

Check Point Survey Report

Suwannee River LiDAR
USGS Contract: G16PC00020
Task Order Number: G16PD01127

Prepared for:
United States Geological Survey (USGS)



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10.	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 (USGS) to provide 140 Check Points in the Suwannee River Water Management District in the State of Florida. Dewberry is tasked to complete the quality assurance of LiDAR products. As part of this work, Dewberry staff will complete a Control Survey of Check Points that will be used to evaluate vertical and horizontal accuracy. The field work was conducted from March 7, 2017 – June 29, 2017.

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 their corresponding coordinate differences are shown in Section 5 of this report.

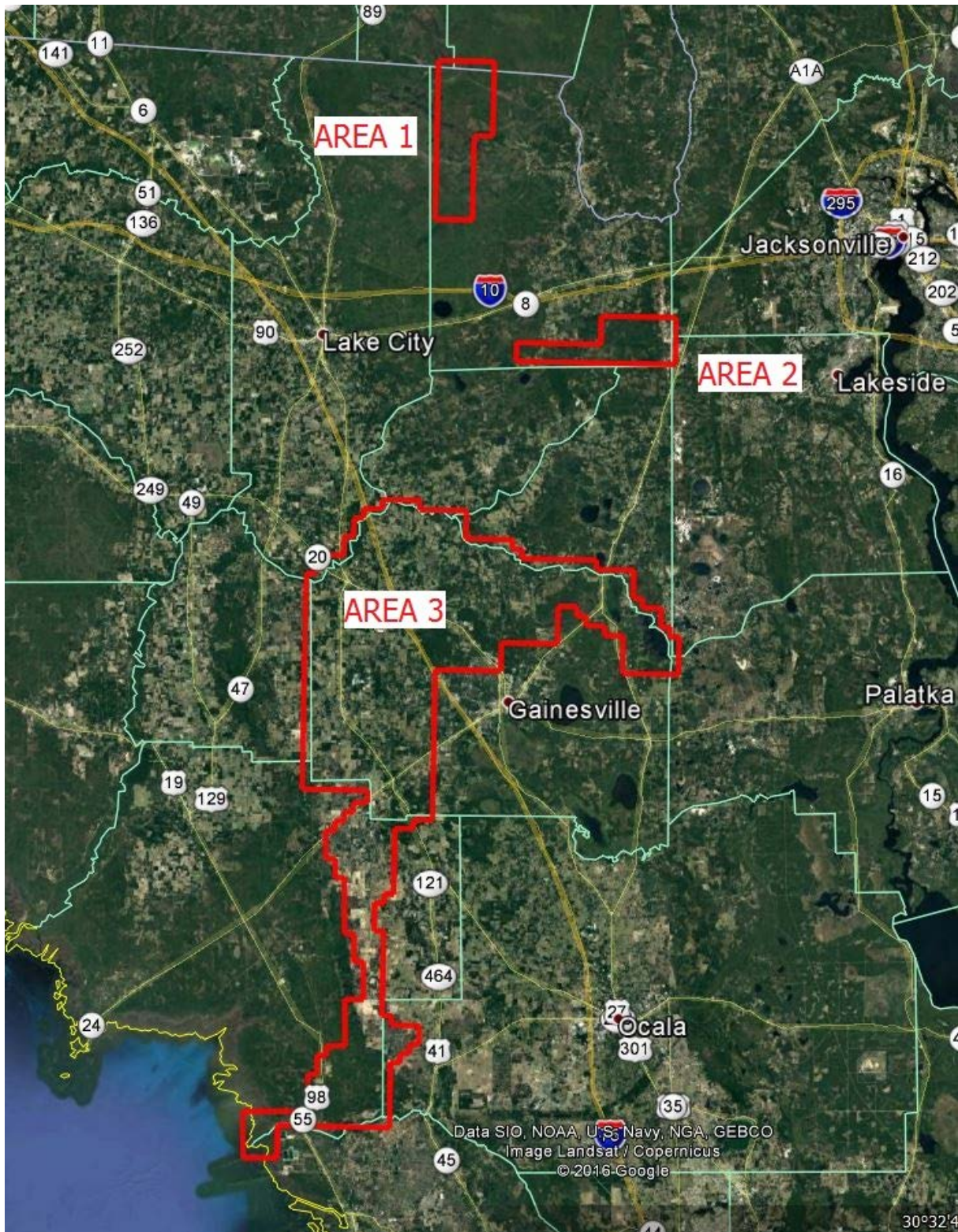
This project consists of three (3) areas, as shown in section 1.3. Areas 1 and 2 lie within Florida State Plane Coordinate System, North Zone, NAD83 (2011 Adjustment). Area 3 lies within Florida State Plane Coordinate System, West Zone, NAD83 (2011 Adjustment). All measurements are made to U.S. Survey Feet. Final horizontal coordinates are referenced to each area's respective State Plane Coordinate System Zone. Final vertical elevations are referenced to NAVD88 in U.S. Survey feet using Geoid model 2012B (Geoid12B).

1.2 *Point of Contact*

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

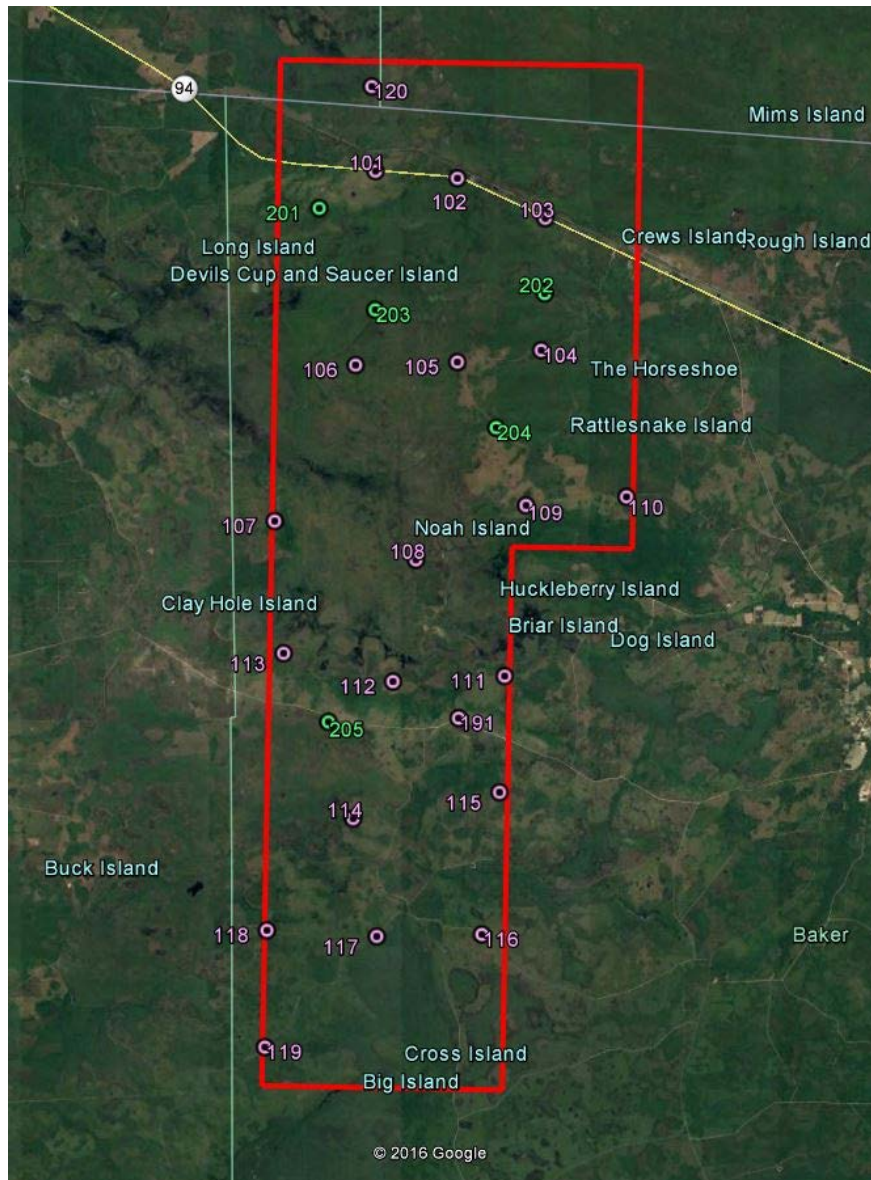
Dewberry Engineers, Inc.
William D. Donley, PSM
Associate Vice President
131 West Kaley Street
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1.3 Project Area



Overall Project Limits

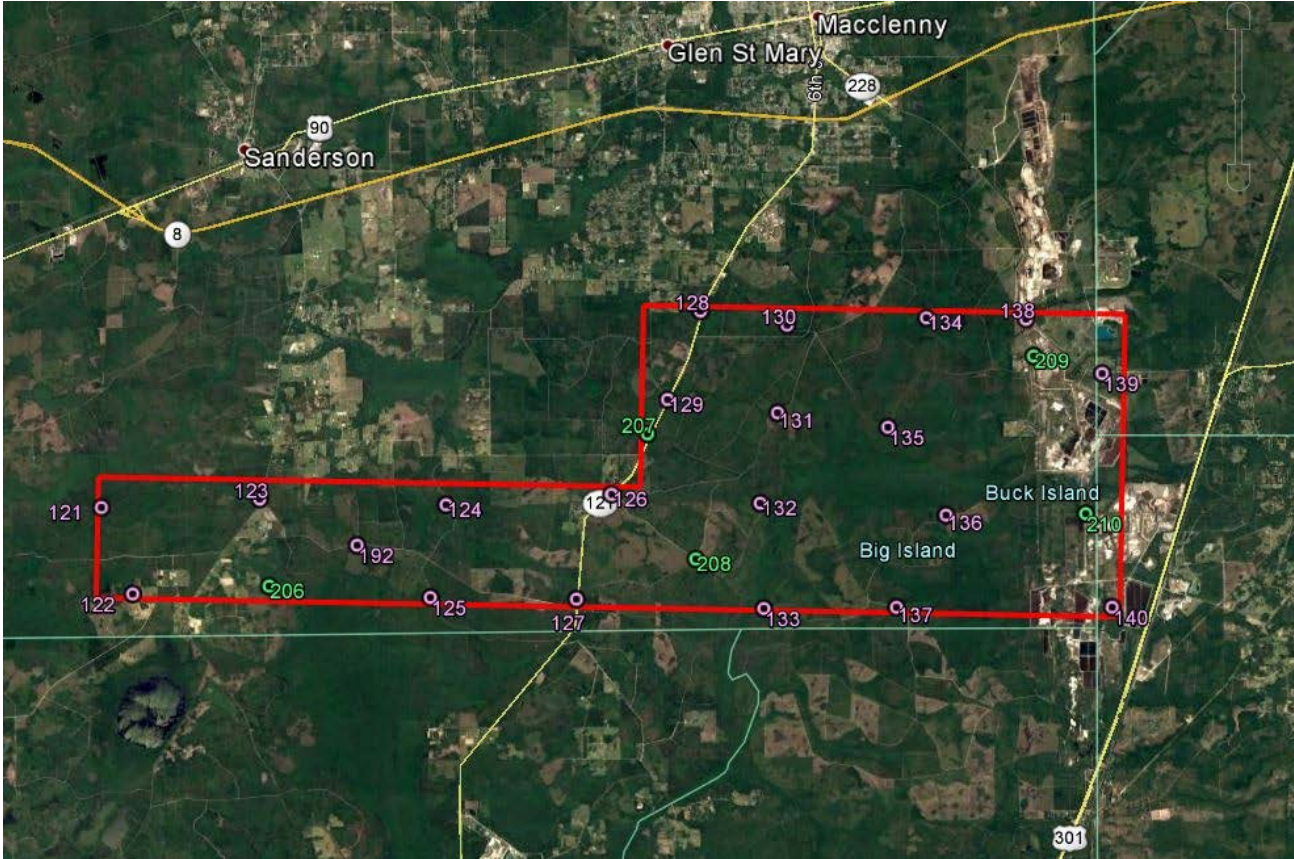
1.3 Project Area (continued)



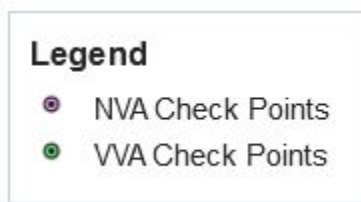
Area 1 - Check Point Locations



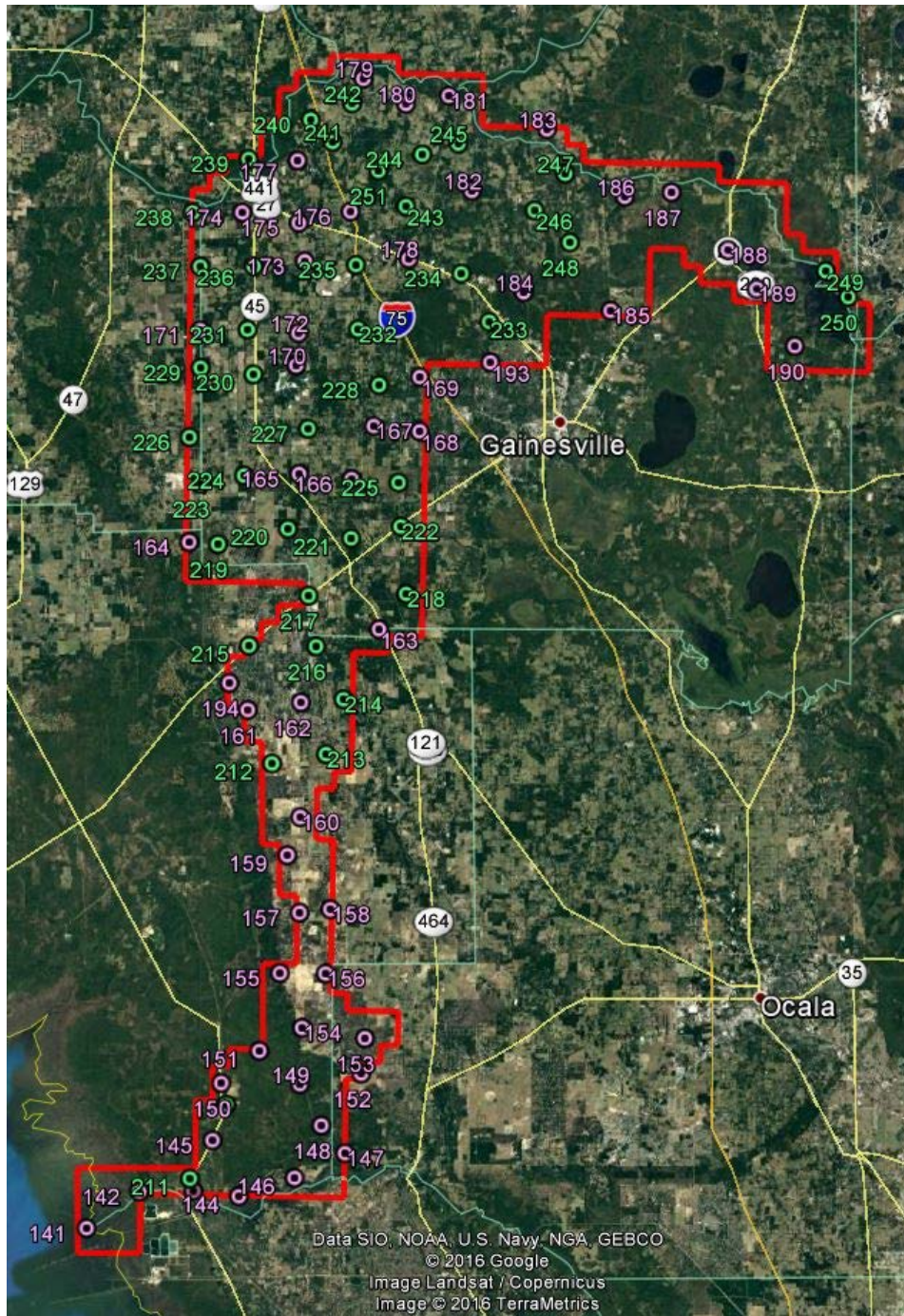
1.3 Project Area (continued)



Area 2 - Check Point Locations



1.3 Project Area (continued)



Area 3 - Check Point Locations



2. PROJECT DETAILS

2.1 *Survey Equipment*

In performing the GPS observations, a Spectra Precision SP80 receiver/antenna attached to a two meter fixed height pole with a Spectra Precision Ranger 3 Data Collector were used. This receiver is a geodetic quality dual frequency GPS receiver and was used to collect data at each surveyed location.

2.2 *Survey Point Details*

The 140 LiDAR Check Points were well distributed throughout the project area.

A sketch was made for each location and a nail & disk or iron rod & cap were 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 field survey was performed by Dewberry Engineers, Inc. office located in Panama City, FL.

Due to the lack of cellular coverage, coordinates for the Check Points in Area 1 were obtained from 30 minute rapid static GPS observations. These observations were evaluated and post-processed with Trimble Business Center software. The Point Derivations Report is attached to this report submittal.

With cellular coverage available, coordinates for the Check Points in Areas 2 and 3 were tied to the VRS Now, a Real Time Network (RTN) managed by Trimble. 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.

2.4 Field Survey Procedures and Analysis

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 $\pm 5\text{cm}$ or within the 95% confidence level. Each occupation which utilized the VRS network was occupied for approximately 1.5 minutes in duration and measured to 90 epochs.

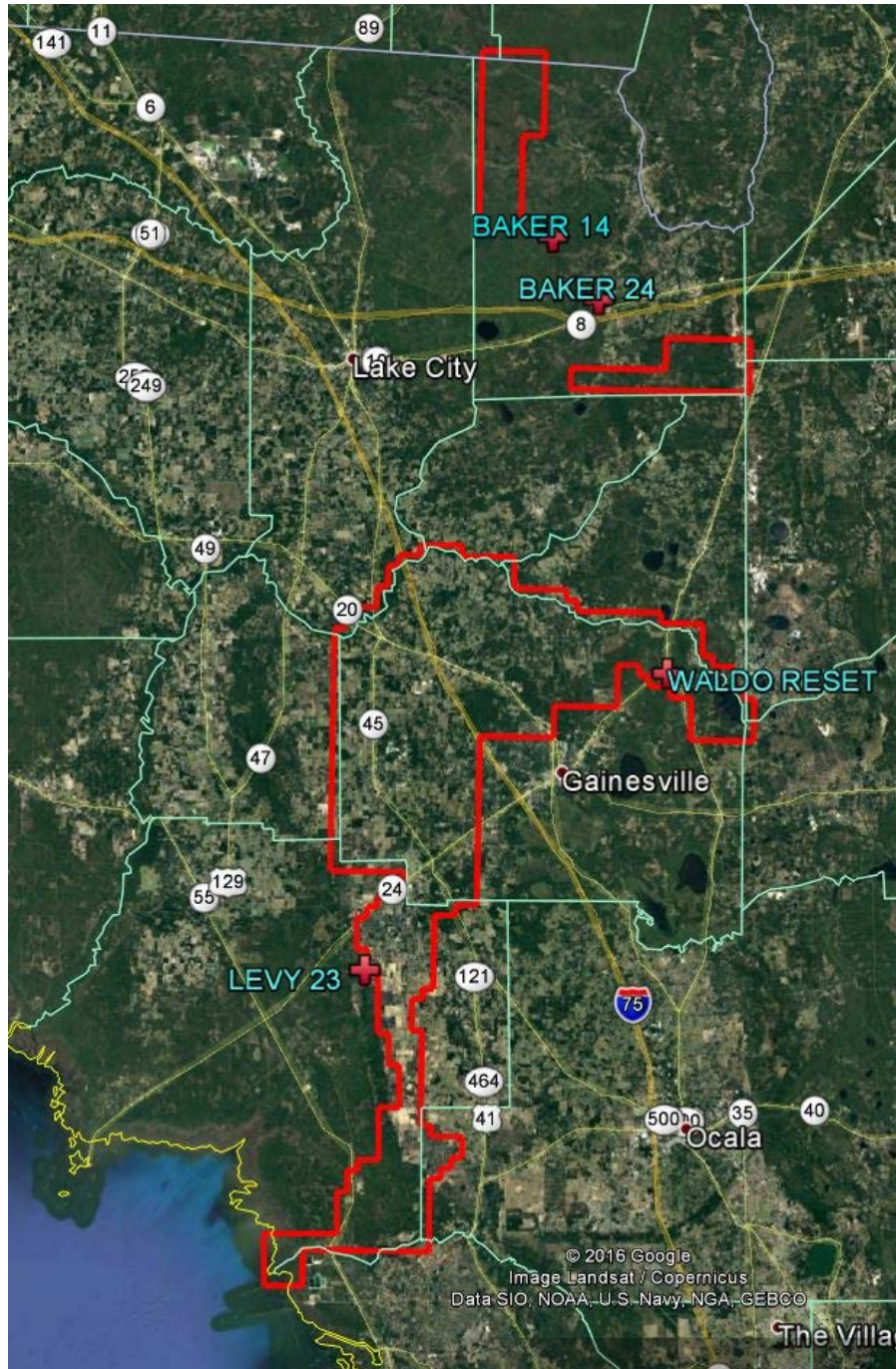
Field GPS observations are detailed on the “Ground Control Point Documentation Reports” submitted as part of this report.

Four (4) existing NGS monuments listed in the NSRS database were located as an additional QA/QC method to check the accuracy of the VRS network. An NGS monument was located at the beginning and end of observations each day to ensure measurement quality. The checks all individually conformed to the required accuracy and the average coordinates for the surveyed NGS monuments are shown below and compared to the published coordinates.

NGS PT. ID	Designation	As Surveyed (ft)			Published (ft)			Differences (ft)		
		Northing	Easting	Elev	Northing	Easting	Elev	ΔN	ΔE	$\Delta Elev$
AE7567	BAKER 14 (FL N)	497473.86	2650304.49	128.80	497473.89	2650304.47	128.79	0.03	0.02	0.01
AE7577	BAKER 24 (FL N)	468144.48	2672620.11	151.31	468144.51	2672620.06	151.30	0.03	0.05	0.01
AC5921	LEVY 23 (FL W)	1840657.37	458888.31	72.83	1840657.35	458888.31	72.78	0.02	0.00	0.05
AR0321	WALDO RESET (FL N)	291784.72	2708500.82	153.02	291784.72	2708500.85	153.05	0.00	0.03	0.03


The above results indicate that the VRS network is providing positional values within the $\pm 5\text{cm}$ parameters for this survey.

2.4 Field Survey Procedures and Analysis (continued)



NGS Monuments

Legend:

-  Horizontal + Vertical NGS Benchmark

2.5 Adjustment

The raw positions for Check Points in Area 1 were adjusted using Trimble Business Center software. GPS baselines between the occupied locations and local NGS Continuously Operating Reference Stations (CORS) were analyzed. The results of the post-processing are shown in Section 3 of this report.

Post-Processing is not necessary for the survey data collected using Virtual Reference Stations within the Trimble VRS Now Virtual Reference System. The system is designed to provide a true Network RTK performance, enabling high-accuracy positioning in real time across a geographic region. Trimble VRS Now uses real-time data streams from the system user and generates correction models for high-accuracy RTK GPS corrections throughout the network. These corrections are applied to the points as they are being collected, 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 Trimble Business Center (TBC). Downloaded data is run through TBC to obtain the following reports: points list, point derivations and a vector spreadsheet. The reports are reviewed for point accuracy and precision.

After review of the point data an “ASCII” or “txt” file is created. Point files are loaded into AutoCAD Civil 3D 2016 to make a visual check of the point data (Pt. #, Coordinates, Elev. and Description). The data is now imported into the final product.

3. **FINAL COORDINATES**

Suwannee River Lidar Project 2017					
Check Points (Area 1)					
AREA	FLORIDA SPC ZONE	POINT #	NORTHING	EASTING	ELEVATION
1	NORTH	NVA-101	576005.43	2622995.07	131.59
1	NORTH	NVA-102	575387.95	2630508.53	125.35
1	NORTH	NVA-103	572134.63	2637852.85	127.32
1	NORTH	NVA-104	561319.31	2636938.91	125.67
1	NORTH	NVA-105	560295.65	2630976.91	125.65
1	NORTH	NVA-106	559827.75	2621848.17	124.70
1	NORTH	NVA-107	546873.72	2615316.89	127.28
1	NORTH	NVA-108	543881.74	2627116.35	125.12
1	NORTH	NVA-109	548550.38	2636199.42	126.07
1	NORTH	NVA-110	549437.57	2644656.09	126.26
1	NORTH	NVA-112	533831.48	2625224.17	126.98
1	NORTH	NVA-113	535939.19	2616267.62	126.43
1	NORTH	NVA-114	522345.08	2622265.48	134.24
1	NORTH	NVA-115	524806.55	2634189.54	131.36
1	NORTH	NVA-116	512879.99	2633223.03	129.06
1	NORTH	NVA-117	512157.96	2623687.74	131.90
1	NORTH	NVA-118	512857.24	2615608.02	135.90
1	NORTH	NVA-119	503316.59	2615302.74	134.26
1	NORTH	NVA-120	583019.51	2622748.61	118.69
1	NORTH	NVA-191	530839.71	2630923.65	132.92
1	NORTH	VVA-201	573058.93	2618481.94	128.16
1	NORTH	VVA-202	566086.35	2637306.30	124.34
1	NORTH	VVA-203	564693.56	2623167.33	123.81
1	NORTH	VVA-204	554852.01	2633722.73	125.77
1	NORTH	VVA-205	530402.80	2619891.36	133.41

3. FINAL COORDINATES (CONTINUED)

Suwannee River Lidar Project 2017					
Check Points (Area 2)					
AREA	FLORIDA SPC ZONE	POINT #	NORTHING (F)	EASTING (F)	ELEV. (F)
2	NORTH	NVA-121	432566.73	2660405.01	132.58
2	NORTH	NVA-122	425486.20	2663133.76	141.77
2	NORTH	NVA-123	433475.56	2673504.26	133.36
2	NORTH	NVA-124	433359.74	2689010.29	123.65
2	NORTH	NVA-125	425651.79	2687846.61	137.33
2	NORTH	NVA-126	434451.75	2702732.06	134.19
2	NORTH	NVA-127	425944.43	2699987.51	136.02
2	NORTH	NVA-128	449867.08	2709880.50	138.06
2	NORTH	NVA-129	442377.45	2707242.62	134.52
2	NORTH	NVA-130	448692.16	2717047.29	139.39
2	NORTH	NVA-131	441447.13	2716390.61	150.54
2	NORTH	NVA-132	433965.59	2715077.29	142.14
2	NORTH	NVA-133	425252.84	2715545.37	138.51
2	NORTH	NVA-134	449496.62	2728599.71	139.36
2	NORTH	NVA-135	440398.99	2725573.37	142.38
2	NORTH	NVA-136	433258.87	2730803.55	143.16
2	NORTH	NVA-137	425541.38	2726553.22	144.75
2	NORTH	NVA-138	449402.40	2737027.61	172.24
2	NORTH	NVA-139	445167.43	2743276.49	149.26
2	NORTH	NVA-140	425699.72	2744356.91	176.79
2	NORTH	NVA-192	429869.58	2681680.78	139.19
2	NORTH	VVA-206	426359.84	2674289.21	134.00
2	NORTH	VVA-207	439316.97	2705640.63	129.62
2	NORTH	VVA-208	429201.44	2709674.09	149.55
2	NORTH	VVA-209	446491.79	2737527.31	173.52
2	NORTH	VVA-210	433579.61	2742063.87	176.55

3. **FINAL COORDINATES (CONTINUED)**

Suwannee River Lidar Project 2017					
Check Points (Area 3)					
AREA	FLORIDA SPC ZONE	POINT #	NORTHING (F)	EASTING (F)	ELEV. (F)
3	WEST	NVA-141	1697693.81	413158.81	5.12
3	WEST	NVA-142	1708478.17	428619.09	4.66
3	WEST	NVA-143	1708628.84	444619.18	16.77
3	WEST	NVA-144	1707076.16	458089.67	32.50
3	WEST	NVA-145	1723517.56	450340.93	43.45
3	WEST	NVA-146	1712443.19	474441.02	43.65
3	WEST	NVA-147	1719613.31	489255.70	59.24
3	WEST	NVA-148	1727845.68	482338.39	79.13
3	WEST	NVA-149	1739906.41	476165.30	72.38
3	WEST	NVA-150	1740350.66	452975.06	30.45
3	WEST	NVA-151	1749701.22	464410.45	55.85
3	WEST	NVA-152	1743019.57	494251.87	80.40
3	WEST	NVA-153	1753548.31	495222.94	136.04
3	WEST	NVA-154	1756490.63	476835.58	58.92
3	WEST	NVA-155	1772563.76	470326.92	58.81
3	WEST	NVA-156	1772404.03	483879.05	88.38
3	WEST	NVA-157	1790273.89	476272.94	83.64
3	WEST	NVA-158	1791282.62	485290.45	62.13
3	WEST	NVA-159	1807157.51	472716.46	84.48
3	WEST	NVA-160	1818293.52	476324.71	87.01
3	WEST	NVA-161	1849730.32	461161.16	70.07
3	WEST	NVA-162	1851855.21	476916.29	83.21
3	WEST	NVA-163	1873294.31	499930.14	65.97
3	WEST	NVA-164	1899008.95	444219.96	62.78
3	WEST	NVA-165	1918872.15	476916.28	86.22
3	WEST	NVA-166	1917261.06	492105.05	84.46
3	WEST	NVA-167	1932807.48	498620.88	85.57
3	WEST	NVA-168	1931200.46	512182.82	124.78
3	WEST	NVA-169	1947103.54	512203.44	89.65
3	WEST	NVA-170	1950676.99	475843.29	103.72
3	WEST	NVA-171	1961143.32	447613.87	92.06
3	WEST	NVA-172	1960166.84	476533.71	91.89
3	WEST	NVA-173	1981238.21	478468.19	85.41
3	WEST	NVA-174	1995675.50	460102.47	69.85
3	WEST	NVA-175	1992527.36	476715.71	96.24

3. **FINAL COORDINATES (CONTINUED)**

Suwannee River Lidar Project 2017					
Check Points					
AREA	FLORIDA SPC ZONE	POINT #	NORTHING (F)	EASTING (F)	ELEV. (F)
3	WEST	NVA-176	1995785.20	491982.89	74.04
3	WEST	NVA-177	2010904.73	476405.33	58.30
3	WEST	NVA-178	1981822.36	509078.92	87.15
3	WEST	NVA-179	2034842.41	495866.82	75.27
3	WEST	NVA-180	2027380.95	508213.65	88.39
3	WEST	NVA-181	2029724.77	521004.92	79.61
3	WEST	NVA-182	2001738.93	527679.40	145.37
3	WEST	NVA-183	2019759.22	549889.98	118.14
3	WEST	NVA-184	1971538.71	542919.48	168.99
3	WEST	NVA-185	1966391.81	568348.81	166.64
3	WEST	NVA-186	2000575.34	573394.65	147.87
3	WEST	NVA-187	2001102.57	586453.88	136.66
3	WEST	NVA-188	1984090.11	603014.54	155.64
3	WEST	NVA-189	1972642.83	611416.16	168.66
3	WEST	NVA-190	1955843.73	622553.76	176.70
3	WEST	NVA-193	1951352.50	532931.02	172.92
3	WEST	NVA-194	1857685.78	455880.83	74.67
3	WEST	VVA-211	1712275.78	443573.61	14.19
3	WEST	VVA-212	1833977.98	468317.09	65.71
3	WEST	VVA-213	1836598.91	484281.35	95.33
3	WEST	VVA-214	1852885.67	489320.13	60.85
3	WEST	VVA-215	1868628.52	461652.60	95.75
3	WEST	VVA-216	1868421.32	481330.40	91.59
3	WEST	VVA-217	1883399.37	478986.30	94.60
3	WEST	VVA-218	1883311.71	508266.42	70.65
3	WEST	VVA-219	1898292.47	452669.48	74.59
3	WEST	VVA-220	1902612.82	472571.56	58.93
3	WEST	VVA-221	1899794.67	492249.43	74.45
3	WEST	VVA-222	1903404.97	506382.74	70.50
3	WEST	VVA-223	1916181.49	447572.73	93.72
3	WEST	VVA-224	1918453.01	460481.39	82.57
3	WEST	VVA-225	1916302.43	505811.48	73.65
3	WEST	VVA-226	1929747.17	444241.52	96.30
3	WEST	VVA-227	1931991.45	479157.39	89.79

3. **FINAL COORDINATES (CONTINUED)**

Suwannee River Lidar Project 2017					
Check Points					
AREA	FLORIDA SPC ZONE	POINT #	NORTHING (F)	EASTING (F)	ELEV. (F)
3	WEST	VVA-228	1944709.99	500446.56	88.15
3	WEST	VVA-229	1950121.67	447655.00	82.27
3	WEST	VVA-230	1948351.17	463328.54	74.85
3	WEST	VVA-231	1961261.94	462480.10	74.77
3	WEST	VVA-232	1961264.62	494097.48	97.64
3	WEST	VVA-233	1963044.96	532651.81	186.82
3	WEST	VVA-234	1977439.56	524525.88	167.14
3	WEST	VVA-235	1980085.11	493511.47	92.87
3	WEST	VVA-236	1979918.57	463426.88	75.14
3	WEST	VVA-237	1980266.36	447671.90	80.35
3	WEST	VVA-238	1995748.06	445502.23	52.06
3	WEST	VVA-239	2011369.87	461956.35	52.99
3	WEST	VVA-241	2016216.45	486641.61	144.62
3	WEST	VVA-242	2027531.37	492635.38	139.57
3	WEST	VVA-243	1997247.13	508294.81	135.45
3	WEST	VVA-244	2012225.37	512981.52	169.50
3	WEST	VVA-245	2015580.72	523886.09	132.27
3	WEST	VVA-246	1995808.67	546167.12	147.27
3	WEST	VVA-247	2006777.21	555256.55	116.22
3	WEST	VVA-248	1986481.56	557481.00	162.76
3	WEST	VVA-249	1977289.56	631622.93	146.91
3	WEST	VVA-250	1970146.46	638320.67	151.91
3	WEST	VVA-251	2007805.67	500241.73	124.56
3	WEST	VVA-252	1734123.88	454682.25	34.32

4. **GPS OBSERVATIONS & RE-OBSERVATION SCHEDULE**

Suwannee River Lidar Project 2017						
POINT #	OBSERVE DATE	JULIAN DATE	TIME OF DAY	REOBSERVE DATE	REOBSERVE JULIAN DATE	REOBSERVE TIME
Check Points (NVA)						
NVA-101	3/24/2017	083	13:30	N/A	N/A	N/A
NVA-102	3/25/2017	084	14:32	N/A	N/A	N/A
NVA-103	3/25/2017	084	15:19	N/A	N/A	N/A
NVA-104	3/26/2017	085	13:50	3/28/2017	087	10:24
NVA-105	3/26/2017	085	14:36	3/28/2017	087	8:42
NVA-106	3/26/2017	085	15:30	3/28/2017	087	12:52
NVA-107	3/27/2017	086	14:10	N/A	N/A	N/A
NVA-108	3/26/2017	085	10:47	3/27/2017	086	16:34
NVA-109	6/29/2017	180	12:50	N/A	N/A	N/A
NVA-110	3/27/2017	086	17:26	3/28/2017	087	8:10
NVA-111	3/25/2017	084	10:46	N/A	N/A	N/A
NVA-112	3/25/2017	084	11:33	N/A	N/A	N/A
NVA-113	3/25/2017	084	13:15	N/A	N/A	N/A
NVA-114	3/24/2017	083	15:40	N/A	N/A	N/A
NVA-115	3/24/2017	083	16:25	N/A	N/A	N/A
NVA-116	3/9/2017	068	13:27	3/27/2017	086	9:17
NVA-117	3/9/2017	068	13:42	3/27/2017	086	10:03
NVA-118	3/9/2017	068	14:19	3/27/2017	086	10:40
NVA-119	3/9/2017	068	14:03	3/27/2017	086	11:21
NVA-120	6/29/2017	180	15:00	N/A	N/A	N/A
NVA-121	3/8/2017	067	14:10	N/A	N/A	N/A
NVA-122	3/8/2017	067	12:57	N/A	N/A	N/A
NVA-123	3/8/2017	067	12:12	3/9/2017	068	11:31
NVA-124	3/8/2017	067	11:45	N/A	N/A	N/A
NVA-125	3/8/2017	067	11:25	3/9/2017	068	12:10
NVA-126	3/7/2017	066	18:05	3/9/2017	068	11:00
NVA-127	3/7/2017	066	15:44	3/9/2017	068	11:06
NVA-128	3/8/2017	067	8:20	3/9/2017	068	10:18
NVA-129	3/8/2017	067	8:36	3/9/2017	068	10:43
NVA-130	3/8/2017	067	9:52	N/A	N/A	N/A
NVA-131	3/8/2017	067	9:31	N/A	N/A	N/A
NVA-132	3/8/2017	067	9:14	N/A	N/A	N/A
NVA-133	3/7/2017	066	15:35	N/A	N/A	N/A

4. GPS OBSERVATIONS & RE-OBSERVATION SCHEDULE
(CONTINUED)

Suwannee River Lidar Project 2017						
POINT #	OBSERVE DATE	JULIAN DATE	TIME OF DAY	REOBSERVE DATE	REOBSERVE JULIAN DATE	REOBSERVE TIME
Check Points (NVA)						
NVA-135	3/8/2017	067	10:33	N/A	N/A	N/A
NVA-136	3/7/2017	066	14:45	3/8/2017	067	16:10
NVA-137	3/7/2017	066	2:51	3/8/2017	067	16:22
NVA-138	3/7/2017	066	9:12	3/8/2017	067	14:52
NVA-139	3/7/2017	066	9:32	N/A	N/A	N/A
NVA-140	3/7/2017	066	12:14	3/8/2017	067	15:46
NVA-141	3/12/2017	071	14:30	3/22/2017	081	16:38
NVA-142	3/12/2017	071	14:10	N/A	N/A	N/A
NVA-143	3/12/2017	071	13:40	3/22/2017	081	16:23
NVA-144	3/12/2017	071	13:27	N/A	N/A	N/A
NVA-145	3/12/2017	071	14:47	N/A	N/A	N/A
NVA-146	3/12/2017	071	13:17	N/A	N/A	N/A
NVA-147	3/12/2017	071	13:03	3/22/2017	081	16:06
NVA-148	3/12/2017	071	12:51	N/A	N/A	N/A
NVA-149	3/12/2017	071	12:42	N/A	N/A	N/A
NVA-150	3/12/2017	071	15:07	3/22/2017	081	17:01
NVA-151	3/12/2017	071	12:32	N/A	N/A	N/A
NVA-152	3/12/2017	071	12:12	N/A	N/A	N/A
NVA-153	3/12/2017	071	11:57	N/A	N/A	N/A
NVA-154	3/12/2017	071	11:45	3/22/2017	081	15:49
NVA-155	3/12/2017	071	11:16	3/22/2017	081	15:39
NVA-156	3/12/2017	071	11:31	3/22/2017	081	15:27
NVA-157	3/12/2017	071	11:05	3/22/2017	081	14:42
NVA-158	3/12/2017	071	10:55	3/22/2017	081	15:14
NVA-159	3/12/2017	071	10:21	N/A	N/A	N/A
NVA-160	3/12/2017	071	10:08	3/22/2017	081	14:07
NVA-161	3/11/2017	070	10:47	3/22/2017	081	13:48
NVA-162	3/11/2017	070	10:30	3/22/2017	081	13:32
NVA-163	3/11/2017	070	13:11	3/22/2017	081	13:11
NVA-164	3/14/2017	073	9:30	3/23/2017	082	9:59
NVA-165	3/17/2017	076	11:23	3/23/2017	082	10:23
NVA-166	3/17/2017	076	11:04	3/23/2017	082	10:35
NVA-167	3/16/2017	075	10:49	3/23/2017	082	10:49

4. GPS OBSERVATIONS & RE-OBSERVATION SCHEDULE
(CONTINUED)

Suwannee River Lidar Project 2017						
POINT #	OBSERVE DATE	JULIAN DATE	TIME OF DAY	REOBSERVE DATE	REOBSERVE JULIAN DATE	REOBSERVE TIME
Check Points (NVA)						
NVA-169	3/16/2017	075	15:02	3/22/2017	081	11:39
NVA-170	3/17/2017	076	12:10	3/23/2017	082	11:04
NVA-171	3/21/2017	080	15:51	3/23/2017	082	11:18
NVA-172	3/17/2017	076	12:24	3/23/2017	082	11:16
NVA-173	3/17/2017	076	12:42	3/23/2017	082	13:02
NVA-174	3/21/2017	080	14:57	3/23/2017	082	13:21
NVA-175	3/17/2017	076	12:52	3/23/2017	082	13:12
NVA-176	3/17/2017	076	13:27	3/23/2017	082	13:55
NVA-177	3/17/2017	076	13:56	3/23/2017	082	13:37
NVA-178	3/16/2017	075	11:50	3/23/2017	082	12:49
NVA-179	3/16/2017	075	12:51	3/23/2017	082	14:30
NVA-180	3/16/2017	075	12:35	3/23/2017	082	14:40
NVA-181	3/16/2017	075	10:20	3/23/2017	082	14:50
NVA-182	3/16/2017	075	10:45	3/23/2017	082	15:43
NVA-183	3/16/2017	075	10:06	3/22/2017	081	10:36
NVA-184	3/16/2017	075	9:29	3/22/2017	081	11:01
NVA-185	3/16/2017	075	9:04	3/22/2017	081	10:04
NVA-186	3/15/2017	074	14:40	3/22/2017	081	10:15
NVA-187	3/15/2017	074	14:24	3/22/2017	081	10:21
NVA-188	3/15/2017	074	12:40	3/22/2017	081	9:20
NVA-189	3/15/2017	074	12:56	3/22/2017	081	9:33
NVA-190	3/15/2017	074	13:18	3/22/2017	081	9:43
NVA-191	3/24/2017	083	17:05	3/27/2017	086	15:37
NVA-192	3/8/2017	067	11:58	3/9/2017	068	12:03
NVA-193	3/16/2017	075	11:10	3/22/2017	081	11:27
NVA-194	3/11/2017	070	11:10	3/23/2017	082	9:32

4. GPS OBSERVATIONS & RE-OBSERVATION SCHEDULE
(CONTINUED)

Suwannee River Lidar Project 2017						
POINT #	OBSERVE DATE	JULIAN DATE	TIME OF DAY	REOBSERVE DATE	REOBSERVE JULIAN DATE	REOBSERVE TIME
Check Points (VVA)						
VVA-201	3/25/2017	084	16:05	3/28/2017	087	14:51
VVA-202	3/28/2017	087	11:08	N/A	N/A	N/A
VVA-203	3/28/2017	087	12:07	N/A	N/A	N/A
VVA-204	3/26/2017	085	11:54	3/28/2017	087	8:51
VVA-205	3/25/2017	084	12:25	3/27/2017	086	12:15
VVA-206	3/9/2017	068	11:47	N/A	N/A	N/A
VVA-207	3/8/2017	067	8:44	3/9/2017	068	10:51
VVA-208	3/8/2017	067	9:02	N/A	N/A	N/A
VVA-209	3/7/2017	066	11:42	3/8/2017	067	15:14
VVA-210	3/7/2017	066	13:52	N/A	N/A	N/A
VVA-211	3/12/2017	071	13:52	N/A	N/A	N/A
VVA-212	3/11/2017	070	7:35	N/A	N/A	N/A
VVA-213	3/11/2017	070	9:52	N/A	N/A	N/A
VVA-214	3/11/2017	070	10:17	N/A	N/A	N/A
VVA-215	3/11/2017	070	11:51	3/23/2017	082	9:42
VVA-216	3/11/2017	070	12:42	N/A	N/A	N/A
VVA-217	3/11/2017	070	14:08	N/A	N/A	N/A
VVA-218	3/11/2017	070	13:28	N/A	N/A	N/A
VVA-219	3/14/2017	073	9:07	N/A	N/A	N/A
VVA-220	3/11/2017	070	14:45	N/A	N/A	N/A
VVA-221	3/11/2017	070	14:22	N/A	N/A	N/A
VVA-222	3/10/2017	069	15:40	N/A	N/A	N/A
VVA-223	3/21/2017	080	17:13	3/23/2017	082	10:11
VVA-224	3/21/2017	080	17:01	N/A	N/A	N/A
VVA-225	3/10/2017	069	15:12	N/A	N/A	N/A
VVA-226	4/11/2017	101	13:27	N/A	N/A	N/A
VVA-227	3/17/2017	076	11:58	N/A	N/A	N/A
VVA-228	3/16/2017	075	14:47	N/A	N/A	N/A
VVA-229	4/15/2017	105	14:20	N/A	N/A	N/A
VVA-230	3/21/2017	080	16:41	N/A	N/A	N/A
VVA-231	3/21/2017	080	16:02	N/A	N/A	N/A
VVA-232	3/16/2017	075	14:25	N/A	N/A	N/A
VVA-233	3/16/2017	075	11:22	N/A	N/A	N/A

4. GPS OBSERVATIONS & RE-OBSERVATION SCHEDULE
(CONTINUED)

Suwannee River Lidar Project 2017						
POINT #	OBSERVE DATE	JULIAN DATE	TIME OF DAY	REOBSERVE DATE	REOBSERVE JULIAN DATE	REOBSERVE TIME
Check Points (VVA)						
VVA-235	3/16/2017	075	14:05	N/A	N/A	N/A
VVA-236	3/21/2017	080	16:13	N/A	N/A	N/A
VVA-237	3/21/2017	080	15:37	N/A	N/A	N/A
VVA-238	3/21/2017	080	15:11	N/A	N/A	N/A
VVA-239	3/21/2017	080	14:29	N/A	N/A	N/A
VVA-241	3/17/2017	076	13:45	N/A	N/A	N/A
VVA-242	3/16/2017	075	13:06	3/23/2017	082	14:22
VVA-243	3/16/2017	075	12:09	N/A	N/A	N/A
VVA-244	3/16/2017	075	12:29	N/A	N/A	N/A
VVA-245	3/16/2017	075	10:34	3/23/2017	082	14:59
VVA-246	3/16/2017	075	9:46	3/23/2017	082	15:59
VVA-247	4/15/2017	105	13:20	N/A	N/A	N/A
VVA-248	3/15/2017	074	14:58	N/A	N/A	N/A
VVA-249	3/15/2017	074	13:50	N/A	N/A	N/A
VVA-250	3/15/2017	074	13:31	N/A	N/A	N/A
VVA-251	3/16/2017	075	13:17	3/22/2017	081	14:08
VVA-252	3/12/2017	071	14:58	N/A	N/A	N/A

5. **POINT COMPARISON REPORT**

Suwannee River Lidar Project 2017				
Check Points				
POINT ID	CHECK POINT ID	Δ NORTH	Δ EAST	VERTICAL Δ
NVA-101	NVA-101CHK	Post-Processed with TBC		
NVA-102	NVA-102CHK	Post-Processed with TBC		
NVA-103	NVA-103CHK	Post-Processed with TBC		
NVA-104	NVA-104CHK	Post-Processed with TBC		
NVA-105	NVA-105CHK	Post-Processed with TBC		
NVA-106	NVA-106CHK	Post-Processed with TBC		
NVA-107	NVA-107CHK	Post-Processed with TBC		
NVA-108	NVA-108CHK	Post-Processed with TBC		
NVA-109	NVA-109CHK	Post-Processed with OPUS		
NVA-110	NVA-110CHK	Post-Processed with TBC		
NVA-112	NVA-112CHK	Post-Processed with TBC		
NVA-113	NVA-113CHK	Post-Processed with TBC		
NVA-114	NVA-114CHK	Post-Processed with TBC		
NVA-115	NVA-115CHK	Post-Processed with TBC		
NVA-116	NVA-116CHK	Post-Processed with TBC		
NVA-117	NVA-117CHK	Post-Processed with TBC		
NVA-118	NVA-118CHK	Post-Processed with TBC		
NVA-119	NVA-119CHK	Post-Processed with TBC		
NVA-120	NVA-120CHK	Post-Processed with OPUS		
NVA-123	NVA-123CK	0.02	0.03	0.03
NVA-125	NVA-125CK	0.03	0.01	0.07
NVA-126	NVA-126CK	0.02	0.02	0.05
NVA-127	NVA-127CK	0.00	0.07	0.06
NVA-128	NVA-128CK	0.02	0.02	0.03
NVA-129	NVA-129CK	0.05	0.00	0.02
NVA-136	NVA-136CK	0.01	0.03	0.05
NVA-137	NVA-137CK	0.00	0.00	0.04
NVA-138	NVA-138CK	0.01	0.01	0.03
NVA-140	NVA-140CK	0.05	0.04	0.04
NVA-141	NVA-141CHK	0.05	0.04	0.06
NVA-143	NVA-143CHK	0.03	0.04	0.02
NVA-147	NVA-147CHK	0.02	0.03	0.07
NVA-150	NVA-150CHK	0.02	0.03	0.01
NVA-154	NVA-154CHK	0.03	0.04	0.04
NVA-155	NVA-155CHK	0.03	0.01	0.05

5. **POINT COMPARISON REPORT (CONTINUED)**

Check Points				
POINT ID	CHECK POINT ID	Δ NORTH	Δ EAST	VERTICAL Δ
NVA-156	NVA-156CHK	0.04	0.02	0.04
NVA-157	NVA-157CHK	0.04	0.02	0.07
NVA-158	NVA-158CHK	0.01	0.02	0.07
NVA-160	NVA-160CHK	0.01	0.01	0.05
NVA-161	NVA-161CHK	0.01	0.00	0.07
NVA-162	NVA-162CHK	0.01	0.01	0.08
NVA-163	NVA-163CHK	0.02	0.01	0.01
NVA-164	NVA-164CHK	0.01	0.02	0.04
NVA-165	NVA-165CHK	0.01	0.01	0.04
NVA-166	NVA-166CHK	0.00	0.01	0.04
NVA-167	NVA-167CHK	0.02	0.00	0.01
NVA-169	NVA-169CHK	0.04	0.05	0.00
NVA-170	NVA-170CHK	0.00	0.01	0.01
NVA-171	NVA-171CHK	0.01	0.01	0.02
NVA-172	NVA-172CHK	0.02	0.01	0.03
NVA-173	NVA-173CHK	0.01	0.00	0.04
NVA-174	NVA-174CHK	0.01	0.01	0.01
NVA-175	NVA-175CHK	0.00	0.01	0.04
NVA-176	NVA-176CHK	0.02	0.01	0.03
NVA-177	NVA-177CHK	0.01	0.05	0.01
NVA-178	NVA-178CHK	0.00	0.00	0.01
NVA-179	NVA-179CHK	0.02	0.01	0.02
NVA-180	NVA-180CHK	0.01	0.02	0.02
NVA-181	NVA-181CHK	0.01	0.05	0.02
NVA-182	NVA-182CHK	0.05	0.01	0.05
NVA-183	NVA-183CHK	0.05	0.03	0.05
NVA-184	NVA-184CHK	0.01	0.04	0.03
NVA-185	NVA-185CHK	0.01	0.03	0.01
NVA-186	NVA-186CHK	0.03	0.03	0.05
NVA-187	NVA-187CHK	0.03	0.00	0.01
NVA-188	NVA-188CHK	0.00	0.00	0.02
NVA-189	NVA-189CHK	0.03	0.02	0.01
NVA-190	NVA-190CHK	0.01	0.02	0.01
NVA-191	NVA-191CHK	Post-Processed with TBC		
NVA-192	NVA-192CK	0.02	0.01	0.03
NVA-193	NVA-193CHK	0.01	0.01	0.00
NVA-194	NVA-194CHK	0.00	0.02	0.03

5. **POINT COMPARISON REPORT (CONTINUED)**

Check Points				
POINT ID	CHECK POINT ID	Δ NORTH	Δ EAST	VERTICAL Δ
VVA-201	VVA-201CHK	Post-Processed with TBC		
VVA-202	VVA-202CHK	Post-Processed with TBC		
VVA-203	VVA-203CHK	Post-Processed with TBC		
VVA-204	VVA-204CHK	Post-Processed with TBC		
VVA-205	VVA-205CHK	Post-Processed with TBC		
VVA-207	VVA-207CK	0.02	0.04	0.04
VVA-209	VVA-209CK	0.02	0.00	0.02
VVA-215	VVA-215CHK	0.02	0.02	0.03
VVA-219	VVA-219CHK	0.01	0.01	0.01
VVA-222	VVA-222CHK	0.01	0.02	0.03
VVA-223	VVA-223CHK	0.02	0.02	0.00
VVA-225	VVA-225CHK	0.00	0.01	0.07
VVA-242	VVA-242CHK	0.00	0.01	0.04
VVA-245	VVA-245CHK	0.02	0.06	0.05
VVA-246	VVA-246CHK	0.07	0.03	0.07
VVA-251	VVA-251CHK	0.03	0.01	0.04

*For points above Post-Processed with TBC, see Point Derivation Report submitted with this report.

7. SURVEY NOTES

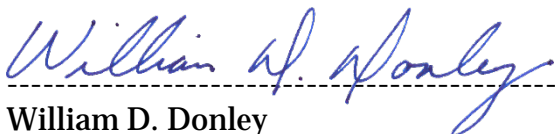
- 1) Coordinates shown hereon are based on the Florida State Plane Coordinate System, North Zone for Area 1, West Zone for Areas 2 and 3, North American Datum of 1983 with 2011 adjustment.
- 2) Elevations shown hereon are based on the North American Vertical Datum of 1988.
- 3) The purpose of this survey was to survey NVA and VVA check points within the Suwannee River Water Management District for the verification of LiDAR data.

8. GLOSSARY

CHK	Check
CORS	Continuously Operating Reference Station
ELEV	Elevation
ft	feet
GCP	Ground Control Point
GPS	Global Positioning System
ID	Identification
LiDAR	Light Detection and Ranging
LS	Land Surveyor
NAD	North American Datum
NAVD	North American Vertical Datum
NGS	National Geodetic Survey
NVA	Non-Vegetated Vertical Accuracy Ground Control Point
QA/QC	Quality Assurance/Quality Control
RTK	Real Time Kinematic
RTN	Real-Time Network
SPC	State Plane Coordinate
SWFWMD	Southwest Florida Water Management District
TBC	Trimble Business Center
USGS	United States Geological Survey
VRS	Virtual Reference System
VVA	Vegetated Vertical Accuracy Ground Control Point

9. SURVEYOR'S CERTIFICATION

I hereby certify this survey report meets the applicable "Standards of Practice" as set forth by the Florida Board of Professional Surveyors and Mappers in rule 5J17.050-.052, Florida Administrative Code.



William D. Donley
Florida Licensed Surveyor & Mapper No. LS 5381

07-26-2017

Date

This Survey is not valid without the signature and original raised seal of a Florida Licensed Surveyor and Mapper.