

**Control Point Survey Report**  
**“WESTERN TENNESSEE LiDAR QA”**  
**USACE CONTRACT NUMBER: W912P9-10-D-0534**  
**TASK ORDER NUMBER: 0001**  
**JANUARY, 2011**

**Prepared for:**  
*United States Army Corps of Engineers*  
*St. Louis District*



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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

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## 1.1 *Project Summary*

Dewberry & Davis, LLC is under contract to United States Army Corps of Engineers, USACE to provide 189 QA/QC Check Points for all or parts of Obion, Dyer, Gibson, Crockett, Lauderdale, Carroll, Haywood, Madison & Chester counties in Tennessee. These points will be used as an independent verification of the LiDAR to meet the minimum requirements of the NSSDA and as part of the FEMA requirement to verify LiDAR data.

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 one hundred eight (108) points were re-observed and are shown in Section 5 of this report.

Final horizontal coordinates are referenced to UTM, Zone 16, NAD83 (NSRS 2007), Meters. Final Vertical elevations are referenced to NAVD 88 Meters, orthometric heights, using Geoid 09.

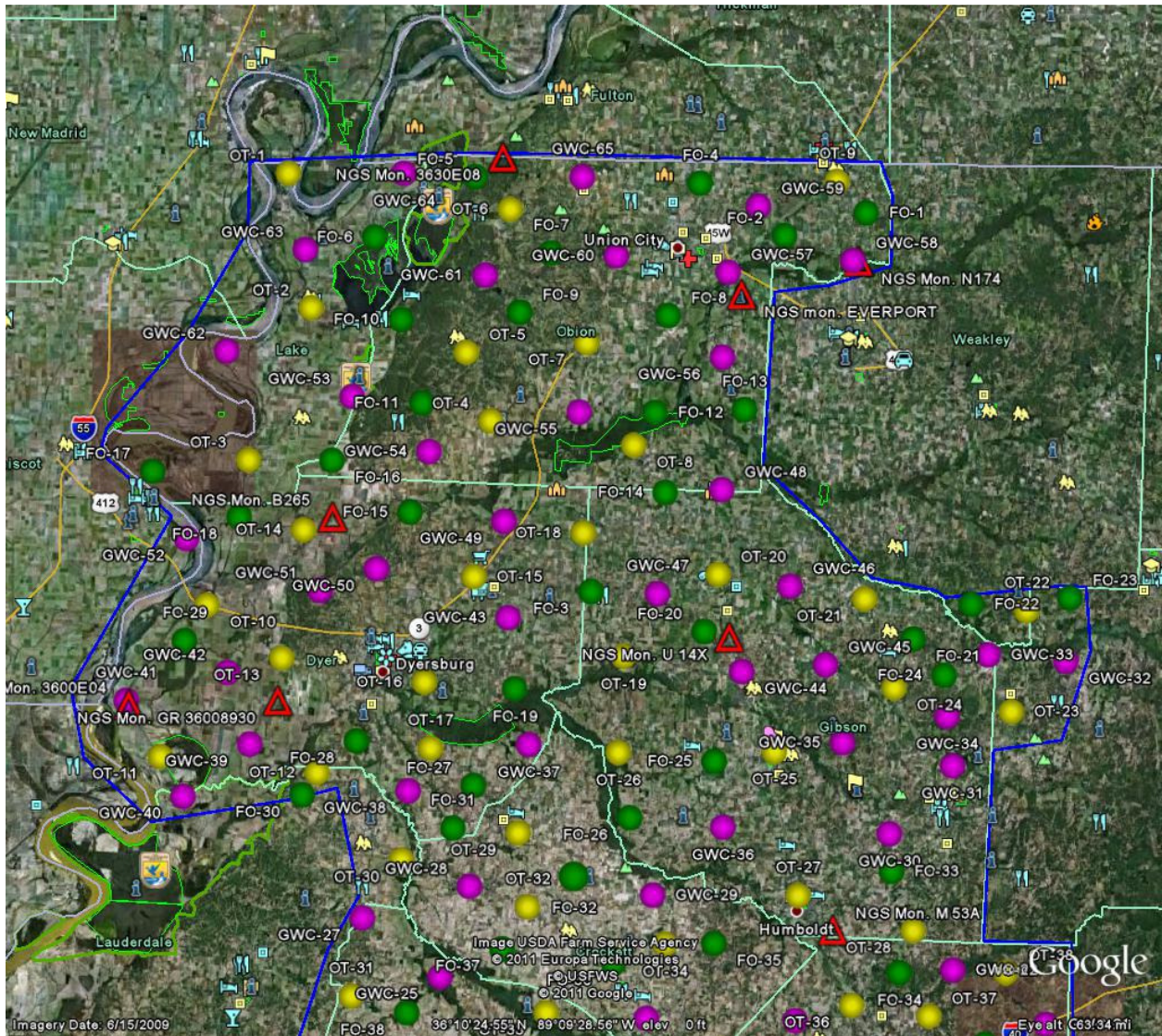
## 1.2 *Points of Contact*

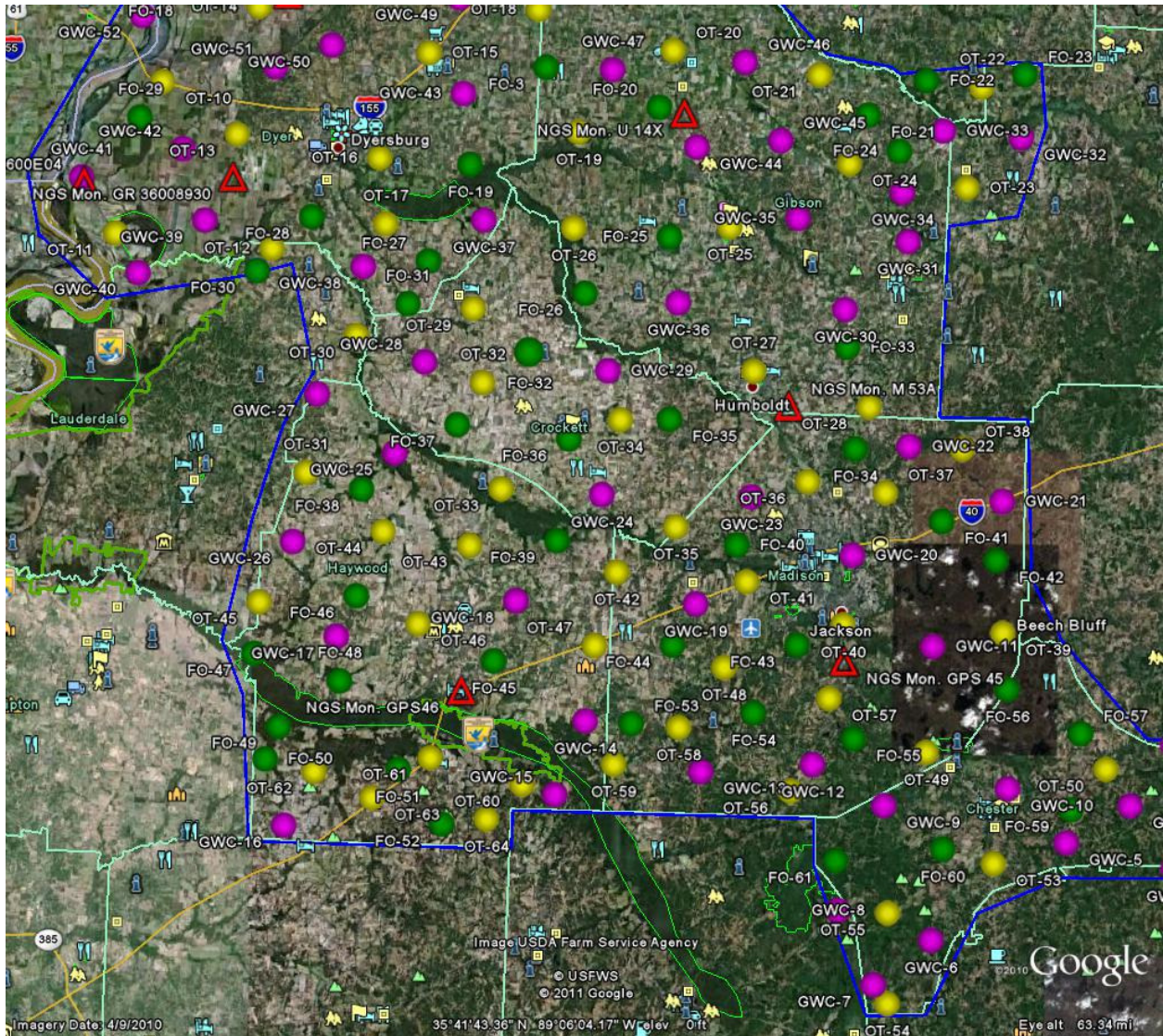
Questions regarding the technical aspects of this report should be addressed to:

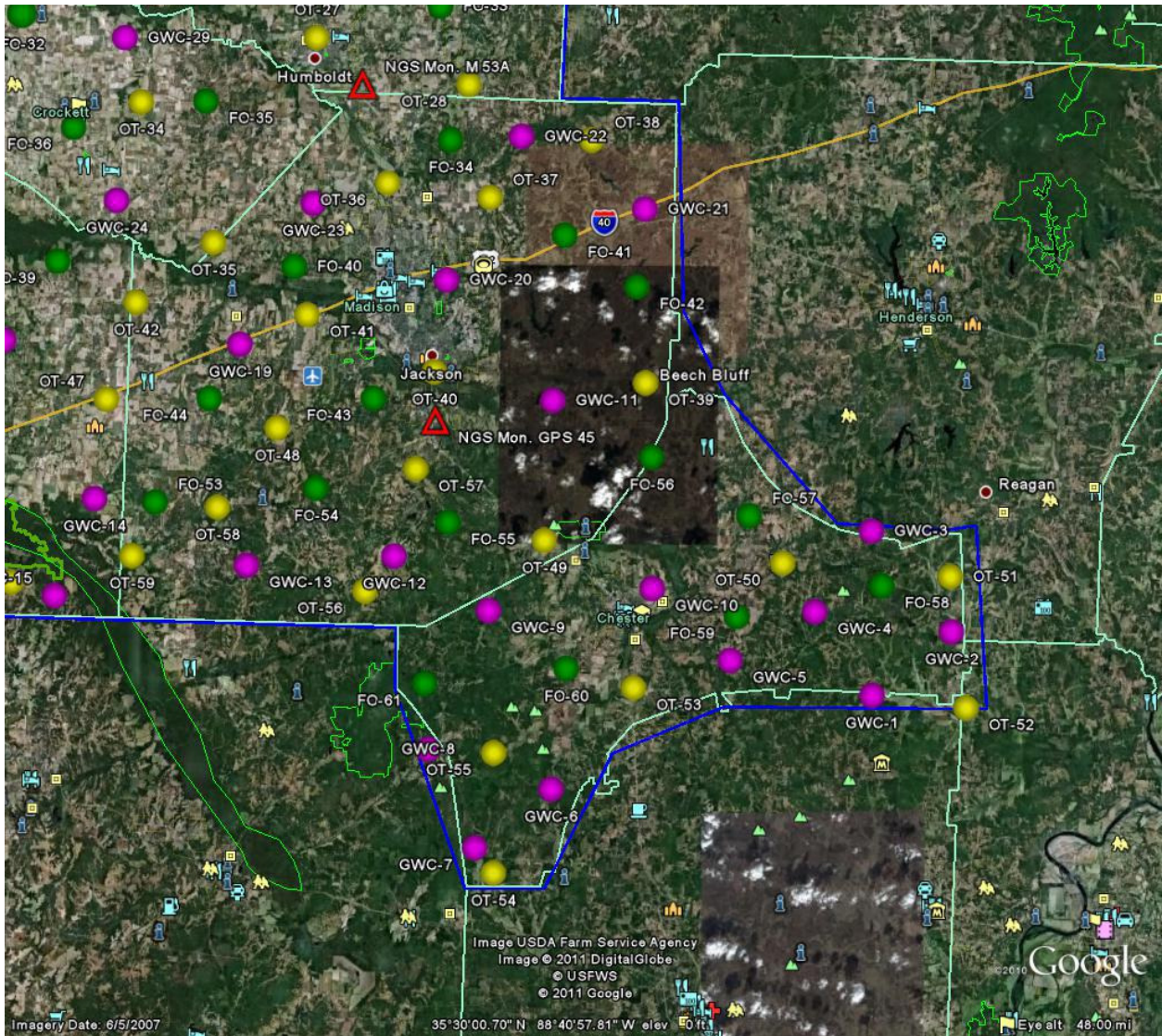
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### 1.3 Project Area(s)







## PROJECT DETAILS

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### 2.1 *Survey Equipment*

In performing the GPS observations, Trimble R-8 GNSS receiver/antenna attached to a two meter fixed height pole with a Trimble TSC2 Data Collector to collect raw data were used to perform the field surveys.

### 2.2 *Survey Point Detail*

The 189 Check Points were well distributed throughout the project area so as to cover as many flight lines as possible using the “dispersed method” of placement.

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 & Davis, LLC office located in Lanham, Maryland was tied to a Real Time Network (RTN) managed by Earl Dudley, Inc. The network is a series of 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 & Davis, LLC used Trimble R-8 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 57% 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 three (3) minutes in duration.

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.

Five (5) existing NGS monuments 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 FE2747, DG5302, GD1912, DF7947 AND DH3700. The results are as follows:

NGS Name	As Surveyed (UTM16)			Published (UTM 16)			Differences (ft)		
	Northing(ft)	Easting(ft)	Elev.(ft)	Northing(ft)	Easting(ft)	Elev.(ft)	$\Delta$ N	$\Delta$ E	$\Delta$ Elev.
GPS 45	12919065.740	1102146.720	395.154	12919065.76	1102146.88	395.1	-0.02	-0.16	+0.05
U 14X	13101878.015	1051137.146	355.700	13101878.01	1051137.06	355.8	+0.01	+0.09	-0.10
EVERPORT	13215622.160	1056677.821	312.479	13215622.23	1056677.73	312.4	-0.07	+0.09	+0.08
GR 36008930	13082612.410	900112.134	262.690	13082612.51	900112.25	262.8	-0.10	-0.12	-0.11
3600E04	13081770.200	850146.544	278.102	13081770.29	850146.64	278.2	-0.09	-0.10	-0.10

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 TGO or Trimble Geomatics Office.

Downloaded data is run through the TGO 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

<b>WESTERN TENNESSEE LiDAR - FINAL COORDINATES</b>			
	<b>UTM ZONE 16 (NAD83)</b>		<b>NAVD 88</b>
<b>OPEN TERRAIN</b>			
<b>POINT ID</b>	<b>NORTHING (M)</b>	<b>EASTING (M)</b>	<b>HEIGHT (M)</b>
OT-1	4041087.152	276103.327	91.184
OT-2	4027402.153	278235.146	87.051
OT-3	4012062.526	271709.627	83.284
OT-4	4015724.769	296442.309	97.536
OT-5	4022695.385	294023.454	144.070
OT-6	4037120.111	298667.747	94.884
OT-7	4023517.058	306282.181	106.165
OT-8	4013076.155	310948.606	91.202
OT-9	4039547.564	331994.844	128.507
OT-10	3997234.531	267044.128	89.435
OT-11	3982131.429	262323.159	79.230
OT-12	3980343.005	278271.117	115.708
OT-13	3991973.651	274844.397	83.332
OT-14	4004929.737	277217.184	82.336
OT-15	3999997.661	294580.307	103.440
OT-16	3989345.130	289214.338	85.817
OT-17	3982839.472	289714.086	95.497
OT-18	4004264.196	305686.916	106.235
OT-19	3991714.105	309624.227	94.226
OT-20	3999819.369	319372.514	110.118
OT-21	3997230.156	334246.500	108.271
OT-22	3995783.499	350797.656	137.611
OT-23	3985583.517	349059.702	114.038
OT-24	3988172.530	337143.880	121.411
OT-25	3981889.789	324883.081	114.191
OT-26	3981988.941	308979.954	90.349
OT-27	3967266.618	327135.948	110.173
OT-28	3963506.565	338849.133	140.239
OT-29	3973971.231	298681.561	102.855
OT-30	3971365.692	286780.324	83.869
OT-31	3957570.151	281509.305	104.123
OT-32	3966481.237	299573.385	107.232

OT-33	3955671.517	301326.018	89.258
OT-34	3962515.328	313526.788	103.763
OT-35	3951621.470	319015.662	104.147
OT-36	3956116.366	332726.992	117.488
OT-37	3954834.903	340344.805	128.708
OT-38	3959090.838	348247.123	142.887
OT-39	3940422.841	352163.167	118.802
OT-40	3941476.180	335947.629	108.585
OT-41	3946009.063	326257.625	105.351
OT-42	3947110.580	312939.152	132.728
OT-43	3950011.861	298026.269	103.257
OT-44	3951729.856	289114.835	92.169
OT-45	3944494.301	276559.234	96.896
OT-46	3942150.431	292750.500	113.608
OT-47	3939818.156	310647.008	122.954
OT-48	3937334.544	323739.578	152.751
OT-49	3928497.646	344070.899	116.614
OT-50	3926553.328	362553.650	159.389
OT-51	3925262.681	375501.676	171.200
OT-52	3915491.168	375644.553	128.775
OT-53	3917103.157	350962.571	143.144
OT-54	3902698.799	339800.081	131.704
OT-55	3912235.144	340162.146	153.656
OT-56	3924704.365	330351.111	142.382
OT-57	3934013.677	334472.074	135.703
OT-58	3931271.649	319078.297	125.355
OT-59	3927656.877	312407.770	101.243
OT-60	3925733.624	303041.794	118.101
OT-61	3928575.433	293765.812	94.153
OT-62	3927278.590	281932.972	103.772
OT-63	3924490.853	287735.715	101.822
OT-64	3922436.358	299253.551	104.123
<b>GRASS, WEEDS, CROPS</b>			
GWC-1	3916200.698	369265.950	125.572
GWC-2	3921069.587	375551.881	127.023
GWC-3	3928222.313	369155.847	193.036
GWC-4	3922495.391	365378.918	171.420
GWC-5	3918967.293	358457.162	130.144

GWC-6	3909359.183	344465.959	195.542
GWC-7	3904903.596	338661.380	169.835
GWC-8	3912708.043	334606.419	127.885
GWC-9	3923050.005	339435.166	142.491
GWC-10	3924474.758	352455.623	129.632
GWC-11	3939078.272	345081.098	115.721
GWC-12	3927419.615	332790.714	149.300
GWC-13	3926863.962	321068.680	146.173
GWC-14	3932104.849	309570.668	102.440
GWC-15	3924454.145	306517.827	132.445
GWC-16	3921870.024	278756.980	104.473
GWC-17	3940910.215	284565.916	108.652
GWC-18	3944235.277	302542.193	115.483
GWC-19	3944066.255	320990.491	128.419
GWC-20	3948520.511	336948.377	148.255
GWC-21	3953796.500	352076.727	169.628
GWC-22	3959437.474	342858.482	116.522
GWC-23	3954482.061	326687.620	130.385
GWC-24	3954842.270	311510.781	107.037
GWC-25	3959490.989	290491.541	86.798
GWC-26	3950430.503	280092.403	95.564
GWC-27	3965493.239	282684.500	121.567
GWC-28	3968614.001	293676.780	114.358
GWC-29	3967520.408	312219.252	99.368
GWC-30	3973410.322	336500.141	109.326
GWC-31	3980306.498	343088.755	114.636
GWC-32	3990613.399	354680.042	113.410
GWC-33	3991404.830	346786.068	116.635
GWC-34	3985238.566	342517.965	145.948
GWC-35	3982781.282	331802.624	115.163
GWC-36	3974315.347	319582.850	99.783
GWC-37	3983260.639	299977.351	83.680
GWC-38	3978345.827	287604.356	91.897
GWC-39	3984207.127	271267.474	79.047
GWC-40	3978071.208	264390.252	79.202
GWC-41	3987804.719	258943.203	79.431
GWC-42	3990629.258	269390.781	79.782
GWC-43	3995869.951	297725.080	93.857
GWC-44	3990049.283	321786.350	109.804

<b>GWC-45</b>	<b>3990518.670</b>	<b>330329.517</b>	<b>107.354</b>
<b>GWC-46</b>	<b>3998758.079</b>	<b>326631.438</b>	<b>122.883</b>
<b>GWC-47</b>	<b>3998073.553</b>	<b>313087.651</b>	<b>102.319</b>
<b>GWC-48</b>	<b>4008496.857</b>	<b>319839.844</b>	<b>89.913</b>
<b>GWC-49</b>	<b>4005565.536</b>	<b>297363.308</b>	<b>94.004</b>
<b>GWC-50</b>	<b>4000906.001</b>	<b>284372.245</b>	<b>141.019</b>
<b>GWC-51</b>	<b>3998797.164</b>	<b>278870.793</b>	<b>145.722</b>
<b>GWC-52</b>	<b>4004183.649</b>	<b>265228.276</b>	<b>81.217</b>
<b>GWC-53</b>	<b>4018351.687</b>	<b>282349.932</b>	<b>85.445</b>
<b>GWC-54</b>	<b>4012667.963</b>	<b>290103.633</b>	<b>97.597</b>
<b>GWC-55</b>	<b>4016504.284</b>	<b>305423.585</b>	<b>87.828</b>
<b>GWC-56</b>	<b>4021877.712</b>	<b>320101.890</b>	<b>112.849</b>
<b>GWC-57</b>	<b>4030481.328</b>	<b>320778.459</b>	<b>92.074</b>
<b>GWC-58</b>	<b>4031570.621</b>	<b>333509.706</b>	<b>104.696</b>
<b>GWC-59</b>	<b>4037141.096</b>	<b>323924.275</b>	<b>100.913</b>
<b>GWC-60</b>	<b>4032248.108</b>	<b>309404.611</b>	<b>110.859</b>
<b>GWC-61</b>	<b>4030497.281</b>	<b>296073.266</b>	<b>135.085</b>
<b>GWC-62</b>	<b>4023129.303</b>	<b>269584.112</b>	<b>84.991</b>
<b>GWC-63</b>	<b>4033284.899</b>	<b>277782.855</b>	<b>90.239</b>
<b>GWC-64</b>	<b>4040911.974</b>	<b>287871.856</b>	<b>88.353</b>
<b>GWC-65</b>	<b>4040290.702</b>	<b>306081.415</b>	<b>116.897</b>
<b>FOREST</b>			
<b>FO-1</b>	<b>4036329.644</b>	<b>334884.644</b>	<b>111.136</b>
<b>FO-2</b>	<b>4034153.343</b>	<b>326561.941</b>	<b>108.826</b>
<b>FO-3</b>	<b>3998347.748</b>	<b>306346.074</b>	<b>105.613</b>
<b>FO-5</b>	<b>4040446.348</b>	<b>295122.247</b>	<b>89.886</b>
<b>FO-6</b>	<b>4034500.267</b>	<b>284824.940</b>	<b>86.448</b>
<b>FO-7</b>	<b>4032602.856</b>	<b>302763.108</b>	<b>115.980</b>
<b>FO-8</b>	<b>4026177.744</b>	<b>314587.659</b>	<b>121.134</b>
<b>FO-9</b>	<b>4026663.188</b>	<b>299533.419</b>	<b>140.035</b>
<b>FO-10</b>	<b>4026079.105</b>	<b>287368.616</b>	<b>95.098</b>
<b>FO-11</b>	<b>4017596.839</b>	<b>289466.004</b>	<b>135.612</b>
<b>FO-12</b>	<b>4016347.488</b>	<b>313172.668</b>	<b>88.097</b>
<b>FO-13</b>	<b>4016600.984</b>	<b>322125.842</b>	<b>87.347</b>
<b>FO-14</b>	<b>4008242.975</b>	<b>314091.271</b>	<b>95.220</b>
<b>FO-15</b>	<b>4006430.085</b>	<b>287984.766</b>	<b>86.722</b>
<b>FO-16</b>	<b>4011931.120</b>	<b>280215.409</b>	<b>83.387</b>
<b>FO-17</b>	<b>4011071.948</b>	<b>261873.890</b>	<b>83.003</b>

FO-18	4006270.677	270748.424	80.909
FO-19	3988473.187	298593.002	99.709
FO-20	3994129.590	317856.871	102.258
FO-21	3993114.914	339197.921	135.152
FO-22	3996531.727	345213.569	126.602
FO-23	3997061.354	355215.034	135.173
FO-24	3989400.789	342362.762	128.601
FO-25	3980970.707	318775.175	104.303
FO-26	3975341.158	310081.398	90.005
FO-27	3978904.353	294098.422	89.179
FO-28	3983576.367	282393.769	81.485
FO-29	3993858.099	264865.767	78.023
FO-30	3977799.758	276769.932	107.570
FO-31	3974517.318	292068.927	86.265
FO-32	3969485.916	304337.170	113.779
FO-33	3969585.819	336677.136	119.226
FO-34	3959102.751	337467.082	120.914
FO-35	3962484.342	318542.092	110.935
FO-36	3960642.722	308276.706	118.476
FO-37	3962216.370	296940.927	91.465
FO-38	3955783.608	287113.361	88.828
FO-39	3951022.257	309707.389	93.333
FO-40	3949782.601	325277.250	131.973
FO-41	3951863.595	346089.114	164.745
FO-42	3947804.949	349615.887	149.864
FO-43	3939514.683	331427.808	115.849
FO-44	3939605.365	318451.157	124.977
FO-45	3938291.792	300343.753	106.695
FO-46	3945015.639	286502.858	112.630
FO-47	3939416.009	275900.636	81.528
FO-48	3936400.327	284642.370	90.636
FO-49	3931891.762	278380.120	83.698
FO-50	3928605.548	276955.662	87.289
FO-51	3927619.005	290759.198	92.873
FO-52	3921770.567	294821.190	119.375
FO-53	3931777.736	314343.491	121.637
FO-54	3932656.475	326711.635	137.782
FO-55	3929930.747	336714.611	147.770
FO-56	3934731.143	352735.545	145.615

<b>FO-57</b>	<b>3929962.154</b>	<b>360127.548</b>	<b>136.395</b>
<b>FO-58</b>	<b>3924818.370</b>	<b>370028.519</b>	<b>166.461</b>
<b>FO-59</b>	<b>3922455.886</b>	<b>359008.124</b>	<b>152.824</b>
<b>FO-60</b>	<b>3918376.106</b>	<b>346279.087</b>	<b>144.856</b>
<b>FO-61</b>	<b>3917590.688</b>	<b>334903.718</b>	<b>141.062</b>

#### 4. GPS OBSERVATION & RE-OBSERVATION SCHEDULE

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POINT ID	Observ. Date	Julian Date	Time of Day	Re-Observ. Date	Re-Observ. Time
OT-1	2/2/2011	33	10:30	2/6/2011	17:04
OT-2	2/2/2011	33	12:15	2/6/2011	17:48
OT-3	2/2/2011	33	14:40	2/6/2011	16:30
OT-4	2/3/2011	34	14:00	2/6/2011	12:10
OT-5	2/4/2011	35	14:27	2/6/2011	17:29
OT-6	2/6/2011	37	7:29	2/8/2011	10:50
OT-7	2/2/2011	33	9:00	2/3/2011	17:09
OT-8	2/2/2011	33	8:20	N/A	N/A
OT-9	2/5/2011	36	14:53	2/6/2011	9:20
OT-10	2/4/2011	35	17:24	2/5/2011	17:23
OT-11	2/4/2011	35	13:24	2/5/2011	16:32
OT-12	2/4/2011	35	11:27	2/5/2011	14:53
OT-13	2/4/2011	35	16:13	2/5/2011	17:04
OT-14	2/2/2011	33	15:50	2/6/2011	13:33
OT-15	2/2/2011	33	14:20	2/6/2011	9:50
OT-16	2/4/2011	35	6:40	2/5/2011	10:30
OT-17	2/4/2011	35	9:07	2/5/2011	10:03
OT-18	2/2/2011	33	12:51	N/A	N/A
OT-19	2/5/2011	36	13:15	2/6/2011	9:20
OT-20	2/2/2011	33	14:20	2/5/2011	17:45
OT-21	2/4/2011	35	17:15	N/A	N/A
OT-22	2/4/2011	35	9:45	2/4/2011	9:40
OT-23	2/4/2011	35	8:10	2/4/2011	9:05
OT-24	2/4/2011	35	16:20	2/4/2011	10:25
OT-25	2/5/2011	36	11:20	2/5/2011	10:40
OT-26	2/5/2011	36	12:50	2/5/2011	9:00
OT-27	2/3/2011	34	10:20	2/5/2011	7:45
OT-28	2/3/2011	34	8:45	N/A	N/A
OT-29	2/3/2011	34	14:25	2/5/2011	11:31
OT-30	2/3/2011	34	13:02	2/5/2011	14:08
OT-31	2/3/2011	34	8:16	2/5/2011	13:22
OT-32	2/3/2011	34	13:33	2/5/2011	12:10
OT-33	2/3/2011	34	14:30	2/5/2011	12:38



OT-34	2/3/2011	34	12:30	N/A	N/A
OT-35	2/3/2011	34	11:00	N/A	N/A
OT-36	2/2/2011	33	8:36	N/A	N/A
OT-37	2/2/2011	33	9:39	2/5/2011	12:15
OT-38	2/2/2011	33	10:40	N/A	N/A
OT-39	2/2/2011	33	14:09	2/5/2011	9:15
OT-40	2/2/2011	33	15:28	2/2/2011	16:50
OT-41	2/4/2011	35	10:10	2/4/2011	10:41
OT-42	2/3/2011	34	13:17	2/5/2011	8:15
OT-43	2/3/2011	34	9:30	2/5/2011	8:51
OT-44	2/2/2011	33	17:50	N/A	N/A
OT-45	2/2/2011	33	15:55	2/5/2011	9:20
OT-46	2/3/2011	34	8:50	2/5/2011	9:45
OT-47	2/3/2011	34	13:44	2/5/2011	10:21
OT-48	2/4/2011	35	9:06	2/5/2011	10:55
OT-49	2/2/2011	33	8:20	2/4/2011	11:20
OT-50	2/3/2011	34	17:15	2/4/2011	11:52
OT-51	2/3/2011	34	16:34	N/A	N/A
OT-52	2/3/2011	34	15:33	2/5/2011	11:45
OT-53	2/3/2011	34	13:21	2/5/2011	12:20
OT-54	2/3/2011	34	11:49	N/A	N/A
OT-55	2/3/2011	34	10:45	N/A	N/A
OT-56	2/2/2011	33	17:31	2/5/2011	13:20
OT-57	2/2/2011	33	16:23	2/5/2011	13:45
OT-58	2/4/2011	35	7:56	2/5/2011	11:20
OT-59	2/3/2011	34	15:21	N/A	N/A
OT-60	2/2/2011	33	9:46	N/A	N/A
OT-61	2/2/2011	33	8:20	2/6/2011	11:45
OT-62	2/2/2011	33	12:44	2/6/2011	8:15
OT-63	2/2/2011	33	11:54	N/A	N/A
OT-64	2/2/2011	33	10:46	2/6/2011	9:20
<b>POINT ID</b>	<b>Observ. Date</b>	<b>Julian Date</b>	<b>Time of Day</b>	<b>Re-Observ. Date</b>	<b>Re-Observ. Time</b>
GWC-1	2/3/2011	34	15:00	2/5/2011	17:55
GWC-2	2/3/2011	34	16:06	N/A	N/A
GWC-3	2/4/2011	35	8:21	N/A	N/A
GWC-4	2/3/2011	34	14:44	N/A	N/A
GWC-5	2/3/2011	34	14:19	2/5/2011	14:15

GWC-6	2/3/2011	34	12:23	2/5/2011	14:50
GWC-7	2/3/2011	34	11:20	N/A	N/A
GWC-8	2/3/2011	34	10:16	2/5/2011	15:20
GWC-9	2/2/2011	33	8:50	2/5/2011	15:45
GWC-10	2/3/2011	34	13:41	N/A	N/A
GWC-11	2/2/2011	33	14:20	N/A	N/A
GWC-12	2/2/2011	33	17:08	N/A	N/A
GWC-13	2/4/2011	35	7:28	2/5/2011	16:21
GWC-14	2/3/2011	34	14:51	2/5/2011	7:01
GWC-15	2/2/2011	33	10:15	2/5/2011	7:35
GWC-16	2/2/2011	33	12:16	N/A	N/A
GWC-17	2/3/2011	34	8:20	2/5/2011	16:45
GWC-18	2/3/2011	34	11:46	N/A	N/A
GWC-19	2/3/2011	34	17:36	N/A	N/A
GWC-20	2/2/2011	33	7:49	2/3/2011	11:20
GWC-21	2/2/2011	33	11:19	2/6/2011	6:52
GWC-22	2/2/2011	33	10:15	2/6/2011	7:20
GWC-23	2/2/2011	33	8:18	2/6/2011	8:20
GWC-24	2/3/2011	34	11:20	N/A	N/A
GWC-25	2/3/2011	34	10:20	2/5/2011	13:01
GWC-26	2/2/2011	33	16:26	2/6/2011	8:45
GWC-27	2/3/2011	34	13:44	2/5/2011	13:52
GWC-28	2/3/2011	34	13:18	2/5/2011	11:52
GWC-29	2/3/2011	34	13:45	2/6/2011	8:10
GWC-30	2/3/2011	34	7:30	2/6/2011	7:25
GWC-31	2/4/2011	35	7:40	2/5/2011	8:05
GWC-32	2/4/2011	35	8:40	2/5/2011	9:25
GWC-33	2/4/2011	35	10:10	2/5/2011	10:00
GWC-34	2/5/2011	36	8:35	N/A	N/A
GWC-35	2/4/2011	35	15:30	N/A	N/A
GWC-36	2/3/2011	34	16:08	2/6/2011	8:30
GWC-37	2/4/2011	35	8:40	N/A	N/A
GWC-38	2/3/2011	34	15:25	2/5/2011	14:32
GWC-39	2/4/2011	35	12:18	N/A	N/A
GWC-40	2/4/2011	35	13:20	2/5/2011	15:20
GWC-41	2/4/2011	35	14:19	2/5/2011	16:28
GWC-42	2/4/2011	35	15:56	2/5/2011	16:45
GWC-43	2/2/2011	33	14:42	N/A	N/A
GWC-44	2/4/2011	35	14:15	2/5/2011	16:05

GWC-45	2/4/2011	35	14:45	2/5/2011	16:40
GWC-46	2/4/2011	35	13:15	2/5/2011	17:30
GWC-47	2/5/2011	36	14:30	2/6/2011	9:40
GWC-48	2/2/2011	33	12:20	N/A	N/A
GWC-49	2/2/2011	33	12:30	N/A	N/A
GWC-50	2/5/2011	36	6:50	N/A	N/A
GWC-51	2/5/2011	36	7:15	2/6/2011	9:03
GWC-52	2/2/2011	33	16:52	N/A	N/A
GWC-53	2/2/2011	33	13:54	2/6/2011	16:32
GWC-54	2/4/2011	35	14:28	2/6/2011	12:59
GWC-55	2/5/2011	36	7:00	2/6/2011	11:49
GWC-56	2/5/2011	36	7:56	N/A	N/A
GWC-57	2/5/2011	36	10:19	2/6/2011	11:15
GWC-58	2/5/2011	36	11:52	2/6/2011	12:42
GWC-59	2/5/2011	36	15:29	2/6/2011	14:08
GWC-60	2/6/2011	37	10:28	N/A	N/A
GWC-61	2/6/2011	37	8:09	2/8/2011	10:00
GWC-62	2/2/2011	33	13:07	N/A	N/A
GWC-63	2/2/2011	33	11:23	2/6/2011	16:29
GWC-64	2/4/2011	35	10:15	N/A	N/A
GWC-65	2/5/2011	36	17:05	2/6/2011	15:02
<b>POINT ID</b>	<b>Observ. Date</b>	<b>Julian Date</b>	<b>Time of Day</b>	<b>Re-Observ. Date</b>	<b>Re-Observ. Time</b>
FO-1	2/5/2011	36	14:01	2/6/2011	14:30
FO-2	2/5/2011	36	13:03	N/A	N/A
FO-3	2/5/2011	36	13:45	N/A	N/A
FO-5	2/4/2011	35	9:26	N/A	N/A
FO-6	2/4/2011	35	11:02	N/A	N/A
FO-7	2/4/2011	35	9:45	N/A	N/A
FO-8	2/5/2011	36	8:45	N/A	N/A
FO-9	2/6/2011	37	8:57	N/A	N/A
FO-10	2/4/2011	35	12:14	N/A	N/A
FO-11	2/4/2011	35	13:22	2/6/2011	10:15
FO-12	2/2/2011	33	9:29	N/A	N/A
FO-13	2/2/2011	33	11:20	N/A	N/A
FO-14	2/2/2011	33	13:10	N/A	N/A
FO-15	2/5/2011	36	14:30	2/6/2011	10:15
FO-16	2/4/2011	35	15:12	N/A	N/A

FO-17	2/3/2011	34	17:00	N/A	N/A
FO-18	2/6/2011	37	14:07	N/A	N/A
FO-19	2/4/2011	35	8:45	N/A	N/A
FO-20	2/5/2011	36	15:00	N/A	N/A
FO-21	2/4/2011	35	11:55	N/A	N/A
FO-22	2/4/2011	35	11:05	N/A	N/A
FO-23	2/4/2011	35	9:05	N/A	N/A
FO-24	2/4/2011	35	16:50	N/A	N/A
FO-25	2/5/2011	36	12:00	N/A	N/A
FO-26	2/3/2011	34	14:30	N/A	N/A
FO-27	2/3/2011	34	16:05	2/5/2011	15:42
FO-28	2/4/2011	35	10:30	N/A	N/A
FO-29	2/4/2011	35	16:43	N/A	N/A
FO-30	2/4/2011	35	12:05	N/A	N/A
FO-31	2/3/2011	34	16:06	N/A	N/A
FO-32	2/3/2011	34	14:05	N/A	N/A
FO-33	2/3/2011	34	8:00	N/A	N/A
FO-34	2/3/2011	34	9:06	N/A	N/A
FO-35	2/3/2011	34	12:50	2/6/2011	15:50
FO-36	2/3/2011	34	11:45	N/A	N/A
FO-37	2/3/2011	34	12:15	N/A	N/A
FO-38	2/3/2011	34	10:30	N/A	N/A
FO-39	2/3/2011	34	10:20	2/4/2011	7:20
FO-40	2/4/2011	35	11:30	N/A	N/A
FO-41	2/2/2011	33	11:59	N/A	N/A
FO-42	2/2/2011	33	13:04	N/A	N/A
FO-43	2/4/2011	35	9:50	N/A	N/A
FO-44	2/3/2011	34	16:40	N/A	N/A
FO-45	2/3/2011	34	12:36	N/A	N/A
FO-46	2/3/2011	34	13:15	N/A	N/A
FO-47	2/2/2011	33	16:20	N/A	N/A
FO-48	2/3/2011	34	7:55	N/A	N/A
FO-49	2/2/2011	33	14:04	N/A	N/A
FO-50	2/2/2011	33	13:35	2/6/2011	14:21
FO-51	2/2/2011	33	8:45	N/A	N/A
FO-52	2/2/2011	33	11:26	N/A	N/A
FO-53	2/3/2011	34	16:00	N/A	N/A
FO-54	2/4/2011	35	8:43	N/A	N/A
FO-55	2/2/2011	33	16:41	N/A	N/A

<b>FO-56</b>	<b>2/4/2011</b>	<b>35</b>	<b>10:03</b>	<b>N/A</b>	<b>N/A</b>
<b>FO-57</b>	<b>2/4/2011</b>	<b>35</b>	<b>9:02</b>	<b>N/A</b>	<b>N/A</b>
<b>FO-58</b>	<b>2/4/2011</b>	<b>35</b>	<b>7:23</b>	<b>N/A</b>	<b>N/A</b>
<b>FO-59</b>	<b>2/3/2011</b>	<b>34</b>	<b>14:04</b>	<b>N/A</b>	<b>N/A</b>
<b>FO-60</b>	<b>2/3/2011</b>	<b>34</b>	<b>13:02</b>	<b>N/A</b>	<b>N/A</b>
<b>FO-61</b>	<b>2/3/2011</b>	<b>34</b>	<b>9:14</b>	<b>2/6/2011</b>	<b>12:20</b>

## 5. POINT COMPARISON REPORT

POINT ID NO.	Point Check	Delta North (ft)	Delta East (ft)	Vert. (ft)
OT-1	OT-1CK	0.03	0.08	0.15
OT-2	OT-2CK	0.09	0.03	0.15
OT-3	OT-3CK	0.01	0.03	0.15
OT-4	OT-4CK	0.04	0.07	0.15
OT-5	OT-5CK	0.06	0.02	0.03
OT-6	OT-6CK	0.05	0.01	0.15
OT-7	OT-7CK	0.01	0.03	0.08
OT-9	OT-9CK	0.03	0.03	0.04
OT-10	OT-10CK	0.00	0.02	0.06
OT-11	OT-11CK	0.05	0.10	0.15
OT-12	OT-12CK	0.02	0.01	0.11
OT-13	OT-13CK	0.01	0.02	0.03
OT-14	OT-14CK	0.05	0.04	0.11
OT-15	OT-15CK	0.02	0.15	0.09
OT-16	OT-16CK	0.01	0.05	0.06
OT-17	OT-17CK	0.02	0.01	0.13
OT-19	OT-19CK	0.01	0.01	0.12
OT-20	OT-20CK	0.02	0.04	0.10
OT-22	OT-22CK	0.04	0.01	0.02
OT-23	OT-23CK	0.06	0.04	0.02
OT-24	OT-24CK	0.15	0.03	0.15
OT-25	OT-25CK	0.10	0.02	0.06
OT-26	OT-26CK	0.01	0.02	0.09
OT-27	OT-27CK	0.02	0.03	0.15
OT-29	OT-29CK	0.02	0.09	0.15
OT-30	OT-30CK	0.15	0.03	0.14
OT-31	OT-31CK	0.09	0.05	0.09
OT-32	OT-32CK	0.04	0.03	0.07
OT-33	OT-33CK	0.15	0.01	0.10
OT-37	OT-37CK	0.03	0.05	0.06
OT-39	OT-39CK	0.02	0.03	0.05
OT-40	OT-40CK	0.10	0.09	0.06
OT-41	OT-41CK	0.11	0.09	0.08
OT-42	OT-42CK	0.05	0.06	0.06
OT-43	OT-43CK	0.08	0.08	0.06
OT-45	OT-45CK	0.09	0.06	0.07

<b>OT-46</b>	<b>OT-46CK</b>	<b>0.07</b>	<b>0.07</b>	<b>0.06</b>
<b>OT-47</b>	<b>OT-47CK</b>	<b>0.06</b>	<b>0.03</b>	<b>0.02</b>
<b>OT-48</b>	<b>OT-48CK</b>	<b>0.08</b>	<b>0.09</b>	<b>0.10</b>
<b>OT-49</b>	<b>OT-49CK</b>	<b>0.00</b>	<b>0.06</b>	<b>0.03</b>
<b>OT-50</b>	<b>OT-50CK</b>	<b>0.07</b>	<b>0.06</b>	<b>0.05</b>
<b>OT-52</b>	<b>OT-52CK</b>	<b>0.02</b>	<b>0.03</b>	<b>0.09</b>
<b>OT-53</b>	<b>OT-53CK</b>	<b>0.09</b>	<b>0.06</b>	<b>0.06</b>
<b>OT-56</b>	<b>OT-56CK</b>	<b>0.08</b>	<b>0.06</b>	<b>0.06</b>
<b>OT-57</b>	<b>OT-57CK</b>	<b>0.06</b>	<b>0.02</b>	<b>0.03</b>
<b>OT-58</b>	<b>OT-58CK</b>	<b>0.08</b>	<b>0.09</b>	<b>0.03</b>
<b>OT-61</b>	<b>OT-61CK</b>	<b>0.10</b>	<b>0.11</b>	<b>0.15</b>
<b>OT-62</b>	<b>OT-62CK</b>	<b>0.03</b>	<b>0.05</b>	<b>0.06</b>
<b>OT-64</b>	<b>OT-64CK</b>	<b>0.09</b>	<b>0.07</b>	<b>0.04</b>
<b>GWC-1</b>	<b>GWC-1CK</b>	<b>0.03</b>	<b>0.02</b>	<b>0.06</b>
<b>GWC-5</b>	<b>GWC-5CK</b>	<b>0.09</b>	<b>0.00</b>	<b>0.06</b>
<b>GWC-6</b>	<b>GWC-6CK</b>	<b>0.03</b>	<b>0.01</b>	<b>0.01</b>
<b>GWC-8</b>	<b>GWC-8CK</b>	<b>0.09</b>	<b>0.01</b>	<b>0.05</b>
<b>GWC-9</b>	<b>GWC-9CK</b>	<b>0.09</b>	<b>0.11</b>	<b>0.15</b>
<b>GWC-13</b>	<b>GWC-13CK</b>	<b>0.06</b>	<b>0.05</b>	<b>0.03</b>
<b>GWC-14</b>	<b>GWC-14CK</b>	<b>0.08</b>	<b>0.09</b>	<b>0.06</b>
<b>GWC-15</b>	<b>GWC-15CK</b>	<b>0.01</b>	<b>0.02</b>	<b>0.06</b>
<b>GWC-17</b>	<b>GWC-17CK</b>	<b>0.08</b>	<b>0.09</b>	<b>0.02</b>
<b>GWC-20</b>	<b>GWC-20CK</b>	<b>0.08</b>	<b>0.06</b>	<b>0.04</b>
<b>GWC-21</b>	<b>GWC-21CK</b>	<b>0.09</b>	<b>0.07</b>	<b>0.08</b>
<b>GWC-22</b>	<b>GWC-22CK</b>	<b>0.09</b>	<b>0.05</b>	<b>0.06</b>
<b>GWC-23</b>	<b>GWC-23CK</b>	<b>0.10</b>	<b>0.15</b>	<b>0.14</b>
<b>GWC-25</b>	<b>GWC-25CK</b>	<b>0.01</b>	<b>0.08</b>	<b>0.07</b>
<b>GWC-26</b>	<b>GWC-26CK</b>	<b>0.02</b>	<b>0.06</b>	<b>0.03</b>
<b>GWC-27</b>	<b>GWC-27CK</b>	<b>0.03</b>	<b>0.04</b>	<b>0.08</b>
<b>GWC-28</b>	<b>GWC-28CK</b>	<b>0.06</b>	<b>0.02</b>	<b>0.13</b>
<b>GWC-29</b>	<b>GWC-29CK</b>	<b>0.10</b>	<b>0.03</b>	<b>0.04</b>
<b>GWC-30</b>	<b>GWC-30CK</b>	<b>0.05</b>	<b>0.09</b>	<b>0.05</b>
<b>GWC-31</b>	<b>GWC-31CK</b>	<b>0.05</b>	<b>0.00</b>	<b>0.15</b>
<b>GWC-32</b>	<b>GWC-32CK</b>	<b>0.10</b>	<b>0.04</b>	<b>0.03</b>
<b>GWC-33</b>	<b>GWC-33CK</b>	<b>0.02</b>	<b>0.03</b>	<b>0.03</b>
<b>GWC-36</b>	<b>GWC-36CK</b>	<b>0.07</b>	<b>0.01</b>	<b>0.05</b>
<b>GWC-38</b>	<b>GWC-38CK</b>	<b>0.06</b>	<b>0.02</b>	<b>0.01</b>
<b>GWC-40</b>	<b>GWC-40CK</b>	<b>0.09</b>	<b>0.11</b>	<b>0.14</b>

<b>GWC-41</b>	<b>GWC-41CK</b>	<b>0.00</b>	<b>0.02</b>	<b>0.15</b>
<b>GWC-42</b>	<b>GWC-42CK</b>	<b>0.02</b>	<b>0.02</b>	<b>0.10</b>
<b>GWC-44</b>	<b>GWC-44CK</b>	<b>0.01</b>	<b>0.00</b>	<b>0.15</b>
<b>GWC-45</b>	<b>GWC-45CK</b>	<b>0.08</b>	<b>0.06</b>	<b>0.04</b>
<b>GWC-46</b>	<b>GWC-46CK</b>	<b>0.08</b>	<b>0.04</b>	<b>0.15</b>
<b>GWC-47</b>	<b>GWC-47CK</b>	<b>0.04</b>	<b>0.00</b>	<b>0.01</b>
<b>GWC-51</b>	<b>GWC-51CK</b>	<b>0.15</b>	<b>0.10</b>	<b>0.06</b>
<b>GWC-53</b>	<b>GWC-53CK</b>	<b>0.08</b>	<b>0.10</b>	<b>0.14</b>
<b>GWC-54</b>	<b>GWC-54CK</b>	<b>0.00</b>	<b>0.05</b>	<b>0.11</b>
<b>GWC-55</b>	<b>GWC-55CK</b>	<b>0.02</b>	<b>0.04</b>	<b>0.06</b>
<b>GWC-57</b>	<b>GWC-57CK</b>	<b>0.01</b>	<b>0.04</b>	<b>0.10</b>
<b>GWC-58</b>	<b>GWC-58CK</b>	<b>0.03</b>	<b>0.02</b>	<b>0.14</b>
<b>GWC-59</b>	<b>GWC-59CK</b>	<b>0.06</b>	<b>0.00</b>	<b>0.05</b>
<b>GWC-61</b>	<b>GWC-61CK</b>	<b>0.03</b>	<b>0.03</b>	<b>0.10</b>
<b>GWC-63</b>	<b>GWC-63CK</b>	<b>0.02</b>	<b>0.05</b>	<b>0.15</b>
<b>GWC-65</b>	<b>GWC-65CK</b>	<b>0.00</b>	<b>0.03</b>	<b>0.08</b>
<b>FO-1</b>	<b>FO-1CK</b>	<b>0.11</b>	<b>0.12</b>	<b>0.06</b>
<b>FO-11</b>	<b>FO-11CK</b>	<b>0.08</b>	<b>0.06</b>	<b>0.12</b>
<b>FO-15</b>	<b>FO-15CK</b>	<b>0.09</b>	<b>0.08</b>	<b>0.05</b>
<b>FO-27</b>	<b>FO-27CK</b>	<b>0.06</b>	<b>0.08</b>	<b>0.06</b>
<b>FO-35</b>	<b>FO-35CK</b>	<b>0.00</b>	<b>0.01</b>	<b>0.05</b>
<b>FO-39</b>	<b>FO-39CK</b>	<b>0.06</b>	<b>0.07</b>	<b>0.06</b>
<b>FO-50</b>	<b>FO-50CK</b>	<b>0.05</b>	<b>0.06</b>	<b>0.10</b>
<b>FO-61</b>	<b>FO-61CK</b>	<b>0.08</b>	<b>0.06</b>	<b>0.07</b>