Final Vertical Accuracy Report
Coastal Georgia Elevation Project (CGEP)
NOAA Coastal Services Center
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Submitted to:
NOAA Coastal Services Center

Prepared by:
Dewberry

1 Overview

The goal of the NOAA Coastal Services Center LiDAR Task Order is to provide high accuracy elevation datasets of multiple deliverable products including LiDAR, hydro-enforced digital elevation models (DEMs), and 3D breaklines for several counties along the coast of Georgia. The project area spans 8,515 square miles. These data will be used to support the environmental, social, and economic well being of coastal Georgia. NOAA Coastal Services Center is working with the Coastal Georgia Elevation Project (CGEP), led by the Coastal Regional Commission.

Dewberry's role is to provide Quality Assurance (QA) of the LiDAR data and supplemental deliverables provided by Photo Science, Inc (PSI) and Fugro EarthData, Inc (FEDI) that includes completeness checks, vertical accuracy testing, and a qualitative review of the bare earth surface.

This report documents the final vertical accuracy for the complete project area.

2 LiDAR Vertical Accuracy Statistics and Analysis

Dewberry tested the survey checkpoints located within each delivery at the time of delivery. Now that all areas of the CGEP have been delivered, Dewberry tested 453 checkpoints for the entire CGEP area.

2.1 LiDAR Vertical Accuracy Test Procedures

The vertical accuracy assessment compares the measured survey checkpoint elevations with those of the TIN as generated from the bare-earth LiDAR. The X/Y locations of the survey checkpoints are overlaid on the TIN and the interpolated Z values of the LiDAR are recorded. These interpolated Z values are then compared with the survey checkpoint Z values and this difference represents the amount of error between the measurements. Once all the Z values are recorded, the Root Mean Square Error (RMSE) is calculated and the vertical accuracy scores are interpolated from the RMSE value. The RMSE equals the square root of the average of the set of squared differences between the dataset coordinate values and the coordinate values from the survey checkpoints.

The first method of evaluating vertical accuracy uses the FEMA specification which follows the methodology set forth by the National Standard for Spatial Data Accuracy. The accuracy is reported at the 95% confidence level using the Root Mean Square Error (RMSE) which is valid when errors follow a normal distribution. By this method, vertical accuracy at the 95% confidence level equals $RMSE_Z$ x 1.9600. For CGEP, vertical accuracy must be 1.2 ft (36 cm) or less based on an RMSEz of 0.6 ft (18 cm) x 1.9600.

The second method of testing vertical accuracy, endorsed by the National Digital Elevation Program (NDEP) and American Society for Photogrammetry and Remote Sensing (ASPRS) uses the same (RMSEZ x 1.9600) method in open terrain only; an alternative method uses the 95th percentile to report vertical accuracy in each of the other land cover categories (defined as Supplemental Vertical Accuracy – SVA) and all land cover categories combined (defined as Consolidated Vertical Accuracy – CVA). The 95th percentile method is used when vertical errors may not follow a normal error distribution, as in vegetated terrain. For CGEP, CVA must be 1.2 ft (36 cm) or less when computed using the 95th percentile method. The CVA is accompanied by a listing of the 5% outliers that are larger than the 95th percentile used to compute the CVA; these are always the largest outliers that may depart from a normal error distribution.

The Fundamental Vertical Accuracy (FVA) is calculated in the same way when implementing FEMA/NSSDA and NDEP/ASPRS methodologies; both methods utilize the 95% confidence level

(RMSEZ x 1.9600) in open terrain where there is no reason for LiDAR errors to depart from a normal error distribution.

The table below summarizes the acceptance criteria.

Quantitative Criteria	Measure of Acceptability
Fundamental Vertical Accuracy (FVA) in open terrain at the 95% confidence level using RMSEz x 1.9600	1.2 ft (based on RMSEz x 1.9600)
Consolidated Vertical Accuracy (CVA) in all land cover categories combines using the 95th percentile method	1.2 ft (based on 95th percentile of all checkpoints)
Supplemental Vertical Accuracy (SVA) reported for each land cover type computed using the 95th percentile method	1.2 ft (based on 95th percentile of checkpoints in each land cover type)

Table 1-Acceptace criteria for CGEP

The spatial distribution of the checkpoints is illustrated in Figure 1 on the page below.

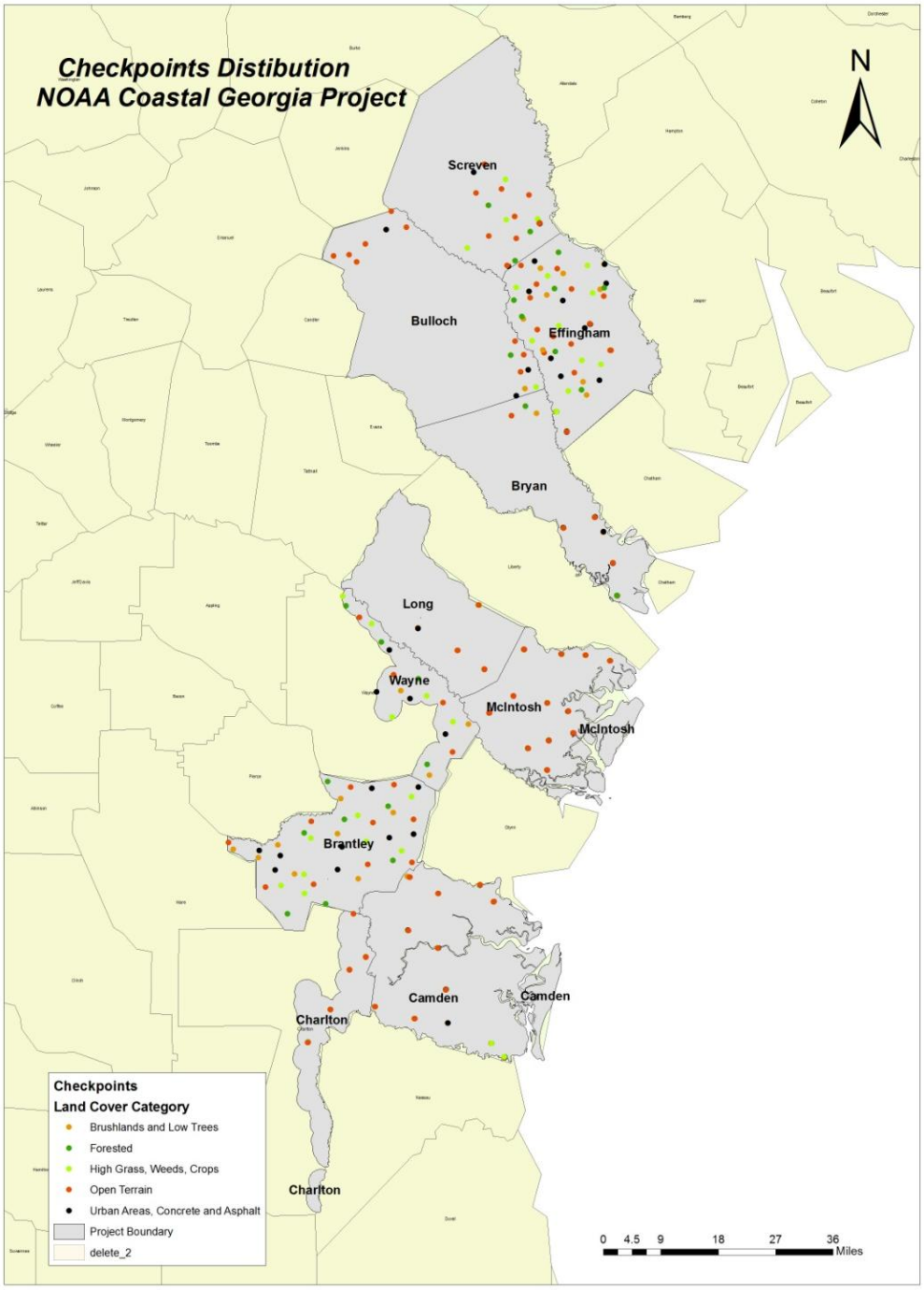

Figure 1: Checkpoints distribution for NOAA Coastal Georgia Project

2.2 Surveyed Checkpoints

The location of each surveyed checkpoint, along with the survey elevation, LiDAR elevation, difference between the two elevations, and land cover types are listed in the table below.

Point ID	Easting	Northing	Z Survey	Z Lidar	LandCover Type	Delta Z	Absolute DeltaZ
B_C12_3	274167.569	838629.011	10.504	9.972	Brush	-0.533	0.533
B_M01_1	596084.720	896572.644	17.836	17.320	Brush	-0.516	0.516
B_C13_5	262498.655	849357.194	4.908	4.532	Brush	-0.376	0.376
B_C06_1	353110.654	794314.444	15.175	14.827	Brush	-0.348	0.348
B_C01_2	770752.195	411495.071	12.438	12.210	Brush	-0.228	0.228
B_M10_3	555867.659	884918.374	14.382	14.171	Brush	-0.211	0.211
B_M09_3	548744.122	902319.855	37.260	37.108	Brush	-0.151	0.151
B_C16_6	318444.556	800817.839	21.373	21.256	Brush	-0.117	0.117
B_L03_2	777553.548	617728.795	45.187	45.071	Brush	-0.116	0.116
B_BLT-17	757198.660	464994.690	79.180	79.101	Brush	-0.079	0.079
BLT-2	884432.350	893297.780	120.460	120.416	Brush	-0.044	0.044
B_C07_3	769529.657	367587.641	13.843	13.825	Brush	-0.018	0.018
B_S01_1	878458.652	952904.348	129.722	129.711	Brush	-0.012	0.012
B_E02_5	932164.672	918683.857	91.794	91.786	Brush	-0.008	0.008
B_BTL-11	624686.300	434709.840	123.510	123.510	Brush	0.000	0.000
B_C01_5	770790.185	411672.125	11.992	11.995	Brush	0.002	0.002
B_C04_5	391341.351	840424.152	19.851	19.866	Brush	0.015	0.015
B_M07_1	518082.116	868918.924	10.903	10.932	Brush	0.029	0.029
BLT-5	864944.660	873713.430	85.060	85.100	Brush	0.040	0.040
B_BLT-12	661540.220	438266.880	122.190	122.234	Brush	0.044	0.044
BLT-6	881294.720	847771.860	56.670	56.715	Brush	0.045	0.045
B_C01_3	770772.561	411636.089	11.263	11.308	Brush	0.045	0.045
B_BLT-18	787310.610	495956.530	47.770	47.820	Brush	0.050	0.050
B_B01_1	709362.675	924282.767	6.223	6.296	Brush	0.073	0.073
B_BLT-15	711176.920	447615.500	61.000	61.087	Brush	0.087	0.087
B_BLT-19	763388.210	565912.770	58.700	58.797	Brush	0.097	0.097
B_CH06_1	721066.877	334890.908	74.002	74.110	Brush	0.108	0.108
B_M13_2	836713.208	547663.440	18.952	19.066	Brush	0.114	0.114
B_M03_2	590696.767	936753.652	16.528	16.673	Brush	0.145	0.145
B_E05_1	892514.834	796851.580	35.227	35.387	Brush	0.161	0.161
B_C04_2	391226.088	840507.545	19.200	19.382	Brush	0.182	0.182
BLT-3	898011.000	911259.770	119.450	119.635	Brush	0.185	0.185
B_B05_3	644756.997	942753.201	14.193	14.385	Brush	0.192	0.192
BLT-1	879161.570	915398.840	129.810	130.016	Brush	0.206	0.206
B_M02_2	595232.963	916735.991	14.779	15.004	Brush	0.225	0.225
BLT-7	914418.500	821659.640	77.720	77.947	Brush	0.227	0.227
B_E03_2	920218.288	869266.572	78.803	79.036	Brush	0.233	0.233
B_M11_3	500337.215	884681.448	28.808	29.044	Brush	0.237	0.237
B_C04_3	391241.977	840581.377	18.089	18.329	Brush	0.240	0.240
B_BLT-9	866363.430	815811.720	68.260	68.531	Brush	0.270	0.270
B_CH2_2	705221.054	301930.423	77.672	77.946	Brush	0.274	0.274
B_BLT-13	675629.830	414209.310	139.300	139.598	Brush	0.298	0.298
B_BLT-24	645423.820	427805.200	128.920	129.223	Brush	0.303	0.303
B_C08_3	742276.385	304494.776	12.503	12.813	Brush	0.310	0.310
B_CH01_2	734589.595	345696.785	17.525	17.839	Brush	0.314	0.314
B_BLT-21	819503.380	538092.240	41.190	41.514	Brush	0.324	0.324

B_B04_1	671791.936	939120.974	13.614	14.047	Brush	0.433	0.433
BLT-4	928733.320	898149.160	74.740	75.175	Brush	0.435	0.435
B_BLT-22	713615.990	476660.260	43.460	43.934	Brush	0.474	0.474
B_M05_2	599948.356	865613.727	16.748	17.280	Brush	0.532	0.532
B_E04_1	937357.318	847793.925	63.888	64.430	Brush	0.541	0.541
B_BLT-14	728135.850	410449.470	57.800	58.364	Brush	0.564	0.564
B_M06_4	561651.892	856837.324	17.838	18.405	Brush	0.567	0.567
B_M02_3	595286.611	916453.551	14.507	15.131	Brush	0.625	0.625
B_BLT-10	875825.810	795427.000	79.600	80.246	Brush	0.646	0.646
B_BLT-16	768864.940	412271.450	18.250	18.953	Brush	0.703	0.703
BLT-8	917646.650	810501.160	71.520	72.241	Brush	0.721	0.721
B_M08_1	524630.328	886141.478	40.018	40.807	Brush	0.789	0.789
W_C12_1	274191.772	838585.617	11.128	10.248	Forest	-0.880	0.880
W_C02_5	397993.350	794574.500	22.142	21.468	Forest	-0.674	0.674
W_C11_2	290809.069	802505.277	23.049	22.407	Forest	-0.643	0.643
W_C03_1	404888.742	828759.748	4.279	3.746	Forest	-0.533	0.533
W_C07_5	769620.115	367508.098	14.644	14.193	Forest	-0.451	0.451
W_C11_3	290824.597	802416.353	23.718	23.300	Forest	-0.418	0.418
W_C06_3	353010.584	794214.273	12.405	11.992	Forest	-0.413	0.413
W_FOR_13	777972.668	575966.423	36.906	36.507	Forest	-0.399	0.399
W_FM01_2	596160.568	896587.440	17.749	17.366	Forest	-0.383	0.383
W_C02_3	398205.531	794451.620	19.753	19.407	Forest	-0.346	0.346
W_C13_1	262790.390	849554.921	7.349	7.003	Forest	-0.346	0.346
W_E02_3	932171.150	918945.709	90.948	90.647	Forest	-0.301	0.301
W_L02_2	810612.360	599169.300	39.284	39.008	Forest	-0.276	0.276
W_FOR_14	785341.900	504981.383	58.679	58.412	Forest	-0.267	0.267
W_C16_2	318584.924	800970.582	21.627	21.376	Forest	-0.250	0.250
W_L04_1	827934.446	636764.973	62.958	62.737	Forest	-0.221	0.221
W_C16_1	318556.591	801008.216	21.578	21.367	Forest	-0.210	0.210
W_M02_4	595319.982	916481.910	14.947	14.743	Forest	-0.204	0.204
W_FOR_17	756800.002	425555.756	53.278	53.090	Forest	-0.188	0.188
W_FOR_18	701269.756	389379.066	65.809	65.623	Forest	-0.186	0.186
W_FOR_5	854619.126	843703.315	106.047	105.868	Forest	-0.179	0.179
W_FOR_21	716703.493	459393.165	53.692	53.519	Forest	-0.173	0.173
W_C07_2	769554.061	367526.318	13.633	13.483	Forest	-0.150	0.150
W_L03_4	777751.533	617784.421	45.487	45.347	Forest	-0.140	0.140
W_L01_2	832760.233	583651.925	58.110	58.016	Forest	-0.093	0.093
W_S01_2	878555.396	952937.532	130.138	130.061	Forest	-0.077	0.077
W_B02_3	697219.907	931288.416	7.482	7.415	Forest	-0.067	0.067
W_B04_2	671730.697	939118.681	14.089	14.027	Forest	-0.062	0.062
W_CH06_2	720939.153	335119.029	73.883	73.825	Forest	-0.059	0.059
W_M10_1	555945.142	885024.267	13.904	13.846	Forest	-0.058	0.058
W_C04_1	391136.665	840420.632	20.142	20.100	Forest	-0.042	0.042
W_B03_3	700858.110	898377.309	19.327	19.287	Forest	-0.040	0.040
W_FOR_15	702811.107	490727.430	55.837	55.811	Forest	-0.026	0.026
W_FOR_12	747492.577	606319.376	99.067	99.070	Forest	0.003	0.003
W_CH2_1	705203.921	302030.718	78.118	78.127	Forest	0.009	0.009
W_L01_4	832898.360	583886.864	57.181	57.212	Forest	0.031	0.031

W_E05_3	892359.422	796896.491	36.014	36.052	Forest	0.037	0.037
W_B02_1	697538.883	931382.202	4.820	4.870	Forest	0.050	0.050
W_M12_1	530600.497	906217.412	7.644	7.705	Forest	0.060	0.060
W_FOR-1	858122.600	921817.700	128.110	128.190	Forest	0.080	0.080
W_FOR_7	913289.375	815067.908	78.908	78.992	Forest	0.084	0.084
W_SCR7	835926.475	967655.103	184.355	184.448	Forest	0.093	0.093
W_FOR_8	891534.828	846535.460	74.236	74.354	Forest	0.118	0.118
W_CH01_5	734523.310	345448.069	17.620	17.743	Forest	0.123	0.123
W_FOR-10	863669.930	875573.420	77.510	77.634	Forest	0.123	0.123
W_C08_5	741993.155	304481.335	15.306	15.477	Forest	0.171	0.171
W_M11_2	500192.740	884646.604	29.659	29.854	Forest	0.195	0.195
W_B05_C	644686.744	942729.373	14.097	14.302	Forest	0.205	0.205
W_FOR_6	866709.481	801428.108	72.997	73.206	Forest	0.209	0.209
W_FOR_11	717848.930	636208.464	158.652	158.875	Forest	0.223	0.223
W_CH3_5	686591.265	274936.933	73.076	73.307	Forest	0.231	0.231
W_FOR-3	931943.300	899321.800	73.030	73.263	Forest	0.233	0.233
W_FOR-9	890825.800	898777.950	116.410	116.652	Forest	0.242	0.242
W_M07_4	518211.854	868833.575	11.515	11.763	Forest	0.247	0.247
W_E03_3	920158.161	869604.420	79.453	79.706	Forest	0.253	0.253
W_FOR_16	752955.851	470466.762	74.872	75.212	Forest	0.340	0.340
W_M13_1	836685.334	547740.490	18.401	18.764	Forest	0.363	0.363
W_E04_5	937485.133	847662.802	60.222	60.622	Forest	0.400	0.400
W_M09_1	548955.214	902096.147	38.861	39.273	Forest	0.412	0.412
W_FOR_19	669377.092	381149.322	138.061	138.592	Forest	0.531	0.531
W_FOR-4	857025.490	889008.490	98.900	99.434	Forest	0.534	0.534
W_M03_3	590815.166	936871.111	16.580	17.149	Forest	0.569	0.569
W_FOR-2	894030.410	928563.310	117.770	118.363	Forest	0.593	0.593
W_FOR_20	683357.226	448371.851	98.931	99.532	Forest	0.601	0.601
W_M06_1	561623.495	856925.714	18.157	18.763	Forest	0.606	0.606
W_M05_3	599985.907	865566.494	16.491	17.120	Forest	0.629	0.629
W_M08_4	524900.025	886076.955	39.075	39.792	Forest	0.717	0.717
W_B05_1	644584.277	942663.526	13.072	13.888	Forest	0.816	0.816
W_C08_4	742083.672	304440.766	14.755	15.624	Forest	0.869	0.869
H_C03_3	405056.637	828949.031	4.499	3.826	High Grass	-0.673	0.673
H_C03A	405321.969	829049.182	11.269	10.666	High Grass	-0.604	0.604
H_GWC-15	772580.650	478146.910	63.760	63.227	High Grass	-0.533	0.533
H_C12_2	274161.597	838583.703	10.799	10.280	High Grass	-0.520	0.520
H_L04_2	828374.181	636585.598	58.626	58.190	High Grass	-0.437	0.437
H_L02_1	810598.852	599197.561	39.816	39.443	High Grass	-0.373	0.373
H_C13C	262806.421	849176.563	5.917	5.630	High Grass	-0.287	0.287
H_C09_2	294390.178	774744.067	19.534	19.275	High Grass	-0.258	0.258
H_C06_2	353114.881	794247.088	11.848	11.623	High Grass	-0.225	0.225
H_GWC-3	918111.420	917746.200	101.670	101.469	High Grass	-0.201	0.201
H_M10_2	555915.302	884966.406	14.197	14.010	High Grass	-0.187	0.187
H_C12C	274126.948	838567.824	10.337	10.155	High Grass	-0.181	0.181
H_C01_1	770814.053	411453.981	13.159	12.981	High Grass	-0.178	0.178
H_GWC-14	806668.980	540371.660	44.670	44.527	High Grass	-0.143	0.143
H_GWC-1	859186.750	899628.280	134.410	134.277	High Grass	-0.133	0.133

H_S01_3	878500.582	952848.083	130.829	130.712	High Grass	-0.117	0.117
H_B04_3	671689.983	939167.529	14.296	14.185	High Grass	-0.111	0.111
H_E01_1	900887.341	780304.778	31.189	31.079	High Grass	-0.110	0.110
H_E01_2	900899.822	780430.329	30.549	30.451	High Grass	-0.098	0.098
H_CH3_2	686365.214	274921.173	73.039	72.942	High Grass	-0.097	0.097
H_E05_C	892323.782	796923.077	35.659	35.579	High Grass	-0.080	0.080
H_E05_2	892422.606	796974.383	35.907	35.828	High Grass	-0.079	0.079
H_L01_1	832648.308	583530.702	58.358	58.283	High Grass	-0.075	0.075
H_CH06_5	720850.107	335098.118	74.375	74.321	High Grass	-0.054	0.054
H_B03_1	700853.848	898144.809	19.651	19.603	High Grass	-0.048	0.048
H_L03_1	777590.466	617672.240	44.561	44.516	High Grass	-0.045	0.045
H_B01_3	709237.788	924106.688	8.017	7.980	High Grass	-0.038	0.038
H_GWC-4	922383.280	894886.520	66.430	66.398	High Grass	-0.032	0.032
H_GWC-11	715228.470	644211.770	163.360	163.340	High Grass	-0.020	0.020
H_CH3_4	686578.658	274693.030	74.310	74.326	High Grass	0.016	0.016
H_GWC-8	913402.460	839409.010	92.260	92.277	High Grass	0.017	0.017
H_SCR4	850293.486	989090.319	168.061	168.083	High Grass	0.022	0.022
H_E02_B	932359.538	918739.252	92.106	92.146	High Grass	0.040	0.040
H_M07_2	518182.836	868933.714	11.191	11.237	High Grass	0.046	0.046
H_E02_1	932334.555	918959.734	91.296	91.345	High Grass	0.050	0.050
H_C04_B	391323.765	840399.646	19.988	20.047	High Grass	0.059	0.059
H_B05_4	644680.180	942746.632	13.914	14.006	High Grass	0.093	0.093
H_GWC-23	784895.880	561630.580	59.760	59.853	High Grass	0.093	0.093
H_GWC-25	764323.800	433281.310	60.190	60.290	High Grass	0.100	0.100
H_C01_6	770950.419	411606.115	13.820	13.924	High Grass	0.104	0.104
H_GWC-6	875598.370	817205.900	72.130	72.245	High Grass	0.115	0.115
H_E03_1	920152.386	869399.965	77.900	78.027	High Grass	0.127	0.127
H_M02_1	595293.571	916668.816	14.250	14.386	High Grass	0.135	0.135
H_GWC-7	872487.760	855405.970	59.400	59.540	High Grass	0.140	0.140
H_C16_4	318602.300	800852.003	21.593	21.748	High Grass	0.155	0.155
H_GWC-13	756265.840	544100.300	54.980	55.138	High Grass	0.158	0.158
H_SCR16	818419.651	932440.567	144.400	144.573	High Grass	0.173	0.173
H_GWC-22	664405.920	404568.330	116.280	116.480	High Grass	0.200	0.200
H_GWC-12	739374.960	621487.650	111.850	112.082	High Grass	0.232	0.232
H_CH3_1	686378.129	274850.724	72.944	73.181	High Grass	0.237	0.237
H_E04_2	937336.025	847868.418	65.791	66.039	High Grass	0.248	0.248
H_GWC-9	902462.140	813933.820	55.570	55.819	High Grass	0.249	0.249
H_CH01_1	734607.157	345664.057	15.426	15.702	High Grass	0.276	0.276
H_SCR2	870523.220	945771.101	138.506	138.797	High Grass	0.291	0.291
H_GWC-2	885285.830	909180.870	127.650	127.943	High Grass	0.293	0.293
H_GWC-5	894513.580	867884.680	109.000	109.332	High Grass	0.332	0.332
H_C08_2	742274.368	304551.021	11.414	11.751	High Grass	0.337	0.337
H_M12_4	531024.283	906504.909	5.386	5.756	High Grass	0.370	0.370
H_M03_4	590842.509	936890.323	16.341	16.718	High Grass	0.377	0.377
H_M11_1	500139.453	884625.402	29.214	29.621	High Grass	0.407	0.407
H_GWC-16	734978.320	441393.290	79.930	80.364	High Grass	0.434	0.434
H_GWC-10	929323.620	835967.560	75.410	75.854	High Grass	0.444	0.444
H_C08_1	742226.565	304555.809	12.358	12.843	High Grass	0.484	0.484

H_M13_3	836868.420	547709.126	17.791	18.294	High Grass	0.502	0.502
H_SCR15	876805.617	956279.877	137.676	138.201	High Grass	0.525	0.525
H_M08_3	524865.838	886068.604	36.597	37.142	High Grass	0.545	0.545
H_GWC-17	728033.780	462631.460	56.740	57.287	High Grass	0.547	0.547
H_SCR10	851019.823	955676.972	150.412	150.990	High Grass	0.578	0.578
H_M05_1	599960.887	865668.387	16.772	17.417	High Grass	0.645	0.645
H_GWC-18	689053.620	443931.890	84.610	85.267	High Grass	0.657	0.657
H_C03_2	404999.868	828905.552	3.447	4.145	High Grass	0.698	0.698
H_M06_5	561323.992	856707.336	17.557	18.263	High Grass	0.706	0.706
H_M08_2	524818.304	886075.506	36.678	37.387	High Grass	0.709	0.709
H_GWC-19	683433.370	414013.380	77.900	78.623	High Grass	0.723	0.723
H_GWC-20	683808.070	398235.540	67.740	68.638	High Grass	0.898	0.898
O_C12B_1	274079.494	838523.148	11.645	10.760	Open Terrain	-0.886	0.886
O_C12_4	274098.243	838577.900	11.032	10.178	Open Terrain	-0.854	0.854
O_C03B_1	405269.206	829022.178	9.896	9.259	Open Terrain	-0.637	0.637
O_C03C	405348.087	829052.652	11.884	11.265	Open Terrain	-0.619	0.619
O_C03B	405269.424	829022.327	9.870	9.257	Open Terrain	-0.613	0.613
O_C11B_A	290877.840	802434.108	23.725	23.114	Open Terrain	-0.611	0.611
O_M01_3	596273.413	896563.283	16.214	15.625	Open Terrain	-0.589	0.589
O_C09_1	294483.915	774771.565	19.836	19.307	Open Terrain	-0.528	0.528
O_M01_C	596193.756	896531.089	16.836	16.331	Open Terrain	-0.505	0.505
O_C03_6	405280.163	829030.826	10.517	10.035	Open Terrain	-0.482	0.482
O_C09_C	294548.689	774871.107	19.269	18.792	Open Terrain	-0.477	0.477
O_C09_B	294571.432	774954.533	19.316	18.869	Open Terrain	-0.447	0.447
O_L02C	810804.128	599178.398	35.982	35.546	Open Terrain	-0.436	0.436
O_C02_C	398099.806	794498.445	20.736	20.332	Open Terrain	-0.404	0.404
O_L04C	828194.354	636930.580	57.860	57.458	Open Terrain	-0.402	0.402
O_L02B_1	810600.550	599221.977	38.865	38.473	Open Terrain	-0.391	0.391
O_C03_4	405069.622	828999.644	4.149	3.782	Open Terrain	-0.367	0.367
O_C02_1	398156.833	794503.241	20.113	19.748	Open Terrain	-0.366	0.366
O_L04B_1	828082.209	636938.463	59.638	59.290	Open Terrain	-0.349	0.349
O_C13B_1	262588.083	849381.463	6.218	5.874	Open Terrain	-0.344	0.344
O_L02_3	810501.962	599247.386	39.066	38.725	Open	-0.340	0.340

					Terrain		
O_C06_C	353072.244	794291.069	14.935	14.602	Open Terrain	-0.333	0.333
OT-3	870749.300	891238.880	125.620	125.301	Open Terrain	-0.319	0.319
O_C06_5	353062.903	794294.137	14.965	14.655	Open Terrain	-0.310	0.310
O_M10_4	555810.137	884918.412	14.863	14.575	Open Terrain	-0.288	0.288
O_C13_2	262750.271	849500.430	6.948	6.664	Open Terrain	-0.284	0.284
O_C04_C	391262.968	840387.656	18.199	17.928	Open Terrain	-0.271	0.271
O_OT-24	772762.590	423737.680	52.830	52.561	Open Terrain	-0.269	0.269
O_C16_C	318431.989	800837.193	21.829	21.568	Open Terrain	-0.261	0.261
O_C07_1	769704.655	367498.621	15.652	15.403	Open Terrain	-0.248	0.248
O_C07C_A	769640.766	367571.414	14.962	14.719	Open Terrain	-0.244	0.244
O_C07B_A	769699.700	367572.061	15.439	15.197	Open Terrain	-0.242	0.242
O_S01_4	878556.622	952779.541	131.247	131.006	Open Terrain	-0.241	0.241
O_OT-15	774194.720	459436.160	69.750	69.512	Open Terrain	-0.239	0.239
O_C02_B	398052.816	794393.611	20.908	20.681	Open Terrain	-0.227	0.227
O_E05_5	892176.077	796710.153	35.509	35.285	Open Terrain	-0.224	0.224
O_C16_3	318617.026	800871.163	21.554	21.335	Open Terrain	-0.219	0.219
O_C02_2	398230.649	794414.011	19.035	18.823	Open Terrain	-0.211	0.211
OT-5	931704.250	892522.540	67.370	67.164	Open Terrain	-0.206	0.206
O_SCR12	857686.508	958222.825	172.512	172.307	Open Terrain	-0.205	0.205
OT-6	858288.080	855103.590	110.950	110.747	Open Terrain	-0.203	0.203
OT-4	905058.720	898375.560	101.680	101.497	Open Terrain	-0.183	0.183
O_B01_4	709264.462	923993.888	15.995	15.839	Open Terrain	-0.156	0.156
O_B03_C	700390.378	898314.595	18.627	18.472	Open Terrain	-0.155	0.155
O_M10C	555845.413	884790.131	14.442	14.290	Open Terrain	-0.152	0.152
O_C01_B	770828.491	411490.030	13.052	12.901	Open Terrain	-0.152	0.152
O_SCR14	846794.252	981043.485	185.908	185.757	Open Terrain	-0.151	0.151
O_C01_4	770784.920	411601.527	11.738	11.590	Open	-0.148	0.148

					Terrain		
O_C01_C	770942.434	411584.000	13.856	13.714	Open Terrain	-0.142	0.142
O_B03_2	700768.225	898268.508	21.415	21.280	Open Terrain	-0.135	0.135
O_C13_4	262822.591	849404.299	6.183	6.049	Open Terrain	-0.134	0.134
O_OT-10	855260.250	793426.340	67.400	67.277	Open Terrain	-0.123	0.123
O_BU-1.006	755603.554	962766.770	184.307	184.185	Open Terrain	-0.122	0.122
O_B02_2	697508.269	931401.100	5.680	5.566	Open Terrain	-0.114	0.114
O_L03_3	777597.869	617724.176	44.866	44.755	Open Terrain	-0.112	0.112
O_B01C_b	709296.780	924179.200	9.206	9.096	Open Terrain	-0.110	0.110
O_L03_B	777639.959	617686.764	44.995	44.887	Open Terrain	-0.108	0.108
O_SCR11	825887.651	977651.352	199.086	198.997	Open Terrain	-0.089	0.089
O_S01C	878432.498	952761.305	129.383	129.301	Open Terrain	-0.082	0.082
O_BU-1.003	727019.100	920741.563	261.560	261.482	Open Terrain	-0.078	0.078
O_B04C	671761.264	939187.967	14.149	14.073	Open Terrain	-0.076	0.076
O_CH06_B1	720948.173	334943.265	74.461	74.387	Open Terrain	-0.074	0.074
O_E02_2	932203.464	918782.274	92.103	92.033	Open Terrain	-0.070	0.070
O_B03_B	700588.431	898254.246	20.733	20.665	Open Terrain	-0.068	0.068
O_CH06_C	720916.107	335036.093	74.756	74.688	Open Terrain	-0.068	0.068
O_OT-25	722076.110	486257.700	55.830	55.763	Open Terrain	-0.067	0.067
OT-30	882329.880	845438.700	56.420	56.353	Open Terrain	-0.067	0.067
O_B04_4	671585.375	939216.837	14.585	14.520	Open Terrain	-0.066	0.066
O_SCR5	832600.403	1001444.401	124.784	124.719	Open Terrain	-0.065	0.065
O_OT-13	798317.440	555981.880	73.660	73.602	Open Terrain	-0.058	0.058
O_B01_2	709308.770	924351.583	10.656	10.600	Open Terrain	-0.056	0.056
O_BU-1.001	707748.697	925570.625	261.297	261.250	Open Terrain	-0.047	0.047
O_M07_3	518359.295	868821.894	10.442	10.398	Open Terrain	-0.044	0.044
O_CH06_3	720922.725	335093.303	73.466	73.426	Open Terrain	-0.041	0.041
O_M07_C	518230.459	868960.525	12.131	12.092	Open	-0.040	0.040

					Terrain		
O_B02_B	697290.581	931378.442	13.238	13.199	Open Terrain	-0.039	0.039
O_B04B_1	671665.682	939242.505	14.950	14.914	Open Terrain	-0.036	0.036
O_L01_C	832778.400	583616.162	58.785	58.754	Open Terrain	-0.031	0.031
O_M07_B	518258.258	868873.711	10.887	10.859	Open Terrain	-0.028	0.028
OT-28	875862.370	902346.550	133.080	133.053	Open Terrain	-0.027	0.027
OT-9	907352.520	829001.040	88.990	88.965	Open Terrain	-0.025	0.025
O_L01_B	832885.269	583504.474	59.606	59.584	Open Terrain	-0.023	0.023
O_E01C	900882.167	780233.991	30.572	30.559	Open Terrain	-0.013	0.013
O_CH01_C	734463.762	345510.566	17.275	17.263	Open Terrain	-0.012	0.012
O_SCR1	859272.548	940090.965	138.164	138.155	Open Terrain	-0.009	0.009
O_OT-23	757916.990	487977.410	81.660	81.653	Open Terrain	-0.007	0.007
O_CH01_B 1	734520.548	345326.666	16.425	16.438	Open Terrain	0.013	0.013
OT-8	904571.530	852776.580	100.620	100.637	Open Terrain	0.017	0.017
O_E01_4	900951.742	780370.410	30.639	30.658	Open Terrain	0.019	0.019
O_CH01_4	734439.205	345499.597	18.932	18.955	Open Terrain	0.023	0.023
O_E03_4	920355.865	869305.477	78.990	79.016	Open Terrain	0.027	0.027
O_SCR8	851626.464	917634.860	112.441	112.484	Open Terrain	0.043	0.043
O_CH2_C	705219.287	302067.734	77.839	77.887	Open Terrain	0.048	0.048
O_M12C	530978.933	906531.107	5.563	5.622	Open Terrain	0.060	0.060
OT-27	876458.680	864741.130	77.910	77.977	Open Terrain	0.067	0.067
O_E03C	920210.541	869522.426	77.006	77.085	Open Terrain	0.078	0.078
O_E04_C	937554.209	847695.011	62.652	62.734	Open Terrain	0.082	0.082
O_SCR13	836512.712	942067.962	191.489	191.574	Open Terrain	0.085	0.085
O_BU-1.004	734274.844	935525.425	287.245	287.333	Open Terrain	0.087	0.087
O_E03A	920279.020	869397.962	77.529	77.618	Open Terrain	0.089	0.089
O_SCR3	869720.071	976010.284	73.497	73.587	Open Terrain	0.090	0.090
O_OT-11	729331.070	626681.320	146.110	146.201	Open	0.091	0.091

					Terrain		
O_CH2_B	705246.473	301984.012	77.807	77.905	Open Terrain	0.098	0.098
O_OT-14	806347.980	515277.010	51.010	51.113	Open Terrain	0.102	0.102
O_M12B_1	530913.412	906542.956	5.939	6.054	Open Terrain	0.115	0.115
O_OT-7	862637.410	829628.760	98.340	98.463	Open Terrain	0.123	0.123
OT-2	863076.960	917751.520	130.270	130.422	Open Terrain	0.152	0.152
OT-26	865559.420	843933.950	101.910	102.084	Open Terrain	0.174	0.174
O_C08_7	742166.657	304488.206	16.131	16.306	Open Terrain	0.176	0.176
O_E04_4	937062.486	847561.526	64.700	64.881	Open Terrain	0.181	0.181
O_C08C_A	742169.070	304477.418	16.600	16.791	Open Terrain	0.191	0.191
O_CH3C_A	686521.790	274912.152	72.856	73.048	Open Terrain	0.192	0.192
O_CH3B_A	686509.782	274771.969	73.332	73.524	Open Terrain	0.193	0.193
O_C08_6	742099.100	304528.697	13.758	13.964	Open Terrain	0.206	0.206
O_M13B_1	836712.795	547847.766	18.785	18.992	Open Terrain	0.208	0.208
O_M09_4	548833.383	902291.095	37.937	38.145	Open Terrain	0.209	0.209
O_BU-1.007	768183.049	949452.152	167.811	168.029	Open Terrain	0.218	0.218
O_E04_B	937409.023	847685.129	63.160	63.379	Open Terrain	0.219	0.219
O_BU-1.002	720645.305	926750.837	266.606	266.832	Open Terrain	0.226	0.226
O_M02C	595383.997	916470.674	12.779	13.006	Open Terrain	0.227	0.227
O_B05_5	644586.834	942745.588	12.443	12.676	Open Terrain	0.233	0.233
O_M09_B	548937.661	902266.078	37.817	38.065	Open Terrain	0.247	0.247
O_OT-22	689232.190	457701.550	82.300	82.554	Open Terrain	0.254	0.254
OT-1	893218.140	915102.710	122.200	122.481	Open Terrain	0.281	0.281
O_OT-21	620690.020	440425.290	132.830	133.119	Open Terrain	0.289	0.289
O_OT-20	651551.100	403534.010	130.770	131.064	Open Terrain	0.294	0.294
O_M13C	836783.077	547711.011	18.974	19.269	Open Terrain	0.295	0.295
OT-29	889894.840	859226.770	99.530	99.836	Open Terrain	0.306	0.306
O_M03_1	590714.737	936893.781	16.783	17.089	Open	0.306	0.306

					Terrain		
o_M12M_6	530998.183	906308.150	2.144	2.466	Open Terrain	0.322	0.322
o_M12M_8	531050.417	906335.379	2.500	2.826	Open Terrain	0.326	0.326
O_M02B_1	595340.878	916423.579	13.631	13.967	Open Terrain	0.336	0.336
o_M12M_10	531109.635	906398.824	3.211	3.547	Open Terrain	0.336	0.336
O_M13_5	836899.917	547586.042	19.276	19.613	Open Terrain	0.337	0.337
o_M12M_2	530999.135	906433.523	2.248	2.593	Open Terrain	0.346	0.346
o_M12M_5	530995.613	906345.506	2.292	2.649	Open Terrain	0.357	0.357
O_M11_B	500115.784	884714.342	28.956	29.318	Open Terrain	0.362	0.362
O_M03_C	590783.723	936948.407	17.168	17.540	Open Terrain	0.372	0.372
O_M11_4	500282.271	884669.857	28.606	28.979	Open Terrain	0.373	0.373
O_M09_C	549137.526	902240.782	39.120	39.496	Open Terrain	0.376	0.376
o_M12M_4	530989.939	906379.871	1.662	2.047	Open Terrain	0.385	0.385
O_OT-19	691428.400	405699.770	83.030	83.417	Open Terrain	0.387	0.387
O_OT-17	736246.770	422059.300	71.300	71.693	Open Terrain	0.393	0.393
o_M12M_9	531098.174	906379.689	2.406	2.818	Open Terrain	0.411	0.411
o_M12M_1	530994.989	906456.627	1.976	2.401	Open Terrain	0.425	0.425
o_M12M_3	530988.201	906408.392	1.955	2.389	Open Terrain	0.434	0.434
O_M08_5	524778.444	886022.801	37.509	37.945	Open Terrain	0.435	0.435
O_M11_C	500252.194	884733.049	28.396	28.863	Open Terrain	0.467	0.467
O_M05B_1	600209.142	865431.132	17.417	17.887	Open Terrain	0.471	0.471
O_M08C	524671.106	885984.274	37.965	38.440	Open Terrain	0.475	0.475
o_M12M_11	531105.069	906415.149	4.727	5.235	Open Terrain	0.509	0.509
O_M09_2	548841.151	902132.762	39.341	39.862	Open Terrain	0.521	0.521
O_OT-18	724291.960	381378.410	73.040	73.566	Open Terrain	0.526	0.526
O_OT-12	757719.460	579275.970	46.780	47.312	Open Terrain	0.532	0.532
O_M08B_1	524554.435	886048.103	38.184	38.725	Open Terrain	0.542	0.542
O_M05_4	600066.812	865614.916	17.937	18.482	Open	0.545	0.545

					Terrain		
O_M06_C	561541.951	856804.520	18.413	18.978	Open Terrain	0.565	0.565
O_OT-16	740268.090	456721.960	71.320	71.907	Open Terrain	0.587	0.587
O_M05C	600109.521	865644.589	17.977	18.570	Open Terrain	0.593	0.593
O_M06_3	561562.541	856814.777	18.535	19.139	Open Terrain	0.604	0.604
o_M12M_13	530923.434	906504.858	1.027	1.645	Open Terrain	0.619	0.619
O_M06_C1	561422.265	856753.748	18.570	19.203	Open Terrain	0.632	0.632
o_M12M_7	530990.790	906269.397	2.753	3.545	Open Terrain	0.792	0.792
o_M12M_12	530930.643	906508.385	2.097	2.971	Open Terrain	0.874	0.874
U_C12_5	274099.578	838543.780	10.806	9.928	Urban	-0.877	0.877
U_M01_4	596319.717	896420.608	17.665	16.962	Urban	-0.703	0.703
U_C03_5	405162.752	828974.217	7.957	7.292	Urban	-0.665	0.665
U_C11_4	290880.806	802354.061	24.115	23.475	Urban	-0.640	0.640
U_C11_1	290910.588	802486.480	23.259	22.660	Urban	-0.600	0.600
U_C11C	290977.388	802418.187	23.650	23.125	Urban	-0.525	0.525
U_M01_B	596226.700	896461.746	17.783	17.266	Urban	-0.517	0.517
U_C09_3	294652.391	775062.438	20.107	19.608	Urban	-0.499	0.499
U_C02_4	398109.062	794514.455	20.930	20.529	Urban	-0.401	0.401
U_C13_3	262792.567	849443.719	7.109	6.713	Urban	-0.396	0.396
U_L04_3	828220.079	636870.461	58.421	58.083	Urban	-0.338	0.338
U_C13_6	262346.827	849556.446	6.050	5.763	Urban	-0.287	0.287
U_C06_B1	353076.967	794405.714	12.751	12.479	Urban	-0.271	0.271
U_C06_4	353047.159	794239.846	13.780	13.512	Urban	-0.268	0.268
U_M10B_1	555777.637	884819.119	15.832	15.570	Urban	-0.262	0.262
U_C07_4	769576.832	367643.090	14.405	14.161	Urban	-0.243	0.243
U_L02_4	810698.956	599122.680	38.600	38.363	Urban	-0.237	0.237
U_C16_5	318545.908	800883.147	21.993	21.773	Urban	-0.220	0.220
U_UT-19	778105.900	486267.480	70.070	69.853	Urban	-0.217	0.217
U_UT-11	753942.480	599587.350	98.080	97.864	Urban	-0.216	0.216
U_C04_4	391338.756	840529.732	17.336	17.133	Urban	-0.203	0.203
U_L03_5	777828.705	617605.395	47.548	47.346	Urban	-0.202	0.202
U_UT-13	800441.820	529994.360	50.780	50.608	Urban	-0.172	0.172
U_C16_B1	318513.435	800881.133	22.069	21.899	Urban	-0.170	0.170
U_UT-22	771145.900	559442.010	60.760	60.602	Urban	-0.158	0.158
U_BU-1.005	751216.481	947411.268	219.343	219.217	Urban	-0.126	0.126
U_S01_5	878366.782	952746.208	132.059	131.936	Urban	-0.123	0.123
U_CH06_4	720884.587	335088.496	75.458	75.345	Urban	-0.112	0.112
U_UT-12	743248.390	564992.010	98.390	98.279	Urban	-0.111	0.111
U_B02_C	697472.695	931389.450	6.240	6.137	Urban	-0.103	0.103
U_UT-7	859236.660	810074.450	65.940	65.837	Urban	-0.103	0.103
U_UT-21	774102.460	447214.350	49.530	49.435	Urban	-0.095	0.095
U_UT-15	753839.230	444257.670	62.640	62.549	Urban	-0.091	0.091

U_L03_C	777640.710	617500.914	47.123	47.033	Urban	-0.090	0.090
U_B03_4	700675.361	898158.977	19.008	18.934	Urban	-0.075	0.075
U_B01B_1	709608.177	924282.190	9.845	9.786	Urban	-0.059	0.059
UT-8	895940.430	826060.450	69.880	69.828	Urban	-0.052	0.052
UT-24	887675.270	840880.150	72.160	72.114	Urban	-0.046	0.046
U_M10_5	555684.471	884795.767	16.000	15.957	Urban	-0.043	0.043
U_E05_B	892499.857	796723.938	36.739	36.697	Urban	-0.042	0.042
U_E01_5	900976.822	780335.195	30.587	30.555	Urban	-0.033	0.033
U_S01B_1	878629.527	952573.563	131.336	131.315	Urban	-0.022	0.022
U_L01_3	832816.074	583696.087	59.476	59.462	Urban	-0.014	0.014
U_E05_4	892292.988	796699.179	37.936	37.923	Urban	-0.012	0.012
U_SCR6	823933.618	995025.915	193.842	193.839	Urban	-0.003	0.003
U_B02_4	697302.016	931305.804	9.271	9.268	Urban	-0.003	0.003
U_CH01_3	734521.023	345570.260	22.124	22.122	Urban	-0.003	0.003
U_E03B	920305.653	869315.133	77.968	77.976	Urban	0.008	0.008
U_E02_C	932188.435	918793.643	92.618	92.626	Urban	0.008	0.008
UT-2	874167.030	921451.810	128.770	128.787	Urban	0.016	0.016
UT-5	915803.060	866137.250	84.690	84.713	Urban	0.023	0.023
U_B05_2	644682.925	942664.050	14.605	14.642	Urban	0.037	0.037
U_L01_5	832887.000	583797.427	57.911	57.954	Urban	0.043	0.043
U_UT-17	663517.910	429269.140	129.560	129.605	Urban	0.045	0.045
U_E02_4	932228.069	918954.866	92.783	92.834	Urban	0.052	0.052
UT-3	933710.690	903097.470	73.160	73.218	Urban	0.058	0.058
U_E01B_1	900865.589	780035.209	31.029	31.088	Urban	0.059	0.059
U_E03B_1	920305.640	869315.124	77.916	77.976	Urban	0.060	0.060
U_M07_5	518229.564	868991.541	12.775	12.839	Urban	0.064	0.064
U_UT-16	711004.250	417964.000	65.330	65.394	Urban	0.064	0.064
U_CH2_3	705164.719	302102.688	77.065	77.131	Urban	0.066	0.066
U_E01_3	900944.256	780481.244	31.180	31.254	Urban	0.074	0.074
UT-10	869859.700	896385.760	132.760	132.841	Urban	0.081	0.081
U_B04_5	671547.761	939352.018	16.565	16.646	Urban	0.081	0.081
U_UT-6	869104.320	831269.210	93.330	93.429	Urban	0.099	0.099
UT-4	897821.380	888876.630	108.610	108.715	Urban	0.105	0.105
U_CH3_3	686439.567	274860.815	74.303	74.415	Urban	0.112	0.112
U_E03_5	920342.100	869245.229	78.582	78.712	Urban	0.129	0.129
UT-1	852572.170	917223.570	119.660	119.798	Urban	0.138	0.138
UT-9	928211.130	822926.240	78.270	78.426	Urban	0.156	0.156
U_B05_B	644798.036	942573.203	15.540	15.701	Urban	0.161	0.161
U_M12_3	530816.183	906612.679	5.902	6.071	Urban	0.170	0.170
U_M12_2	530705.647	906370.446	7.699	7.891	Urban	0.192	0.192
U_M02_5	595353.052	916460.777	14.852	15.070	Urban	0.218	0.218
U_UT-18	645978.530	433867.120	104.770	105.000	Urban	0.230	0.230
U_UT-23	714707.430	436790.810	63.090	63.321	Urban	0.231	0.231
U_E04_3	937326.437	847692.994	63.559	63.799	Urban	0.240	0.240
U_M13_4	836849.726	547633.858	19.483	19.823	Urban	0.341	0.341
U_M03_5	590829.852	936946.562	16.561	16.904	Urban	0.342	0.342
U_UT-14	739314.000	485037.090	66.630	66.998	Urban	0.368	0.368
U_M11_5	500179.222	884743.232	28.653	29.043	Urban	0.390	0.390

U_M03_B	590681.774	937048.157	18.408	18.804	Urban	0.395	0.395
U_UT-20	659236.640	417501.930	98.280	98.681	Urban	0.400	0.400
U_M09_5	548923.659	902174.431	40.479	40.938	Urban	0.459	0.459
U_M08_6	524541.919	886025.127	38.478	39.054	Urban	0.576	0.576
U_M05_5	600082.861	865636.919	18.364	18.941	Urban	0.577	0.577
U_M06_2	561601.784	856853.865	18.822	19.462	Urban	0.640	0.640

Table 2: Survey Checkpoint Coordinates

2.3 Vertical Accuracy Results

Table 3 outlines the calculated RMSEz and associated statistics while Table 4 outlines vertical accuracy and the statistics of the associated errors as computed by the different methods. Table 5 lists the 5% outliers after calculating CVA by the 95th percentile method as per ASPRS and NDEP guidelines.

100 % of Totals	$RMSE_Z$ (ft) Spec=0.6 ft	Mean (ft)	Median (ft)	Skew	Std Dev (ft)	# of Points	Min (ft)	Max (ft)
Consolidated	0.33	0.05	0.03	-0.01	0.33	453	-0.89	0.90
Open Terrain	0.33	0.02	-0.02	-0.04	0.33	164	-0.89	0.87
High Grass	0.35	0.12	0.09	0.06	0.33	75	-0.67	0.90
Brush	0.33	0.16	0.15	-0.04	0.29	58	-0.53	0.79
Forest	0.36	0.03	0.01	0.13	0.36	69	-0.88	0.87
Urban	0.29	-0.04	-0.01	0.29	0.29	87	-0.88	0.64

Table 3: The table shows the calculated RMSEz values for CVA, FVA, and SVA as well as associated statistics of the errors for CGEP.

Land Cover Category	# of Points	FVA — Fundamental Vertical Accuracy ($RMSE_Z$ x 1.9600) Spec=1.20 ft	CVA — Consolidated Vertical Accuracy (95th Percentile) Spec=1.20 ft	SVA — Supplemental Vertical Accuracy (95th Percentile) Spec=1.20 ft
Consolidated	453		0.65	
Open Terrain	164	0.64		0.61
High Grass	75			0.70
Brush	58			0.65
Forest	69			0.70
Urban	87			0.63

Table 4: The table shows the calculated $Accuracy_z$ of the FVA using FEMA/NSSDA guidelines (RMSEz x 1.9600) and the $Accuracy_z$ of the CVA and SVA's using NDEP/ASPRS guidelines (95^{th} percentile) for CGEP.

Checkpoint Name	Land Cover Category	Delta Z value, ft
GWC-20	High Grass	0.898
M12M_12	Open Terrain	0.874
C08_4	Forest	0.869
B05_1	Forest	0.816
M12M_7	Open Terrain	0.792
M08_1	Brush	0.789

GWC-19	High Grass	0.723
BLT-8	Brush	0.721
M08_4	Forest	0.717
M08_2	High Grass	0.709
M06_5	High Grass	0.706
BLT-16	Brush	0.703
C03_2	High Grass	0.698
GWC-18	High Grass	0.657
C03_5	Urban	-0.665
C03_3	High Grass	-0.673
C02_5	Forest	-0.674
M01_4	Urban	-0.703
C12_4	Open Terrain	-0.854
C12_5	Urban	-0.877
C12_1	Forest	-0.880
C12 1	Open Terrain	-0.886

Table 5: 5% outliers after calculating CVA by the 95th percentile method as per ASPRS and NDEP guidelines for CGEP.

2.4 Report Approval

Based on the vertical accuracy testing conducted by Dewberry using NSSDA and FEMA methodology, fundamental vertical accuracy (FVA) at the 95% confidence level (called $Accuracy_z$) is computed by the formula RMSEz x 1.9600. The dataset for CGEP satisfies the criteria outlined in project specifications and tested 0.64 ft in open terrain, based on RMSEz (0.33 ft) x 1.9600.

Based on the vertical accuracy testing conducted by Dewberry using NDEP and ASPRS methodology, consolidated vertical accuracy (CVA) at the 95% confidence level (called $Accuracy_z$) is computed using the 95th percentile method. The dataset for CGEP satisfies the criteria outlined in project specifications and tested 0.65 ft in all land categories combined.

Approved by: _____ Date: 3/11/2011

(sign & stamp)