

# FL PANHANDLE QL2 LIDAR PROJECT ACQUISITION GROUND CONTROL POINTS

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CONTRACT NO. G16PC00020

## **Reference:**

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## **Prepared For:**

Dewberry Consultants LLC

## **Prepared By:**



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PREBLE-RISH

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	Including: a) Ground Control Point Documentation Report – PID.pdf	
	b) Final Coordinate List in Excel Format – ICP-Control.xls	
	c) NGS Data Sheets for Project Controls – NGS Datasheets.pdf	

# 1. INTRODUCTION

## 1.1 *Project Summary*

Dewberry|Preble-Rish is under subcontract to Dewberry Consultants, LLC, to provide 50 Acquisition Ground Control Points that will be used to calibrate newly collected LiDAR and Imagery for the FL Panhandle QL2 LiDAR Project. Field survey was conducted from April 10 through 25, 2018.

Existing NGS Control Points were recovered and surveyed to verify the accuracy of the RTK/GPS survey equipment with the results shown in Section 2.4 and Appendix 1 of this report.

As an internal QA/QC procedure, and to verify that the LiDAR check points meet the 95% confidence level, all of the GCP survey points were re-surveyed and the differences between observations are shown in Appendix 4 of this report. An average of the two observations was computed to generate final coordinates and elevations.

Final horizontal coordinates are referenced to NAD 83 (2011), Universal Transverse Mercator (UTM) Zone 16, meters. Final vertical elevations are referenced to NAVD88 in Meters using Geoid model 2012B (Geoid12B).

## 1.2 *Points of Contact*

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

### **Dewberry|Preble-Rish**

Frederick C. Rankin, P.S.M.  
Professional Surveyor & Mapper  
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Panama City, Florida 32405  
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### 1.3 *Project Area*



**FL PANHANDLE QL2 LIDAR PROJECT – GCP LOCATIONS**

## **2. PROJECT DETAILS**

### **2.1 *Survey Equipment***

In performing the GPS observations, Spectra Precision Epoch 80 GNSS RTK GPS receiver/antenna attached to a 6.56 foot (2 meter) fixed height pole was used, together with a Spectra Precision Ranger Data Collector equipped with SurveyPro Software (version 5.5.2), to collect GPS raw data for the field surveys.

### **2.2 *Survey Point Detail***

50 LiDAR calibration points were distributed throughout the project area. Approximate locations were provided to Dewberry|Preble-Rish prior to field survey.

A sketch was made for each location and a nail was set at the point where possible, unless said point was already located at a photo identifiable point. The LiDAR calibration point locations are detailed on the “Ground Control Point Documentation Report”, which is delivered via electronic transfer, see appendix 5a on sheet 2.

### **2.3 *Network Design***

The GPS survey performed by Dewberry|Preble-Rish was tied to the Trimble VRS Now Permanent Reference Network, a Real Time Network (RTN) managed by the Trimble Company. The Trimble VRS Now Network provides instant access to real-time kinematic (RTK) corrections utilizing a network of continuously operating permanent reference stations located throughout the United States, Europe, and Australia. Each site provides Global Positioning System (GPS) carrier phase and code range measurements in support of 3-dimensional positioning activities through Florida and surrounding states. All of the reference stations have been linked together, creating a Virtual Reference Station System (VRS).

## **2.4 *Field Survey Procedures and Analysis***

Dewberry|Preble-Rish field surveyors used Spectra Precision Epoch 80 GNSS RTK GPS systems, which is a geodetic quality dual frequency GPS receiver, to collect data at each check point location.

A total of eleven (11) existing NGS monuments were located as an additional QA/QC procedure, for the purpose of verifying the accuracy of the VRS network. All NGS monuments used are published in the NSRS database, and represent the primary project control for this survey. Field GPS observations are detailed in the “Project Network Control Monument Report”, see appendix 1 on sheets 8-9.

All of the GCP check point locations were occupied twice. If re-observations matched the initially derived station positions within the allowable tolerance of  $\pm 5\text{cm}$  or within the 95% confidence level, then no further occupations were performed. If re-observations did not match the initially derived positions, a static GPS session was collected and processed through NOAA’s Online Positioning User Service (OPUS). Each VRS occupation utilized the Trimble VRS Now Network, was occupied for approximately 3 to 6 minutes in duration, and measured to 180 - 360 epochs. All static sessions were occupied for a minimum of 45 minutes, and up to 100 minutes. Field GPS observations are detailed in the “Ground Control Point Documentation Report”, and delivered via electronic transfer, see appendix 5a on sheet 2.

## **2.5 *Adjustment***

Most 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 RTK software enables high-accuracy positioning in real time across a geographic region. The RTK software package uses real-time data streams from the GPS 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.

Some survey data was collected using Rapid Static GPS Surveying methodology. Rapid Static methodology is similar to conventional static GPS, except for the benefit of needing shorter occupation times due to shorter baselines, favorable satellite geometry, and minimal signal disturbances. Once data was collected, static sessions were processed through NOAA’s Online Positioning User Service (OPUS). This service provides simplified access to high-accuracy National Spatial Reference System (NSRS) coordinates and elevations. OPUS uses software which computes coordinates and elevations for NGS’ Continuously Operating Reference Station (CORS) network. The resulting positions are accurate and consistent with other National Spatial Reference System users.

## **2.6    *Data Processing Procedures***

After field data is collected (and processed through OPUS for static observations) the information is downloaded into the office software. Text files are created that show the point number, northing, easting, elevation, and description (PNEZD format) for each point surveyed. Points are then entered into a Microsoft Excell spreadsheet, which contains formulas for calculating differences between published and field survey data, as well as, comparing differences between points surveyed multiple times. This data is used to confirm point accuracy and precision.

After review of the point data, an “ASCII” or “txt” file (PNEZD format) is created, which is the industry standard. Point files are loaded into our CADD program (AutoCAD Civil 3D) to make a visual check of the point data (Pt. #, Coordinates, Elev. and Description). For check points that were surveyed twice, an average of the two observations was computed to generate final northings, eastings, and elevations. The data can now be imported into the final product.

**Appendix 1:**  
Project Network Control Monument Report

872 9154 C TIDAL - UTM 16											
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE	
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z		
4/11/2018	3355844.168	618998.122	4.374	3355844.169	618998.115	4.367	0.001	-0.007	-0.007	rmse <sub>N</sub>	0.016
4/11/2018	3355844.196	618998.123	4.353	3355844.169	618998.115	4.367	-0.027	-0.008	0.014	rmse <sub>E</sub>	0.007
4/12/2018	3355844.168	618998.122	4.351	3355844.169	618998.115	4.367	0.001	-0.007	0.016	Hrmse <sub>r</sub>	0.017
4/12/2018	3355844.179	618998.109	4.357	3355844.169	618998.115	4.367	-0.010	0.006	0.010	Vrmse	0.021
4/13/2018	3355844.172	618998.108	4.354	3355844.169	618998.115	4.367	-0.003	0.007	0.013		
4/13/2018	3355844.185	618998.119	4.354	3355844.169	618998.115	4.367	-0.016	-0.004	0.013		
4/17/2018	3355844.185	618998.117	4.346	3355844.169	618998.115	4.367	-0.016	-0.002	0.021		
4/17/2018	3355844.174	618998.120	4.347	3355844.169	618998.115	4.367	-0.005	-0.005	0.020		
4/18/2018	3355844.174	618998.108	4.354	3355844.169	618998.115	4.367	-0.005	0.007	0.013		
4/18/2018	3355844.198	618998.126	4.393	3355844.169	618998.115	4.367	-0.029	-0.011	-0.026		
4/23/2018	3355844.191	618998.113	4.319	3355844.169	618998.115	4.367	-0.022	0.002	0.048		

BAY 1054 - HORIZONTAL ONLY - UTM 16											
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE	
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z		
4/11/2018	3368101.296	654086.644	41.009	3368101.284	654086.624	N.A.	-0.012	-0.020	N.A.	rmse <sub>N</sub>	0.025
4/12/2018	3368101.312	654086.640	41.006	3368101.284	654086.624	N.A.	-0.028	-0.016	N.A.	rmse <sub>E</sub>	0.011
4/13/2018	3368101.311	654086.640	40.986	3368101.284	654086.624	N.A.	-0.027	-0.016	N.A.	Hrmse <sub>r</sub>	0.027
4/16/2018	3368101.315	654086.620	40.991	3368101.284	654086.624	N.A.	-0.031	0.004	N.A.	Vrmse	N.A.
4/19/2018	3368101.304	654086.626	41.001	3368101.284	654086.624	N.A.	-0.020	-0.002	N.A.		
4/19/2018	3368101.310	654086.633	40.981	3368101.284	654086.624	N.A.	-0.026	-0.009	N.A.		
4/20/2018	3368101.308	654086.621	41.000	3368101.284	654086.624	N.A.	-0.024	0.003	N.A.		
4/20/2018	3368101.298	654086.621	41.016	3368101.284	654086.624	N.A.	-0.014	0.003	N.A.		
4/23/2018	3368101.299	654086.622	40.986	3368101.284	654086.624	N.A.	-0.015	0.002	N.A.		
4/23/2018	3368101.316	654086.610	41.028	3368101.284	654086.624	N.A.	-0.032	0.014	N.A.		
4/24/2018	3368101.320	654086.618	41.014	3368101.284	654086.624	N.A.	-0.036	0.006	N.A.		
4/25/2018	3368101.307	654086.634	41.011	3368101.284	654086.624	N.A.	-0.023	-0.010	N.A.		

BAY 2 FLDNR - VERTICAL ONLY - UTM 16											
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE	
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z		
4/11/2018	3368112.904	648647.360	39.949	N.A.	N.A.	39.969	N.A.	N.A.	0.020	rmse <sub>N</sub>	N.A.
4/12/2018	3368112.887	648647.363	39.947	N.A.	N.A.	39.969	N.A.	N.A.	0.022	rmse <sub>E</sub>	N.A.
4/13/2018	3368112.913	648647.379	39.937	N.A.	N.A.	39.969	N.A.	N.A.	0.032	Hrmse <sub>r</sub>	N.A.
4/16/2018	3368112.910	648647.364	39.937	N.A.	N.A.	39.969	N.A.	N.A.	0.032	Vrmse	0.032
4/19/2018	3368112.888	648647.377	39.924	N.A.	N.A.	39.969	N.A.	N.A.	0.045		
4/19/2018	3368112.893	648647.379	39.979	N.A.	N.A.	39.969	N.A.	N.A.	-0.010		
4/20/2018	3368112.905	648647.367	39.924	N.A.	N.A.	39.969	N.A.	N.A.	0.045		
4/20/2018	3368112.893	648647.363	39.980	N.A.	N.A.	39.969	N.A.	N.A.	-0.011		
4/23/2018	3368112.904	648647.368	39.936	N.A.	N.A.	39.969	N.A.	N.A.	0.033		
4/24/2018	3368112.916	648647.368	39.942	N.A.	N.A.	39.969	N.A.	N.A.	0.027		
4/25/2018	3368112.911	648647.379	39.923	N.A.	N.A.	39.969	N.A.	N.A.	0.046		

G 177 - UTM 16											
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE	
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z		
4/11/2018	3321970.286	642162.841	5.870	3321970.297	642162.818	5.887	0.011	-0.023	0.017	rmse <sub>N</sub>	0.011
4/12/2018	3321970.287	642162.842	5.861	3321970.297	642162.818	5.887	0.010	-0.024	0.026	rmse <sub>E</sub>	0.024
										Hrmse <sub>r</sub>	0.026
										Vrmse	0.022

Q 125 - UTM 16											
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE	
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z		
4/10/2018	3400938.666	563870.495	76.004	3400938.663	563870.498	76.053	-0.003	0.003	0.049	rmse <sub>N</sub>	0.009
4/10/2018	3400938.665	563870.474	76.025	3400938.663	563870.498	76.053	-0.002	0.024	0.028	rmse <sub>E</sub>	0.012
4/10/2018	3400938.668	563870.485	76.030	3400938.663	563870.498	76.053	-0.005	0.013	0.023	Hrmse <sub>r</sub>	0.015
4/16/2018	3400938.670	563870.496	76.051	3400938.663	563870.498	76.053	-0.007	0.002	0.002	Vrmse	0.034
4/16/2018	3400938.661	563870.491	76.047	3400938.663	563870.498	76.053	0.002	0.007	0.006		
4/24/2018	3400938.675	563870.489	76.016	3400938.663	563870.498	76.053	-0.012	0.009	0.037		
4/24/2018	3400938.684	563870.516	76.010	3400938.663	563870.498	76.053	-0.021	-0.018	0.043		
4/25/2018	3400938.668	563870.507	76.018	3400938.663	563870.498	76.053	-0.005	-0.009	0.035		
4/25/2018	3400938.664	563870.497	76.015	3400938.663	563870.498	76.053	-0.001	0.001	0.038		
4/25/2018	3400938.671	563870.518	76.003	3400938.663	563870.498	76.053	-0.008	-0.020	0.050		
4/25/2018	3400938.674	563870.494	76.029	3400938.663	563870.498	76.053	-0.011	0.004	0.024		



**Appendix 1:**

*Project Network Control Monument Report (Cont.)*

APALACHICOLA - UTM 16										
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z	
4/12/2018	3290067.140	694818.923	4.584	3290067.129	694818.911	4.635	-0.011	-0.012	0.051	rmse <sub>N</sub> 0.011 rmse <sub>E</sub> 0.012 Hrmse <sub>e</sub> <b>0.016</b> Vrmse 0.051

J 45 - UTM 16										
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z	
4/12/2018	3290092.825	695063.615	4.497	3290092.833	695063.631	4.537	0.008	0.016	0.040	rmse <sub>N</sub> 0.006 rmse <sub>E</sub> 0.017 Hrmse <sub>e</sub> <b>0.018</b> Vrmse 0.030
4/17/2018	3290092.830	695063.649	4.522	3290092.833	695063.631	4.537	0.003	-0.018	0.015	

Y 295 - UTM 16										
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z	
4/13/2018	3289295.105	683028.215	4.129	3289295.102	683028.206	4.156	-0.003	-0.009	0.027	rmse <sub>N</sub> 0.003 rmse <sub>E</sub> 0.009 Hrmse <sub>e</sub> <b>0.009</b> Vrmse 0.027

S 293 - UTM 16										
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z	
4/16/2018	3298803.554	718232.930	7.167	3298803.557	718232.945	7.215	0.003	0.015	0.048	rmse <sub>N</sub> 0.003 rmse <sub>E</sub> 0.015 Hrmse <sub>e</sub> <b>0.015</b> Vrmse 0.048

FLGPS 20 - UTM 16										
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z	
4/17/2018	3300610.872	854853.967	7.588	3300610.854	854853.947	7.627	-0.018	-0.020	0.039	rmse <sub>N</sub> 0.012 rmse <sub>E</sub> 0.016 Hrmse <sub>e</sub> <b>0.020</b> Vrmse 0.034
4/17/2018	3300610.862	854853.965	7.596	3300610.854	854853.947	7.627	-0.008	-0.018	0.031	
4/19/2018	3300610.858	854853.957	7.595	3300610.854	854853.947	7.627	-0.004	-0.010	0.032	
4/23/2018	3300610.867	854853.963	7.593	3300610.854	854853.947	7.627	-0.013	-0.016	0.034	

TLC 1023 - UTM 16										
Date	Field Survey Data (M)			Published Data (M)			Differences (M)			RMSE
	Northing	Easting	Elevation	Northing	Easting	Elevation	Delta N	Delta E	Delta Z	
4/19/2018	3378002.130	780330.516	26.398	3378002.146	780330.529	26.408	0.016	0.013	0.010	rmse <sub>N</sub> 0.014 rmse <sub>E</sub> 0.014 Hrmse <sub>e</sub> <b>0.020</b> Vrmse 0.030
4/23/2018	3378002.151	780330.545	26.434	3378002.146	780330.529	26.408	-0.005	-0.016	-0.026	
4/24/2018	3378002.125	780330.546	26.381	3378002.146	780330.529	26.408	0.021	-0.017	0.027	
4/25/2018	3378002.143	780330.519	26.362	3378002.146	780330.529	26.408	0.003	0.010	0.046	

## Appendix 2:

### Final Calibration Ground Control Point Coordinates

<b>FL Panhandle QL2 LiDAR Project 2018</b>			
<b>POINT #</b>	<b>NORTHING (M)</b>	<b>EASTING (M)</b>	<b>ELEV. (M)</b>
GCP-101	3429660.241	503424.355	81.484
GCP-102	3427176.207	520899.697	73.740
GCP-103	3421394.067	542856.168	31.181
GCP-104	3426148.336	559936.877	70.540
GCP-105	3426692.935	582560.279	63.781
GCP-106	3413853.887	512160.426	63.906
GCP-107	3413559.331	531085.733	71.502
GCP-108	3410236.888	556650.438	56.850
GCP-109	3413183.759	579413.505	76.165
GCP-110	3394041.348	511828.035	44.294
GCP-111	3398053.111	537545.916	44.243
GCP-112	3400503.708	561478.656	74.042
GCP-113	3397363.622	579556.661	63.049
GCP-114	3367960.370	512763.201	7.601
GCP-115	3367613.519	541922.930	8.724
GCP-116	3371571.830	563759.875	2.978
GCP-117	3368206.504	584578.712	5.868
GCP-118	3430516.518	652026.608	48.539
GCP-119	3428617.237	688561.402	34.383
GCP-120	3406480.361	655492.591	46.755
GCP-121	3413422.267	675400.131	35.621
GCP-122	3406246.417	689573.645	33.532
GCP-123	3390675.494	653362.579	91.048
GCP-124	3388817.396	682809.898	67.290
GCP-125	3392205.629	716911.813	89.953
GCP-126	3392183.950	747533.814	79.285
GCP-127	3368529.028	670688.049	42.200
GCP-128	3369233.121	694626.322	50.176
GCP-129	3370197.059	726106.695	49.801
GCP-130	3373689.022	749355.180	31.647
GCP-131	3349488.130	669112.757	20.951
GCP-132	3347501.762	691761.279	13.522
GCP-133	3347284.343	717476.670	21.294
GCP-134	3346516.463	753875.260	5.427
GCP-135	3396649.371	799026.861	38.786
GCP-136	3380562.803	785524.950	48.977
GCP-137	3389485.046	816240.669	34.727
GCP-138	3364915.979	806319.196	19.956
GCP-139	3343533.414	784067.658	4.920
GCP-140	3323547.083	694495.956	7.447
GCP-141	3321667.064	740758.442	3.894
GCP-142	3306045.450	695590.320	3.697
GCP-143	3304753.912	724621.348	4.262
GCP-144	3287285.716	675028.247	2.507
GCP-145	3283720.101	706656.035	2.120
GCP-146	3310124.302	856730.388	10.428
GCP-147	3303823.897	853122.195	9.423
GCP-148	3294929.241	856482.273	9.152
GCP-149	3288025.054	849185.365	1.480
GCP-150	3287131.719	853214.916	2.882

**Appendix 3:**  
GPS Observation & Re-Observation Schedule

<b>FL Panhandle QL2 LiDAR Project 2018</b>					
<b>POINT #</b>	<b>SURVEY DATE</b>	<b>JULIAN DATE</b>	<b>TIME</b>	<b>RE-SURVEY DATE</b>	<b>RE-SURVEY TIME</b>
GCP-101	4/24/2018	124	12:56	4/25/2018	13:50
GCP-102	4/10/2018	100	11:30	4/11/2018	12:30
GCP-103	4/11/2018	101	15:50	4/12/2018	11:10
GCP-104	4/17/2018	117	10:22	4/18/2018	9:57
GCP-105	4/17/2018	117	11:05	4/18/2018	10:51
GCP-106	4/10/2018	100	13:55	4/11/2018	13:57
GCP-107	4/10/2018	100	14:40	4/11/2018	15:19
GCP-108	4/17/2018	117	9:39	4/18/2018	9:35
GCP-109	4/16/2018	116	13:28	4/17/2018	8:52
GCP-110	4/12/2018	112	12:33	4/16/2018	9:47
GCP-111	4/12/2018	112	10:05	4/16/2018	9:12
GCP-112	4/12/2018	112	9:07	4/16/2018	8:42
GCP-113	4/16/2018	116	12:41	4/17/2018	8:18
GCP-114	4/12/2018	112	13:35	4/13/2018	14:10
GCP-115	4/12/2018	112	14:40	4/13/2018	13:03
GCP-116	4/12/2018	112	15:44	4/13/2018	12:21
GCP-117	4/13/2018	113	11:40	4/16/2018	11:20
GCP-118	4/17/2018	117	14:51	4/18/2018	13:35
GCP-119	4/19/2018	119	9:00	4/20/2018	11:25
GCP-120	4/17/2018	117	13:27	4/18/2018	12:28
GCP-121	4/18/2018	118	14:32	4/19/2018	8:30
GCP-122	4/19/2018	119	9:46	4/20/2018	10:43
GCP-123	4/17/2018	117	14:05	4/18/2018	12:51
GCP-124	4/19/2018	119	10:25	4/20/2018	10:10
GCP-125	4/19/2018	119	11:20	4/20/2018	9:00
GCP-126	4/20/2018	120	12:35	4/23/2018	10:05
GCP-127	4/19/2018	119	13:30	4/20/2018	7:45
GCP-128	4/19/2018	119	12:20	4/20/2018	8:14
GCP-129	4/23/2018	123	8:35	4/23/2018	14:05
GCP-130	4/20/2018	120	14:00	4/23/2018	9:12
GCP-131	4/11/2018	111	10:40	4/16/2018	7:57
GCP-132	4/11/2018	111	12:20	4/24/2018	13:13
GCP-133	4/12/2018	112	15:30	4/13/2018	15:42
GCP-134	4/16/2018	116	12:02	4/17/2018	10:28
GCP-135	4/23/2018	123	11:30	4/25/2018	11:02
GCP-136	4/19/2018	119	14:43	4/24/2018	11:15
GCP-137	4/23/2018	123	12:25	4/25/2018	10:20
GCP-138	4/16/2018	116	14:20	4/17/2018	11:56
GCP-139	4/16/2018	116	13:01	4/17/2018	11:06
GCP-140	4/11/2018	101	12:57	4/12/2018	12:50
GCP-141	4/16/2018	116	15:50	4/17/2018	9:43
GCP-142	4/12/2018	112	13:05	4/13/2018	13:49
GCP-143	4/16/2018	116	16:31	4/17/2018	9:03
GCP-144	4/12/2018	112	10:58	4/13/2018	11:30
GCP-145	4/11/2018	101	14:36	4/12/2018	10:01
GCP-146	4/19/2018	119	12:21	4/23/2018	12:26
GCP-147	4/17/2018	117	13:45	4/18/2018	11:52
GCP-148	4/17/2018	117	14:12	4/19/2018	11:37
GCP-149	4/19/2018	119	10:49	4/23/2018	11:30
GCP-150	4/19/2018	119	11:10	4/23/2018	11:44

**Appendix 4:**  
*Point Comparison Report*

<b>FL Panhandle QL2 LiDAR Project 2018</b>				
<b>POINT ID</b>	<b>POINT CHK</b>	<b>DELTA N (M)</b>	<b>DELTA E (M)</b>	<b>VERT DIFF (M)</b>
GCP-101	GCP-1CHK	-0.005	0.003	-0.040
GCP-102	GCP-2CHK	0.010	-0.001	-0.008
GCP-103	GCP-3CHK	0.022	0.016	0.003
GCP-104	GCP-4CHK	-0.009	0.002	-0.013
GCP-105	GCP-5CHK	-0.004	-0.003	-0.027
GCP-106	GCP-6CHK	0.004	-0.005	0.009
GCP-107	GCP-7CHK	0.003	-0.003	0.033
GCP-108	GCP-8CHK	0.002	-0.014	-0.018
GCP-109	GCP-9CHK	0.002	0.000	0.012
GCP-110	GCP-10CHK	0.002	-0.003	0.030
GCP-111	GCP-11CHK	0.007	-0.004	0.016
GCP-112	GCP-12CHK	0.003	0.007	0.018
GCP-113	GCP-13CHK	-0.004	-0.002	0.007
GCP-114	GCP-14CHK	0.005	0.007	0.013
GCP-115	GCP-15CHK	0.003	0.012	0.023
GCP-116	GCP-16CHK	-0.009	-0.004	-0.027
GCP-117	GCP-17CHK	0.000	-0.011	0.014
GCP-118	GCP-18CHK	0.002	-0.014	0.002
GCP-119	GCP-19CHK	-0.001	0.006	-0.007
GCP-120	GCP-20CHK	-0.009	-0.009	0.008
GCP-121	GCP-21CHK	0.027	0.003	-0.001
GCP-122	GCP-22CHK	0.021	-0.002	-0.009
GCP-123	GCP-23CHK	-0.004	-0.010	0.044
GCP-124	GCP-24CHK	0.012	-0.003	-0.024
GCP-125	GCP-25CHK	0.005	-0.002	0.017
GCP-126	GCP-26CHK	-0.004	0.012	-0.001
GCP-127	GCP-27CHK	0.005	-0.004	0.034
GCP-128	GCP-28CHK	-0.005	0.008	0.013
GCP-129	GCP-29CHK	0.018	-0.019	0.004
GCP-130	GCP-30CHK	0.003	-0.016	0.020
GCP-131	GCP-31CHK	0.003	-0.002	-0.007
GCP-132	GCP-32CHK	0.002	0.000	-0.034
GCP-133	GCP-33CHK	-0.002	0.000	-0.004
GCP-134	GCP-34CHK	0.005	-0.002	0.011
GCP-135	GCP-35CHK	-0.005	0.008	0.039
GCP-136	GCP-36CHK	-0.018	0.000	-0.008
GCP-137	GCP-37CHK	0.019	0.000	-0.013
GCP-138	GCP-38CHK	0.006	-0.007	-0.011
GCP-139	GCP-39CHK	-0.009	0.014	-0.018
GCP-140	GCP-40CHK	0.014	0.007	0.027
GCP-141	GCP-41CHK	0.014	-0.001	0.008
GCP-142	GCP-42CHK	0.008	-0.015	0.015
GCP-143	GCP-43CHK	-0.007	-0.009	-0.008
GCP-144	GCP-44CHK	0.013	0.025	0.036
GCP-145	GCP-45CHK	-0.019	-0.031	0.036
GCP-146	GCP-46CHK	-0.001	0.002	0.049
GCP-147	GCP-47CHK	0.007	-0.003	-0.017
GCP-148	GCP-48CHK	-0.008	0.006	-0.026
GCP-149	GCP-49CHK	-0.001	-0.002	-0.004
GCP-150	GCP-50CHK	-0.008	0.012	-0.023