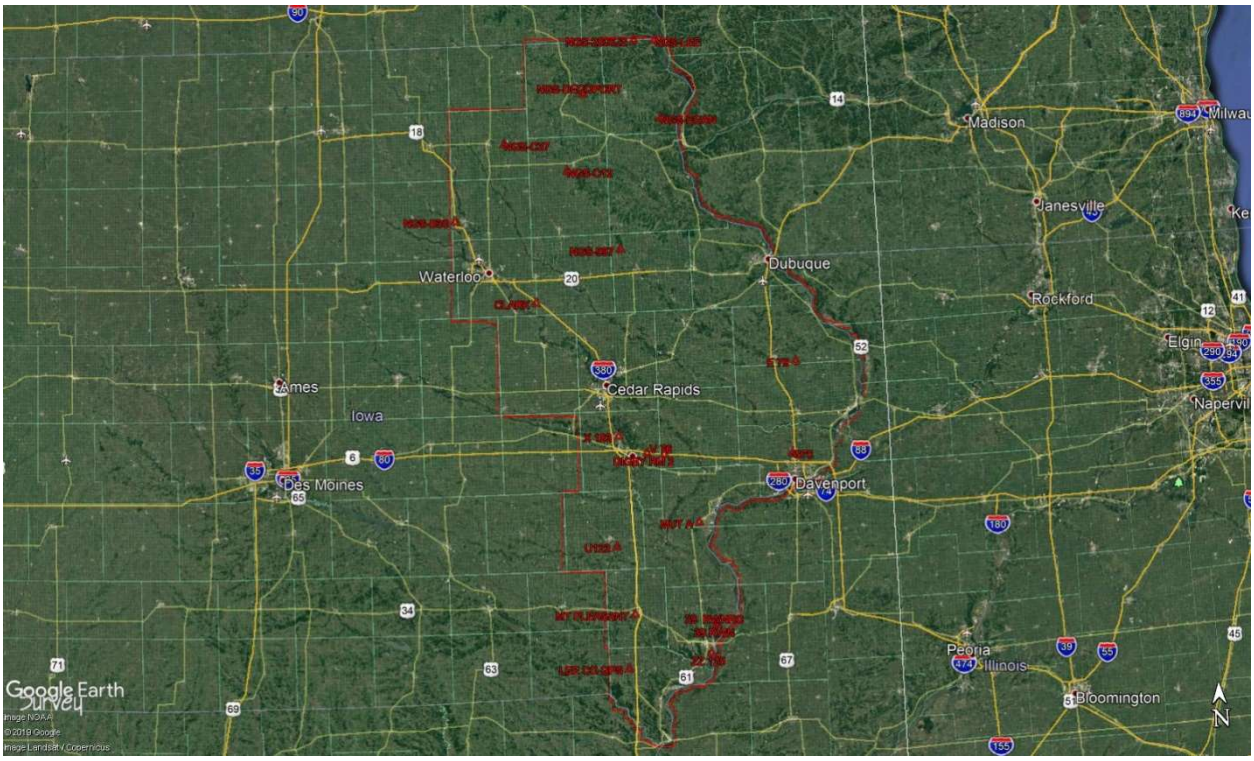
Field GPS observations are detailed on the "Control Point Documentation Reports" submitted as part of this report.

Fourteen (14) existing NGS monument listed in the NSRS database were located for the Louisiana area 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 AE9186, AB9853, AE2146, AJ8263 DK6836, LD0627, MG0328, MG0495, NJ0599, NJ0606, NJ0232, NK0164, ON0828, and OO0226.. The results are as follows:

	Observed Values			Data Sheet Values					
PT. #	NORTHING	EASTING	ELEVS.	NORTHING	EASTING	ELEVS.	Δ X	Δ Y	Δ Z
X 183	4623738.032	615808.502	238.807	4623738.022	615808.514	238.839	0.010	-0.012	-0.032
U123	4569578.672	613542.936	228.088	4569578.670	613542.931	228.102	0.002	0.005	-0.014
LEE	4817861.104	638804.442	197.228	4817861.143	638804.447	197.248	-0.039	-0.005	-0.020
EGAN	4779299.333	640536.491	353.666	4779299.335	640536.496	353.690	-0.002	-0.005	-0.024
C37	4768236.497	563142.902	351.737	4768236.488	563142.900	351.776	0.009	0.002	-0.039
C12	4754284.028	593848.566	359.636	4754284.041	593848.558	359.629	-0.013	0.008	0.007
B30	4730930.731	538040.261	285.480	4730930.745	538040.251	285.504	-0.014	0.010	-0.024
2806J2	4818072.054	628387.524	348.769	4818072.039	628387.527	348.815	0.015	-0.003	-0.046
997	4715132.862	619243.643	304.090	4715132.855	619243.673	304.112	0.007	-0.030	-0.022
MUT A	4580470.864	654500.783	165.989	4580470.848	654500.769	166.000	0.016	0.014	-0.011
MT PLEASANT	4536045.024	621642.510	224.291	N/A	N/A	224.308	N/A	N/A	-0.017
39 RWN	4530095.552	662022.127	215.767	4530095.574	662022.126	215.800	-0.022	0.001	-0.033
E 79	4658389.312	704045.995	269.759	4658389.300	704046.008	269.781	0.012	-0.013	-0.022
G70	4613270.251	701462.137	237.734	4613270.245	701462.154	237.776	0.006	-0.017	-0.042

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 IaRTN network 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 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 2019) 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/ELEVATIONS*

POINT ID	NORTHING (m)	EASTING (m)	ELEV. (m)
ALBERS EQUAL AREA, NAD83 (2011), NAVD 88, Meters, Geoid 12B			
GCP			
GCP-01	2250291.779	289663.848	352.617
GCP-02	2235403.745	297969.054	351.642
GCP-03	2222660.987	281010.187	296.307
GCP-04	2251588.377	280090.621	346.535
GCP-05	2197360.824	286826.231	278.916
GCP-06	2195886.738	279098.530	277.528
GCP-07	2170069.006	289568.799	290.289
GCP-08	2169340.557	303314.563	256.539
GCP-09	2171331.945	321493.799	302.615
GCP-10	2170720.642	335589.238	280.382
GCP-11	2174000.360	370938.510	287.007
GCP-12	2175159.968	398697.034	293.521
GCP-13	2172025.248	420727.933	318.899
GCP-14	2165196.528	451643.645	212.272
GCP-15	2178905.896	435285.228	195.370
GCP-16	2189822.486	425327.983	298.428
GCP-17	2188833.782	407880.441	370.592
GCP-18	2201528.270	407688.622	190.564
GCP-19	2185619.040	379860.506	350.109
GCP-20	2186335.456	355325.387	318.329
GCP-21	2189474.758	321936.939	299.041
GCP-22	2195707.375	307305.009	316.581
GCP-23	2212437.387	317640.714	323.905
GCP-24	2215280.829	299938.840	313.375
GCP-25	2253152.882	315901.915	351.638
GCP-26	2236552.775	311127.396	339.861
GCP-27	2237151.396	329620.665	337.716
GCP-28	2286317.565	315093.674	397.199
GCP-29	2287445.492	332332.452	402.186
GCP-30	2265195.249	338276.530	267.468
GCP-31	2262531.607	323928.044	369.063
GCP-32	2194494.880	333257.352	321.906
GCP-33	2212876.355	341064.986	306.818
GCP-34	2195926.530	363726.640	371.595
GCP-35	2215575.166	373091.262	231.374

GCP-36	2192423.925	390937.531	347.548
GCP-37	2210385.223	398206.462	191.747
GCP-38	2217809.155	386875.602	325.703
GCP-39	2237576.794	390498.047	191.276
GCP-40	2230577.969	352252.841	258.577
GCP-41	2240365.474	358447.791	364.189
GCP-42	2261610.751	365377.739	379.794
GCP-43	2272870.036	385808.868	195.494
GCP-44	2283863.480	361348.720	234.673
GCP-45	2287216.683	379147.326	199.389
GCP-46	2252988.991	374059.042	356.697
GCP-47	2260082.749	399021.702	193.460
GCP-48	2274492.444	353770.816	332.275
GCP-49	2211092.041	356995.176	266.179
GCP-101	2164138.727	288086.193	280.565
GCP-102	2152609.575	285343.870	311.986
GCP-103	2163948.570	309830.494	262.273
GCP-104	2151211.106	311782.887	251.080
GCP-105	2163731.659	336031.802	278.607
GCP-106	2143993.597	339019.417	279.210
GCP-107	2135887.546	303623.762	294.474
GCP-108	2134667.639	326124.566	250.014
GCP-109	2116915.180	312258.662	267.938
GCP-110	2118721.646	321851.202	289.263
GCP-111	2116992.614	331486.575	270.239
GCP-112	2104570.263	306679.998	242.012
GCP-113	2107139.184	335652.569	242.786
GCP-114	2162551.581	348147.576	292.560
GCP-115	2158731.596	369665.420	308.456
GCP-116	2159461.438	388763.763	270.831
GCP-117	2149861.463	345804.798	263.943
GCP-118	2149692.158	366520.607	293.327
GCP-119	2147985.414	393998.828	254.617
GCP-120	2138725.268	346044.416	254.749
GCP-121	2141444.470	366598.257	256.168
GCP-122	2133208.748	387893.950	250.152
GCP-123	2126237.957	345499.486	226.455
GCP-124	2123839.481	365675.793	251.715
GCP-125	2123832.489	390582.867	282.623

GCP-126	**2117310.434**	**341271.912**	**262.687**
GCP-127	**2110583.026**	**376184.576**	**243.526**
GCP-128	**2110486.014**	**390509.535**	**275.941**
GCP-129	**2104700.556**	**342946.662**	**242.958**
GCP-130	**2093122.458**	**361722.018**	**240.678**
GCP-131	**2090241.730**	**389376.268**	**228.015**
GCP-132	**2165222.328**	**399255.011**	**282.608**
GCP-133	**2159522.743**	**419621.473**	**312.914**
GCP-134	**2157914.723**	**455685.889**	**184.276**
GCP-135	**2149091.951**	**396889.897**	**284.786**
GCP-136	**2147299.680**	**410843.543**	**281.445**
GCP-137	**2150006.959**	**434109.412**	**291.895**
GCP-138	**2147391.502**	**449165.777**	**287.549**
GCP-139	**2128446.581**	**410144.340**	**248.926**
GCP-140	**2135598.746**	**436297.952**	**217.449**
GCP-141	**2120442.799**	**400334.349**	**228.310**
GCP-142	**2123646.695**	**438992.025**	**227.387**
GCP-143	**2108931.615**	**407635.395**	**254.634**
GCP-144	**2102938.570**	**432032.969**	**213.653**
GCP-145	**2101390.403**	**450235.244**	**203.943**
GCP-146	**2095699.335**	**402635.286**	**238.189**
GCP-147	**2090851.878**	**422603.648**	**243.824**
GCP-148	**2089480.572**	**451705.910**	**235.334**
GCP-149	**2152384.424**	**457116.734**	**183.693**
GCP-150	**2139360.444**	**467680.998**	**254.851**
GCP-151	**2130713.538**	**460329.695**	**196.859**
GCP-152	**2133920.601**	**478235.858**	**179.945**
GCP-153	**2119689.583**	**455439.198**	**214.244**
GCP-154	**2117250.894**	**467915.484**	**268.604**
GCP-155	**2113043.056**	**479372.521**	**217.758**
GCP-156	**2102471.828**	**465566.998**	**196.043**
GCP-157	**2100497.964**	**473647.827**	**179.589**
GCP-158	**2087808.666**	**467183.717**	**207.465**
GCP-159	**2073945.722**	**449516.825**	**192.602**
GCP-160	**2084796.037**	**447880.191**	**240.906**
GCP-161	**2068546.202**	**444496.384**	**176.065**
GCP-162	**2076299.445**	**411690.735**	**215.412**
GCP-163	**2059506.475**	**412219.413**	**188.032**
GCP-164	**2087384.295**	**398667.862**	**224.058**

GCP-165	2087759.496	382640.314	247.989
GCP-166	2088275.421	361810.314	230.185
GCP-167	2081467.843	371609.736	222.945
GCP-168	2080211.404	372245.981	215.341
GCP-169	2061367.386	355134.301	202.651
GCP-170	2074267.171	392164.837	206.095
GCP-171	2069598.899	369654.410	193.282
GCP-172	2058872.905	346070.717	224.458
GCP-173	2041353.942	358023.541	231.290
GCP-174	2039999.820	358219.486	230.668
GCP-175	2029182.618	400389.682	176.774
GCP-176	2028499.458	400276.693	177.223
GCP-177	2023379.329	360962.472	224.683
GCP-178	2023049.877	379824.162	212.820
GCP-179	2021411.469	379772.971	211.216
GCP-180	2051045.190	385811.560	186.989
GCP-181	2054332.436	408387.511	164.947
GCP-182	2037302.437	384334.604	222.238
GCP-183	2018929.670	395222.933	225.851
GCP-184	2010025.438	402776.729	235.661
GCP-185	2011119.654	403440.621	233.628
GCP-186	2003627.718	370338.855	203.914
GCP-187	2005652.177	371742.100	223.027
GCP-188	1999279.054	384358.837	231.878
GCP-189	1987538.877	406276.434	211.203
GCP-190	1985169.852	408902.552	213.481
GCP-191	1988981.860	404206.898	210.876
GCP-192	1942729.146	387438.650	203.573
GCP-193	1943108.433	385845.975	193.406
GCP-194	1940562.019	388476.286	175.148
GCP-195	1966767.579	390073.984	163.984
GCP-196	1966512.232	387530.742	165.528
GCP-197	1967711.547	391219.948	169.832
GCP-198	1976114.301	398927.645	171.945
GCP-199	1956058.438	372257.797	207.911
GCP-200	1971019.926	365218.695	215.298
GCP-201	1983253.492	367567.364	217.725

4. *GPS OBSERVATIONS*

POINT ID	OBSERV. DATE	JULIAN DATE	TIME OF DAY (AST)	RE-OBSERV. DATE	RE-OBSERV. TIME
GCP-01	11/13/2019	317	14:56	11/13/2019	16:00
GCP-02	11/11/2019	315	15:25	11/14/2019	17:59
GCP-03	11/11/2019	315	13:48	11/14/2019	11:16
GCP-04	11/13/2019	317	15:27	N/A	N/A
GCP-05	11/10/2019	314	16:16	11/14/2019	10:08
GCP-06	11/11/2019	315	11:40	11/14/2019	9:41
GCP-07	11/11/2019	315	9:14	11/14/2019	8:26
GCP-08	11/9/2019	313	9:34	N/A	N/A
GCP-09	11/9/2019	313	10:46	N/A	N/A
GCP-10	11/9/2019	313	12:09	N/A	N/A
GCP-11	11/8/2019	312	15:48	N/A	N/A
GCP-12	11/7/2019	311	12:37	11/18/2019	10:07
GCP-13	11/7/2019	311	9:27	11/18/2019	9:43
GCP-14	11/17/2019	321	9:58	N/A	N/A
GCP-15	11/6/2019	310	9:21	11/8/2019	8:53
GCP-16	11/6/2019	310	10:07	N/A	N/A
GCP-17	11/6/2019	310	16:52	11/7/2019	10:45
GCP-18	11/8/2019	312	9:53	N/A	N/A
GCP-19	11/7/2019	311	15:01	N/A	N/A
GCP-20	11/9/2019	313	13:54	N/A	N/A
GCP-21	11/10/2019	314	11:50	11/12/2019	10:16
GCP-22	11/10/2019	314	10:50	N/A	N/A
GCP-23	11/12/2019	316	16:52	N/A	N/A
GCP-24	11/13/2019	317	10:17	N/A	N/A
GCP-25	11/13/2019	317	13:42	11/14/2019	13:50
GCP-26	11/14/2019	318	12:41	11/14/2019	17:41
GCP-27	11/2/2019	306	11:43	11/4/2019	14:04
GCP-28	11/14/2019	318	14:56	N/A	N/A
GCP-29	11/14/2019	318	15:23	N/A	N/A
GCP-30	10/31/2019	304	17:51	N/A	N/A
GCP-31	10/31/2019	304	9:50	11/14/2019	16:26
GCP-32	11/10/2019	314	12:47	11/12/2019	11:06
GCP-33	11/4/2019	308	15:05	11/12/2019	14:12
GCP-34	11/8/2019	312	13:59	N/A	N/A
GCP-35	11/5/2019	309	15:07	11/8/2019	12:02
GCP-36	11/5/2019	309	16:42	11/6/2019	15:26

GCP-37	11/6/2019	310	13:08	N/A	N/A
GCP-38	11/5/2019	309	10:20	11/6/2019	14:04
GCP-39	11/3/2019	307	8:54	11/3/2019	16:05
GCP-40	11/4/2019	308	16:46	11/5/2019	13:00
GCP-41	11/2/2019	306	15:15	11/4/2019	12:48
GCP-42	11/1/2019	305	12:44	11/1/2019	17:42
GCP-43	11/1/2019	305	16:48	11/3/2019	14:21
GCP-44	10/30/2019	303	17:19	N/A	N/A
GCP-45	11/1/2019	305	15:31	N/A	N/A
GCP-46	11/3/2019	307	11:24	11/4/2019	11:19
GCP-47	11/3/2019	307	15:29	11/4/2019	8:47
GCP-48	10/31/2019	304	16:33	N/A	N/A
GCP-49	11/12/2019	316	12:52	N/A	N/A
GCP-101	11/12/2019	316	12:45	11/13/2019	11:35
GCP-102	11/12/2019	316	12:04	N/A	N/A
GCP-103	11/12/2019	316	13:33	N/A	N/A
GCP-104	11/12/2019	316	10:37	11/13/2019	12:48
GCP-105	11/12/2019	316	16:57	11/13/2019	10:16
GCP-106	11/12/2019	316	15:44	11/13/2019	13:45
GCP-107	11/12/2019	316	9:43	N/A	N/A
GCP-108	11/10/2019	315	9:38	N/A	N/A
GCP-109	11/7/2019	311	12:35	N/A	N/A
GCP-110	11/7/2019	311	14:00	N/A	N/A
GCP-111	11/10/2019	315	8:26	N/A	N/A
GCP-112	11/7/2019	311	11:35	11/8/2019	8:15
GCP-113	11/5/2019	309	16:45	N/A	N/A
GCP-114	11/13/2019	317	9:24	N/A	N/A
GCP-115	11/13/2019	317	9:53	N/A	N/A
GCP-116	11/12/2019	316	14:45	N/A	N/A
GCP-117	11/12/2019	316	16:27	N/A	N/A
GCP-118	11/13/2019	317	9:20	N/A	N/A
GCP-119	11/12/2019	316	13:35	N/A	N/A
GCP-120	11/12/2019	316	16:04	11/13/2019	14:05
GCP-121	11/13/2019	317	8:50	N/A	N/A
GCP-122	11/12/2019	316	12:05	11/13/2019	11:48
GCP-123	11/10/2019	314	10:34	N/A	N/A
GCP-124	1/8/2020	8	14:02	N/A	N/A
GCP-125	11/9/2019	313	13:15	N/A	N/A
GCP-126	11/10/2019	314	7:54	11/10/2019	12:01

GCP-127	11/6/2019	310	14:45	11/7/2019	9:05
GCP-128	11/6/2019	310	13:10	N/A	N/A
GCP-129	11/5/2019	309	15:55	N/A	N/A
GCP-130	11/4/2019	308	11:20	N/A	N/A
GCP-131	11/4/2019	308	14:47	N/A	N/A
GCP-132	11/12/2019	316	15:35	N/A	N/A
GCP-133	11/10/2019	314	10:50	N/A	N/A
GCP-134	11/9/2019	313	10:30	11/9/2019	14:32
GCP-135	11/12/2019	316	13:55	11/13/2019	12:12
GCP-136	11/2/2019	316	10:55	11/13/2019	13:40
GCP-137	11/10/2019	314	10:07	N/A	N/A
GCP-138	11/9/2019	313	11:48	N/A	N/A
GCP-139	11/9/2019	313	11:35	N/A	N/A
GCP-140	11/10/2019	314	9:25	N/A	N/A
GCP-141	11/8/2019	312	12:35	11/9/2019	8:38
GCP-142	11/9/2019	313	9:50	N/A	N/A
GCP-143	11/6/2019	310	11:40	11/7/2019	7:42
GCP-144	11/5/2019	309	11:25	N/A	N/A
GCP-145	11/6/2019	310	8:26	11/6/2019	12:37
GCP-146	11/5/2019	309	12:25	11/6/2019	8:20
GCP-147	11/4/2019	308	15:25	N/A	N/A
GCP-148	11/5/2019	309	13:56	N/A	N/A
GCP-149	11/9/2019	313	10:07	11/9/2019	14:14
GCP-150	11/8/2019	312	12:20	N/A	N/A
GCP-151	11/8/2019	312	9:25	11/9/2019	8:50
GCP-152	11/8/2019	312	11:48	N/A	N/A
GCP-153	11/6/2019	310	11:33	11/8/2019	8:28
GCP-154	11/6/2019	310	10:22	11/8/2019	10:32
GCP-155	11/5/2019	309	12:19	N/A	N/A
GCP-156	11/5/2019	309	12:48	N/A	N/A
GCP-157	11/5/2019	309	11:33	11/5/2019	15:40
GCP-158	11/5/2019	309	10:06	11/5/2019	14:43
GCP-159	11/4/2019	308	13:31	11/5/2019	8:56
GCP-160	11/4/2019	308	16:25	11/5/2019	10:25
GCP-161	11/4/2019	308	12:38	11/5/2019	8:17
GCP-162	11/4/2019	308	10:05	11/4/2019	16:08
GCP-163	11/3/2019	307	12:56	N/A	N/A
GCP-164	1/8/2020	8	12:06	N/A	N/A
GCP-165	1/8/2020	8	12:43	N/A	N/A

GCP-166	11/4/2019	308	11:55	11/5/2019	7:50
GCP-167	11/3/2019	307	14:15	11/4/2019	9:55
GCP-168	11/3/2019	307	14:30	11/4/2019	9:40
GCP-169	11/3/2019	307	12:00	11/4/2019	8:12
GCP-170	11/4/2019	308	9:44	N/A	N/A
GCP-171	11/3/2019	307	13:12	11/4/2019	8:50
GCP-172	11/3/2019	307	11:38	11/4/2019	7:55
GCP-173	11/2/2019	306	14:05	11/3/2019	9:15
GCP-174	11/2/2019	306	13:20	11/3/2019	9:02
GCP-175	11/2/2019	306	13:13	11/3/2019	9:47
GCP-176	11/2/2019	306	12:59	N/A	N/A
GCP-177	1/9/2020	9	14:35	N/A	N/A
GCP-178	11/2/2019	306	15:38	N/A	N/A
GCP-179	11/2/2019	306	16:54	11/3/2019	16:23
GCP-180	11/2/2019	306	14:46	11/3/2019	15:27
GCP-181	11/3/2019	307	11:56	N/A	N/A
GCP-182	11/2/2019	306	15:55	11/3/2019	15:54
GCP-183	11/1/2019	305	17:05	11/3/2019	7:16
GCP-184	11/1/2019	305	15:55	N/A	N/A
GCP-185	11/1/2019	305	15:37	N/A	N/A
GCP-186	10/31/2019	304	11:13	11/1/2019	8:56
GCP-187	10/31/2019	304	10:32	11/1/2019	9:17
GCP-188	11/1/2019	305	10:30	N/A	N/A
GCP-189	11/1/2019	305	12:40	11/2/2019	9:03
GCP-190	11/1/2019	305	13:25	11/2/2019	9:22
GCP-191	10/31/2019	304	16:02	N/A	N/A
GCP-192	10/30/2019	303	10:24	N/A	N/A
GCP-193	10/30/2019	303	11:06	N/A	N/A
GCP-194	10/30/2019	303	8:00	N/A	N/A
GCP-195	11/1/2019	305	10:18	11/2/2019	9:10
GCP-196	11/1/2019	305	10:45	11/2/2019	8:58
GCP-197	11/1/2019	305	9:59	11/2/2019	9:28
GCP-198	1/10/2020	10	11:08	N/A	N/A
GCP-199	1/10/2020	10	13:08	N/A	N/A
GCP-200	11/1/2019	305	12:25	11/1/2019	17:22
GCP-201	11/1/2019	305	16:15	11/2/2019	10:50

5. *POINT COMPARISON*

Point ID	Point CK	Delta North (M)	Delta East (M)	Vertical Difference (M)
GCP-01	GCP-01 CK	-0.008	0.003	-0.006
GCP-02	GCP-02 CK	0.004	0.006	-0.006
GCP-03	GCP-03 CK	-0.017	0.001	0.000
GCP-05	GCP-05 CK	-0.008	-0.029	0.002
GCP-06	GCP-06 CK	-0.002	0.006	-0.027
GCP-07	GCP-07 CK	0.000	-0.010	-0.007
GCP-12	GCP-12 CK	-0.020	0.013	-0.001
GCP-13	GCP-13 CK	0.004	0.004	0.008
GCP-15	GCP-15 CK	0.009	-0.014	0.001
GCP-17	GCP-17 CK	0.004	-0.008	-0.025
GCP-21	GCP-21 CK	0.008	0.004	-0.028
GCP-25	GCP-25 CK	-0.011	0.002	0.018
GCP-26	GCP-26 CK	0.020	0.010	-0.002
GCP-27	GCP-27 CK	-0.015	-0.011	-0.024
GCP-31	GCP-31 CK	0.003	-0.010	0.003
GCP-32	GCP-32 CK	0.007	0.007	0.006
GCP-33	GCP-33 CK	0.008	0.007	-0.013
GCP-35	GCP-35 CK	0.012	-0.009	-0.025
GCP-36	GCP-36 CK	0.009	0.023	-0.015
GCP-38	GCP-38 CK	-0.046	-0.010	-0.004
GCP-39	GCP-39 CK	0.011	0.017	-0.025
GCP-40	GCP-40 CK	-0.019	0.001	0.002
GCP-41	GCP-41 CK	0.012	0.003	-0.021
GCP-42	GCP-42 CK	0.010	-0.005	-0.032
GCP-43	GCP-43 CK	-0.033	-0.014	0.039
GCP-46	GCP-46 CK	-0.015	-0.005	0.003
GCP-47	GCP-47 CK	0.004	0.007	0.009
GCP-101	GCP-101 CK	-0.007	-0.003	-0.002
GCP-104	GCP-104 CK	0.003	0.012	-0.020
GCP-105	GCP-105 CK	-0.002	0.008	0.032
GCP-106	GCP-106 CK	0.004	0.002	-0.009
GCP-112	GCP-112 CK	0.003	0.008	-0.038
GCP-120	GCP-120 CK	0.005	-0.002	-0.013
GCP-122	GCP-122 CK	0.003	0.003	-0.034
GCP-126	GCP-126 CK	0.000	0.003	0.011
GCP-127	GCP-127 CK	-0.014	-0.009	0.030
GCP-134	GCP-134 CK	-0.002	0.004	-0.007
GCP-135	GCP-135 CK	-0.004	-0.002	0.010
GCP-136	GCP-136 CK	-0.011	-0.008	0.017

GCP-141	GCP-141 CK	0.009	0.009	-0.012
GCP-143	GCP-143 CK	-0.013	-0.011	0.000
GCP-145	GCP-145 CK	-0.006	-0.001	0.002
GCP-146	GCP-146 CK	0.009	-0.005	0.008
GCP-149	GCP-149 CK	0.001	0.001	0.018
GCP-151	GCP-151 CK	0.008	-0.007	0.027
GCP-153	GCP-153 CK	0.009	-0.009	-0.032
GCP-154	GCP-154 CK	0.014	0.001	0.000
GCP-157	GCP-157 CK	0.000	0.009	-0.010
GCP-158	GCP-158 CK	0.006	0.004	0.010
GCP-159	GCP-159 CK	-0.004	0.005	-0.011
GCP-160	GCP-160 CK	0.004	-0.002	0.007
GCP-161	GCP-161 CK	0.004	0.003	-0.009
GCP-162	GCP-162 CK	-0.008	-0.006	-0.003
GCP-166	GCP-166 CK	-0.002	0.000	0.015
GCP-167	GCP-167 CK	-0.013	0.004	0.007
GCP-168	GCP-168 CK	0.010	0.004	-0.027
GCP-169	GCP-169 CK	0.008	0.005	0.016
GCP-171	GCP-171 CK	0.013	-0.002	0.008
GCP-172	GCP-172 CK	-0.005	-0.015	0.004
GCP-173	GCP-173 CK	0.015	0.001	-0.010
GCP-174	GCP-174 CK	0.009	0.007	0.001
GCP-175	GCP-175 CK	-0.006	0.011	-0.031
GCP-179	GCP-179 CK	0.004	0.001	-0.007
GCP-180	GCP-180 CK	-0.007	-0.001	0.022
GCP-182	GCP-182 CK	-0.010	0.008	-0.037
GCP-183	GCP-183 CK	0.007	0.003	-0.007
GCP-186	GCP-186 CK	-0.004	0.005	-0.006
GCP-187	GCP-187 CK	0.004	0.000	0.006
GCP-189	GCP-189 CK	-0.008	0.018	-0.009
GCP-190	GCP-190 CK	-0.017	-0.004	-0.015
GCP-195	GCP-195 CK	0.020	0.004	-0.022
GCP-196	GCP-196 CK	-0.022	0.007	-0.012
GCP-197	GCP-197 CK	-0.005	0.019	-0.025
GCP-200	GCP-200 CK	-0.002	-0.004	0.011
GCP-201	GCP-201 CK	-0.010	-0.010	0.001