Check Point Survey Report
"CHESAPEAKE BAY, Virginia QL2 LiDAR"
USGS Contract: G10PC00013
Task Order Number: G15PD00714

Prepared for:
United States Geological Survey (USGS)

Prepared By:

Dewberry Consultants LLC

10003 Derekwood Lane, Suite 204
Lanham, Maryland, 20706
Phone (301)364-1855 Fax (301)731-0188

TABLE OF CONTENTS

1. Introduction
   - 1.1 Project Summary 3
   - 1.2 Points of Contact(s) 3
   - 1.3 Project Area 4-8

2. Project Details
   - 2.1 Survey Equipment 9
   - 2.2 Survey Point Details 9
   - 2.3 Network Design 9
   - 2.4 Field Survey Procedures and Analysis 10-11
   - 2.5 Adjustment 12
   - 2.6 Data processing Procedures 12

3. Final Coordinates 13-18

4. GPS Observation & Re-Observation Schedule 19-24

5. Point Comparison Report 25-27

6. Deliverables ..... Sent via Electronic Transfer

   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

1.1 *Project Summary*

Dewberry Consultants LLC is under contract to the United States Geological Survey to provide 202 Check Points in the State of Virginia. 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 Check Point surveys that will be used to evaluate vertical and horizontal accuracy. The ground survey was conducted November 18-21 & November 30 – December 5, 2015.

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 approximately 50% of the points were re-observed and are shown in Section 5 of this report.

Final horizontal coordinates are referenced to UTM Zone 17 North, NAD83 in feet. Final Vertical elevations are referenced to NAVD88 in feet using Geoid model 2012B (Geoid12B).

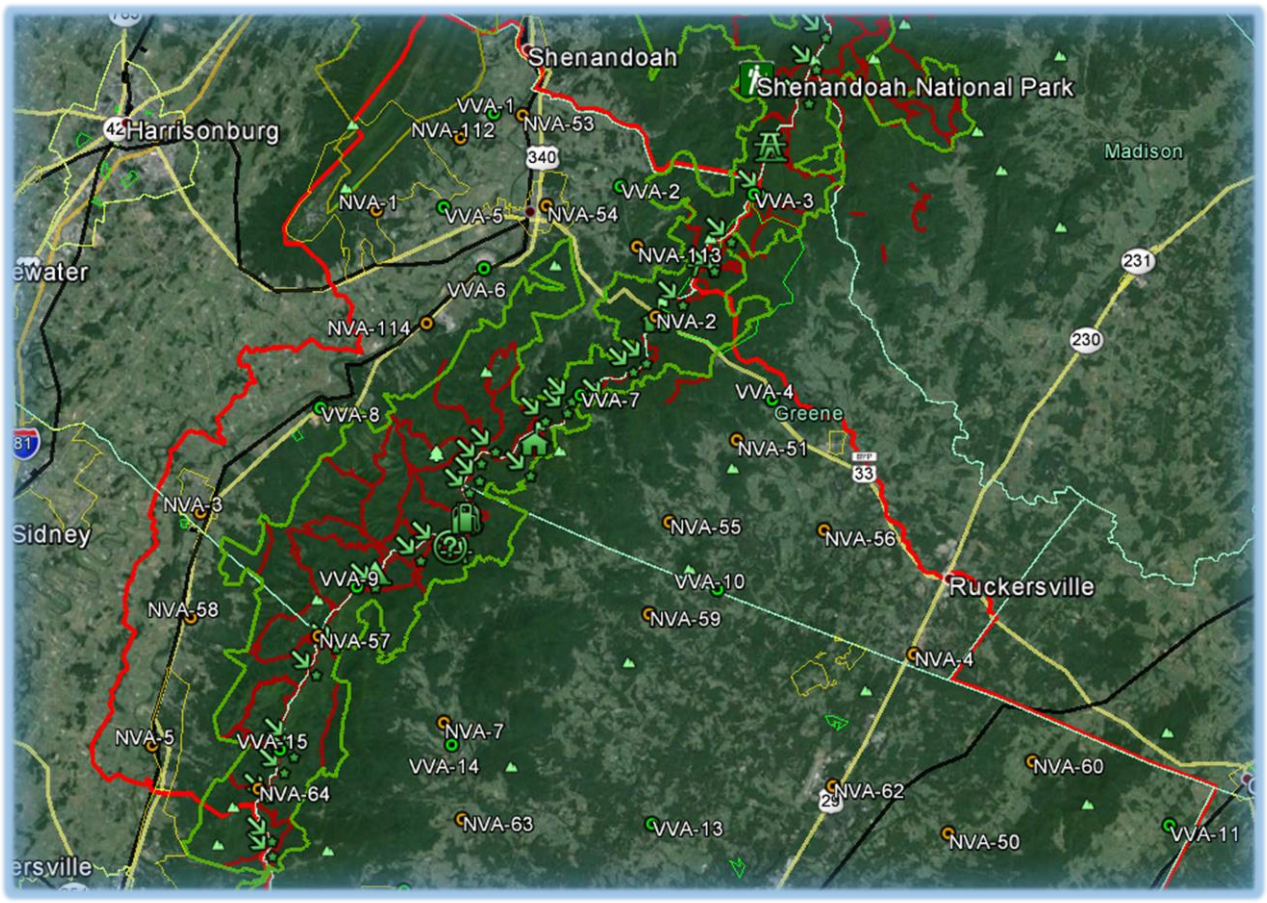
1.2 *Points of Contact*

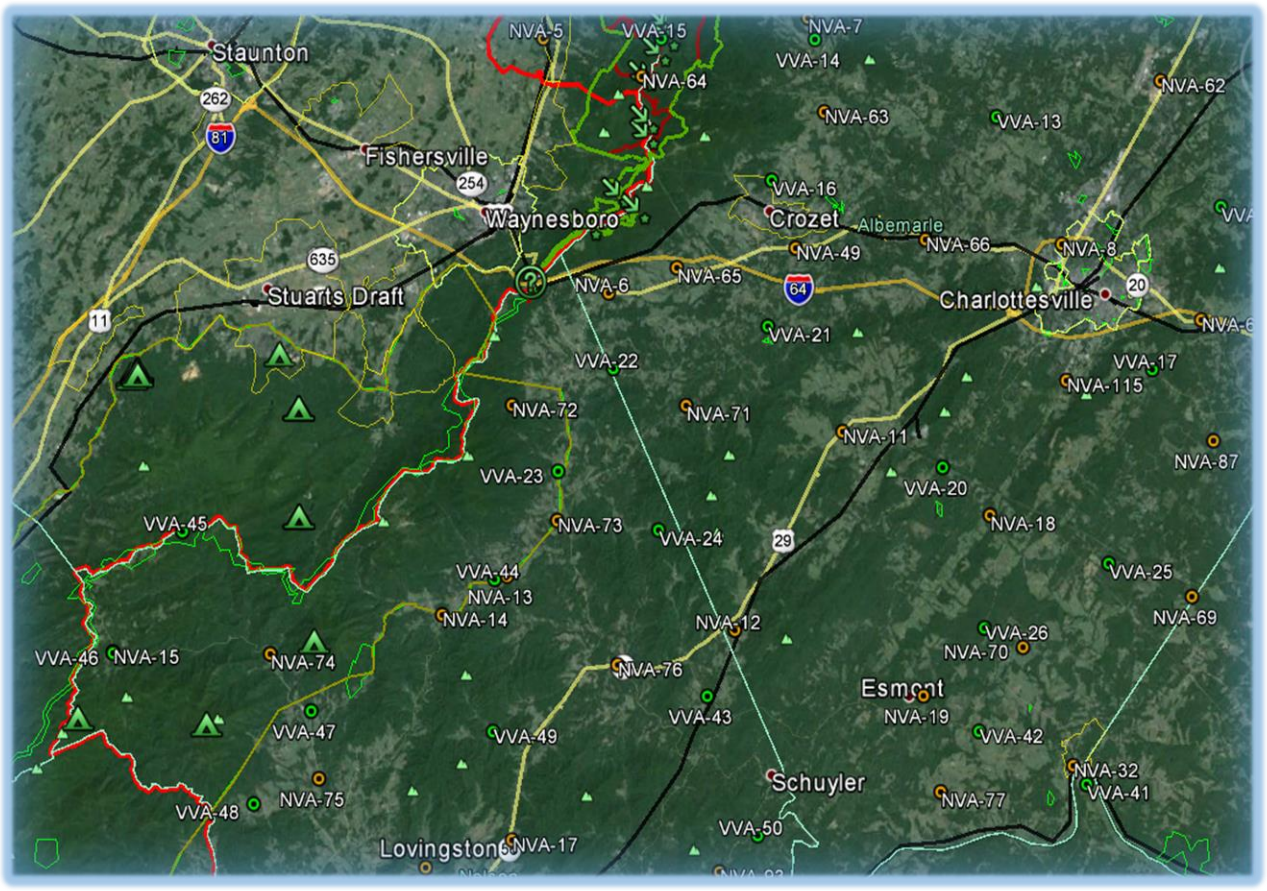
Questions regarding the technical aspects of this report should be addressed to:

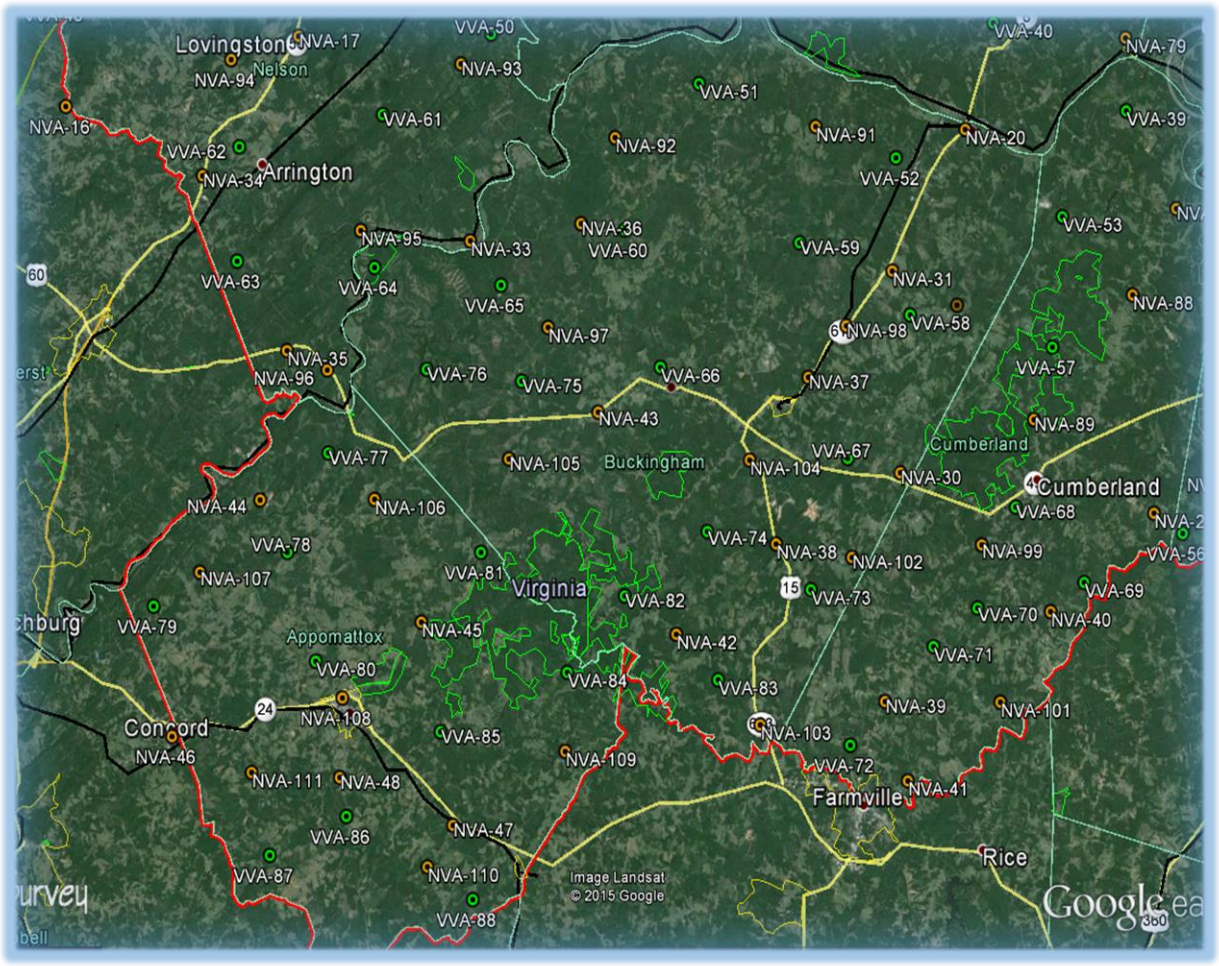
Dewberry Consultants LLC

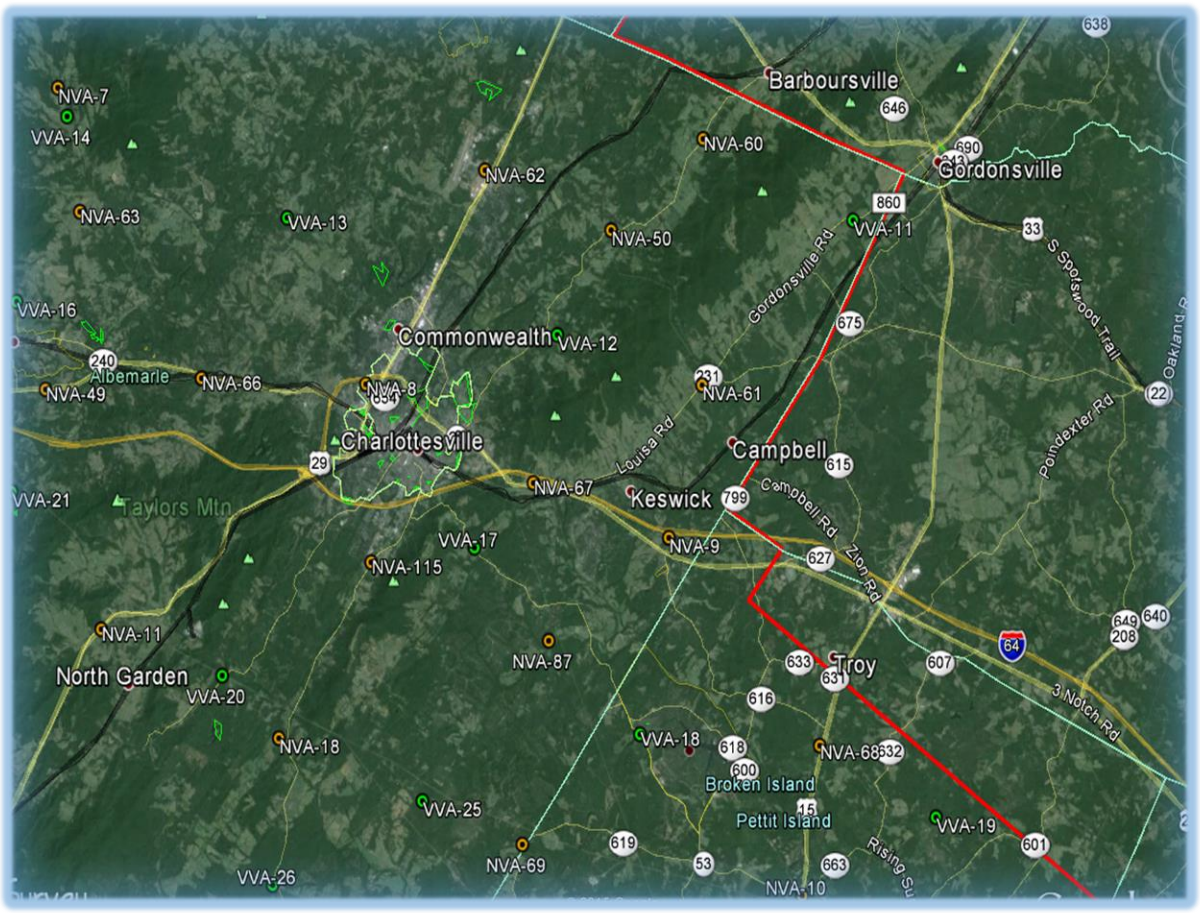
Gary D. Simpson, L.S.
Senior Associate
10003 Derekwood Lane
Suite 204
Lanham, Maryland 20706
(301) 364-1855 direct
(301) 731-0188 fax

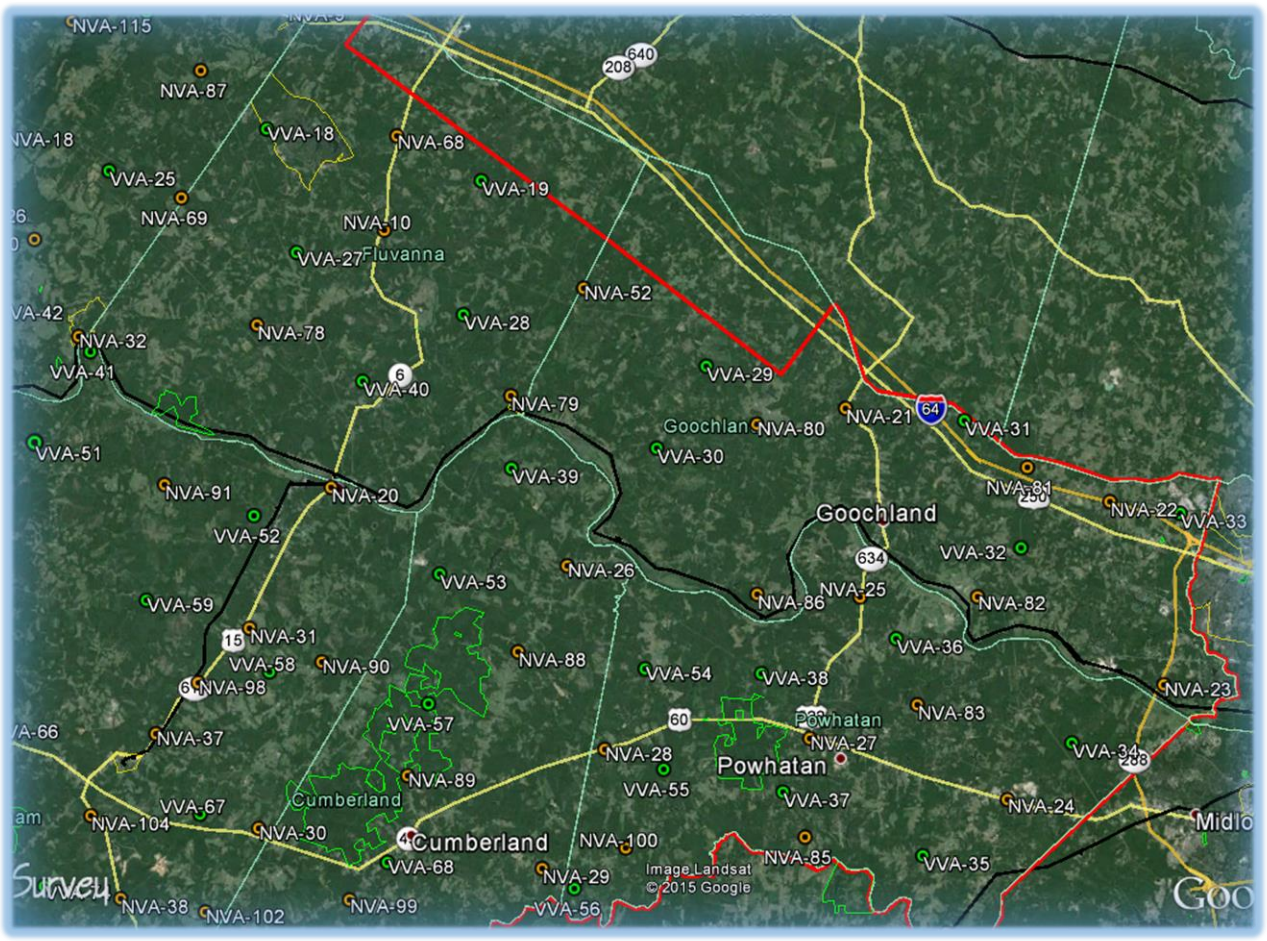
1.3 *Project Area*




Staunton
Fishersville
Waynesboro
Stuarts Draft
Crozet
Albemarle
Charlottesville
Esmont
Schuyler
Lovingston
NVA-5
VVA-15
NVA-7
VVA-14
NVA-64
NVA-62
NVA-63
VVA-13
VVA-16
NVA-49
NVA-66
NVA-8
NVA-65
NVA-6
VVA-21
VVA-22
VVA-17
NVA-115
NVA-72
NVA-71
NVA-11
NVA-87
VVA-23
VVA-20
VVA-45
NVA-73
VVA-24
NVA-18
VVA-44
NVA-13
NVA-14
VVA-25
NVA-69
NVA-12
VVA-26
NVA-70
VVA-46
NVA-15
NVA-74
NVA-76
VVA-43
NVA-19
VVA-42
VVA-47
VVA-49
NVA-32
VVA-41
VVA-48
NVA-75
NVA-77
VVA-50
NVA-17
262
81
254
635
11
64
20
29


Lovingston
Nelson
Arrington
Buckingham
Virginia
Appomattox
Concord
Cumberland
Farmville
Rice
Image Landsat
© 2015 Google
Google
NVA-16
NVA-17
NVA-94
NVA-93
VVA-50
VVA-51
VVA-61
VVA-62
NVA-34
NVA-92
NVA-91
NVA-20
VVA-40
NVA-79
VVA-39
VVA-52
VVA-53
NVA-36
VVA-60
NVA-95
NVA-33
VVA-59
VVA-63
VVA-64
VVA-65
NVA-31
NVA-88
NVA-97
NVA-98
VVA-58
NVA-35
NVA-96
VVA-76
VVA-75
VVA-66
NVA-37
VVA-57
NVA-43
NVA-89
VVA-77
NVA-105
VVA-67
NVA-104
NVA-30
NVA-44
NVA-106
VVA-68
VVA-78
VVA-74
NVA-38
NVA-102
NVA-99
NVA-107
VVA-81
VVA-82
VVA-73
VVA-69
VVA-79
NVA-45
NVA-42
VVA-70
NVA-40
VVA-80
VVA-84
VVA-83
VVA-71
NVA-108
NVA-39
NVA-101
VVA-85
NVA-103
NVA-46
NVA-109
VVA-72
NVA-111
NVA-48
NVA-41
VVA-86
NVA-47
VVA-87
NVA-110
VVA-88


NVA-7
VVA-14
NVA-63
VVA-13
NVA-62
NVA-60
Barboursville
646
638
690
Gordonsville
860
VVA-11
33
S Spotswood Trail
Oakland
22
NVA-50
Gordonsville Rd
675
VVA-16
Commonwealth
VVA-12
240
Albemarle
NVA-49
NVA-66
NVA-8
894
231
NVA-61
Charlottesville
29
Louisa Rd
Campbell
615
Poindexter Rd
VVA-21
Taylors Mtn
NVA-67
Keswick
799
Campbell Rd
Zion Rd
627
VVA-17
NVA-9
NVA-115
NVA-11
North Garden
VVA-20
NVA-87
633
631
Troy
607
649
640
208
64
3 Notch Rd
616
NVA-18
VVA-18
618
NVA-68
632
600
Broken Island
15
Pettit Island
VVA-25
VVA-19
601
619
NVA-69
53
663
VVA-26
NVA-10
Rising Su



Chesapeake Bay, Virginia QL2 LiDAR

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 203 LiDAR Check 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 Check Point locations are detailed on the "Check Point Documentation Report" sheets attached to this report.

2.3 *Network Design*

The GPS survey performed by Dewberry Consultants LLC office located in Lanham, MD was tied to a Real Time Network (RTN) managed by KEYNET GPS, Inc. 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.

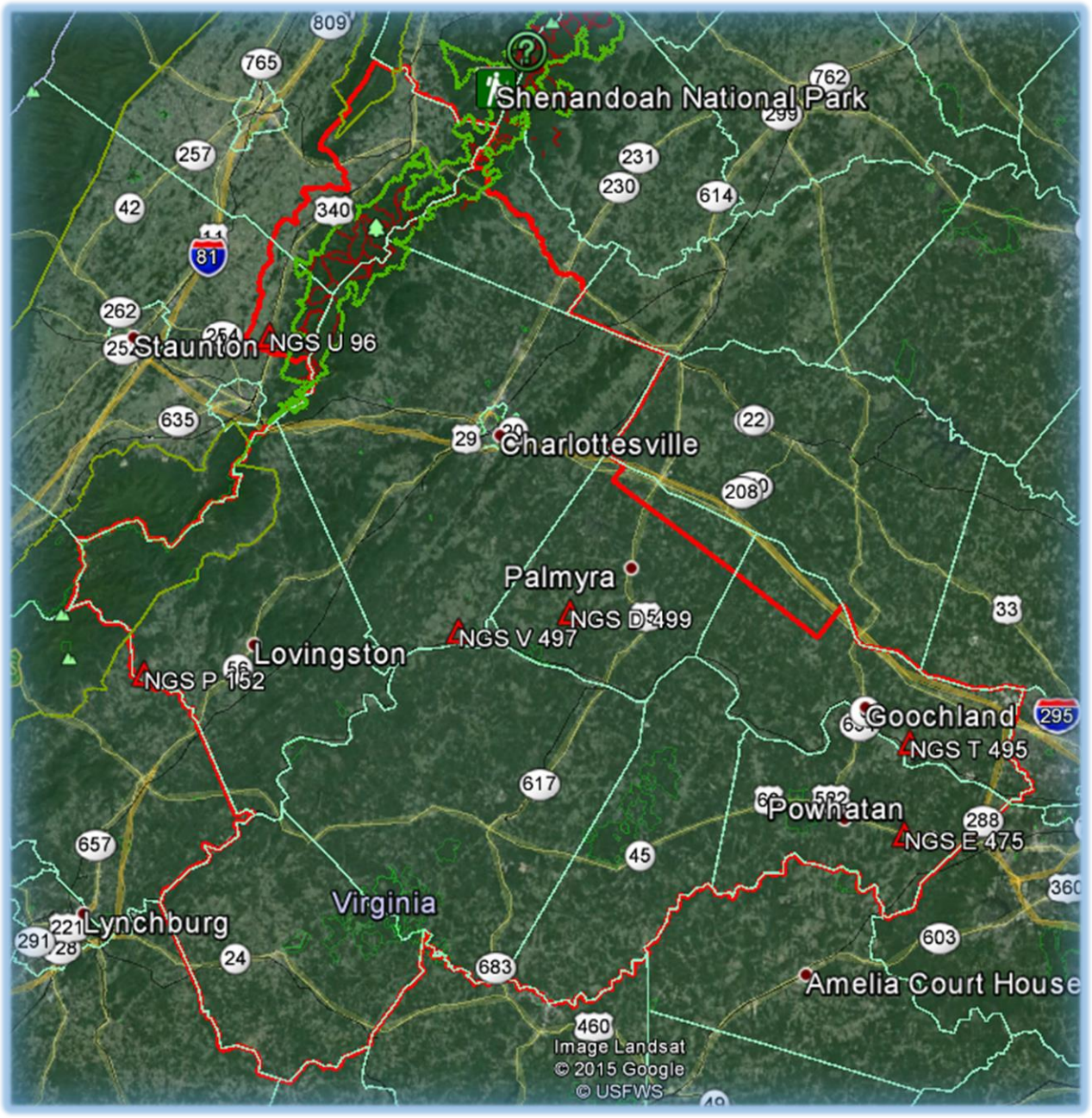
Each occupation which utilized OPUS (if used) was occupied between 20 and 30 minutes.

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

Six (6) 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 GV3441, GW1042, HW0695, GW2026, GW2018 and GV3585. The results are as follows:

NGS PT. ID	As Surveyed (F)			Published (F)			Differences (F)		
	Northing(F)	Easting(F)	Elev.(F)	Northing(F)	Easting(F)	Elev. (F)	Δ N	Δ E	Δ Elev.
NGS P 152	3786628.73	11324591.91	785.68	3786628.52	11324591.8	786.06	0.21	0.09	0.38
NGS U96	6739308.75	11382064.71	1251.55	6739308.70	11382064.6	1251.58	0.05	0.07	0.03
NGS V 497	3807284.61	11471043.56	405.94	3807284.61	11471043.5	406.25	0.00	0.03	0.31
NGS-D499	3816354.60	11522955.93	502.13	3816354.67	11522955.9	502.19	0.07	0.04	0.06
NGS E475	3714345.14	11679534.21	409.11	3714345.23	11679534.3	409.00	0.10	0.08	0.11
NGS T495	3756890.88	11681749.28	276.04	3756890.79	11681749.3	276.18	0.09	0.03	0.14

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 KEYNET 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 TBC or 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 2014) 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*

POINT ID	NORTHING (FT)	EASTING (FT)	ELEV. (FT)
NVA			
NVA-1	13955511.186	2294655.240	1246.162
NVA-2	13938264.157	2343681.106	2347.520
NVA-3	13902393.679	2265480.088	1120.045
NVA-4	13881143.339	2390317.794	528.046
NVA-5	13861855.326	2258204.480	1254.529
NVA-6	13816830.045	2271926.381	842.619
NVA-7	13867109.221	2308733.480	719.628
NVA-8	13827989.047	2358628.536	486.469
NVA-9	13808215.566	2407559.132	460.929
NVA-10	13759455.288	2430205.621	301.126
NVA-11	13793442.096	2317369.158	770.257
NVA-12	13756955.455	2297942.877	685.996
NVA-13	13765640.844	2253858.862	678.730
NVA-14	13758443.540	2241692.671	831.771
NVA-15	13750317.973	2179670.370	2600.328
NVA-16	13701935.442	2199252.940	744.564
NVA-17	13718463.630	2256234.016	761.636
NVA-18	13779100.251	2345972.789	438.707
NVA-19	13746252.534	2334164.791	617.064
NVA-20	13702910.365	2420026.927	340.412
NVA-21	13723266.787	2532716.113	358.242
NVA-22	13704417.275	2591550.165	346.443
NVA-23	13664572.725	2604557.643	274.714
NVA-24	13638492.840	2570699.736	361.168
NVA-25	13682011.421	2537114.203	306.950
NVA-26	13687150.668	2472451.380	355.266
NVA-27	13650755.253	2526848.998	377.282
NVA-28	13647152.239	2481791.186	360.916
NVA-29	13619178.142	2468564.483	362.822
NVA-30	13628312.313	2406549.368	399.917
NVA-31	13671580.499	2402902.701	510.518
NVA-32	13734541.059	2363389.351	272.608
NVA-33	13675312.560	2299266.108	352.765
NVA-34	13687754.714	2233236.936	766.930
NVA-35	13650283.815	2254954.745	664.646

NVA-36	13679801.925	2326402.095	563.113
NVA-37	13652505.410	2386369.166	600.118
NVA-38	13611482.066	2375977.977	557.855
NVA-39	13578006.560	2403763.891	509.854
NVA-40	13598553.935	2443842.200	382.308
NVA-41	13560819.486	2409697.748	305.907
NVA-42	13591206.782	2352031.726	610.609
NVA-43	13638951.884	2331586.887	509.045
NVA-44	13617668.903	2249284.175	676.591
NVA-45	13592197.001	2289521.600	826.312
NVA-46	13565704.004	2229015.373	884.858
NVA-47	13548204.035	2298382.101	723.534
NVA-48	13557919.212	2270445.309	854.404
NVA-49	13825885.343	2307544.660	641.472
NVA-50	13850177.417	2397188.395	543.755
NVA-51	13917471.998	2358409.186	795.153
NVA-52	13748064.239	2474438.891	448.875
NVA-53	13972775.352	2319577.113	951.250
NVA-54	13957157.759	2324196.087	1019.048
NVA-55	13902963.979	2347072.410	676.252
NVA-56	13902264.652	2374076.983	616.495
NVA-57	13881671.340	2286839.360	2326.783
NVA-58	13884165.687	2264292.008	1224.323
NVA-59	13886894.605	2343960.647	622.830
NVA-60	13863085.206	2411529.723	500.899
NVA-61	13829314.569	2412288.525	458.916
NVA-62	13857863.343	2376834.679	591.051
NVA-63	13850412.700	2312350.111	729.617
NVA-64	13855158.421	2277258.466	2713.030
NVA-65	13821688.748	2284852.945	738.335
NVA-66	13828086.381	2332369.684	520.275
NVA-67	13815133.168	2385739.033	392.967
NVA-68	13780324.022	2432394.462	417.314
NVA-69	13765487.986	2385315.818	547.927
NVA-70	13755547.380	2353096.638	432.485
NVA-71	13797071.520	2287292.713	883.257
NVA-72	13796268.135	2254116.816	927.866
NVA-73	13775824.347	2263187.055	602.912
NVA-74	13750582.947	2209074.722	1029.287

NVA-75	**13728424.733**	**2218782.483**	**734.021**
NVA-76	**13750366.524**	**2275400.608**	**565.057**
NVA-77	**13729180.856**	**2338019.632**	**406.424**
NVA-78	**13738059.497**	**2402702.962**	**503.678**
NVA-79	**13724046.586**	**2459040.976**	**248.825**
NVA-80	**13719287.037**	**2513339.813**	**329.368**
NVA-81	**13711411.960**	**2573149.458**	**359.862**
NVA-82	**13682770.176**	**2562974.398**	**275.726**
NVA-83	**13658781.015**	**2550329.632**	**336.271**
NVA-84	**13608839.053**	**2558091.623**	**305.174**
NVA-85	**13629099.046**	**2526340.559**	**330.661**
NVA-86	**13682024.000**	**2514408.914**	**335.284**
NVA-87	**13793497.588**	**2388763.135**	**320.794**
NVA-88	**13668009.226**	**2462122.503**	**379.384**
NVA-89	**13638974.836**	**2438959.070**	**419.186**
NVA-90	**13664602.728**	**2419024.534**	**428.078**
NVA-91	**13702531.985**	**2383267.481**	**378.650**
NVA-92	**13698733.400**	**2334140.401**	**566.261**
NVA-93	**13713730.257**	**2295981.260**	**486.775**
NVA-94	**13713006.490**	**2239449.021**	**722.172**
NVA-95	**13676845.905**	**2272351.689**	**367.627**
NVA-96	**13646308.601**	**2264951.605**	**634.627**
NVA-97	**13656975.733**	**2318799.928**	**592.613**
NVA-98	**13659336.211**	**2391912.512**	**602.415**
NVA-99	**13612640.553**	**2426446.677**	**475.532**
NVA-100	**13625665.963**	**2486973.380**	**387.626**
NVA-101	**13578569.827**	**2432003.556**	**408.469**
NVA-102	**13609062.786**	**2394669.267**	**379.619**
NVA-103	**13572050.678**	**2373130.458**	**456.362**
NVA-104	**13635173.989**	**2367331.855**	**671.996**
NVA-105	**13628207.610**	**2310034.875**	**660.033**
NVA-106	**13618542.661**	**2277319.646**	**656.027**
NVA-107	**13601555.284**	**2234903.933**	**785.978**
NVA-108	**13575230.610**	**2270628.816**	**874.729**
NVA-109	**13565058.464**	**2325490.252**	**628.945**
NVA-110	**13539008.774**	**2292343.694**	**673.818**
NVA-111	**13559409.665**	**2247978.079**	**754.379**
NVA-112	**13968439.378**	**2308911.405**	**1238.313**
NVA-113	**13950428.715**	**2340159.150**	**1388.494**

NVA-114	13936231.224	2303911.172	1014.815
NVA-115	13803556.899	2360111.763	528.162
VVA			
VVA-1	13972887.608	2314571.865	961.171
VVA-2	13960782.791	2336951.421	1223.124
VVA-3	13959780.328	2360027.222	3137.848
VVA-4	13924653.966	2364372.227	986.625
VVA-5	13956388.295	2306297.509	1082.639
VVA-6	13945976.221	2313617.835	1014.579
VVA-7	13924431.990	2331034.944	2296.442
VVA-8	13921072.348	2285807.628	1094.606
VVA-9	13890395.382	2293353.868	2790.349
VVA-10	13891487.286	2355742.382	623.550
VVA-11	13852580.414	2435772.154	518.480
VVA-12	13835552.125	2389018.702	599.380
VVA-13	13850482.243	2345445.094	586.471
VVA-14	13863299.662	2310179.025	679.031
VVA-15	13862024.412	2280735.727	2985.201
VVA-16	13837806.041	2302585.908	725.711
VVA-17	13806006.961	2376580.996	537.215
VVA-18	13781093.947	2403661.559	363.112
VVA-19	13770380.557	2451336.692	420.324
VVA-20	13787127.948	2337234.823	659.715
VVA-21	13811580.871	2302621.696	549.039
VVA-22	13803286.824	2273245.140	803.758
VVA-23	13784678.482	2263096.757	698.730
VVA-24	13774568.468	2282649.831	858.378
VVA-25	13772488.058	2367053.436	489.624
VVA-26	13758865.992	2345605.568	554.342
VVA-27	13754180.974	2410986.197	388.003
VVA-28	13741419.257	2448033.128	218.210
VVA-29	13731715.792	2502030.231	373.320
VVA-30	13707929.902	2491370.950	331.298
VVA-31	13721511.439	2559377.257	340.656
VVA-32	13699351.399	2568399.717	344.650
VVA-33	13702650.862	2604938.585	262.468
VVA-34	13651253.851	2584629.043	235.174
VVA-35	13625273.864	2552967.617	338.287
VVA-36	13672650.428	2542758.585	298.343

VVA-37	**13638749.790**	**2521268.110**	**359.616**
VVA-38	**13665074.744**	**2514899.512**	**293.730**
VVA-39	**13708193.352**	**2459590.714**	**371.755**
VVA-40	**13726367.784**	**2426223.583**	**460.806**
VVA-41	**13731172.658**	**2366061.611**	**277.083**
VVA-42	**13739634.241**	**2348778.820**	**375.991**
VVA-43	**13744968.612**	**2292874.004**	**666.792**
VVA-44	**13765025.177**	**2251470.683**	**708.462**
VVA-45	**13772040.596**	**2192197.757**	**3297.527**
VVA-46	**13750163.472**	**2179706.458**	**2594.997**
VVA-47	**13740543.105**	**2217019.261**	**837.919**
VVA-48	**13722919.395**	**2204950.675**	**921.379**
VVA-49	**13737912.776**	**2252037.115**	**875.309**
VVA-50	**13720490.333**	**2303044.822**	**552.851**
VVA-51	**13711222.925**	**2353943.028**	**457.119**
VVA-52	**13695086.726**	**2402361.637**	**433.400**
VVA-53	**13684614.169**	**2444411.180**	**365.356**
VVA-54	**13667139.387**	**2488575.563**	**307.299**
VVA-55	**13643449.271**	**2494913.487**	**294.575**
VVA-56	**13616512.461**	**2475946.574**	**348.958**
VVA-57	**13653720.952**	**2443095.651**	**360.332**
VVA-58	**13662153.051**	**2407526.735**	**474.819**
VVA-59	**13677242.530**	**2380166.962**	**401.921**
VVA-61	**13702005.943**	**2277041.279**	**959.148**
VVA-62	**13694355.806**	**2241959.400**	**606.769**
VVA-63	**13669346.088**	**2241964.793**	**714.025**
VVA-64	**13668876.764**	**2275773.183**	**561.832**
VVA-65	**13665377.250**	**2307552.409**	**682.571**
VVA-66	**13649142.951**	**2346630.694**	**468.897**
VVA-67	**13629806.858**	**2391048.751**	**535.381**
VVA-68	**13620627.851**	**2434318.778**	**384.376**
VVA-69	**13605099.156**	**2451886.138**	**352.814**
VVA-70	**13598881.505**	**2425912.994**	**391.738**
VVA-71	**13585873.283**	**2411994.440**	**496.390**
VVA-72	**13568246.119**	**2395789.771**	**384.669**
VVA-73	**13601754.335**	**2384733.301**	**377.022**
VVA-74	**13614641.418**	**2359448.224**	**585.544**
VVA-75	**13645190.332**	**2312674.936**	**583.300**
VVA-76	**13640325.053**	**2292635.358**	**850.827**

VVA-77	**13628198.231**	**2265604.107**	**602.443**
VVA-78	**13606668.726**	**2256239.614**	**805.586**
VVA-79	**13593912.861**	**2223767.026**	**776.791**
VVA-80	**13583063.520**	**2263902.131**	**788.313**
VVA-81	**13608217.261**	**2304185.043**	**869.551**
VVA-82	**13599757.002**	**2339391.400**	**610.743**
VVA-83	**13581614.648**	**2362557.355**	**586.623**
VVA-84	**13582372.250**	**2325675.814**	**608.691**
VVA-85	**13568483.436**	**2294852.084**	**721.085**
VVA-86	**13549504.367**	**2272081.940**	**730.547**
VVA-87	**13546214.105**	**2258442.635**	**749.700**
VVA-88	**13532379.885**	**2303725.550**	**674.837**

4. *GPS OBSERVATIONS*

POINT ID	OBSERV. DATE	JULIAN DATE	TIME OF DAY	RE-OBSERV. DATE	RE-OBSERV. TIME
NVA					
NVA-1	12/3/2015	337	15:52	N/A	N/A
NVA-2	12/3/2015	337	13:25	12/3/2015	20:06
NVA-3	12/3/2015	337	17:27	N/A	N/A
NVA-4	12/4/2015	338	12:48	N/A	N/A
NVA-5	12/13/2015	347	8:11	12/3/2015	18:21
NVA-6	12/5/2015	339	8:57	N/A	N/A
NVA-7	12/4/2015	338	17:11	N/A	N/A
NVA-8	12/4/2015	338	8:03	12/4/2015	19:19
NVA-9	12/4/2015	338	9:46	12/4/2015	20:48
NVA-10	12/2/2015	336	19:43	N/A	N/A
NVA-11	12/5/2015	339	11:11	N/A	N/A
NVA-12	12/1/2015	335	9:32	12/1/2015	19:21
NVA-13	12/3/2015	337	10:08	N/A	N/A
NVA-14	12/3/2015	337	10:37	12/4/2015	12:36
NVA-15	12/1/2015	335	18:40	N/A	N/A
NVA-16	12/1/2015	335	15:12	12/3/2015	5:51
NVA-17	12/1/2015	335	12:19	12/1/2015	20:37
NVA-18	11/30/2015	334	15:02	N/A	N/A
NVA-19	12/2/2015	336	10:03	12/3/2015	7:04
NVA-20	11/22/2015	326	15:30	N/A	N/A
NVA-21	11/20/2015	324	10:56	11/20/2015	20:16
NVA-22	11/20/2015	324	8:12	11/20/2015	18:08
NVA-23	11/20/2015	324	16:50	11/20/2015	20:59
NVA-24	11/22/2015	326	6:43	N/A	N/A
NVA-25	11/20/2015	324	15:40	N/A	N/A
NVA-26	11/20/2015	324	13:35	N/A	N/A
NVA-27	11/21/2015	325	17:05	N/A	N/A
NVA-28	11/21/2015	325	15:58	11/21/2015	18:35
NVA-29	11/22/2015	326	9:30	N/A	N/A
NVA-30	11/22/2015	326	13:52	N/A	N/A
NVA-31	11/22/2015	326	15:35	N/A	N/A
NVA-32	11/20/2015	324	16:59	N/A	N/A
NVA-33	11/21/2015	325	11:20	N/A	N/A
NVA-34	12/1/2015	335	14:11	N/A	N/A

NVA-35	11/21/2015	325	9:48	11/21/2015	19:33
NVA-36	12/3/2015	337	14:35	N/A	N/A
NVA-37	11/22/2015	326	14:34	N/A	N/A
NVA-38	11/22/2015	326	11:11	N/A	N/A
NVA-39	11/22/2015	326	12:01	11/22/2015	13:54
NVA-40	11/22/2015	326	10:17	N/A	N/A
NVA-41	11/22/2015	326	11:29	N/A	N/A
NVA-42	11/22/2015	326	9:27	N/A	N/A
NVA-43	11/21/2015	325	15:14	11/21/2015	20:25
NVA-44	11/20/2015	325	18:20	11/21/2015	18:45
NVA-45	11/20/2015	325	16:12	N/A	N/A
NVA-46	11/20/2015	325	7:39	11/20/2015	18:55
NVA-47	11/20/2015	325	11:51	11/20/2015	21:04
NVA-48	11/20/2015	325	15:07	N/A	N/A
NVA-49	12/5/2015	339	8:31	12/5/2015	12:32
NVA-50	12/4/2015	338	11:20	12/4/2015	22:13
NVA-51	12/4/2015	338	14:12	12/5/2015	5:26
NVA-52	12/2/2015	336	18:32	N/A	N/A
NVA-53	12/3/2015	337	14:39	N/A	N/A
NVA-54	12/3/2015	337	14:24	12/3/2015	21:08
NVA-55	12/4/2015	338	14:28	N/A	N/A
NVA-56	12/4/2015	338	13:13	12/5/2015	4:51
NVA-57	12/3/2015	337	10:02	12/3/2015	19:18
NVA-58	12/3/2015	337	17:41	N/A	N/A
NVA-59	12/4/2015	338	14:51	12/5/2015	6:01
NVA-60	12/4/2015	338	10:58	12/4/2015	21:46
NVA-61	12/4/2015	338	10:05	12/4/2015	21:04
NVA-62	12/4/2015	338	12:29	12/4/2015	22:57
NVA-63	12/4/2015	338	18:11	N/A	N/A
NVA-64	12/3/2015	337	8:54	12/3/2015	18:47
NVA-65	12/5/2015	339	8:44	N/A	N/A
NVA-66	12/5/2015	339	7:52	12/5/2015	12:20
NVA-67	12/4/2015	338	9:29	12/4/2015	20:31
NVA-68	12/2/2015	336	19:17	12/4/2015	8:14
NVA-69	12/2/2015	336	20:40	12/3/2015	8:09
NVA-70	11/30/2015	334	16:26	12/3/2015	7:37
NVA-71	12/5/2015	339	10:35	12/5/2015	13:36
NVA-72	12/5/2015	339	9:43	N/A	N/A
NVA-73	12/3/2015	337	9:53	12/4/2015	13:03

NVA-74	12/1/2015	335	17:42	12/4/2015	12:15
NVA-75	12/1/2015	335	16:51	12/4/2015	11:20
NVA-76	12/1/2015	335	10:57	12/1/2015	19:33
NVA-77	12/2/2015	336	11:39	N/A	N/A
NVA-78	11/22/2015	326	17:36	N/A	N/A
NVA-79	12/2/2015	336	16:49	12/4/2015	5:59
NVA-80	11/20/2015	324	11:15	N/A	N/A
NVA-81	11/20/2015	324	9:50	11/20/2015	19:03
NVA-82	11/20/2015	324	16:20	11/20/2015	20:33
NVA-83	11/21/2015	325	7:00	11/21/2015	17:33
NVA-84	11/22/2015	326	7:25	N/A	N/A
NVA-85	11/22/2015	326	8:40	N/A	N/A
NVA-86	11/20/2015	324	14:20	N/A	N/A
NVA-87	12/3/2015	337	17:37	N/A	N/A
NVA-88	11/21/2015	325	8:48	11/21/2015	19:16
NVA-89	11/21/2015	325	10:45	11/21/2015	19:32
NVA-90	11/21/2015	325	9:45	N/A	N/A
NVA-91	12/2/2015	336	14:28	N/A	N/A
NVA-92	12/3/2015	337	15:19	N/A	N/A
NVA-93	12/3/2015	337	12:11	12/4/2015	9:57
NVA-94	12/1/2015	335	12:43	12/1/2015	20:51
NVA-95	11/21/2015	325	10:56	N/A	N/A
NVA-96	11/21/2015	325	9:29	11/21/2015	19:21
NVA-97	11/21/2015	325	14:26	N/A	N/A
NVA-98	11/22/2015	326	14:50	N/A	N/A
NVA-99	11/21/2015	325	15:19	11/21/2015	20:17
NVA-100	11/22/2015	326	9:00		
NVA-101	11/22/2015	326	11:06	11/22/2015	14:56
NVA-102	11/22/2015	326	10:53	N/A	N/A
NVA-103	11/22/2015	326	10:05	N/A	N/A
NVA-104	11/22/2015	326	13:00	N/A	N/A
NVA-105	11/21/2015	325	16:07	11/21/2015	20:51
NVA-106	11/21/2015	325	17:32	N/A	N/A
NVA-107	11/21/2015	325	8:19	N/A	N/A
NVA-108	11/20/2015	324	15:30	N/A	N/A
NVA-109	11/20/2015	324	12:38	N/A	N/A
NVA-110	11/20/2015	324	11:33	11/20/2015	20:16
NVA-111	11/20/2015	324	8:49	11/20/2015	19:16
NVA-112	12/3/2015	337	15:23	N/A	N/A

NVA-113	12/3/2015	337	13:54	12/3/2015	20:35
NVA-114	12/3/2015	337	16:42	12/3/2015	21:56
NVA-115	12/4/2015	338	8:44	12/4/2015	19:59
VVA					
VVA-1	12/3/2015	337	15:10	N/A	N/A
VVA-2	12/3/2015	337	14:09	12/3/2015	20:48
VVA-3	12/3/2015	337	12:17	12/3/2015	19:49
VVA-4	12/4/2015	338	13:55	N/A	N/A
VVA-5	12/3/2015	337	15:38	N/A	N/A
VVA-6	12/3/2015	337	16:30	N/A	N/A
VVA-7	12/3/2015	337	11:10	12/3/2015	19:36
VVA-8	12/3/2015	337	17:00	N/A	N/A
VVA-9	12/3/2015	337	10:17	N/A	N/A
VVA-10	12/4/2015	338	15:25	12/5/2015	5:47
VVA-11	12/4/2015	338	10:34	N/A	N/A
VVA-12	12/4/2015	338	11:45	12/4/2015	22:30
VVA-13	12/5/2015	339	7:34	N/A	N/A
VVA-14	12/4/2015	338	17:42	N/A	N/A
VVA-15	12/3/2015	337	9:15	12/3/2015	19:02
VVA-16	12/4/2015	338	8:16	N/A	N/A
VVA-17	12/4/2015	337	9:12	12/4/2015	20:13
VVA-18	12/3/2015	337	18:03	12/4/2015	8:29
VVA-19	12/3/2015	337	18:57	12/4/2015	7:53
VVA-20	11/30/2015	334	14:38	12/4/2015	9:04
VVA-21	12/5/2015	339	10:52	12/5/2015	13:59
VVA-22	12/5/2015	339	9:13	12/5/2015	12:58
VVA-23	12/5/2015	339	10:13	N/A	N/A
VVA-24	12/3/2015	337	8:52	12/4/2015	13:18
VVA-25	12/3/2015	337	17:06	N/A	N/A
VVA-26	11/30/2015	334	15:42	12/3/2015	7:53
VVA-27	12/3/2015	337	16:34	N/A	N/A
VVA-28	12/2/2015	336	17:56	12/4/2015	7:18
VVA-29	11/20/2015	324	11:40	N/A	N/A
VVA-30	11/20/2015	324	12:40	N/A	N/A
VVA-31	11/20/2015	324	10:20	11/20/2015	19:43
VVA-32	11/20/2015	324	9:35	N/A	N/A
VVA-33	11/20/2015	324	7:50	11/20/2015	17:47
VVA-34	11/21/2015	325	6:37	N/A	N/A
VVA-35	11/22/2015	326	7:48	N/A	N/A

VVA-36	11/21/2015	325	7:28	N/A	N/A
VVA-37	11/21/2015	325	16:45	N/A	N/A
VVA-38	11/21/2015	325	7:57	N/A	N/A
VVA-39	11/20/2015	324	13:15	N/A	N/A
VVA-40	12/2/2015	336	16:08	12/4/2015	6:53
VVA-41	12/2/2015	336	12:00	N/A	N/A
VVA-42	12/2/2015	336	10:50	12/3/2015	7:18
VVA-43	12/1/2015	335	9:55	12/1/2015	19:53
VVA-44	12/3/2015	337	10:21	12/4/2015	12:46
VVA-45	11/21/2015	325	13:24	N/A	N/A
VVA-46	12/1/2015	335	19:01	N/A	N/A
VVA-47	12/1/2015	335	17:13	12/4/2015	11:38
VVA-48	12/1/2015	335	16:03	12/4/2015	10:56
VVA-49	12/1/2015	335	11:36	12/4/2015	10:33
VVA-50	12/3/2015	337	13:16	12/4/2015	9:38
VVA-51	12/2/2015	336	13:15	N/A	N/A
VVA-52	12/2/2015	336	14:52	N/A	N/A
VVA-53	11/21/2015	325	9:20	11/21/2015	20:28
VVA-54	11/21/2015	325	8:20	11/21/2015	18:56
VVA-55	11/21/2015	325	16:20	11/21/2015	18:21
VVA-56	11/22/2015	326	9:19	N/A	N/A
VVA-57	11/21/2015	325	10:15	11/21/2015	20:28
VVA-58	11/22/2015	326	15:11	N/A	N/A
VVA-59	11/22/2015	326	15:58	N/A	N/A
VVA-60	12/3/2015	337	14:55	N/A	N/A
VVA-61	12/3/2015	337	11:43	12/4/2015	10:13
VVA-62	12/1/2015	335	13:13	12/1/2015	21:10
VVA-63	11/21/2015	325	10:16	N/A	N/A
VVA-64	11/21/2015	325	12:03	N/A	N/A
VVA-65	11/21/2015	325	14:01	N/A	N/A
VVA-66	11/21/2015	325	14:55	11/21/2015	20:11
VVA-67	11/22/2015	326	13:25	N/A	N/A
VVA-68	11/21/2015	325	11:10	11/21/2015	20:08
VVA-69	11/22/2015	326	10:01	N/A	N/A
VVA-70	11/22/2015	326	10:50	11/22/2015	14:35
VVA-71	11/22/2015	326	12:15	11/22/2015	14:24
VVA-72	11/22/2015	326	12:54	11/22/2015	13:38
VVA-73	11/22/2015	326	10:35	N/A	N/A
VVA-74	11/22/2015	326	11:43	N/A	N/A

VVA-75	**11/21/2015**	**325**	**13:06**	**N/A**	**N/A**
VVA-76	**11/21/2015**	**325**	**12:44**	**11/21/2015**	**19:53**
VVA-77	**11/21/2015**	**325**	**9:10**	**11/21/2015**	**19:01**
VVA-78	**11/20/2015**	**324**	**17:41**	**11/21/2015**	**18:17**
VVA-79	**11/21/2015**	**325**	**7:59**	**11/21/2015**	**18:01**
VVA-80	**11/20/2015**	**324**	**17:04**	**N/A**	**N/A**
VVA-81	**11/22/2015**	**326**	**8:59**	**N/A**	**N/A**
VVA-82	**11/21/2015**	**325**	**16:45**	**N/A**	**N/A**
VVA-83	**11/22/2015**	**326**	**9:45**	**N/A**	**N/A**
VVA-84	**11/20/2015**	**324**	**13:34**	**N/A**	**N/A**
VVA-85	**11/20/2015**	**324**	**14:15**	**N/A**	**N/A**
VVA-86	**11/20/2015**	**324**	**14:52**	**N/A**	**N/A**
VVA-87	**11/20/2015**	**324**	**9:40**	**11/20/2015**	**19:37**
VVA-88	**11/20/2015**	**324**	**11:05**	**11/20/2015**	**20:28**

5. *POINT COMPARISON*

LiDAR QA/QC				
POINT ID	POINT CK	DELTA NORTH (F)	DELTA EAST (F)	VERT. DIFF (F)
NVA				
NVA-2	NVA-2 CK	0.03	0.02	0.00
NVA-5	NVA-5 CK	0.00	0.00	0.06
NVA-8	NVA-8 CK	0.02	0.01	0.03
NVA-9	NVA-9 CK	0.03	0.05	0.04
NVA-12	NVA-12 CK	0.02	0.03	0.03
NVA-14	NVA-14 CK	0.00	0.01	0.06
NVA-16	NVA-16 CK	0.02	0.02	0.06
NVA-17	NVA-17 CK	0.02	0.00	0.04
NVA-19	NVA-19 CK	0.01	0.02	0.03
NVA-21	NVA-21 CK	0.06	0.02	0.02
NVA-22	NVA-22 CK	0.00	0.00	0.01
NVA-23	NVA-23 CK	0.01	0.01	0.02
NVA-28	NVA-28 CK	0.09	0.02	0.05
NVA-35	NVA-35 CK	0.04	0.01	0.03
NVA-39	NVA-39 CK	0.00	0.00	0.01
NVA-43	NVA-43 CK	0.03	0.04	0.00
NVA-44	NVA-44 CK	0.02	0.02	0.04
NVA-46	NVA-46 CK	0.01	0.01	0.01
NVA-47	NVA-47 CK	0.03	0.01	0.07
NVA-49	NVA-49 CK	0.02	0.00	0.01
NVA-50	NVA-50 CK	0.00	0.01	0.05
NVA-51	NVA-51 CK	0.01	0.01	0.03
NVA-54	NVA-54 CK	0.03	0.00	0.17
NVA-56	NVA-56 CK	0.00	0.01	0.03
NVA-57	NVA-57 CK	0.02	0.01	0.14
NVA-59	NVA-59 CK	0.03	0.03	0.05
NVA-60	NVA-60 CK	0.03	0.00	0.05
NVA-61	NVA-61 CK	0.00	0.01	0.00
NVA-62	NVA-62 CK	0.01	0.01	0.01
NVA-64	NVA-64 CK	0.02	0.03	0.00
NVA-66	NVA-66 CK	0.01	0.01	0.02
NVA-67	NVA-67 CK	0.01	0.01	0.01
NVA-68	NVA-68 CK	0.01	0.02	0.09
NVA-69	NVA-69 CK	0.04	0.02	0.02

NVA-70	NVA-70 CK	0.02	0.01	0.03
NVA-71	NVA-71 CK	0.01	0.01	0.09
NVA-73	NVA-73 CK	0.02	0.04	0.02
NVA-74	NVA-74 CK	0.06	0.00	0.05
NVA-75	NVA-75 CK	0.02	0.01	0.03
NVA-76	NVA-76 CK	0.01	0.02	0.05
NVA-79	NVA-79 CK	0.05	0.03	0.01
NVA-81	NVA-81 CK	0.02	0.01	0.03
NVA-82	NVA-82 CK	0.00	0.00	0.05
NVA-83	NVA-83 CK	0.02	0.03	0.02
NVA-88	NVA-88 CK	0.01	0.02	0.04
NVA-89	NVA-89 CK	0.04	0.00	0.09
NVA-93	NVA-93 CK	0.01	0.00	0.04
NVA-94	NVA-94 CK	0.01	0.04	0.02
NVA-96	NVA-96 CK	0.03	0.02	0.03
NVA-99	NVA-99 CK	0.15	0.07	0.22
NVA-101	NVA-101 CK	0.00	0.01	0.02
NVA-105	NVA-105 CK	0.03	0.00	0.00
NVA-110	NVA-110 CK	0.02	0.03	0.01
NVA-111	NVA-111 CK	0.10	0.00	0.03
NVA-113	NVA-113 CK	0.01	0.00	0.01
NVA-114	NVA-114 CK	0.04	0.00	0.10
NVA-115	NVA-115 CK	0.00	0.01	0.01
VVA				
VVA-02	VVA-02 CK	0.02	0.03	0.06
VVA-03	VVA-03 CK	N/A	N/A	N/A
VVA-07	VVA-07 CK	N/A	N/A	N/A
VVA-10	VVA-10 CK	0.01	0.00	0.04
VVA-12	VVA-12 CK	0.01	0.00	0.00
VVA-15	VVA-15 CK	0.00	0.01	0.03
VVA-17	VVA-17 CK	0.01	0.01	0.08
VVA-18	VVA-18 CK	0.02	0.01	0.05
VVA-19	VVA-19 CK	0.00	0.02	0.00
VVA-20	VVA-20 CK	0.03	0.00	0.03
VVA-21	VVA-21 CK	0.02	0.02	0.01
VVA-22	VVA-22 CK	0.00	0.07	0.15
VVA-24	VVA-24 CK	0.00	0.00	0.02
VVA-26	VVA-26 CK	0.00	0.01	0.09
VVA-28	VVA-28 CK	0.00	0.04	0.02

VVA-31	VVA-31 CK	0.00	0.01	0.00
VVA-33	VVA-33 CK	0.08	0.05	0.06
VVA-40	VVA-40 CK	0.04	0.04	0.02
VVA-42	VVA-42 CK	0.04	0.01	0.06
VVA-43	VVA-43 CK	0.01	0.02	0.02
VVA-44	VVA-44 CK	0.00	0.03	0.02
VVA-47	VVA-47 CK	0.01	0.01	0.03
VVA-48	VVA-48 CK	0.02	0.02	0.11
VVA-49	VVA-49 CK	0.01	0.00	0.03
VVA-50	VVA-50 CK	0.07	0.08	0.30
VVA-53	VVA-53 CK	0.04	0.01	0.08
VVA-54	VVA-54 CK	0.02	0.01	0.04
VVA-55	VVA-55 CK	0.04	0.02	0.11
VVA-57	VVA-57 CK	0.01	0.01	0.01
VVA-61	VVA-61 CK	0.01	0.02	0.09
VVA-62	VVA-62 CK	0.01	0.05	0.03
VVA-66	VVA-66 CK	0.01	0.02	0.00
VVA-68	VVA-68 CK	0.01	0.02	0.08
VVA-70	VVA-70 CK	0.07	0.04	0.02
VVA-71	VVA-71 CK	0.07	0.09	0.22
VVA-72	VVA-72 CK	0.01	0.02	0.08
VVA-76	VVA-76 CK	0.05	0.05	0.15
VVA-77	VVA-77 CK	0.00	0.01	0.03
VVA-78	VVA-78 CK	0.00	0.03	0.08
VVA-79	VVA-79 CK	0.03	0.06	0.24
VVA-87	VVA-87 CK	0.01	0.01	0.02
VVA-88	VVA-88 CK	0.03	0.03	0.03