GROUND CONTROL SURVEY REPORT

GROUND TRUTH SURVEY
FOR LIDAR CONTROL

Professional Management
and LiDAR Data Collection
and Processing Services

Block 4

PROJECT TITLE:	Professional Management and LiDAR Data Collection and Processing Services
WORK ORDER NAME:	Task Order A
WORK ORDER NUMBER:	2007058492720
CONSULTANT NAME:	3001, Inc., CH2M Hill, Inc.
PROJECT MANAGERS:	Jeremy Conner, 3001 Project Manager JoLee Gardner, CH2M Hill Project Manager

Services provided by:

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Slidell, Louisiana 70458

September 2008

Florida Division of Emergency Management
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100

Re: Professional Management and LiDAR Data Collection and Processing Services, Block 4

This photogrammetric mapping ground control survey is certified as meeting or exceeding, in quality and precision, the standards applicable for this work as set forth in Chapter 61G17-6, Florida Adminstrative Code.

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Signed:_____Date:_____

CONTENTS

ABSTRACT

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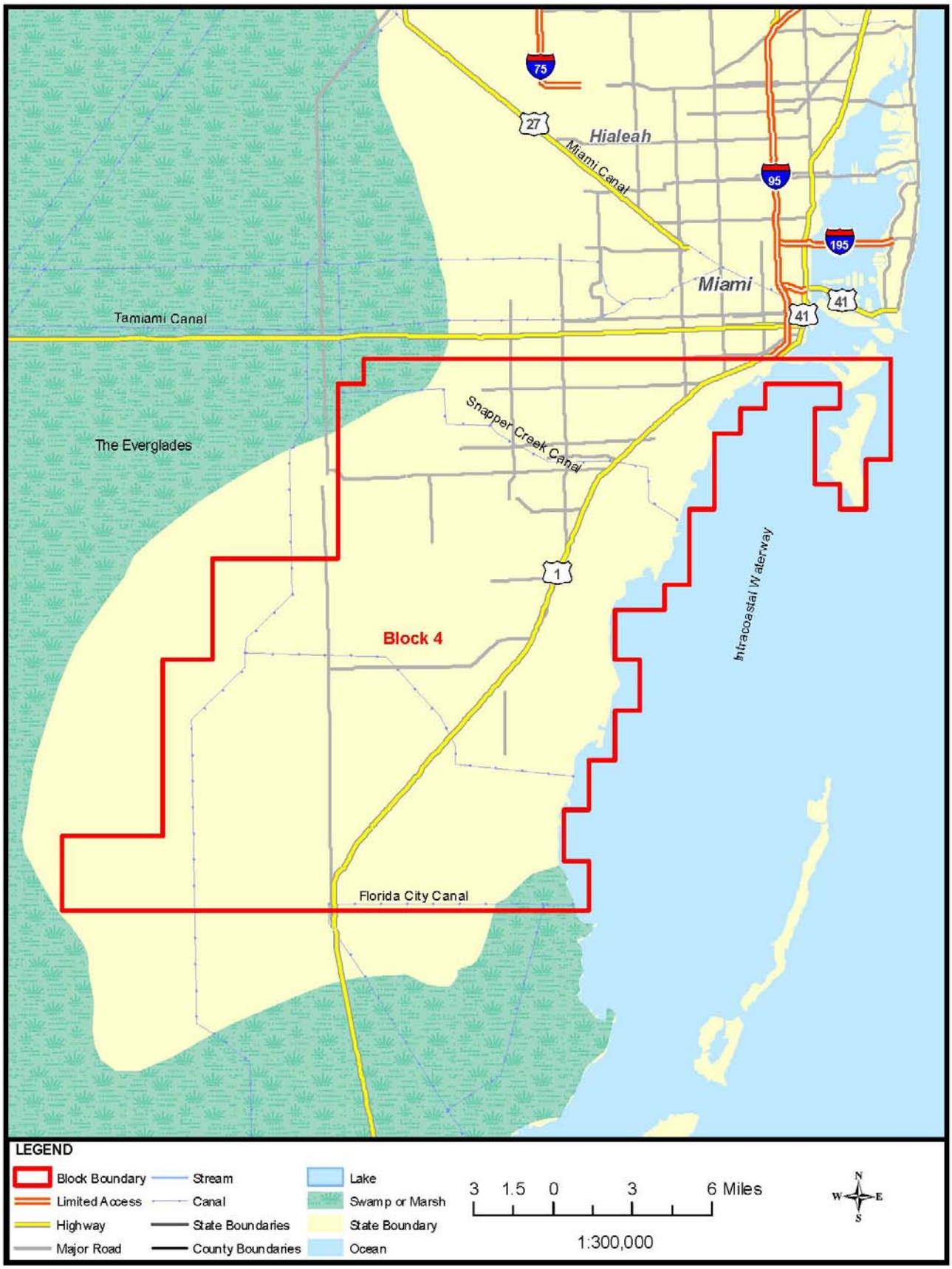
This report documents the GPS ground surveys conducted in support of LIDAR data collection for the Professional Management and LiDAR Data Collection and Processing Services project, Block 4. The data was collected between July 7 and July 10, 2007. Additional survey data was collected on December 9, 2007. The ground control stations were established utilizing six Trimble 4000 series receivers, two Trimble 4700 GPS receivers, six Trimble Compact L1/L2 antennas with ground plane, one Trimble microcentered L1/L2 antenna with ground plane, and one Trimble microcentered L1/L2 antenna without ground plane. There were no problems encountered during this survey.

Following the control network surveys, surveys were conducted at 8 sites utilizing the base stations established in the static network. These surveys established "Ground Truth" data at each site on different surface types, including bare-earth / low grass, brush lands / low trees, forested areas fully covered by trees, and urban areas.

BLOCK 4 SITE MAP



SURVEY METHODOLOGY

SURVEY METHODOLOGY

Prior to beginning the survey collection, a reconnaissance was done of the existing control in the project area, and surrounding areas. Based on the results of the findings, the controls to be included in the network were selected based on their locations, horizontal and vertical orders, and their accessibility. In addition to the survey control, several Continuously Operating Reference Stations (CORS) were included into the GPS network. All control monuments and CORS can be found in the Fully-Constrained Adjustment table, found in Section 4-B, and can also be seen on the GPS Network Map shown in Section 4-A.

The GPS network was then planned to coincide with the following set of standards:

- FGCC, GEOMETRIC GEODETIC ACCURACY STANDARDS AND SPECIFICATIONS FOR USING GPS RELATIVE POSITIONING TECHNIQUES, VERSION 5.0, AUGUST 1989
- FGDC, GEOSPATIAL POSITIONING ACCURACY STANDARDS, NATIONAL STANDARD FOR SPATIAL DATA ACCURACY (NSSDA)
- NGS-58, GUIDELINES FOR ESTABLISHING GPS-DERIVED ELLIPSOID HEIGHTS (2CM AND 5CM)
- NGS-59, GUIDELINES FOR ESTABLISHING GPS-DERIVED ORTHOMETRIC HEIGHTS (2CM AND 5CM)
- FGCC STANDARDS AND SPECIFICATIONS FOR GEODETIC CONTROL NETWORKS, 1984
- FEMA FLOOD HAZARD MAPPING PROGRAM, GUIDELINES AND SPECIFICATIONS FOR FLOOD HAZARD MAPPING PARTNERS, APPENDIX A

Control monuments were tied together with four hour occupations. These monuments were then tied to newly established monuments, or secondary control monuments, with multiple one hour occupations.

After the static GPS network was completed, the ground truth data points were collected using a total station and data collector. This data was collected from base stations tied into the static GPS network, and additional “check-in” points were collected and compared to positions established in the static network. The ground truth data was then processed and used to verify the LIDAR positions.

The horizontal and vertical datums used for this project are listed below:

Coordinate System: US State Plane
Zone: Florida East 0901
Horizontal Datum: NAD83 (1999) / HARN Adjustment
Vertical Datum: NAVD88
Geoid Model: Geoid03
Units: US Survey Feet

MAIN REPORT

STATIC GPS SUMMARY

The Standard Operating Procedure for the data collection includes a geodetic control network plan designed to maximize the use of the highest order control points in the area of interest, and to optimize the spatial distribution of geodetic control across the network. Also included is the simultaneous occupation of points designed to provide redundant vectors and loop closures, as well as a collection of a superfluity of points to compare observed values against published values of geodetic control points.

In addition, the static GPS network was established to verify the compatibility and correlation of existing published NGS controls in the project area. Horizontal and vertical constraints were selected based on the order of accuracy and correlation of the controls selected.

PRELIMINARY ANALYSIS

The baselines were processed using Trimble Geomatics Offices's baseline processing module, WAVE (*Weighted Ambiguity Vector Estimator*). Ionosphere-free fixed solutions were found to provide the best results. Preliminary blunder detections were undertaken using "Redundant Vectors" and Global Network Closures and any extremely large errors were eliminated.

MINIMALLY CONSTRAINED ADJUSTMENT

The data are then processed using a minimally constrained geodetic control network to test the network internally, without external constraints, and produce a statistical summary. The statistics from this process are required to be within the tolerance outlined in the Geometric Geodetic Accuracy Standards and Specifications for using GPS Relative Positioning Techniques, published by the FGCC. These tolerances are represented as ellipsoids showing the margin of error value on a graph of the theoretical points, covariance values that indicate the degree of error of the vectors relative to the other vectors in the network, and a chi-squared test that compares the predicted variance determined through a least-squares analysis to the observed variance. The summary is evaluated to eliminate vectors that are outside of the error tolerances to be replaced with redundant vectors that are within the tolerances until all tolerances are met.

FULLY CONSTRAINED ADJUSTMENT

The quality of the existing horizontal controls is assessed before undertaking the constrained adjustment. Geodetic inverses between the published NAD83 (1999) coordinates of existing stations were compared with the geodetic inverses derived from the minimally constrained least square adjustment results. This distance analysis is especially useful, since it provides a datum invariant means of comparison.

Once the minimally constrained network satisfies the requirements of the above tests, the highest order control points in the control network are selected with an optimum spatial relationship to fully constrain the network to known control points, and have their published values entered as the position for those points and the network re-adjusted. The fully constrained positions are given in Section 4-B. The same statistical tests are rerun on the adjusted network, as well as visually comparing adjusted values of geodetic control points to published values of control points not used as constraints. Again, the summary is evaluated to identify vectors outside of the tolerances and constraining points reselected to obtain the best fit to the geoid where all vectors are within the prescribed tolerances.

ERROR ELLIPSES

The adjustment results show that the a posteriori variance factor of the network was close to 1.0, as should be desired, and passed the χ^2 test. None of the residual components in the network were flagged for possible rejection under the τ-max test at the 0.05 level of significance. The relative confidence ellipses reveal that the horizontal positional accuracy between all directly connected pairs of stations in the network were better than (1:100,000) at the 95% level of confidence. The horizontal and vertical Error ellipses are included in this report in Section 4-D.

GROUND TRUTH SUMMARY

Surveys were conducted to establish ground truth data at representative sites throughout the project area. These sites were selected on the basis of the various types of ground surfaces and vegetation covers that would be encountered by the LIDAR surveys. As a quality control measure, a number of “check-in” points consisted of published horizontal and vertical control points within the area. The base stations used to collect survey data were included in the static GPS network, and were selected on the basis of their having an unobstructed view of the sky, as well as being in a location considered favorable for collecting ground truth data. The vertical and horizontal accuracy of each base station was determined by the statistical tests performed in the least squares adjustment process.

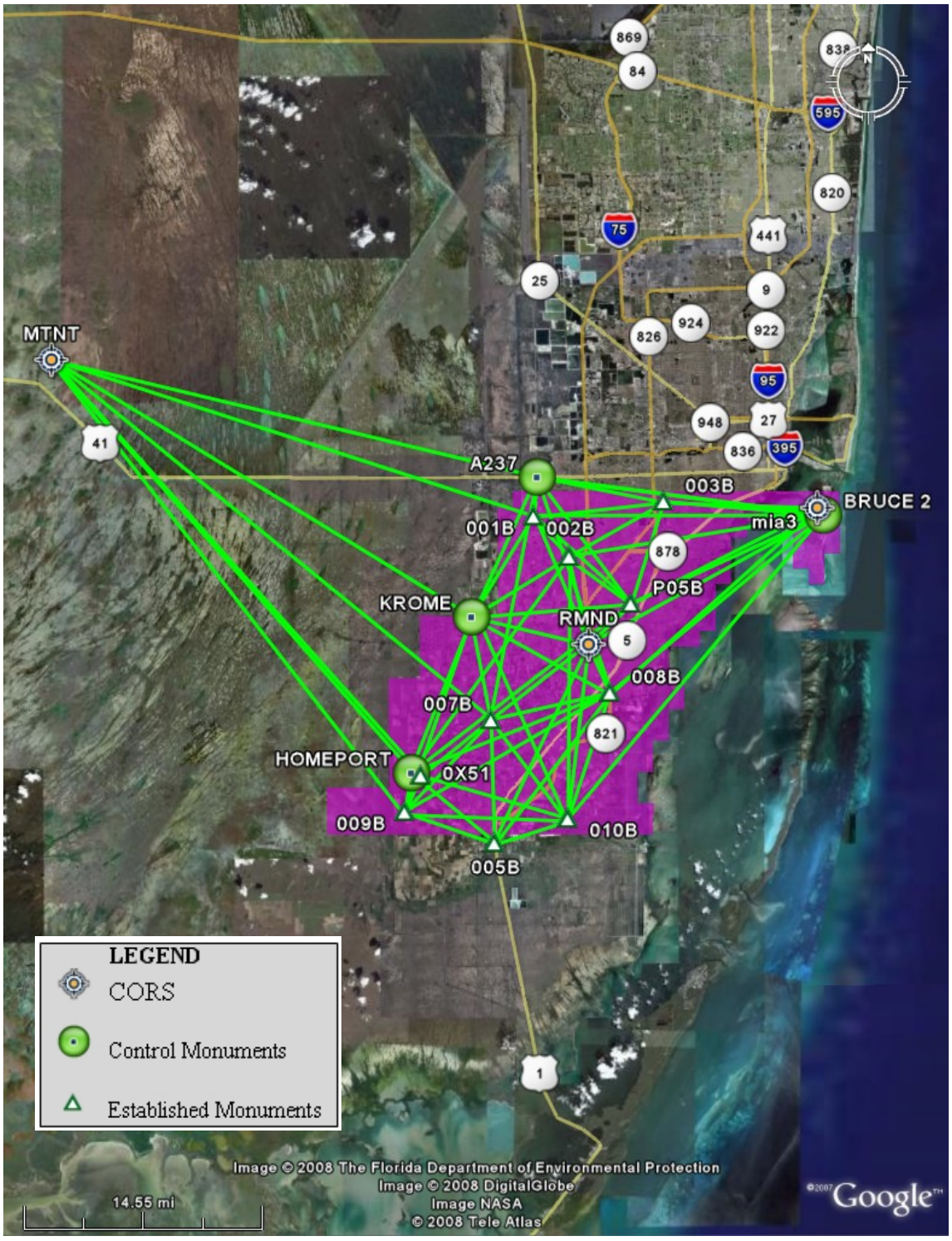
SAMPLE POINTS / TEST POINTS

The test points were distributed and categorized into sites as shown in the Map of Ground Truth Locations attached in this report (Section 5-A). These sites were selected on the basis of various types of ground surfaces and vegetation covers. At the time of LIDAR data acquisition, checkpoints were collected on surfaces with bare-earth / low grass, brush lands / low trees, forested areas fully covered by trees, and urban areas.

GPS NETWORK

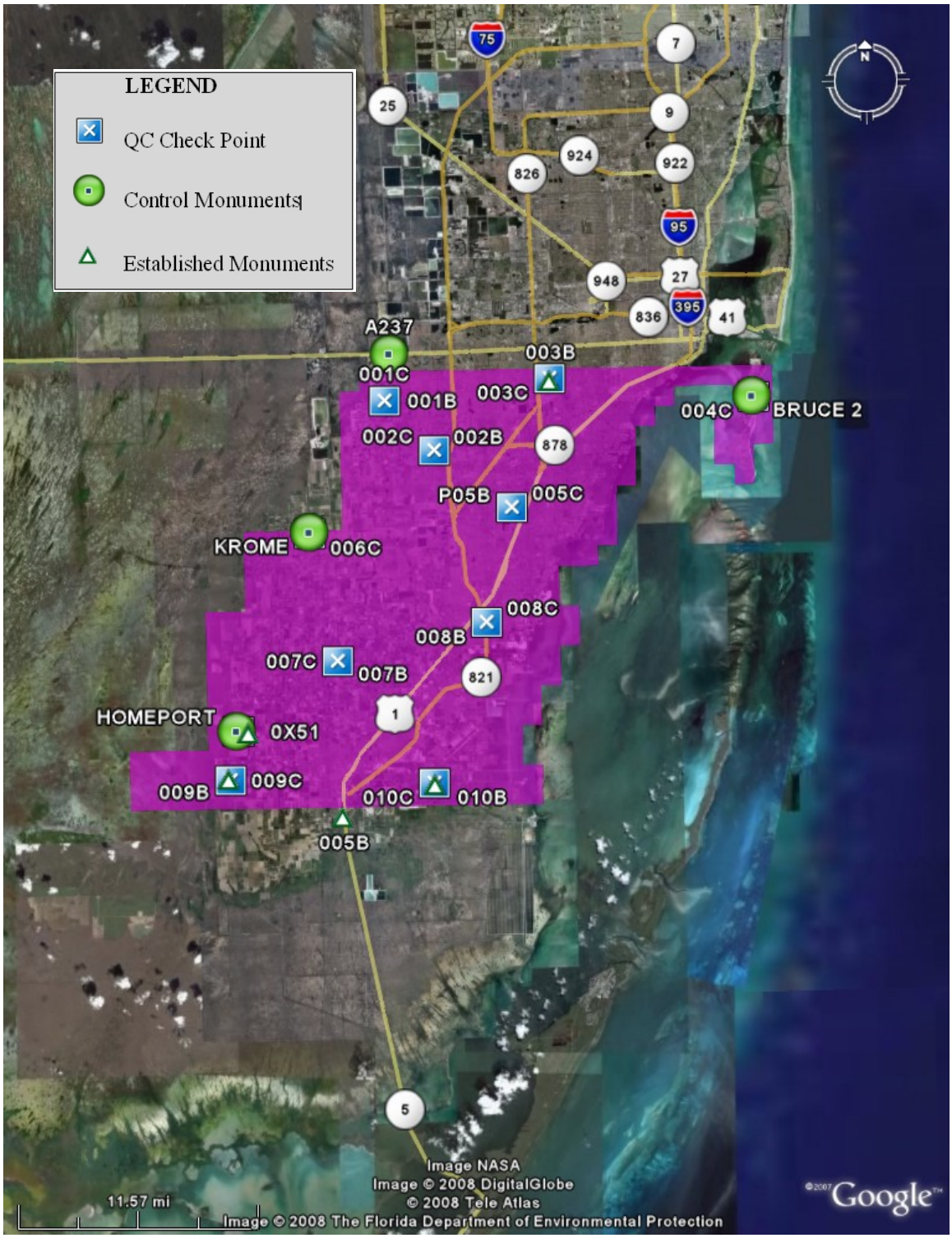
A. GPS Network Map

GPS Network Map



This map shows the GPS baselines processed for this network. The CORS and control monuments can be distinguished from the newly established monuments (see the legend above).

QC Check Points



The QC check points can be seen in the above map. The QC procedures are described in Section 3, in the Ground Truth Summary. The individual check sites can be seen in detail in Section 5-B.

B. Fully Constrained

GPS Control Network
Fully-Constrained Adjustment

Coordinate System: US State Plane
Zone: Florida East 0901
Horizontal Datum: NAD83 (1999)
HARN Adjustment
Vertical Datum: NAVD88
Geoid Model: Geoid03
Units: US Survey Feet

Name	Latitude	Longitude	Northing	Easting	Elev	Ellip Ht	North Error	East Error	Ellip Error	Fix
MIA3	25 43 58.09808	80 09 36.60080	509458.62	932637.26	36.49	-47.71	0.00	0.00	0.00	LLh
MTNT	25 51 56.76081	80 54 25.18701	556914.06	686748.36	17.53	-62.15	0.00	0.00	0.00	LLh
RMND	25 36 49.58921	80 23 02.14117	465790.41	859175.16	35.96	-46.22	0.00	0.00	0.00	LLh
A 237	25 45 40.28832	80 25 59.08175	519296.79	842749.01	6.41	-74.83	0.00	0.00	0.00	LLh
BRUCE 2	25 43 35.37067	80 09 15.51874	507176.30	934579.87	2.40	-81.90	0.00	0.00	0.00	LLh
HOMEPORT	25 30 06.12790	80 33 23.75745	424831.28	802411.55	4.89	-75.81	0.00	0.00	0.00	LLh
KROME	25 38 18.85532	80 29 50.96822	474644.54	821718.91	13.24	-67.66	0.01	0.01	0.05	
001B	25 43 42.60999	80 26 08.79564	507412.25	841911.76	6.78	-74.45	0.01	0.01	0.04	
002B	25 41 34.50173	80 24 04.38999	494528.65	853347.02	6.23	-75.40	0.01	0.02	0.04	
003B	25 44 27.51206	80 18 32.50776	512144.01	883614.78	8.02	-74.38	0.02	0.02	0.05	
005B	25 26 29.92583	80 28 30.95339	403102.13	829324.14	6.30	-75.16	0.02	0.02	0.10	
007B	25 32 59.28145	80 28 40.73802	442406.22	828273.07	6.39	-75.06	0.02	0.02	0.06	
008B	25 34 23.76321	80 21 43.84107	451101.99	866413.23	5.76	-76.89	0.02	0.02	0.06	
009B	25 28 09.38965	80 33 44.43206	413039.75	800556.09	4.74	-75.87	0.02	0.02	0.06	
010B	25 27 45.76234	80 24 13.59572	410857.41	852880.83	4.40	-77.95	0.02	0.03	0.08	
0X51	25 30 04.06708	80 32 47.26350	424634.50	805755.81	5.93	-74.88	0.02	0.02	0.07	
P05B	25 39 04.80026	80 20 29.35887	479508.43	873092.37	12.13	-70.32	0.01	0.01	0.03	
001C	25 43 42.35620	80 26 15.57679	507383.98	841291.75	7.26	-73.96	0.03	0.03	0.07	
002C	25 41 35.97456	80 24 01.11470	494678.70	853645.96	5.79	-75.85	0.03	0.03	0.08	
003C	25 44 29.37938	80 18 37.00568	512330.39	883202.50	6.57	-75.82	0.04	0.03	0.08	
004C	25 43 32.51797	80 09 12.58397	506890.00	934850.11	2.38	-81.94	0.02	0.03	0.06	
005C	25 39 09.37622	80 20 29.59228	479970.31	873068.71	11.30	-71.15	0.03	0.03	0.07	
006C	25 38 15.23753	80 29 50.55733	474279.44	821757.90	13.10	-67.80	0.03	0.03	0.06	
007C	25 32 55.06396	80 28 40.75398	441980.43	828273.28	6.40	-75.05	0.03	0.03	0.07	
008C	25 34 24.12125	80 21 46.56500	451136.94	866163.63	5.47	-77.17	0.03	0.03	0.08	
009C	25 28 03.05260	80 33 44.30213	412400.03	800570.10	4.56	-76.05	0.03	0.03	0.09	
010C	25 27 45.72710	80 24 20.88093	410850.87	852213.16	4.72	-77.61	0.04	0.04	0.10	
011C	25 30 05.47362	80 33 19.95900	424766.39	802759.78	5.30	-75.41	0.02	0.02	0.03	

ERRORS ARE REPORTED AT THE 95% CONFIDENCE LEVEL.

C. NGS Published Positions vs GPS Derived Positions

NGS Positions vs GPS Derived Positions

Coordinate System: US State Plane
Zone: Florida East 0901
Horizontal Datum: NAD83 (1999)
Vertical Datum: NAVD88 / HARN Adjustment
Geoid Model: Geoid03
Units: US Survey Feet

Name	Northing	Easting	Elev	Ellip Ht	Horiz Order	Vert Order	Ellip Order
mia3	509458.62	932637.26		-47.71	CORS	CORS	CORS
mtnt	556914.06	686748.36		-62.15	CORS	CORS	CORS
rmnd	465790.41	859175.16		-46.22	CORS	CORS	CORS
HOMEPORT	424831.28	802411.55	4.97	-75.81	Feb '07	1	Feb '07
A 237	519296.79	842749.01	6.48	-74.83	Feb '07	1	Feb '07
BRUCE 2	507176.30	934579.87	2.37	-81.90	Feb '07	1	Feb '07
KROME	474644.44	821718.93	13.35	-67.55	1	1	-

Northing	Easting	Elev	Ellip Ht
509458.62	932637.26	36.49	-47.71
556914.06	686748.36	17.53	-62.15
465790.41	859175.16	35.96	-46.22
424831.28	802411.55	4.89	-75.81
519296.79	842749.01	6.41	-74.83
507176.30	934579.87	2.40	-81.90
474644.54	821718.91	13.24	-67.66

delta North	delta East	delta Elev	delta Ellip
0.00	0.00		0.00
0.00	0.00		0.00
0.00	0.00		0.00
0.00	0.00	0.09	0.00
0.00	0.00	0.07	0.00
0.00	0.00	-0.03	0.00
-0.10	0.02	0.11	

Feb 07 = Refers to NGS adjustment from February 2007 which
establishedhorizontal positions and ellipsoid heights

D. Error Ellipses

Point Error Ellipses

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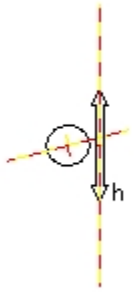	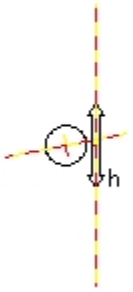	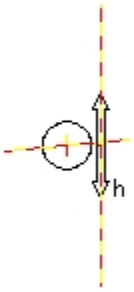
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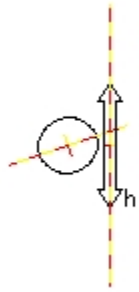	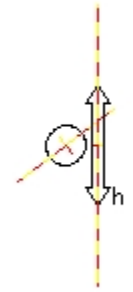	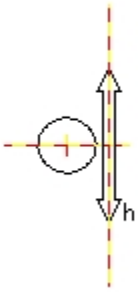
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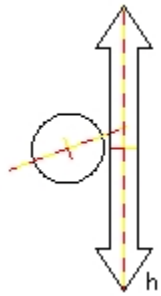	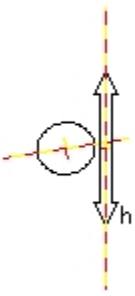	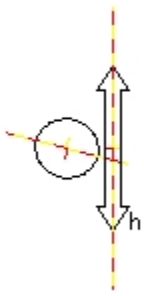
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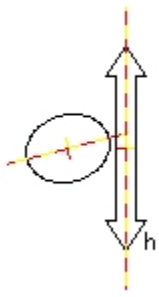	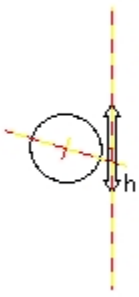	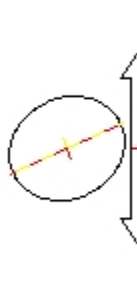
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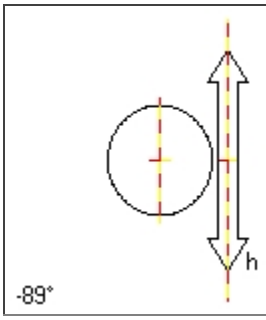	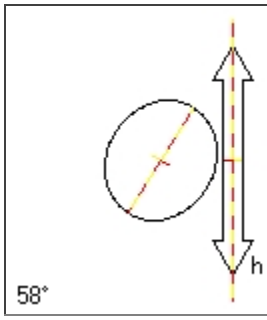	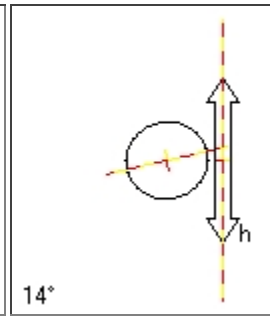
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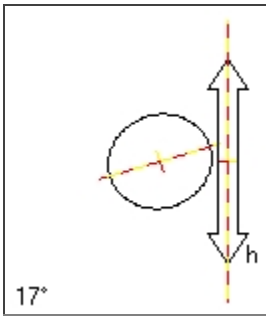
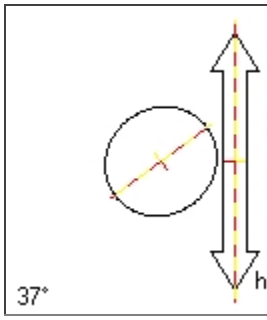
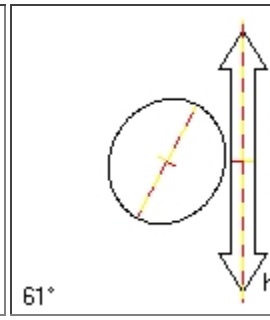
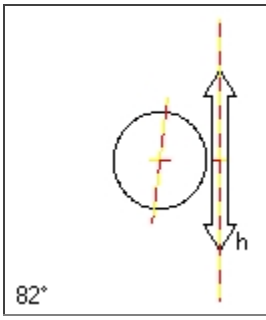
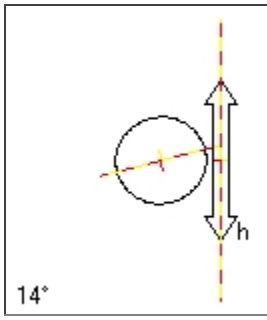
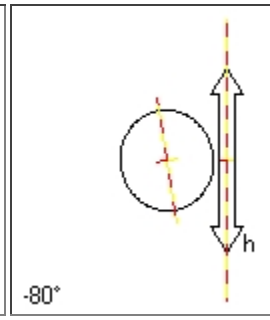
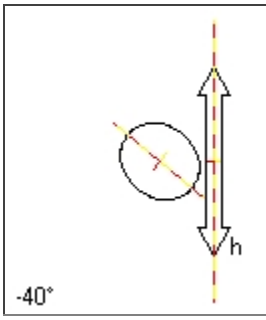
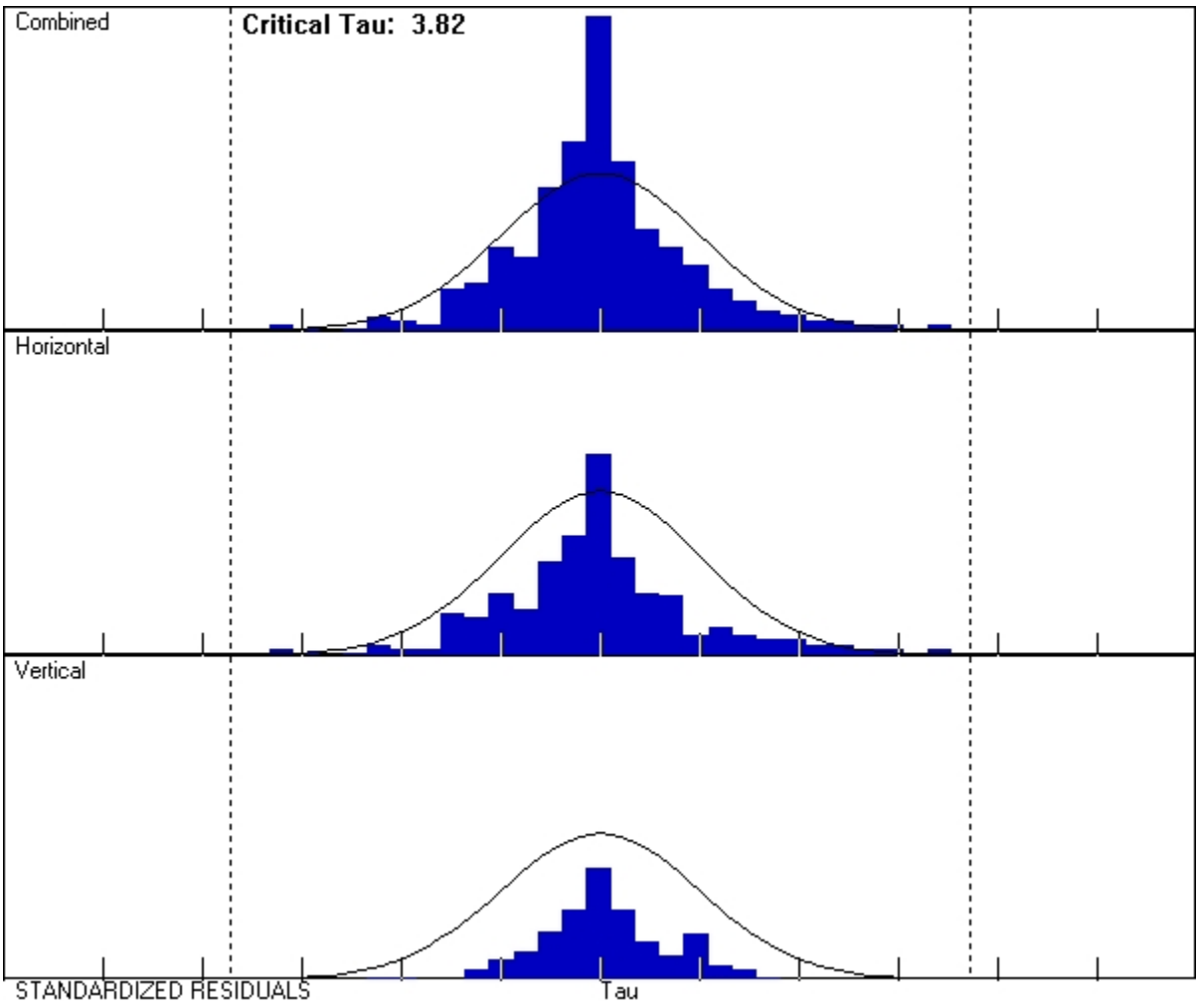
		
Tick Size: 0.0100sft Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ		
005C	**006C**	**007C**
		
Tick Size: 0.0100sft Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ		
0X51		
		
Tick Size: 0.0100sft Horizontal Bivariate Scalar: 2.45σ Vertical Univariate Scalar: 1.96σ		

E. Histograms of Standardized Residuals

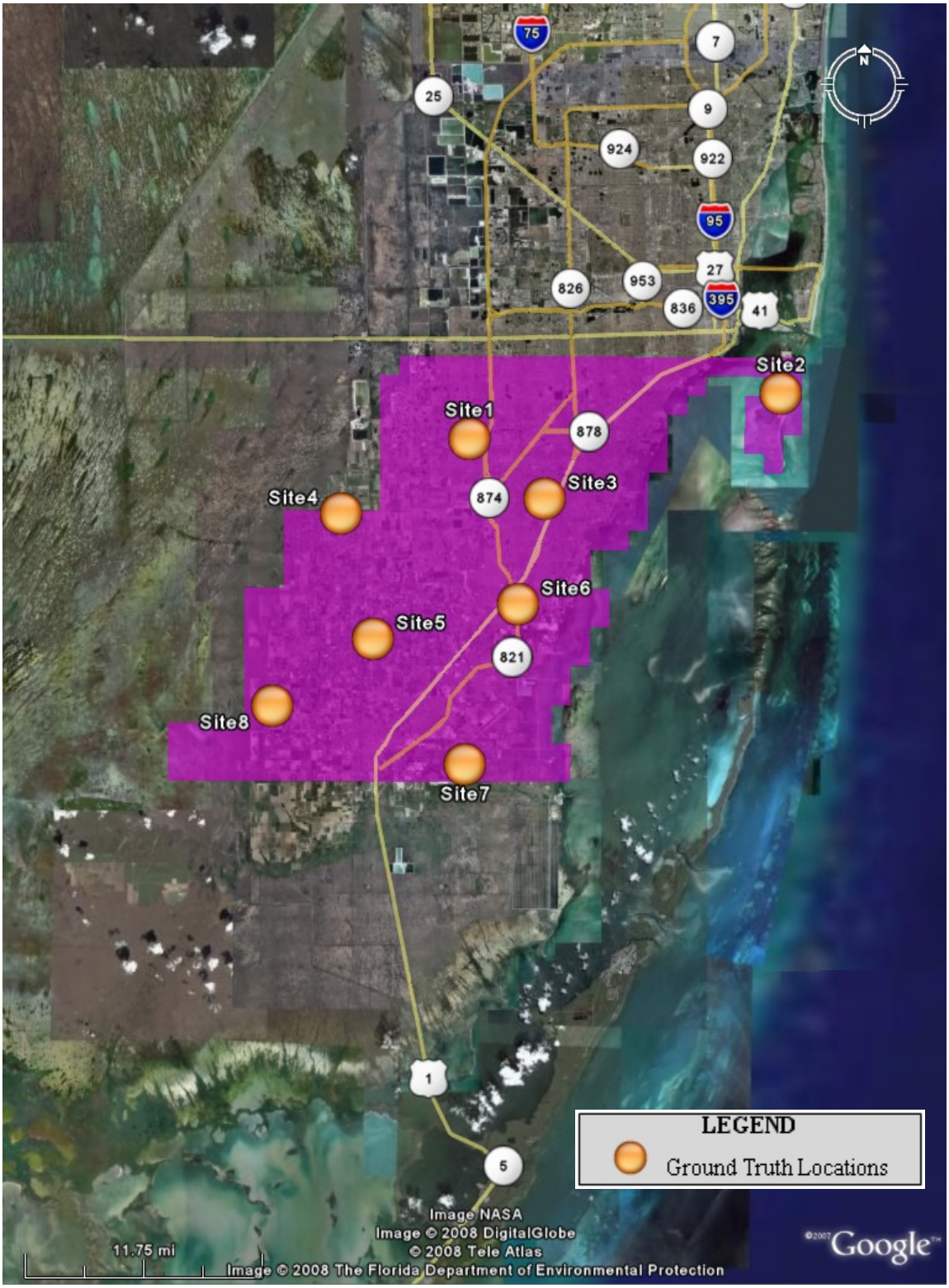
Histograms of Standardized Residuals



GROUND TRUTH SURVEY

A. Map of Ground Truth Locations

Ground Control Areas



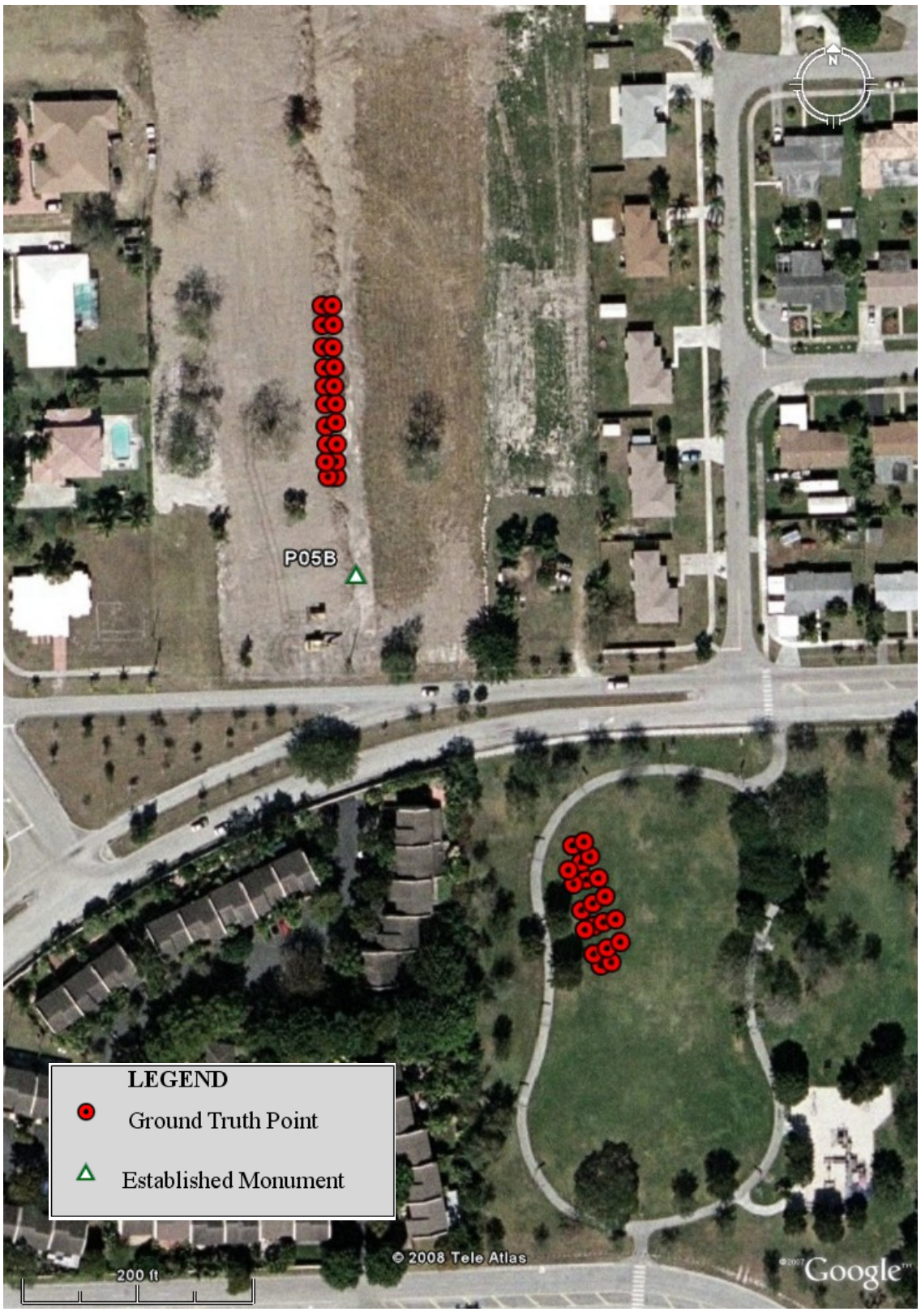
The individual check sites can be seen in detail on the following pages.

B. Ground Truth Site Maps

SITE 1 - Ground Truth Points

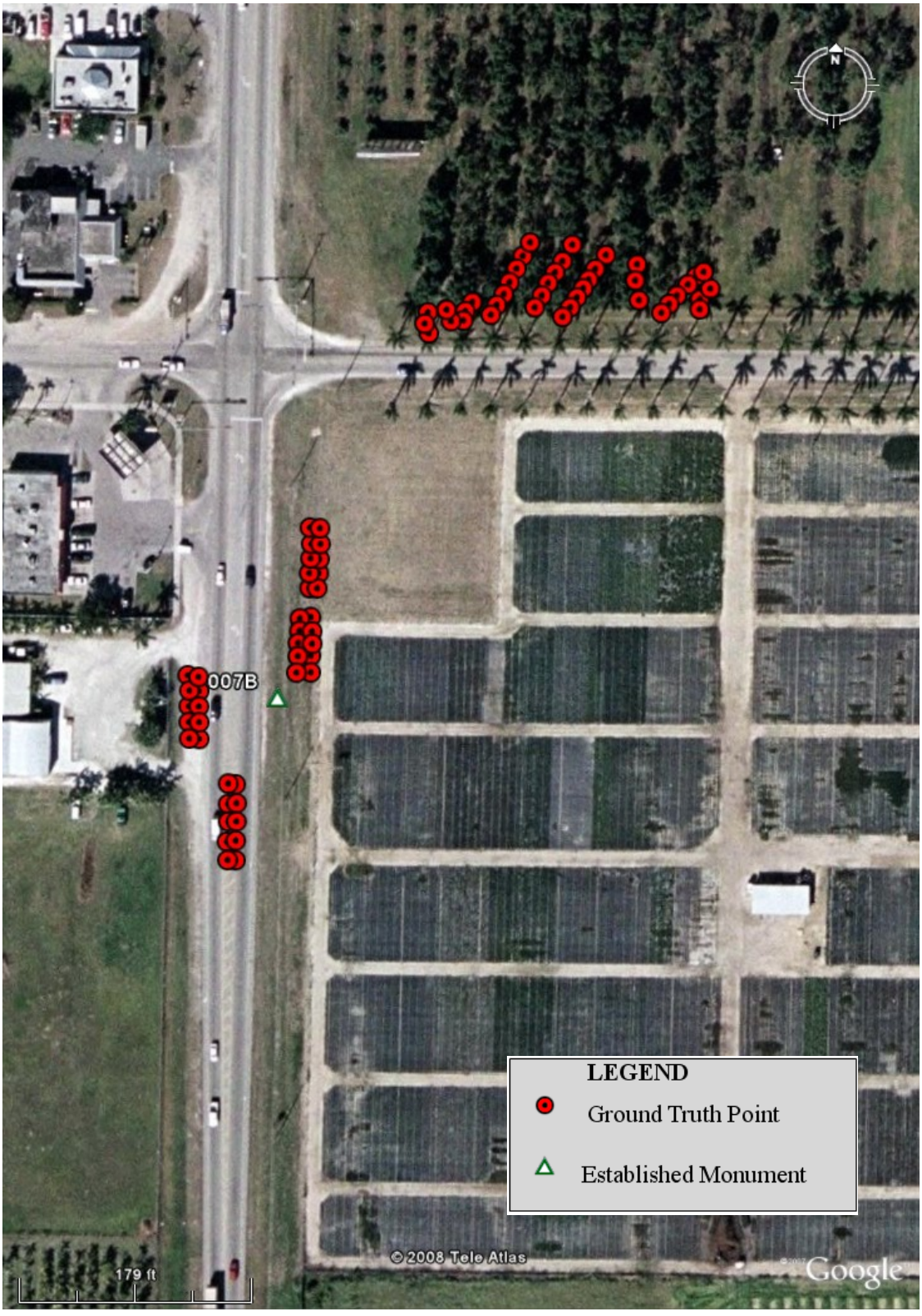
SITE 2 - Ground Truth Points

SITE 3 - Ground Truth Points

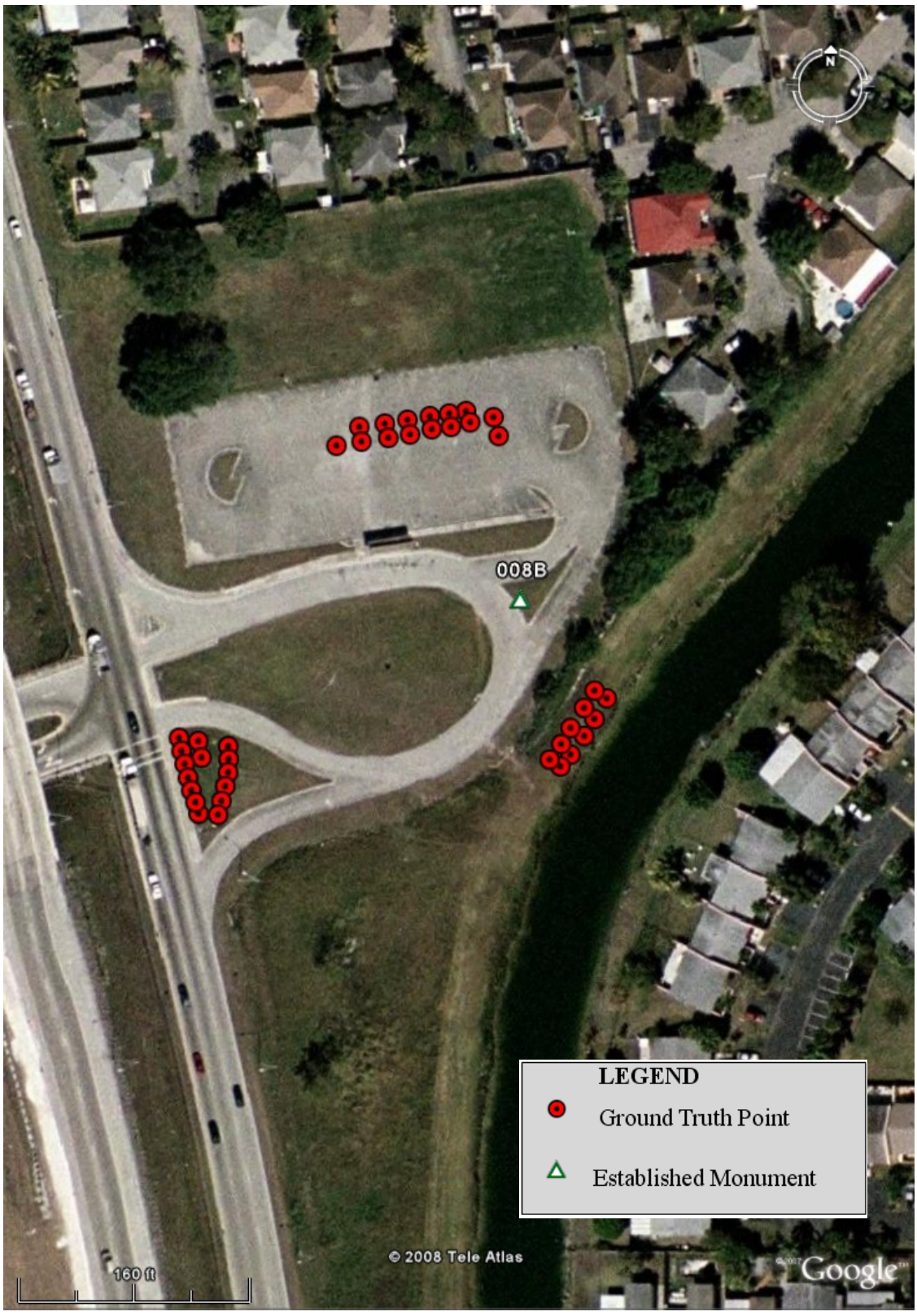


SITE 4 - Ground Truth Points

SITE 5 - Ground Truth Points



SITE 6 - Ground Truth Points



SITE 7 - Ground Truth Points

SITE 8 - Ground Truth Points

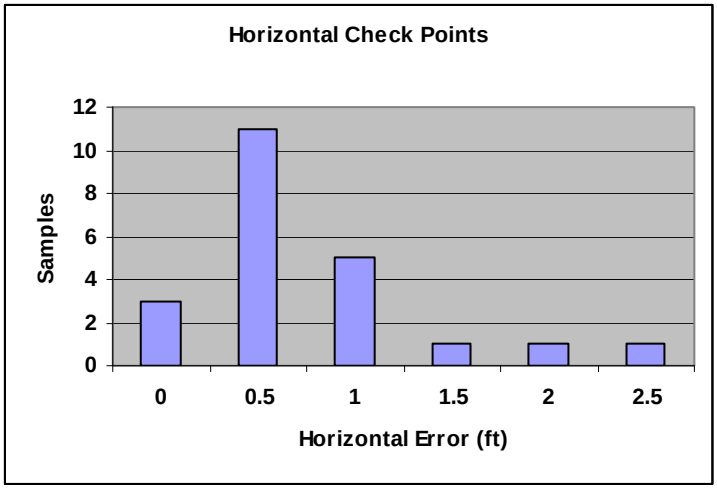
C. Horizontal Accuracy Assessment

HORIZONTAL ACCURACY CHECK POINTS

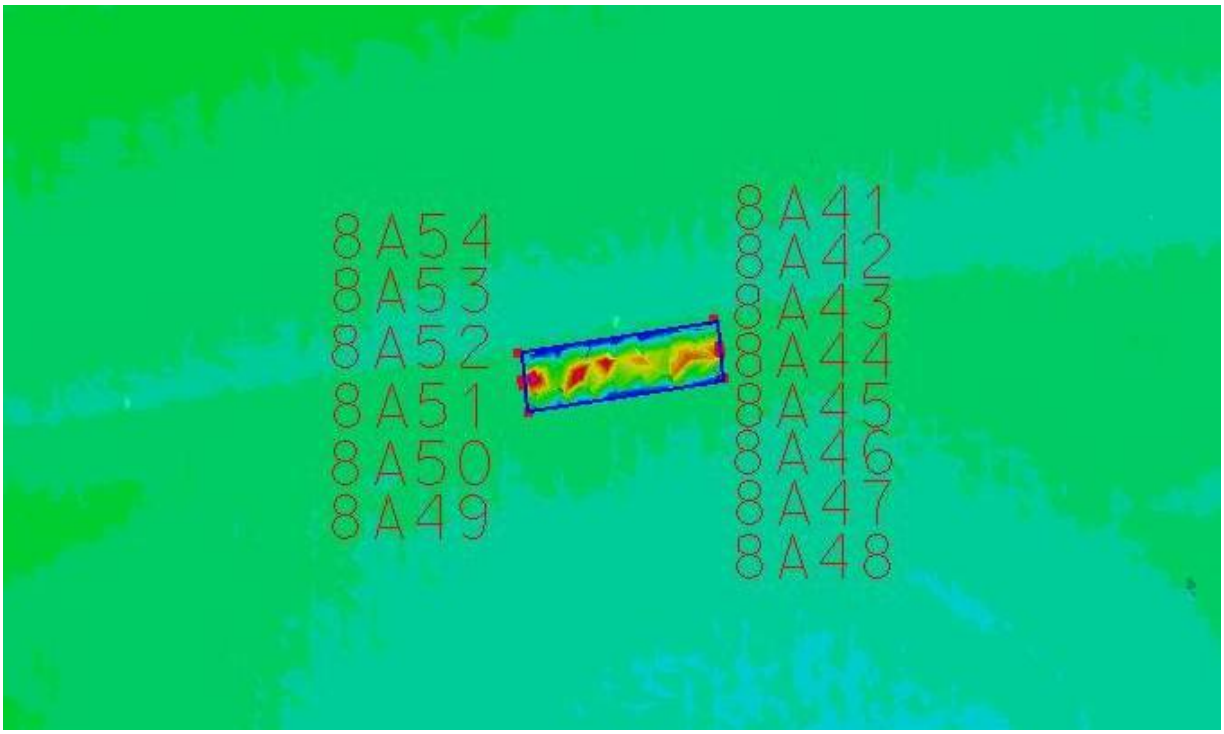
Horizontal check points were collected at several sites within the project area, in order to verify the horizontal accuracy of the LiDAR data. These check points are collected in the same locations as the vertical ground truth data, from base stations that were established in the static GPS network. The horizontal check points were collected with a total station and data collector.

After the LiDAR data has been processed these horizontal check points are plotted and compared to the approximate positions from the LiDAR data set. For this purpose building corners are most often used, because they can be identified from the LiDAR data and the corners can be estimated. Distances are measured from the estimated LiDAR positions to the surveyed positions. The statistics are shown below, and screen captures of the LiDAR derived features are shown on the following pages.

Horizontal Check Points (ft)	
RMSEr	0.98
Mean	0.96
Standard Error	0.30
Median	0.50
Mode	0.49
Standard Deviation	1.40
Sample Variance	1.96
Kurtosis	5.57
Skewness	2.48
Range	5.27
Minimum	0.02
Maximum	5.29



Site 8 – Horizontal Check Point



Site 11 – Horizontal Check Point

CONTROL MARK DATA SHEETS

```
AH3723 ********************************************************************
AH3723  CORS       -  This is a GPS Continuously Operating Reference Station.
AH3723  DESIGNATION -  MIAMI 3 CORS ARP
AH3723  CORS_ID    -  MIA3
AH3723  PID        -  AH3723
AH3723  STATE/COUNTY-  FL/MIAMI-DADE
AH3723  USGS QUAD   -  KEY BISCAYNE (1994)
AH3723
AH3723                    *CURRENT SURVEY CONTROL
AH3723 ______________________________________________________________________
AH3723* NAD 83(CORS)-  25 43 58.09808(N)    080 09 36.60080(W)     ADJUSTED
AH3723* NAVD 88     -
AH3723 ______________________________________________________________________
AH3723  EPOCH DATE  -       2002.00
AH3723  X           -     982,510.903 (meters)                COMP
AH3723  Y           -  -5,664,648.798 (meters)                COMP
AH3723  Z           -   2,752,419.865 (meters)                COMP
AH3723  ELLIP HEIGHT-         -14.542 (meters)          (03/??/02) GPS OBS
AH3723  GEOID HEIGHT-         -25.66  (meters)                GEOID03
AH3723
AH3723  HORZ ORDER  -  SPECIAL (CORS)
AH3723  ELLP ORDER  -  SPECIAL (CORS)
AH3723
AH3723.ITRF positions are available for this station.
AH3723.The coordinates were established by GPS observations
AH3723.and adjusted by the National Geodetic Survey in March 2002.
AH3723.The coordinates are valid at the epoch date displayed above.
AH3723.The epoch date for horizontal control is a decimal equivalence
AH3723.of Year/Month/Day.
AH3723
AH3723
AH3723.The PID for the CORS L1 Phase Center is AJ7937.
AH3723
AH3723.The XYZ, and position/ellipsoidal ht. are equivalent.
AH3723
AH3723.The ellipsoidal height was determined by GPS observations
AH3723.and is referenced to NAD 83.
AH3723
AH3723.The geoid height was determined by GEOID03.
AH3723
AH3723;                 North         East     Units Scale Factor Converg.
AH3723;SPC FL E     -   155,283.296   284,268.404   MT  1.00002883   +0 21 52.8
AH3723;SPC FL E     -   509,458.61    932,637.26    sFT  1.00002883   +0 21 52.8
AH3723
AH3723!           -  Elev Factor  x  Scale Factor =   Combined Factor
AH3723!SPC FL E     -   1.00000228  x   1.00002883  =   1.00003111
AH3723
AH3723                      SUPERSEDED SURVEY CONTROL
AH3723
AH3723  NAD 83(CORS)-  25 43 58.09790(N)    080 09 36.60095(W) AD(1997.00) c
AH3723  ELLIP H (08/??/98)  -14.538  (m)                    GP(1997.00) c c
AH3723
AH3723.Superseded values are not recommended for survey control.
AH3723.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AH3723.See file dsdata.txt to determine how the superseded data were derived.
AH3723
```

AH3723_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ8424046362(NAD 83)
AH3723_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
AH3723
AH3723 STATION DESCRIPTION
AH3723
AH3723'DESCRIBED BY NATIONAL GEODETIC SURVEY 2002
AH3723'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
AH3723'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
AH3723'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
AH3723' FTP CORS.NGS.NOAA.GOV: CORS/COORD AND CORS/STATION_LOG
AH3723' HTTP://WWW.NGS.NOAA.GOV UNDER PRODUCTS AND SERVICES.

```
DF7988 ***********************************************************************
DF7988  CORS        -  This is a GPS Continuously Operating Reference Station.
DF7988  DESIGNATION -  RICHMOND CORS ARP
DF7988  CORS_ID     -  RMND
DF7988  PID         -  DF7988
DF7988  STATE/COUNTY-  FL/MIAMI-DADE
DF7988  USGS QUAD   -  GOULDS (1994)
DF7988
DF7988                    *CURRENT SURVEY CONTROL
DF7988 _______________________________________________________________________
DF7988* NAD 83(CORS)-  25 36 49.58921(N)    080 23 02.14117(W)     ADJUSTED
DF7988* NAVD 88     -
DF7988 _______________________________________________________________________
DF7988  EPOCH DATE  -        2002.00
DF7988  X           -     961,335.300 (meters)                 COMP
DF7988  Y           -  -5,674,075.696 (meters)                 COMP
DF7988  Z           -   2,740,535.349 (meters)                 COMP
DF7988  ELLIP HEIGHT-         -14.088 (meters)          (09/??/03) GPS OBS
DF7988  GEOID HEIGHT-         -25.05  (meters)                 GEOID03
DF7988
DF7988  HORZ ORDER  -  SPECIAL (CORS)
DF7988  ELLP ORDER  -  SPECIAL (CORS)
DF7988
DF7988.ITRF positions are available for this station.
DF7988.The coordinates were established by GPS observations
DF7988.and adjusted by the National Geodetic Survey in September 2003.
DF7988.The coordinates are valid at the epoch date displayed above.
DF7988.The epoch date for horizontal control is a decimal equivalence
DF7988.of Year/Month/Day.
DF7988
DF7988
DF7988.The PID for the CORS L1 Phase Center is DF7989.
DF7988
DF7988.The XYZ, and position/ellipsoidal ht. are equivalent.
DF7988
DF7988.The ellipsoidal height was determined by GPS observations
DF7988.and is referenced to NAD 83.
DF7988
DF7988.The geoid height was determined by GEOID03.
DF7988
DF7988;                North         East      Units Scale Factor Converg.
DF7988;SPC FL E     -  141,973.202   261,877.112   MT  0.99998844   +0 15 58.8
DF7988;SPC FL E     -  465,790.41    859,175.16    sFT  0.99998844   +0 15 58.8
DF7988
DF7988!           -  Elev Factor  x  Scale Factor =   Combined Factor
DF7988!SPC FL E     -  1.00000221  x   0.99998844  =   0.99999065
DF7988
DF7988                    SUPERSEDED SURVEY CONTROL
DF7988
DF7988.No superseded survey control is available for this station.
DF7988
DF7988_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ6185633057(NAD 83)
DF7988_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DF7988
DF7988                    STATION DESCRIPTION
DF7988
```

DF7988'DESCRIBED BY NATIONAL GEODETIC SURVEY 2003
DF7988'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
DF7988'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
DF7988'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DF7988'   FTP CORS.NGS.NOAA.GOV: CORS/COORD AND CORS/STATION_LOG
DF7988'   HTTP://WWW.NGS.NOAA.GOV UNDER PRODUCTS AND SERVICES.

```
DF7050 ************************************************************************
DF7050  CORS        -  This is a GPS Continuously Operating Reference Station.
DF7050  DESIGNATION -  MIAMI TNT CORS ARP
DF7050  CORS_ID     -  MTNT
DF7050  PID         -  DF7050
DF7050  STATE/COUNTY-  FL/COLLIER
DF7050  USGS QUAD   -  FIFTYMILE BEND (1995)
DF7050
DF7050                    *CURRENT SURVEY CONTROL
DF7050 ______________________________________________________________________
DF7050* NAD 83(CORS)-  25 51 56.76081(N)    080 54 25.18701(W)     ADJUSTED
DF7050* NAVD 88     -
DF7050 ______________________________________________________________________
DF7050  EPOCH DATE  -        2002.00
DF7050  X           -     907,579.127 (meters)                 COMP
DF7050  Y           -  -5,670,639.703 (meters)                 COMP
DF7050  Z           -   2,765,679.841 (meters)                 COMP
DF7050  ELLIP HEIGHT-         -18.942 (meters)          (08/??/03) GPS OBS
DF7050  GEOID HEIGHT-         -24.29  (meters)                 GEOID03
DF7050
DF7050  HORZ ORDER  -  SPECIAL (CORS)
DF7050  ELLP ORDER  -  SPECIAL (CORS)
DF7050
DF7050.ITRF positions are available for this station.
DF7050.The coordinates were established by GPS observations
DF7050.and adjusted by the National Geodetic Survey in August 2003.
DF7050.The coordinates are valid at the epoch date displayed above.
DF7050.The epoch date for horizontal control is a decimal equivalence
DF7050.of Year/Month/Day.
DF7050
DF7050
DF7050.The PID for the CORS L1 Phase Center is DF7051.
DF7050
DF7050.The XYZ, and position/ellipsoidal ht. are equivalent.
DF7050
DF7050.The ellipsoidal height was determined by GPS observations
DF7050.and is referenced to NAD 83.
DF7050
DF7050.The geoid height was determined by GEOID03.
DF7050
DF7050;                North         East      Units Scale Factor Converg.
DF7050;SPC FL E     -  169,747.743   209,321.320   MT  0.99994225   +0 02 26.1
DF7050;SPC FL E     -  556,914.05    686,748.36    sFT  0.99994225   +0 02 26.1
DF7050
DF7050!           -  Elev Factor  x  Scale Factor =   Combined Factor
DF7050!SPC FL E     -  1.00000298  x   0.99994225  =   0.99994523
DF7050
DF7050                    SUPERSEDED SURVEY CONTROL
DF7050
DF7050.No superseded survey control is available for this station.
DF7050
DF7050_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ0931860822(NAD 83)
DF7050_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DF7050
DF7050                    STATION DESCRIPTION
DF7050
```

DF7050'DESCRIBED BY NATIONAL GEODETIC SURVEY 2003
DF7050'STATION IS A GPS CORS. LATEST INFORMATION INCLUDING POSITIONS AND
DF7050'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
DF7050'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
DF7050'   FTP CORS.NGS.NOAA.GOV: CORS/COORD AND CORS/STATION_LOG
DF7050'   HTTP://WWW.NGS.NOAA.GOV UNDER PRODUCTS AND SERVICES.

```
AC4651 ***********************************************************************
AC4651  CBN        -  This is a Cooperative Base Network Control Station.
AC4651  DESIGNATION -  HOMEPORT
AC4651  PID        -  AC4651
AC4651  STATE/COUNTY-  FL/MIAMI-DADE
AC4651  USGS QUAD   -  GROSSMAN HAMMOCK (1973)
AC4651
AC4651                    *CURRENT SURVEY CONTROL
AC4651  ______________________________________________________________________
AC4651* NAD 83(2007)-  25 30 06.12790(N)    080 33 23.75745(W)     ADJUSTED
AC4651* NAVD 88     -        1.516  (meters)       4.97   (feet)  ADJUSTED
AC4651  ______________________________________________________________________
AC4651  EPOCH DATE  -       2002.00
AC4651  X          -     945,108.598 (meters)                  COMP
AC4651  Y          -  -5,682,222.771 (meters)                  COMP
AC4651  Z          -   2,729,330.799 (meters)                  COMP
AC4651  LAPLACE CORR-          -3.26  (seconds)                DEFLEC99
AC4651  ELLIP HEIGHT-         -23.106 (meters)         (02/10/07) ADJUSTED
AC4651  GEOID HEIGHT-         -24.59  (meters)                 GEOID03
AC4651  DYNAMIC HT  -          1.513 (meters)       4.96  (feet)  COMP
AC4651
AC4651  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
AC4651  Type    PID    Designation                    North   East  Ellip
AC4651  ----------------------------------------------------------------------
AC4651  NETWORK AC4651 HOMEPORT                        0.61   0.57   1.74
AC4651  ----------------------------------------------------------------------
AC4651  MODELED GRAV-     978,986.3   (mgal)                   NAVD 88
AC4651
AC4651  VERT ORDER  -  FIRST     CLASS II
AC4651
AC4651.This mark is at Homestead Airport (X51)
AC4651
AC4651.The horizontal coordinates were established by GPS observations
AC4651.and adjusted by the National Geodetic Survey in February 2007.
AC4651
AC4651.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AC4651.See National Readjustment for more information.
AC4651.The horizontal coordinates are valid at the epoch date displayed above.
AC4651.The epoch date for horizontal control is a decimal equivalence
AC4651.of Year/Month/Day.
AC4651
AC4651.The orthometric height was determined by differential leveling
AC4651.and adjusted in May 1994.
AC4651
AC4651.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AC4651
AC4651.The Laplace correction was computed from DEFLEC99 derived deflections.
AC4651
AC4651.The ellipsoidal height was determined by GPS observations
AC4651.and is referenced to NAD 83.
AC4651
AC4651.The geoid height was determined by GEOID03.
AC4651
AC4651.The dynamic height is computed by dividing the NAVD 88
AC4651.geopotential number by the normal gravity value computed on the
AC4651.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
```

AC4651.degrees latitude (g = 980.6199 gals.).
AC4651
AC4651.The modeled gravity was interpolated from observed gravity values.
AC4651
AC4651; North East Units Scale Factor Converg.
AC4651;SPC FL E - 129,488.834 244,575.529 MT 0.99996570 +0 11 27.3
AC4651;SPC FL E - 424,831.28 802,411.55 sFT 0.99996570 +0 11 27.3
AC4651;UTM 17 - 2,820,576.635 544,560.320 MT 0.99962452 +0 11 27.3
AC4651
AC4651! - Elev Factor x Scale Factor = Combined Factor
AC4651!SPC FL E - 1.00000363 x 0.99996570 = 0.99996933
AC4651!UTM 17 - 1.00000363 x 0.99962452 = 0.99962815
AC4651
AC4651: Primary Azimuth Mark Grid Az
AC4651:SPC FL E - HOMEPORT AZ MK 179 16 42.1
AC4651:UTM 17 - HOMEPORT AZ MK 179 16 42.1
AC4651
AC4651|----------|
AC4651| PID Reference Object Distance Geod. Az |
AC4651| dddmmss.s |
AC4651| AC4661 HOMEPORT AZ MK APPROX. 1.1 KM 1792809.4 |
AC4651|----------|
AC4651
AC4651 SUPERSEDED SURVEY CONTROL
AC4651
AC4651 NAD 83(1999)- 25 30 06.12806(N) 080 33 23.75794(W) AD( ) A
AC4651 ELLIP H (12/09/02) -23.093 (m) GP( ) 4 1
AC4651 NAD 83(1999)- 25 30 06.12806(N) 080 33 23.75794(W) AD( ) B
AC4651 ELLIP H (05/31/01) -23.009 (m) GP( ) 5 1
AC4651 NAD 83(1990)- 25 30 06.12664(N) 080 33 23.75743(W) AD( ) B
AC4651 ELLIP H (09/13/90) -23.030 (m) GP( ) 4 1
AC4651 NAVD 88 (12/09/02) 1.52 (m) 5.0 (f) LEVELING 3
AC4651 NGVD 29 (09/01/92) 1.978 (m) 6.49 (f) ADJUSTED 1 2
AC4651
AC4651.Superseded values are not recommended for survey control.
AC4651.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AC4651.See file dsdata.txt to determine how the superseded data were derived.
AC4651
AC4651_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ4456020577(NAD 83)
AC4651_MARKER: F = FLANGE-ENCASED ROD
AC4651_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
AC4651_SP_SET: STAINLESS STEEL ROD IN SLEEVE
AC4651_STAMPING: HOMEPORT 1989
AC4651_MARK LOGO: NGS
AC4651_PROJECTION: FLUSH
AC4651_MAGNETIC: O = OTHER; SEE DESCRIPTION
AC4651_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AC4651_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AC4651+SATELLITE: SATELLITE OBSERVATIONS - August 04, 2005
AC4651_ROD/PIPE-DEPTH: 2.4 meters
AC4651_SLEEVE-DEPTH : 0.91 meters
AC4651
AC4651 HISTORY - Date Condition Report By
AC4651 HISTORY - 1989 MONUMENTED NGS
AC4651 HISTORY - 19910221 GOOD FLDNR
AC4651 HISTORY - 19930518 GOOD NGS

AC4651 HISTORY - 20020219 SEE DESCRIPTION MAPTEC
AC4651 HISTORY - 20050804 GOOD WEIDEN
AC4651
AC4651 STATION DESCRIPTION
AC4651
AC4651'DESCRIBED BY NATIONAL GEODETIC SURVEY 1989
AC4651'THE STATION IS LOCATED IN HOMESTEAD AT THE HOMESTEAD GENERAL AVIATION
AC4651'AIRPORT, IN GRASSY MEDIAN AT THE NORTH END OF RUNWAY 18-36.
AC4651'OWNERSHIP--DADE COUNTY AVIATION DEPARTMENT, P.O. BOX 592075, MIAMI FL
AC4651'33159, AIRPORT MANAGER IS A.J. SILVAROLI, PHONE 305-247-4883, OR
AC4651'CHARLIE CANNON ON SITE CONTACT. NOTE--PERMISSION MUST BE OBTAINED
AC4651'BEFORE ENTERING AIRPORT.
AC4651'TO REACH THE STATION FROM THE JUNCTION OF U.S. HIGHWAY 1 AND AVOCADO
AC4651'DR. (NW 296TH ST.), LOCATED AT THE NORTHEAST CORNER OF HOMESTEAD, GO
AC4651'WEST ALONG AVOCADO DR. FOR 8.7 KM (5.40 MI) TO THE JUNCTION OF 217TH
AC4651'AVE., THEN GO RIGHT, NORTH, ALONG 217TH AVE. FOR 0.88 KM (0.55 MI) TO
AC4651'THE AIRPORT ACCESS ROAD ON THE LEFT, THEN GO LEFT, WEST ALONG THE
AC4651'AIRPORT ACCESS ROAD FOR 0.4 KM (0.25 MI) TO THE DADE COUNTY AVIATION
AC4651'DEPT. SIGN ON THE RIGHT, THEN GO RIGHT, NORTH THEN WEST ALONG AN
AC4651'ASPHALT ROAD FOR 0.16 KM (0.10 MI) TO THE AIRPORT OFFICE ON THE RIGHT,
AC4651'THEN PASS TO THE WEST SIDE OF THE OFFICE AND GO NORTH AND WEST ALONG
AC4651'PAVED TAXIWAY FOR 0.72 KM (0.45 MI) TO THE NORTH END OF RUNWAY 18-36
AC4651'AND THE STATION IN THE GRASSY MEDIAN.
AC4651'THE STATION IS RECESSED 10 CM BELOW GROUND. LOCATED 22.2 M (72.8 FT)
AC4651'WEST OF THE WEST EDGE OF THE TAXIWAY, 20.4 M (66.9 FT) SOUTH OF THE
AC4651'SOUTH EDGE OF TAXI APPROACH, IN LINE WITH TAXI HOLDING BARS, 31.4 M
AC4651'(103.0 FT) EAST OF THE EAST EDGE OF THE RUNWAY AND ABOUT LEVEL WITH
AC4651'THE RUNWAY.
AC4651'DESCRIBED BY G.F. SMITH.
AC4651
AC4651 STATION RECOVERY (1991)
AC4651
AC4651'RECOVERY NOTE BY FL DEPT OF NAT RES 1991
AC4651'RECOVERED IN GOOD CONDITION.
AC4651
AC4651 STATION RECOVERY (1993)
AC4651
AC4651'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1993
AC4651'0.1 KM (0.05 MI) WESTERLY ALONG SOUTHWEST 8TH STREET FROM THE POST
AC4651'OFFICE IN HOMESTEAD, THENCE 1.6 KM (1.00 MI) NORTHERLY ALONG KROME
AC4651'AVENUE, THENCE 6.5 KM (4.05 MI) WESTERLY ALONG AVOCADO DRIVE, THENCE
AC4651'1.0 KM (0.60 MI) NORTHERLY ALONG SOUTHWEST 217TH AVENUE, THENCE 1.5
AC4651'KM (0.95 MI) WESTERLY ALONG THE HOMESTEAD GENERAL AVIATION AIRPORT
AC4651'ENTRANCE ROAD, AN APRON ON THE SOUTH SIDE OF A HANGER AND A TAXIWAY,
AC4651'THENCE 0.2 KM (0.10 MI) NORTHERLY ALONG A TAXIWAY, 46.7 M (153.2 FT)
AC4651'EAST OF THE CENTERLINE OF RUNWAY 18-36, 31.7 M (104.0 FT) SOUTH OF
AC4651'THE CENTER OF A TAXIWAY, 29.6 M (97.1 FT) WEST OF AND LEVEL WITH THE
AC4651'CENTERLINE OF A TAXIWAY, AND ON THE EXTENDED LINE OF A HOLD BAR.
AC4651'NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO CAP. THE
AC4651'MARK IS ON PROPERTY OWNED BY THE HOMESTEAD GENERAL AVIATION AIRPORT,
AC4651'28700 SOUTHWEST 217TH AVENUE, HOMESTEAD, FLORIDA 33030,
AC4651'CONTACT--MICHAEL J HANDRAHAN--AIRPORT MANAGER, TELEPHONE NUMBER (305)
AC4651'247-4883.
AC4651
AC4651 STATION RECOVERY (2002)
AC4651

AC4651'RECOVERY NOTE BY MAPTECH INCORPORATED 2002 (RLT)
AC4651'THE MARK IS ON PROPERTY OWNED BY MIAMI-DADE AVIATION, HOMESTEAD
AC4651'REGIONAL AIRPORT, 29101 SW 123 AVENUE, HOMESTEAD, FL 33039.
AC4651'CONTACT NEIL WATSON, AIRPORT MANAGER, PHONE 305-247-4883.
AC4651'
AC4651'TO REACH THE STATION FROM THE INTERSECTION OF KROME AVENUE
AC4651'(STATE HIGHWAY 997) AND MOWRY DRIVE IN HOMESTEAD, GO WEST ON
AC4651'MOWRY DRIVE FOR 4.0 MI (6.4 KM) TO THE INTERSECTION OF SW 217TH
AC4651'AVENUE. TURN RIGHT AND GO NORTH ON SW 217TH AVENUE FOR 2.1 MI (3.4
AC4651'KM) TO A SIDE ROAD LEFT. TURN LEFT AND GO WEST ON HOMESTEAD
AC4651'REGIONAL AIRPORT ENTRANCE ROAD FOR 0.4 MI (0.6 KM) TO A SIDE ROAD
AC4651'RIGHT. TURN RIGHT AND GO NORTH FOR 0.1 MI (0.15 KM) AND THEN GO
AC4651'WEST FOR 0.1 MI (0.15 KM) TO THE AIRPORT MANAGERS OFFICE. CHECK IN
AC4651'WITH MANAGERS OFFICE TO GET TO SURVEY POINT. FROM ROAD AT WEST
AC4651'SIDE OF MANAGERS OFFICE GO NORTH FOR 50 M (164 FT) TURN LEFT AND GO
AC4651'WEST FOR 50 M (164 FT) TURN RIGHT AND GO NORTH FOR 0.1 MI (0.15 KM)
AC4651'TO
AC4651'AN EAST-WEST TAXIWAY. TURN LEFT AND GO WEST ON TAXIWAY FOR 0.35
AC4651'MI (0.55 KM) TO A NORTH-SOUTH TAXIWAY AND THE STATION IN THE
AC4651'SOUTHWEST QUADRANT OF THE INTERSECTION OF TAXIWAYS.
AC4651'
AC4651'THE STATION IS LOCATED 46.7 M (153.2 FT) EAST OF THE CENTERLINE OF
AC4651'RUNWAY 18-36, 31.7 M (104.0 FT) SOUTH OF A TAXIWAY, 29.6 M (97.1 FT)
AC4651'WEST
AC4651'OF THE CENTERLINE OF A TAXIWAY AND 11.5 M (37.7 FT) SOUTHWEST OF
AC4651'THE SOUTH POST OF RUNWAY INDICATOR B 18.
AC4651'
AC4651'NOTE THE STAMPING PART OF THE LOGO CAP HAS BEEN BROKEN OFF, THE
AC4651'ROD IS IN GOOD CONDITION.
AC4651'
AC4651'
AC4651'
AC4651'
AC4651
AC4651 STATION RECOVERY (2005)
AC4651
AC4651'RECOVERY NOTE BY WEIDENER SURVEYING AND MAPPING 2005
AC4651'NOT SUITABLE FOR RTK-GPS. AIRPORT STAFF WILL NOT ALLOW IT.

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AC0477 ***********************************************************************
AC0477  DESIGNATION -  A 237
AC0477  PID         -  AC0477
AC0477  STATE/COUNTY-  FL/MIAMI-DADE
AC0477  USGS QUAD   -  HIALEAH SW (1988)
AC0477
AC0477                     *CURRENT SURVEY CONTROL
AC0477 ______________________________________________________________________
AC0477* NAD 83(2007)-  25 45 40.28832(N)    080 25 59.08175(W)     ADJUSTED
AC0477* NAVD 88     -        1.975  (meters)       6.48   (feet)  ADJUSTED
AC0477 ______________________________________________________________________
AC0477  EPOCH DATE  -        2002.00
AC0477  X           -     955,289.716 (meters)                  COMP
AC0477  Y           -  -5,667,910.012 (meters)                  COMP
AC0477  Z           -   2,755,248.798 (meters)                  COMP
AC0477  LAPLACE CORR-          -2.29  (seconds)                 DEFLEC99
AC0477  ELLIP HEIGHT-         -22.807 (meters)          (02/10/07) ADJUSTED
AC0477  GEOID HEIGHT-         -24.76  (meters)                  GEOID03
AC0477  DYNAMIC HT  -          1.972 (meters)       6.47  (feet)  COMP
AC0477
AC0477  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
AC0477  Type    PID    Designation                    North   East  Ellip
AC0477  ----------------------------------------------------------------------
AC0477  NETWORK AC0477 A 237                           1.37   1.41   2.51
AC0477  ----------------------------------------------------------------------
AC0477  MODELED GRAV-     979,033.0   (mgal)                    NAVD 88
AC0477
AC0477  VERT ORDER  -  FIRST     CLASS II
AC0477
AC0477.The horizontal coordinates were established by GPS observations
AC0477.and adjusted by the National Geodetic Survey in February 2007.
AC0477
AC0477.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AC0477.See National Readjustment for more information.
AC0477.The horizontal coordinates are valid at the epoch date displayed above.
AC0477.The epoch date for horizontal control is a decimal equivalence
AC0477.of Year/Month/Day.
AC0477
AC0477.The orthometric height was determined by differential leveling
AC0477.and adjusted in July 2006.
AC0477
AC0477.Photographs are available for this station.
AC0477
AC0477.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AC0477
AC0477.The Laplace correction was computed from DEFLEC99 derived deflections.
AC0477
AC0477.The ellipsoidal height was determined by GPS observations
AC0477.and is referenced to NAD 83.
AC0477
AC0477.The geoid height was determined by GEOID03.
AC0477
AC0477.The dynamic height is computed by dividing the NAVD 88
AC0477.geopotential number by the normal gravity value computed on the
AC0477.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AC0477.degrees latitude (g = 980.6199 gals.).
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AC0477
AC0477.The modeled gravity was interpolated from observed gravity values.
AC0477
AC0477;   North   East   Units Scale Factor Converg.
AC0477;SPC FL E   -   158,281.978   256,870.411   MT 0.99998110   +0 14 47.1
AC0477;SPC FL E   -   519,296.79   842,749.01   sFT 0.99998110   +0 14 47.1
AC0477;UTM 17   - 2,849,359.954   556,851.007   MT 0.99963991   +0 14 47.1
AC0477
AC0477!   - Elev Factor x Scale Factor =   Combined Factor
AC0477!SPC FL E   -   1.00000358 x   0.99998110 =   0.99998468
AC0477!UTM 17   -   1.00000358 x   0.99963991 =   0.99964349
AC0477
AC0477   SUPERSEDED SURVEY CONTROL
AC0477
AC0477 NAD 83(1999)- 25 45 40.28800(N)   080 25 59.08152(W) AD(   ) 1
AC0477 ELLIP H (12/12/02) -22.776 (m)   GP(   ) 5 1
AC0477 NAVD 88 (09/04/92)   1.990 (m)   6.53   (f) UNKNOWN   1 1
AC0477 NAVD 88 (06/15/91)   2.089 (m)   6.85   (f) UNKNOWN   1 1
AC0477 NGVD 29 (09/01/92)   2.467 (m)   8.09   (f) ADJUSTED   1 1
AC0477
AC0477.Superseded values are not recommended for survey control.
AC0477.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AC0477.See file dsdata.txt to determine how the superseded data were derived.
AC0477
AC0477_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ5685149360(NAD 83)
AC0477_MARKER: DB = BENCH MARK DISK
AC0477_SETTING: 66 = SET IN ROCK OUTCROP
AC0477_SP_SET: BEDROCK
AC0477_STAMPING: A 237 1965
AC0477_MARK LOGO: CGS
AC0477_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
AC0477_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
AC0477+STABILITY: POSITION/ELEVATION WELL
AC0477_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AC0477+SATELLITE: SATELLITE OBSERVATIONS - March 05, 2005
AC0477
AC0477 HISTORY   - Date   Condition   Report By
AC0477 HISTORY   - 1965   MONUMENTED   CGS
AC0477 HISTORY   - 1986   MARK NOT FOUND   USPSQD
AC0477 HISTORY   - 1987   MARK NOT FOUND   USPSQD
AC0477 HISTORY   - 19910302 GOOD   USPSQD
AC0477 HISTORY   - 19920218 GOOD   NGS
AC0477 HISTORY   - 20020527 GOOD   MAPTEC
AC0477 HISTORY   - 20050305 GOOD   FLDEP
AC0477
AC0477   STATION DESCRIPTION
AC0477
AC0477'DESCRIBED BY COAST AND GEODETIC SURVEY 1965
AC0477'7.6 MI W FROM WEST MIAMI.
AC0477'ABOUT 7.6 MILES WEST ALONG U.S. HIGHWAY 41 FROM THE TAMIAMI
AC0477'STATION POST OFFICE AT WEST MIAMI, IN SECTION 4, R 39 E, T 54 S,
AC0477'ABOUT 0.9 MILE EAST OF A 60-FOOT CONCRETE BRIDGE UNDER THE
AC0477'NORTH LANE OF THE HIGHWAY, NEAR THE JUNCTION OF SW 147 TH AVENUE,
AC0477'ON THE SOUTH BANK OF THE TAMIAMI CANAL, SET ON THE TOP OF AND
AC0477'ABOUT IN THE CENTER OF A 4-BY-3-FOOT ROCK OUTCROP WHICH
AC0477'PROJECTS 1 FOOT ABOVE THE LEVEL OF THE GROUND, 45 FEET EAST OF

AC0477'BENCH MARK TC 15 RESET DWC DESCRIBED, 34 1/2 FEET NORTH OF THE
AC0477'CENTER LINE OF THE NORTH LANE OF THE HIGHWAY, 6 FEET SOUTH
AC0477'OF THE SOUTH BANK OF THE CANAL AND 2 FEET BELOW THE LEVEL OF
AC0477'THE HIGHWAY.
AC0477
AC0477 STATION RECOVERY (1986)
AC0477
AC0477'RECOVERY NOTE BY US POWER SQUADRON 1986 (LEM)
AC0477'MARK NOT FOUND.
AC0477
AC0477 STATION RECOVERY (1987)
AC0477
AC0477'RECOVERY NOTE BY US POWER SQUADRON 1987 (RRB)
AC0477'MARK NOT FOUND.
AC0477
AC0477 STATION RECOVERY (1991)
AC0477
AC0477'RECOVERY NOTE BY US POWER SQUADRON 1991 (LEM)
AC0477'RECOVERED IN GOOD CONDITION.
AC0477
AC0477 STATION RECOVERY (1992)
AC0477
AC0477'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1992
AC0477'12.8 KM (7.95 MI) WESTERLY ALONG U.S. HIGHWAY 41 FROM THE POST
AC0477'OFFICE IN WEST MIAMI, IN TOP OF AND NEAR THE CENTER OF A 3 BY 3-FOOT
AC0477'AREA OF EXPOSED BEDROCK, 15.2 M (49.9 FT) WEST OF THE EXTENDED CENTER
AC0477'OF A HIGHWAY CROSSOVER, 10.5 M (34.4 FT) NORTH OF THE CENTERLINE OF
AC0477'THE WESTBOUND LANES OF THE HIGHWAY, 1.0 M (3.3 FT) EAST OF A WITNESS
AC0477'POST, AND 0.3 M (1.0 FT) BELOW THE LEVEL OF THE HIGHWAY.
AC0477
AC0477 STATION RECOVERY (2002)
AC0477
AC0477'RECOVERY NOTE BY MAPTECH INCORPORATED 2002 (CDP)
AC0477'STATION RECOVERY (2002)
AC0477'RECOVERY NOTE BY MAPTECH, INCORPORATED 2002 (CDP)
AC0477'RECOVERED AS DESCRIBED.
AC0477'
AC0477'
AC0477
AC0477 STATION RECOVERY (2005)
AC0477
AC0477'RECOVERY NOTE BY FL DEPT OF ENV PRO 2005 (JLM)
AC0477'THE MARK IS ABOUT 7.0 MI SOUTH-SOUTHWEST OF HIALEAH, 3.2 MI WEST OF
AC0477'SWEETWATER, IN SECTION 3, TOWNSHIP 54 SOUTH, RANGE 39 EAST.
AC0477'
AC0477'TO REACH THE MARK FROM THE JUNCTION OF STATE HIGHWAY 997 (KROME
AC0477'AVENUE, SW 177 AVENUE) AND U.S. HIGHWAY 41 (TAMIAMI TRAIL, SW 8TH ST)
AC0477'ABOUT 10.0 MI SOUTHWEST OF HIALEAH, GO EAST ON U.S. HIGHWAY 41
AC0477'(TAMIAMI TRAIL, SW 8TH ST) FOR 3.05 MI TO THE JUNCTION OF SOUTHWEST
AC0477'147TH AVENUE ON THE RIGHT, A CROSSOVER AND THE MARK ON THE LEFT, SET
AC0477'IN THE TOP OF A ROCK OUTCROP ABOUT 1.0 FT BELOW THE LEVEL OF U.S.
AC0477'HIGHWAY 41 WESTBOUND LANES. THE MARK CAN ALSO BE REACHED FROM THE
AC0477'HOMESTEAD EXTENSION FLORIDA TURNPIKE OVERPASS EXIT 25 (STATE HIGHWAY
AC0477'821) IN SWEETWATER AND U.S. HIGHWAY 41 (TAMIAMI TRAIL, SW 8TH ST), GO
AC0477'WEST ON U.S. HIGHWAY 41 (TAMIAMI TRAIL, SW 8TH ST) FOR 2.95 MI TO THE
AC0477'JUNCTION OF SOUTHWEST 147TH AVENUE ON THE LEFT AND THE MARK ON THE

AC0477'RIGHT.
AC0477'
AC0477'LOCATED 70.0 FT WEST OF THE EXTENDED CENTERLINE OF SOUTHWEST 147TH
AC0477'AVENUE, 50.0 FT WEST OF THE EXTENDED CENTERLINE OF THE CROSSOVER,
AC0477'32.0 FT NORTHWEST OF AN ALUMINUM POLE NUMBER A-2-20, 28.7 FT NORTH OF
AC0477'THE NORTH CURB AND GUARDRAIL OF U.S. HIGHWAY 41 WESTBOUND LANES AND
AC0477'3.3 FT EAST OF A METAL WITNESS POST.
AC0477'
AC0477'NOTE A MAGNET WAS IMBEDDED IN THE GROUND ON THE SOUTH SIDE OF THE ROCK
AC0477'OUTCROP.

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AA5493 **********************************************************************
AA5493  FBN        -  This is a Federal Base Network Control Station.
AA5493  DESIGNATION -  BRUCE 2
AA5493  PID        -  AA5493
AA5493  STATE/COUNTY-  FL/MIAMI-DADE
AA5493  USGS QUAD   -  KEY BISCAYNE (1994)
AA5493
AA5493                    *CURRENT SURVEY CONTROL
AA5493  ______________________________________________________________________
AA5493* NAD 83(2007)-  25 43 35.37067(N)    080 09 15.51874(W)     ADJUSTED
AA5493* NAVD 88     -        0.723  (meters)       2.37   (feet)  ADJUSTED
AA5493  ______________________________________________________________________
AA5493  EPOCH DATE  -        2002.00
AA5493  X          -     983,140.187 (meters)                 COMP
AA5493  Y          -  -5,664,838.250 (meters)                 COMP
AA5493  Z          -   2,751,785.289 (meters)                 COMP
AA5493  LAPLACE CORR-          -3.90  (seconds)                DEFLEC99
AA5493  ELLIP HEIGHT-         -24.964 (meters)          (02/10/07) ADJUSTED
AA5493  GEOID HEIGHT-         -25.70  (meters)                 GEOID03
AA5493  DYNAMIC HT  -          0.722 (meters)       2.37  (feet)  COMP
AA5493
AA5493  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
AA5493  Type    PID    Designation                    North   East  Ellip
AA5493  ----------------------------------------------------------------------
AA5493  NETWORK AA5493 BRUCE 2                         0.14   0.12   0.12
AA5493  ----------------------------------------------------------------------
AA5493  MODELED GRAV-     979,021.1   (mgal)                    NAVD 88
AA5493
AA5493  VERT ORDER  -  FIRST     CLASS II
AA5493
AA5493.This is a reference station for the ATL OCEAN&MET LAB
AA5493.National Continuously Operating Reference Station (AOML).
AA5493
AA5493.The horizontal coordinates were established by GPS observations
AA5493.and adjusted by the National Geodetic Survey in February 2007.
AA5493
AA5493.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AA5493.See National Readjustment for more information.
AA5493.The horizontal coordinates are valid at the epoch date displayed above.
AA5493.The epoch date for horizontal control is a decimal equivalence
AA5493.of Year/Month/Day.
AA5493
AA5493.The orthometric height was determined by differential leveling
AA5493.and adjusted in July 2002.
AA5493.WARNING-GPS observations at this control monument resulted in a GPS
AA5493.derived orthometric height which differed from the leveled height by
AA5493.more than one decimeter (0.1 meter).
AA5493
AA5493.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AA5493
AA5493.The Laplace correction was computed from DEFLEC99 derived deflections.
AA5493
AA5493.The ellipsoidal height was determined by GPS observations
AA5493.and is referenced to NAD 83.
AA5493
AA5493.The geoid height was determined by GEOID03.
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AA5493
AA5493.The dynamic height is computed by dividing the NAVD 88
AA5493.geopotential number by the normal gravity value computed on the
AA5493.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AA5493.degrees latitude (g = 980.6199 gals.).
AA5493
AA5493.The modeled gravity was interpolated from observed gravity values.
AA5493
AA5493;                North        East     Units Scale Factor Converg.
AA5493;SPC FL E     -   154,587.645   284,860.514   MT  1.00003007   +0 22 01.6
AA5493;SPC FL E     -   507,176.30    934,579.87   sFT  1.00003007   +0 22 01.6
AA5493;UTM  17      - 2,845,666.882   584,831.560   MT  0.99968886   +0 22 01.6
AA5493
AA5493!            -  Elev Factor  x  Scale Factor =   Combined Factor
AA5493!SPC FL E     -   1.00000392  x   1.00003007  =   1.00003399
AA5493!UTM  17      -   1.00000392  x   0.99968886  =   0.99969278
AA5493
AA5493:              Primary Azimuth Mark                  Grid Az
AA5493:SPC FL E     -  BRUCE                               313 56 46.6
AA5493:UTM  17      -  BRUCE                              313 56 46.6
AA5493
AA5493|---------------------------------------------------------------------|
AA5493| PID    Reference Object                Distance      Geod. Az  |
AA5493|                                        dddmmss.s |
AA5493| AA5494 BRUCE                          APPROX. 1.0 KM 3141848.2 |
AA5493|---------------------------------------------------------------------|
AA5493
AA5493                       SUPERSEDED SURVEY CONTROL
AA5493
AA5493  NAD 83(1999)-  25 43 35.37063(N)    080 09 15.51894(W) AD(       ) A
AA5493  ELLIP H (04/12/01)  -24.997  (m)                    GP(       ) 4 1
AA5493  ELLIP H (07/24/97)  -24.843  (m)                    GP(       ) 2 1
AA5493  NAD 83(1990)-  25 43 35.37003(N)    080 09 15.51953(W) AD(       ) A
AA5493  ELLIP H (06/30/95)  -25.010  (m)                    GP(       ) 2 1
AA5493  NAVD 88 (04/12/01)    0.72   (m)          2.4    (f) LEVELING    3
AA5493
AA5493.Superseded values are not recommended for survey control.
AA5493.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA5493.See file dsdata.txt to determine how the superseded data were derived.
AA5493
AA5493_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ8483245667(NAD 83)
AA5493_MARKER: F = FLANGE-ENCASED ROD
AA5493_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
AA5493_STAMPING: BRUCE 2 1995
AA5493_MARK LOGO: NGS
AA5493_PROJECTION: FLUSH
AA5493_MAGNETIC: N = NO MAGNETIC MATERIAL
AA5493_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AA5493_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA5493+SATELLITE: SATELLITE OBSERVATIONS - February 07, 2002
AA5493_ROD/PIPE-DEPTH: 40.2 meters
AA5493_SLEEVE-DEPTH  : 3 meters
AA5493
AA5493  HISTORY     - Date     Condition        Report By
AA5493  HISTORY     - 1995     MONUMENTED       NGS
AA5493  HISTORY     - 19960404 GOOD             NGS
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AA5493 HISTORY - 19980408 GOOD NGS
AA5493 HISTORY - 19980413 GOOD NGS
AA5493 HISTORY - 19990405 GOOD FL-025
AA5493 HISTORY - 20020207 GOOD FLDEP
AA5493 HISTORY - 20050511 GOOD PB
AA5493
AA5493 STATION DESCRIPTION
AA5493
AA5493'DESCRIBED BY NATIONAL GEODETIC SURVEY 1995 (RLT)
AA5493'THE STATION IS IN VIRGINIA KEY, NEAR THE 1ST ENTRANCE ROAD TO THE
AA5493'SUNDAY ON THE BAY RESTAURANT AND DOCKSIDE BAR IN SECTION 21, TOWNSHIP
AA5493'54 SOUTH, RANGE 41 EAST. TO REACH THE STATION FROM THE TOLL BOOTH FOR
AA5493'THE RICKENBACKER CAUSEWAY ON THE EAST SIDE OF MIAMI, GO EAST-SOUTHEAST
AA5493'FOR 3.65 MI (5.87 KM) CROSSING THE BEAR CUT BRIDGE TO THE STATION ON
AA5493'THE LEFT IN THE MEDIAN OF THE RICKENBACKER CAUSEWAY, A STAINLESS STEEL
AA5493'ROD DRIVEN TO REFUSAL AT A DEPTH OF 58.8 FT, (17.9 M) WITH A LOGO CAP
AA5493'RECESSED 0.1 FT (3.0 CM) BELOW THE LEVEL OF THE GROUND. LOCATED 63.7
AA5493'FT (19.4 M) WEST OF AND ACROSS THE WESTBOUND LANES OF THE RICKENBACKER
AA5493'CAUSEWAY FROM A LIGHT POLE NUMBER 8 7551 4145 06, 35.0 FT (10.7 M)
AA5493'EAST-NORTHEAST OF THE NORTHEAST EDGE OF THE PAVEMENT OF THE
SOUTHBOUND
AA5493'LANES OF THE RICKENBACKED CAUSEWAY, 6.0 FT (1.8 M) WEST-NORTHWEST OF
AA5493'THE NORTHWEST EDGE OF THE PAVEMENT OF THE NORTHBOUND LANES OF THE
AA5493'RICKENBACKED CAUSEWAY AND 1.0 FT (0.3 M) NORTHEAST OF A CARSONITE
AA5493'WITNESS POST. NOTE ACCESS TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO
AA5493'CAP.
AA5493
AA5493 STATION RECOVERY (1996)
AA5493
AA5493'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (CFS)
AA5493'RECOVERED AS DESCRIBED WITH THE FOLLOWING ADDITION. THE STATION IS
AA5493'LOCATED 28.65 M (94.00 FT) SOUTHEAST OF THE SOUTHEAST CORNER OF A 1.6
AA5493'X 1.6 METER (5.2 FT) CONCRETE STORM DRAIN.
AA5493
AA5493 STATION RECOVERY (1998)
AA5493
AA5493'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1998 (ALG)
AA5493'THE STATION WAS RECOVERED AS DESCRIBED ALL DISTANCES AND DIRECTIONS
AA5493'CHECKED.
AA5493
AA5493 STATION RECOVERY (1998)
AA5493
AA5493'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1998 (ALG)
AA5493'RECOVERED AS DESCRIBED.
AA5493
AA5493 STATION RECOVERY (1999)
AA5493
AA5493'RECOVERY NOTE BY DADE COUNTY FLORIDA 1999
AA5493'RECOVERED AS DESCRIBED.
AA5493
AA5493 STATION RECOVERY (2002)
AA5493
AA5493'RECOVERY NOTE BY FL DEPT OF ENV PRO 2002 (SS)
AA5493'RECOVERED AS DESCRIBED.
AA5493
AA5493 STATION RECOVERY (2005)

AA5493
AA5493'RECOVERY NOTE BY PBS&J 2005 (DWD)
AA5493'RECOVERED IN GOOD CONDITION.

SURVEY INFORMATION

A. Field Personnel

The following field personnel worked on this GPS network, and related survey collection:

Field Supervisor: J. Purpera
Party Chief: M. Havard
Instrument Man: V. McNeal
Instrument Man: C. LaPrarie

The point of contact for survey related questions is:

Josh Hardy
Operations Supervisor
(985) 661-3001

B. GPS Logsheets