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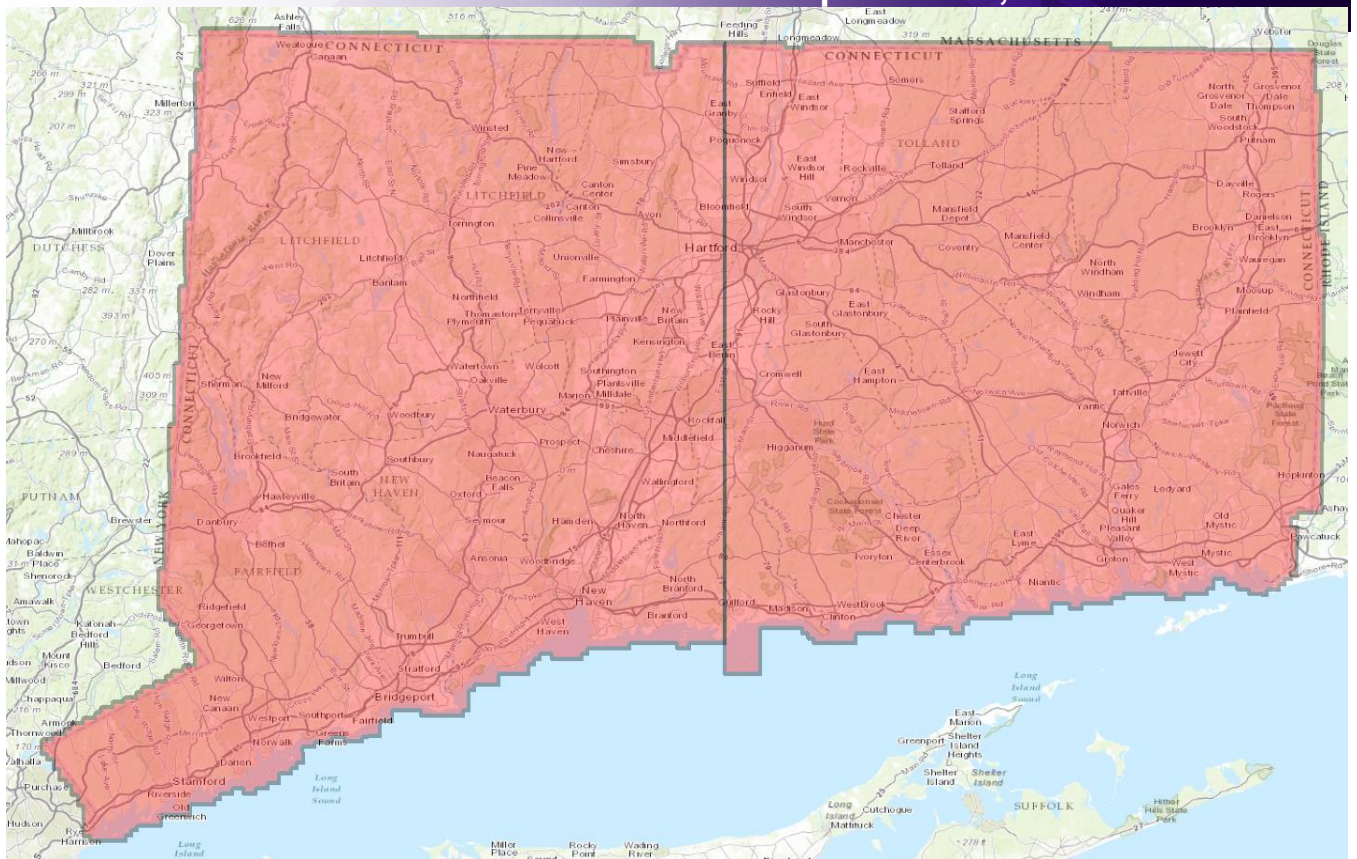
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CRCOG

2016 ORTHOIMAGERY PROGRAM

GROUND CONTROL SURVEY REPORT

September 4, 2016



EXECUTIVE SUMMARY

Sanborn Map Company is contracted by the Capitol Regional Council of Governments (CRCOG) to acquire three (3) inch, 4-band color digital Orthophotography and QL2 USGS-compliant LiDAR data. The project covers about 5100 square miles covering the state of Connecticut.

The purpose of this survey was to establish the locations of ground control points (GCP) for the 2016 CRCOG photography project. Three hundred seventeen (317) control points were established throughout project area. Control points served as both photo control as well as LiDAR calibration points and check points. The photo ID points were strategically positioned to well control photo portion of the program. LiDAR check points were positioned to, as much as possible, achieve equal and random point distribution. All surveys were performed by sub-contractor The Bongiovanni Group INC., Connecticut registered professional land surveyor.

The coordinates and elevations presented in this report represent the NAD 83 (2011) Epoch 2010.00 and the NAVD 88 (Geoid model 12AUS) datums. Coordinates are CT State Plane (0600 CT) coordinates. Coordinates and elevations were established based upon GPS observations taken between April 15, 2016 and June 14, 2016, using Trimble GNSS RTK R8 receivers and solutions provided through the Keystone KEYNET Network. All data is in US Survey Feet.

Contact

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

Sanborn

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THE BONGIOVANNI GROUP, INC.
170 PANE ROAD, 2ND FLOOR
NEWINGTON, CONNECTICUT 06111
(860) 666-0134



AUGUST 2016

I HEREBY CERTIFY THIS SURVEY AND REPORT
TO BE SUBSTANTIALLY CORRECT

ALAN BONGIOVANNI, L.L.S. #14649

8-15-2016

DATE



OVERVIEW

GNSS Receivers used were Trimble R8s and Trimble R8-Model 2, used in conjunction with Trimble TSC3 and TSC2 Controllers. Data was downloaded using Trimble Business Center software version 3.61. All points were observed with a minimum of 180 epochs.

The final adjustments were constrained to High Accuracy Reference Network incorporating local NGS monuments and CORS stations.

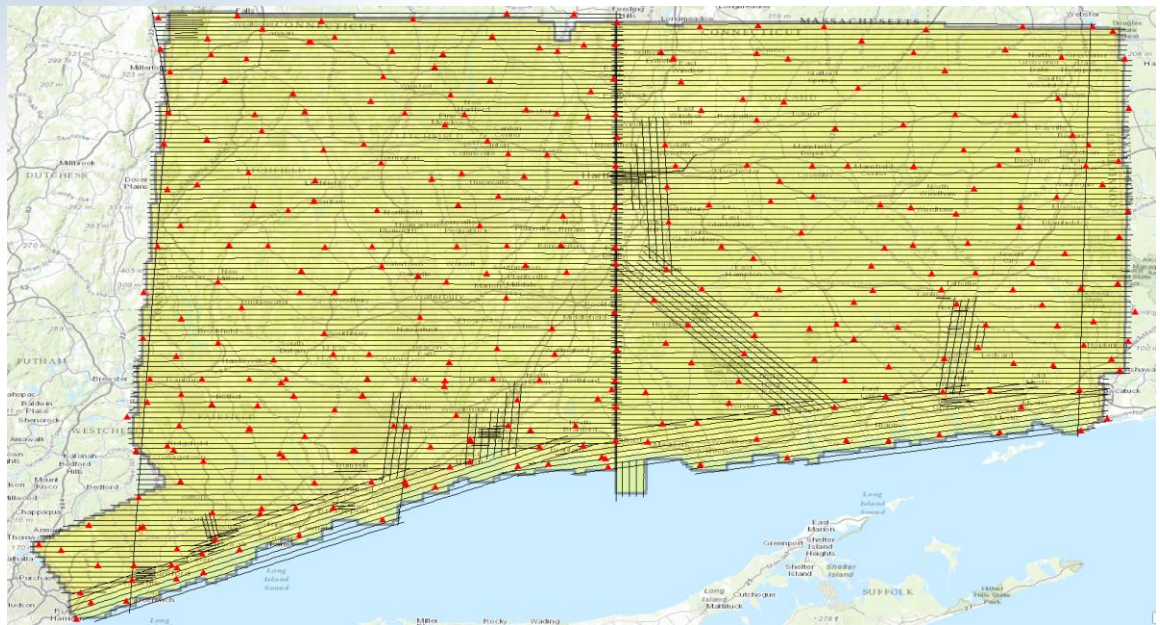


Figure 1: Project Layout with GCPs.

APPENDIX A

Control Coordinates

Sanborn Map Company

Point Control for CROG

Final Coordinate List

Horizontal Datum: NAD83-2011

Vertical Datum: NAVD88

Projection: SPCS CT 0600

Point ID	Easting	Northing	Elevation
CR001	792355.225	944020.987	791.591
CR002	796851.489	882000.440	510.572
CR003	790435.622	794901.740	519.240
CR004	786162.328	708403.340	750.579
CR005	779897.551	631102.443	381.771
CR006	776059.594	577294.963	69.224
CR007	1014644.841	666994.809	41.370
CR008	1014736.489	706622.212	184.235
CR009	1014837.137	766384.576	272.273
CR010	1014538.059	793644.587	228.722
CR011	1014903.581	846362.789	69.686
CR012	1014957.298	880026.697	169.333
CR013	1015633.835	940133.165	206.372
CR014	1247110.092	938389.153	515.006
CR015	1244738.878	847705.037	488.659
CR016	1243258.273	767844.496	417.232
CR017	1243053.372	701821.083	94.372
CR018	1256923.789	935908.793	734.810
CR019	1262855.237	917647.949	671.175
CR020	1265422.612	885789.972	673.357
CR021	1260495.117	850957.339	523.833
CR022	1265853.678	818403.853	403.263
CR023	1261626.647	801973.222	370.141
CR024	1261115.516	771262.200	314.306
CR025-B	1265963.806	753315.028	362.846
CR026	1266710.568	733948.751	312.481
CR027	1262975.003	714592.345	49.720
CR028	1199059.258	700503.778	99.015

CR029	1175797.184	700024.851	197.809
CR030	1093421.975	686403.837	36.901
CR031	1055112.350	678983.136	157.703
CR032	977469.108	663294.515	73.612
CR033	933368.937	650432.386	22.755
CR034	894513.558	640294.556	120.071
CR035	875586.190	624006.348	9.446
CR036	817432.665	603906.582	27.823
CR037	750301.314	569575.926	29.817
CR038	730022.979	600807.242	366.933
CR039	754947.060	613500.258	452.872
CR040	778763.539	661518.914	544.794
CR041	774694.773	684037.523	488.300
CR042	782923.244	735063.473	577.204
CR043	783516.114	764885.292	939.283
CR044	795536.395	832206.306	433.006
CR045	794122.355	861989.806	475.097
CR046	797600.589	908595.758	730.867
CR047	793013.206	923538.711	766.784
CR048	830860.288	945228.831	904.718
CR049	871481.379	941200.630	1213.135
CR050	916153.431	942316.740	786.389
CR051	961932.489	945970.996	1134.651
CR052	994714.494	945247.660	247.602
CR053	1055651.435	937458.194	198.720
CR054	1116351.425	937690.479	632.282
CR055	1084095.244	938075.281	274.824
CR056	1165992.405	935892.296	705.816
CR057	1212961.060	938295.822	411.604
CR058	1148045.481	696740.897	59.707
CR059	1057187.609	766394.460	330.785
CR060	1094981.973	766220.366	533.624
CR061	1141005.062	765838.307	389.258
CR062	1174835.440	766393.961	201.843
CR063	1209753.475	766816.066	96.123
CR064	1202370.004	848092.804	455.212
CR065-B	1156999.659	847275.640	262.459
CR066	1128165.440	846882.152	273.624
CR067	1111162.311	846708.179	617.875
CR068	1079230.981	846967.036	628.120
CR069	1044134.053	846624.784	79.178
CR070	1015090.552	689201.474	116.451
CR071	1015607.986	726463.563	217.958

CR072	1014292.592	750714.819	236.039
CR073	1014996.906	782845.127	76.347
CR074	1014743.151	819992.396	216.169
CR075	1015619.973	865113.952	131.168
CR076	1013872.173	903426.553	167.830
CR077	1014690.552	925766.695	221.805
CR078	838871.815	880529.851	786.116
CR079	863240.161	882341.507	1451.522
CR080	895339.957	888960.261	1319.089
CR081	911805.055	881277.243	707.950
CR082	941008.937	880351.479	368.926
CR083	986179.138	880420.796	179.840
CR084	988068.909	794723.541	213.229
CR085	961655.924	794525.283	318.168
CR086	937134.829	794226.902	906.062
CR087	895728.740	794094.238	757.188
CR088	872542.167	793990.891	802.910
CR089	844788.154	794708.110	475.119
CR090	825645.993	795385.432	409.083
CR091	811664.713	708141.861	414.255
CR092	834854.164	708045.676	730.658
CR093	852866.417	707750.801	418.704
CR094	892702.061	707846.378	658.240
CR095	916201.855	707565.861	275.798
CR096	954734.916	707229.691	124.496
CR097	977384.274	706894.843	101.853
CR098	759227.097	587170.608	269.113
CR099	798536.997	597400.040	184.156
CR100	815957.078	621161.984	128.966
CR101	857148.283	623959.627	30.916
CR102	811724.654	654826.107	349.916
CR103	800231.553	678029.744	501.930
CR104	801243.344	698434.641	459.680
CR105	838763.025	690713.238	512.290
CR106	862039.583	670639.369	332.660
CR107	839464.077	644161.840	311.484
CR108	876830.007	687628.021	500.476
CR109	905551.358	677140.891	24.502
CR110	936593.771	683938.380	81.361
CR111-B	923616.824	663417.499	162.660
CR112	966681.950	693613.479	25.395
CR113	995206.581	677211.232	97.719
CR114	1033736.615	759304.242	212.645

CR115	1052393.073	718319.213	550.379
CR116	1029835.951	698602.571	371.395
CR117	1075637.529	706349.077	143.899
CR118	1050380.914	742855.442	128.834
CR119	1123258.246	743663.910	369.676
CR120	1182335.840	757089.999	106.697
CR121	1149097.844	715776.362	205.878
CR122	1193197.375	729066.168	251.558
CR123	1244933.723	731008.497	195.209
CR124	1196558.693	743465.989	55.414
CR125	1229990.232	717581.376	306.420
CR126	1219210.536	784056.381	142.586
CR127	1230623.663	827332.576	204.116
CR128	1212315.360	808004.670	177.664
CR129	1159470.463	819966.117	227.944
CR130	1169833.547	776992.850	178.486
CR131	1146776.920	793315.027	394.751
CR132	1095139.298	836947.449	372.845
CR133	1105614.625	803118.993	592.052
CR134	1040088.703	833000.746	74.725
CR135	1082444.765	786587.311	473.172
CR136	1039864.955	779138.956	20.889
CR137	1040945.301	809661.359	70.118
CR138	1039080.216	860176.375	68.651
CR139-B	1042746.038	916335.373	147.671
CR140	1076782.955	890352.945	239.200
CR141	1083752.856	920352.814	266.829
CR142	1083802.556	876836.915	480.940
CR143	1133090.138	897621.568	609.962
CR144	1122070.253	871142.642	384.414
CR145	1134742.577	928713.793	713.028
CR146	1180761.498	880909.347	480.195
CR147	1211375.414	857720.002	528.802
CR148	1204517.816	923121.032	394.893
CR149	1230576.037	891543.974	234.648
CR150	1002851.737	894912.365	231.141
CR151	986370.762	921543.053	270.729
CR152	953727.812	902182.572	1000.863
CR153	954719.618	930875.725	1120.909
CR154	926723.028	910884.340	498.075
CR155	934493.419	892878.314	426.978
CR156	905935.936	921537.035	1187.439
CR157	901548.131	904738.874	989.675

CR158	857439.069	894127.083	848.125
CR159	865336.480	927692.101	845.438
CR160	842791.062	936196.984	668.818
CR161	815928.032	930212.486	783.526
CR162	834939.442	916907.697	645.836
CR163	824281.256	903095.522	587.074
CR164	815237.019	864735.603	1291.305
CR165	835518.462	842699.191	1334.214
CR166	801716.793	808511.251	416.823
CR167-B	867203.093	824196.321	894.887
CR168	872328.304	857240.701	1323.870
CR169	900367.425	848636.269	527.430
CR170	898158.867	817580.704	980.566
CR171	948445.735	807515.001	425.773
CR172	939760.841	841504.141	877.541
CR173	952332.161	862837.951	313.114
CR174	981229.427	853863.620	176.031
CR175	957732.481	826622.513	288.922
CR176	989173.211	814132.519	286.564
CR177	995587.628	835478.264	161.569
CR178	990869.141	777326.244	215.120
CR179	983563.077	740440.503	84.235
CR180	961162.779	760600.471	187.531
CR181	956637.229	727277.186	143.629
CR182	931827.485	771043.494	511.765
CR183	919046.404	747723.559	372.271
CR184	894013.908	724101.998	449.452
CR185	877169.829	764468.284	321.253
CR186	871988.898	737697.083	222.929
CR187	860922.853	778351.118	456.580
CR188	846761.405	720422.407	530.002
CR189	831531.290	754591.188	674.990
CR190	819901.150	771589.402	230.660
CR191	819618.968	731477.424	281.815
CR192	1175464.774	909113.145	726.890
CR193	1238210.312	867674.639	265.880
CR194	1190088.936	832319.103	315.236
CR195	1111398.657	826797.340	324.206
CR196	1187440.750	796910.188	202.094
CR197	1224313.163	756943.265	238.006
CR198	1083250.450	736131.873	345.141
CR199	1037946.398	678299.696	122.186
CR200	1112725.817	720877.820	82.583

CR201	748201.570	552491.960	7.880
CR202	755446.277	563316.608	10.627
CR203	773175.909	563849.714	8.041
CR204	911916.456	676834.535	314.257
CR205	1122692.545	689627.742	44.753
CR206	795507.241	587270.001	112.422
CR207	811297.572	582177.356	4.953
CR208	810771.503	594354.959	140.799
CR209	829214.480	596878.010	5.974
CR210	858651.529	606289.228	7.263
CR211	900065.084	616202.394	16.946
CR212	926068.175	637127.357	29.261
CR213	943228.534	653377.238	7.754
CR214	966946.405	650601.489	14.504
CR215	981818.928	651929.167	4.910
CR216	999155.268	663965.923	92.528
CR217	1011406.056	650092.944	13.988
CR218	1174369.329	671971.182	33.508
CR219	1056872.848	651709.038	6.455
CR220	1099451.120	656470.490	9.427
CR221	1149630.386	667816.490	26.905
CR222	1204178.863	673839.964	3.038
CR223	1244203.175	675111.665	2.096
CR224	1257010.051	682991.522	29.068
CR225-VA	817563.701	919721.350	686.317
CR226-VA	866548.219	927779.180	842.864
CR227-VA	877952.921	930534.625	1307.311
CR228-VA	930793.657	919618.576	869.250
CR229-VA	977870.682	923436.250	296.370
CR230-VA	971234.507	883212.599	301.700
CR231-VA	999223.038	925302.108	276.101
CR232-VA	1001486.461	878852.940	178.082
CR233-VA	962354.755	854340.241	301.820
CR234-VA	931557.274	873237.976	1016.062
CR235-VA	891732.373	860879.652	682.624
CR236-VA	842138.490	869864.985	709.020
CR237-VA	810393.329	834909.763	553.373
CR238-VA	837753.754	821771.795	866.995
CR239-VA	868136.765	837339.356	1099.991
CR240-VA	854632.321	817874.197	993.280
CR241-VA	925106.253	837897.142	926.462
CR242-VA	970198.247	839898.869	271.821
CR243-VA	937860.999	821231.942	881.910

CR244-VA	970653.672	781848.544	221.535
CR245-VA	951850.162	776482.756	206.605
CR246VA B	917851.250	775005.979	287.185
CR247-VA	900393.597	781172.784	480.226
CR248-VA	860031.624	764531.445	957.768
CR249-VA	801836.733	747488.488	439.031
CR250-VA	798988.302	723106.124	701.867
CR251-VA	876331.846	724159.150	375.987
CR252-VA	933025.007	718423.185	639.153
CR253-VA	984893.923	723917.628	204.007
CR254-VA-B	1013092.177	700626.396	182.442
CR255-VA	972951.368	674303.498	25.000
CR256-VA-B	1009810.082	655567.184	1.921
CR257-VA-B	930714.751	703163.331	535.151
CR258-VA-B	890480.487	696614.488	49.551
CR259-VA-B	850684.670	705788.544	387.979
CR260-VA	816136.576	691773.138	416.227
CR261-VA	784479.807	693498.087	604.493
CR262-VA-B	794085.488	664890.489	718.050
CR263-VA-B	834832.621	675590.211	679.017
CR264-VA-B	851365.215	656838.231	444.748
CR265-VA-B	886614.083	661433.411	320.463
CR266-VA	961967.148	677039.904	10.725
CR267-VA-B	943502.879	667642.037	24.454
CR268-VA-B	911174.419	640849.691	71.216
CR269-VA	866504.736	640185.787	269.486
CR270-VA-B	839675.466	620573.080	216.497
CR271-VA	800316.373	641561.330	552.334
CR272-VA-B	780517.301	611281.904	215.957
CR273-VA	741246.982	597271.753	506.081
CR274-VA	777070.459	586785.214	53.414
CR275-VA-B	798144.745	585513.275	10.306
CR276-VA	1232024.072	918444.755	420.817
CR277-VA	1209749.743	880734.373	516.535
CR278-VA	1160060.779	920872.481	969.731
CR279-VA	1098687.205	916464.922	876.089
CR280-VA	1046646.903	901557.273	110.592
CR281-VA	1036894.413	920837.508	122.901
CR282-VA	1056573.183	883006.228	198.273
CR283-VA	1096988.970	888519.400	683.034
CR284-VA	1155365.646	873994.637	479.711
CR285-VA	1185032.054	857719.305	685.201
CR286-VA	1245937.324	861580.731	435.590

CR287-VA	1253026.845	835868.046	703.273
CR288-VA	1235138.118	790744.768	546.968
CR289-VA	1212945.916	820572.078	216.727
CR290-VA	1181436.566	816013.878	269.493
CR291-VA	1160592.051	795488.291	301.355
CR292-VA	1144377.759	821460.458	256.216
CR293-VA	1090579.873	823717.671	540.190
CR294-VA	1060582.889	821086.397	339.309
CR295-VA	1066642.942	794000.988	699.489
CR296-VA	1140339.090	781877.113	500.845
CR297-VA	1083993.845	750315.918	406.307
CR298-VA	1039569.516	730869.847	242.911
CR299-VA	1070753.194	692259.484	364.920
CR300-VA	1030672.584	666659.414	24.755
CR301-VA	1084613.015	668448.034	29.009
CR302-VA	1127764.077	706715.382	364.767
CR303-VA	1078116.134	724392.135	5.963
CR304-VA	1131891.499	757971.806	499.452
CR305-VA	1128451.981	667833.370	28.978
CR306-VA	1176266.416	721672.868	71.453
CR307-VA	1214733.825	690394.515	3.326
CR308-VA	1210546.991	718662.946	241.191
CR309-VA	1258676.735	721740.804	169.326
CR310-VA	1231901.668	743312.820	334.053
CR311-VA	1249421.881	746254.215	480.237
CR312-VA	1110029.747	740941.150	290.481
CR313-VA	1153336.265	741657.135	584.995
CR314-VA	1191478.525	777328.340	66.684
CR315-VA	1132069.325	733911.808	264.644
CR051ALT	962185.372	941354.475	1163.149
CR052ALT	990785.001	942037.556	249.378

APPENDIX B

Survey Statistics

(Electronically Attached)

APPENDIX C

Photo ID Recovery Sheets

(Electronically Attached)

APPENDIX D

Geo-reference Files

(Electronically Attached)