MINIMUM TECHNICAL STANDARDS, VOL. 1
FINAL REPORT OF LIDAR CONTROL AND QA/QC CHECKPOINT SURVEY

INDIAN RIVER COUNTY, FLORIDA

STATE OF FLORIDA
DIVISION OF EMERGENCY MANAGEMENT

TASK ORDER NO. 20070525-492718A
TASK ORDER NO. 20070525-492718C
CONTRACT NO. 07-HS-34-14-00-22-469
PRIVITY AGREEMENT

DECEMBER 23, 2008
REVISED

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PREPARED BY:
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DECEMBER 23, 2008
REVISED

QUALITY

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NOTICE OF PROPRIETARY INFORMATION

MINIMUM TECHNICAL STANDARDS REPORT
OF LiDAR GROUND CONTROL SURVEY

Task Order No. 20070525-492718a
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Contract No. 07-HS-34-14-00-22-469
Privity Agreement

INDIAN RIVER COUNTY, FLORIDA

For:
State of Florida, Division of Emergency Management
"State Emergency Response Team"
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100

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Prepared by:
David Bruno, PSM
Florida Professional Surveyor and Mapper PSM 5670

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REPORT OF LiDAR GROUND CONTROL SURVEY
INDIAN RIVER COUNTY
FOR THE
FLORIDA DIVISION OF EMERGENCY MANGEMENT

Introduction

This report contains an outline of the QA/QC Survey that supported LiDAR Data Acquisition in the general area of:

- Indian River County, Florida

Project Area

This project area encompasses approximately +/-255 square miles of the Eastern (coastal) portion of Indian River County for the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

Purpose

The purpose of this survey was to acquire a minimum of twenty (20) independently surveyed LiDAR Control Points and a minimum of one-hundred twenty (120) three-dimensional LiDAR QA/QC Checkpoints per 500 square miles of project area. To the extent allowed by the terrain, the LiDAR Control Points and Checkpoints were distributed so that points were spaced at intervals of at least 10% of the diagonal distance across the dataset and at least 20% of the points were located in each quadrant of the +/-255 square-mile project area. All field surveying and related activities conformed to the *FEMA Flood Hazard Mapping Program, Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix A*.

LiDAR Control Points were defined as observations made on unobstructed, relatively flat, light-colored, hard uniform surfaces. Three-dimensional coordinate values were calculated for these points and then incorporated in the initial processing of the LiDAR data to ensure the proper horizontal and vertical geographical location of the LiDAR data set.

LiDAR QA/QC Checkpoints were ground truth observations distributed within the land cover classes of urban, bare-earth/low grass, brush land/sparse trees and dense trees/forested. These QA/QC Checkpoints were used to verify the accuracy of the LiDAR missions for final DTM and contour deliverables.

Date of Survey

All LiDAR Control Point and LiDAR QA/QC Checkpoint field operations took place between January 8, 2008 and January 10, 2008 and on March 5, 2008.

Map Reference

Maps illustrating project boundaries, LiDAR QA/QC Checkpoints, LiDAR Control Points and GPS control stations for this project area can be found in Appendix E of this report.

Name of Responsible Surveyor

David Bruno, PSM
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Orlando, Florida 32817-1484
Professional Surveyor and Mapper Number 5670

Name of Company

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Laurel Building
3504 Lake Lynda Drive, Suite 400
Orlando, Florida 32817-1484
Florida Certificate of Authorization No. LB-0006777

Field and Office Personnel

Dave Bruno
Tim Cornwell
Scott Lamb
Ben Messer
Steve Roberts

Abbreviations

1-D – One-Dimensional
2-D – Two-Dimensional
3-D – Three-Dimensional
cm – Centimeter
CP – Certified Photogrammetrist
DOI – Digital Orthophoto Imagery
FAC – Florida Administrative Code
FDEM – Florida Division of Emergency Mapping
FGDC – Federal Geodetic Control Committee
FL – Florida
GPS – Global Positioning System
Inc. – Incorporated
LiDAR – Light Detecting and Ranging
MTS – Florida Minimum Technical Standards (FAC 61G17)
NAD 83/99-HARN – North American Datum 1983 High Accuracy Reference Network 1999 adjustment
NAVD 88 – North American Vertical Datum of 1988
NGS – National Geodetic Survey
NOAA – National Oceanic and Atmospheric Administration
NSSDA – National Standards for Spatial Data Accuracy

PID – Photo Identifiable Point (feature)
QC – Quality Control
RMSE – Root Mean Square Error
RTK – Real-Time Kinematics
STD – Standard Deviations
TGO – Trimble Geomatics Office
TTC – Trimble Total Control
U.S. – United States
Woolpert – Woolpert, Inc

Data Sources

Existing Control Point Coordinates:	NGS Information Services NOAA, N/NGS12 National Geodetic Survey SSMC-3, #9202 1315 East-West Highway Silver Spring, MD 20910-3282 Phone: (301) 713-3242 Fax: (301) 713-4172 Email: info_center@ngs.noaa.gov http://www.ngs.noaa.gov/

Monumentation

Woolpert field crews performed a field reconnaissance to verify the existence and suitability of pre-selected existing National Geodetic Survey (NGS) control stations. These existing control stations were utilized to insure that quality X, Y, and Z coordinate values were computed for each of the newly established QA/QC Checkpoints throughout the project area. During the field reconnaissance, field crews recovered and verified four existing NGS control stations suitable for GPS observations: **GPS 12, GPS 44, GPS117** and **SEBAPORT.** The NGS Data Sheets for these stations can be found in Appendix A of this report.

Woolpert field crews also recovered and incorporated **DALLAS**, a new Woolpert control station established for the Indian River County Orthophoto portion of this mapping project. The station recovery information sheet for this point can be found in Appendix B of this report.

Woolpert established a total of 19 LiDAR Control Points and 76 LiDAR QA/QC Checkpoints. Intervisable pairs of the LiDAR QA/QC Checkpoints were used for conventional surveying of the dense trees/forested LiDAR QA/QC Checkpoints. All of these stations consisted of one of the following: a PK Nail, 6" spike with a plastic washer, a paint mark, a railroad spike, a hub and tack or a scribe mark.

Methodology

All field reconnaissance, monumentation, observations, data adjustments, and final report development was performed under the direct supervision of David Bruno, PSM 5670, Professional Surveyor and Mapper in Charge. Rapid Static GPS survey techniques, along with conventional survey methods were utilized in collecting the LiDAR Control Points and the LiDAR QA/QC Checkpoints for this project. Woolpert's ISO 9001 2000 certified QA/QC process for ground control and GPS surveys was used as a guideline for this project.

All surveying was performed in such a way as to conform to the *Standards and Specifications for Geodetic Control Networks (1984),* published by the Federal Geodetic Control Committee (FGCC). All GPS measurements pertaining to horizontal photogrammetric ground control were performed to meet or exceed Second Order Horizontal Control as set forth by the FGCC, *Geometric Geodetic Accuracy Standards and Specifications for using GPS Relative Positioning Techniques*, Version 5.0, August 1989. All GPS measurements for establishing vertical control were performed to meet or exceed Third Order Vertical Control Accuracy Standards and Specifications. Furthermore, the procedures used for GPS-Derived elevation differences met or exceeded the *Guidelines for Establishing GPS-Derived Ellipsoidal Heights (Standards: 2 centimeters and 5 centimeters), NGS-58*, November 1977, and/or *Guidelines for Establishing GPS-Derived Orthometric Heights (Standards: 2 centimeters and 5 centimeters), NGS-59*, October 2005.

Rapid Static GPS

Woolpert field crews utilized Rapid Static GPS surveying techniques for measuring 57 of the 76 LiDAR QA/QC Checkpoints and the LiDAR Control Points. Rapid Static GPS surveying required a minimum of two receivers to occupy NGS Control Stations and LiDAR QA/QC Checkpoints or LiDAR Control Points for a minimum of 30 minutes, depending upon baseline length, number of satellites, and satellite geometry. This method is comparable in accuracy to static surveying; however, shorter observation time is made possible due to advancements in hardware and software. The final coordinates for the LiDAR Control Points and the LiDAR QA/QC Checkpoints can be found in Appendix C of this report.

For this survey, Woolpert field crews utilized three (3) Woolpert-owned, Trimble Navigation R8 model 2 GNSS dual-frequency geodetic GPS receivers as base stations and up to four (4) Woolpert-owned, Trimble Navigation R8 model 2 GNSS dual-frequency geodetic GPS receivers as rovers. Each observation session utilized a 5-second sync rate, lasting between 30-45 minutes each depending on distance from the furthest base station.

Using rapid-static GPS techniques, the field crews also observed four (4) existing NGS control stations and one (1) newly established control stations in the GPS network in an effort to establish survey quality control coordinates throughout the project. The Rapid Static GPS control network consisted of the following NGS and newly established stations: **GPS 12, GPS 44, GPS 117, SEBAPORT** and **DALLAS.**

Conventional Surveying

Using intervisable pairs of LiDAR QA/QC Checkpoints, Woolpert field crews used a Woolpert-owned Topcon GTS-701 Total Station or a Woolpert-owned Topcon GTS-711 Total Station to acquire nineteen (19) LiDAR QA/QC Checkpoints in obscured areas (dense trees/forested) where GPS observations were limited. The final coordinates for the LiDAR QA/QC Checkpoints can be found in Appendix D of this report.

Datum Reference and Final Coordinates

All horizontal GPS control was based on the Florida State Plane Coordinate System (East Zone), referenced to North American Datum 1983, adjustment of 1999 (NAD83/99) HARN, expressed in U.S. Survey Feet. All vertical control was based on the North American Vertical Datum of 1988 (NAVD88), also expressed in U.S. Survey Feet.

GPS Data Analysis and Processing

The field crew chief processed all session baselines each day using *Trimble Navigation's* Trimble Geomatics Office (TGO) Version 1.63 baseline processor with the broadcast ephemeris. *Trimble Navigation's* Trimble Geomatics Office (TGO) Wave Software User's Guide (November 1999) was used as a reference. The ratio and root-mean-square error (RMSE) criteria on pages 3-4 to 3-6 of the guide were followed. Other criteria used a maximum of 10.5 percent rejections, along with float-versus-fixed deltas of 10 cm. All cases that failed to meet any of these criteria were rejected and not used. Fixed solutions were obtained for all vector baselines.

Daily processing allowed the field crews to discover any weak links in the network and immediately schedule re-observations of the affected baselines. Once the fieldwork was complete, the processed baselines were then run through a rigorous loop closure analysis. Any baselines that failed this analysis were either reprocessed or removed from the network.

Rapid Static Adjustment

Upon completion of all field data processing, Woolpert performed a minimally constrained and fully constrained least-squares adjustments using *Trimble Navigation's* Trimble Total Control (TTC) version 2.73. After an acceptable minimally constrained least-squares adjustment was obtained, a fully constrained least-squares adjustment was performed by fixing the GPS networks to existing NGS and Woolpert control stations. Geoid 03 was used to convert ellipsoidal heights to orthometric heights. For this survey the following stations were held fixed:

DIMENSIONS	EXISTING NGS CONTROL STATIONS
3-D Control Stations	GPS 44 (AA5818), GPS 117 (AH5710), SEBAPORT (AF7421) and DALLAS (established during Indian River Orthophoto Phase)

Accuracy Statement

The positional accuracy of the LiDAR Control Points was 0.04-feet (avg. 0.02-feet) horizontally and 0.10-feet (avg. 0.05-feet) vertically at the 95% confidence level. The positional accuracy of the LiDAR QA/QC checkpoints was 0.05-feet (avg. 0.03-feet) horizontally and 0.11-feet (avg. 0.05-feet) vertically at the 95% confidence level.

The ground control survey meets positional accuracies necessary to support a DTM to meet or exceed a 3.8-foot horizontal accuracy and 0.6-foot fundamental vertical accuracy at the 95% confidence level.

The positional accuracies information can be found in Appendix D of this report.

Notes

1. **THIS REPORT OF SURVEY IS PART OF THE LiDAR MAPPING QA/QC GROUND CONTROL SURVEY. SIX (6) GROUND CONTROL LAYOUT MAPS SHALL ACCOMPANY THE SURVEY REPORT. NEITHER THE MAPS NOR THIS REPORT OF SURVEY IS FULL AND COMPLETE WITHOUT THE OTHER. THIS REPORT OF SURVEY IS NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER IN RESPONSIBLE CHARGE.**

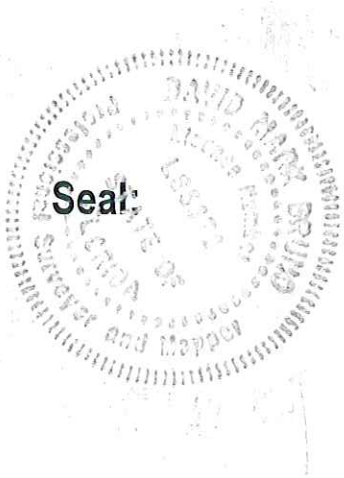
2. **THIS REPORT OF SURVEY CONSISTS OF FOURTY-FOUR (44) PAGES AND EACH PAGE SHALL NOT BE CONSIDERED FULL OR COMPLETE UNLESS ATTACHED TO THE OTHER(S). ADDITIONS OR DELETIONS TO SURVEY MAPS AND REPORTS BY OTHER THAN THE SIGNING PARTY OR PARTIES IS PROHIBITED WITHOUT THE WRITTEN CONSENT OF THE SIGNING PARTY OR PARTIES.**

3. **THIS LiDAR MAPPING QA/QC GROUND CONTROL SURVEY DATA AND REPORT IS CERTIFIED TO THE FLORIDA DIVISION OF EMERGENCY MANAGEMENT AS MEETING OR EXCEEDING, IN QUALITY AND PRECISION, THE STANDARDS APPLICABLE FOR THIS WORK, AS SET FORTH IN CHAPTER 61G17, FLORIDA ADMINISTRATIVE CODE & FEMA GUIDELINES AND SPECIFICATIONS FOR FLOOD HAZARD MAPPING PARTNERS.**

Surveyor and Mapper in Responsible Charge:
David Bruno PSM
Professional Surveyor and Mapper
License Number: LS 5670

Signed: _____

Seal:



APPENDIX A: EXISTING GROUND CONTROL INFORMATION

This appendix contains the published National Geodetic Survey (NGS) data sheets for the control stations utilized in the Indian River County Project Area of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE =  ,PROGRAM = datasheet, VERSION = 7.61
1        National Geodetic Survey,   Retrieval Date = OCTOBER 17, 2008
 AA5818 ***********************************************************************
 AA5818  DESIGNATION -  GPS 44
 AA5818  PID         -  AA5818
 AA5818  STATE/COUNTY-  FL/INDIAN RIVER
 AA5818  USGS QUAD   -  OSLO (1983)
 AA5818
 AA5818                        *CURRENT SURVEY CONTROL
 AA5818  ______________________________________________________________________
 AA5818* NAD 83(2007)-  27 34 25.24060(N)    080 28 48.70294(W)     ADJUSTED
 AA5818* NAVD 88     -         7.062  (meters)      23.17   (feet)  ADJUSTED
 AA5818  ______________________________________________________________________
 AA5818  EPOCH DATE  -        2002.00
 AA5818  X           -     935,722.868 (meters)                     COMP
 AA5818  Y           -  -5,579,810.440 (meters)                     COMP
 AA5818  Z           -   2,934,700.351 (meters)                     COMP
 AA5818  LAPLACE CORR-          -1.34  (seconds)                    DEFLEC99
 AA5818  ELLIP HEIGHT-         -20.361 (meters)          (02/10/07) ADJUSTED
 AA5818  GEOID HEIGHT-         -27.43  (meters)                     GEOID03
 AA5818  DYNAMIC HT  -           7.052 (meters)      23.14  (feet)  COMP
 AA5818
 AA5818  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AA5818  Type    PID    Designation                      North   East  Ellip
 AA5818  ----------------------------------------------------------------
 AA5818  NETWORK AA5818 GPS 44                            0.55   0.47   1.14
 AA5818  ----------------------------------------------------------------
 AA5818  MODELED GRAV-     979,148.8   (mgal)                      NAVD 88
 AA5818
 AA5818  VERT ORDER  -  FIRST     CLASS II
 AA5818
 AA5818.The horizontal coordinates were established by GPS observations
 AA5818.and adjusted by the National Geodetic Survey in February 2007.
 AA5818
 AA5818.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA5818.See National Readjustment for more information.
 AA5818.The horizontal coordinates are valid at the epoch date displayed above.
 AA5818.The epoch date for horizontal control is a decimal equivalence
 AA5818.of Year/Month/Day.
 AA5818
 AA5818.The orthometric height was determined by differential leveling
 AA5818.and adjusted in November 2007.
 AA5818
 AA5818.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA5818
 AA5818.The Laplace correction was computed from DEFLEC99 derived deflections.
 AA5818
 AA5818.The ellipsoidal height was determined by GPS observations
 AA5818.and is referenced to NAD 83.
 AA5818
 AA5818.The geoid height was determined by GEOID03.
 AA5818
 AA5818.The dynamic height is computed by dividing the NAVD 88
 AA5818.geopotential number by the normal gravity value computed on the
 AA5818.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 AA5818.degrees latitude (g = 980.6199 gals.).
 AA5818
 AA5818.The modeled gravity was interpolated from observed gravity values.
```

```
AA5818
AA5818;                    North         East      Units Scale Factor Converg.
AA5818;SPC FL E     -   359,076.223   251,326.159   MT  0.99997368   +0 14 26.2
AA5818;SPC FL E     - 1,178,069.24    824,559.24   sFT  0.99997368   +0 14 26.2
AA5818;UTM  17      - 3,050,085.689   551,308.647   MT  0.99963249   +0 14 26.2
AA5818
AA5818!             -  Elev Factor  x  Scale Factor =   Combined Factor
AA5818!SPC FL E     -   1.00000320  x   0.99997368  =   0.99997688
AA5818!UTM  17      -   1.00000320  x   0.99963249  =   0.99963569
AA5818
AA5818:                Primary Azimuth Mark                    Grid Az
AA5818:SPC FL E     -  GPS 43                                  000 35 17.3
AA5818:UTM  17      -  GPS 43                                  000 35 17.3
AA5818
AA5818|---------------------------------------------------------------------|
AA5818| PID    Reference Object                    Distance      Geod. Az   |
AA5818|                                                          dddmmss.s  |
AA5818| AA5817 GPS 43                           APPROX. 0.8 KM 0004943.5  |
AA5818|---------------------------------------------------------------------|
AA5818
AA5818                          SUPERSEDED SURVEY CONTROL
AA5818
AA5818  NAD 83(1999)-  27 34 25.24095(N)    080 28 48.70280(W) AD(       ) 1
AA5818  ELLIP H (06/19/01)  -20.367  (m)                       GP(       ) 4 1
AA5818  NAD 83(1990)-  27 34 25.23987(N)    080 28 48.70331(W) AD(       ) 1
AA5818  ELLIP H (06/26/95)  -20.302  (m)                       GP(       ) 3 1
AA5818
AA5818.Superseded values are not recommended for survey control.
AA5818.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA5818.See file dsdata.txt to determine how the superseded data were derived.
AA5818
AA5818_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNL5130950086(NAD 83)
AA5818_MARKER: DD = SURVEY DISK
AA5818_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA5818_STAMPING: GPS 44
AA5818_MARK LOGO: FL-061
AA5818_PROJECTION: RECESSED 8 CENTIMETERS
AA5818_MAGNETIC: N = NO MAGNETIC MATERIAL
AA5818_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA5818+STABILITY: SURFACE MOTION
AA5818_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA5818+SATELLITE: SATELLITE OBSERVATIONS - November 16, 2005
AA5818
AA5818  HISTORY     - Date     Condition        Report By
AA5818  HISTORY     - 1994     MONUMENTED       GCYI
AA5818  HISTORY     - 20051116 GOOD             FLDEP
AA5818
AA5818                          STATION DESCRIPTION
AA5818
AA5818'DESCRIBED BY G.C.Y., INCORPORATED 1994 (MRL)
AA5818'THE STATION IS ABOUT 6.7 MI (10.8 KM) SOUTHWEST OF VERO BEACH, 5.5 MI
AA5818'(8.9 KM) SOUTHEAST OF THE INTERSECTION OF INTERSTATE 95 AND STATE
AA5818'ROADS 60 AND 9 IN SECTION 30, TOWNSHIP 33 SOUTH, RANGE 39 EAST.
AA5818'
AA5818'TO REACH THE STATION FROM THE INTERSECTION OF INTERSTATE 95 AND STATE
AA5818'ROADS 60 AND 9, WEST OF VERO BEACH, GO EAST ON STATE ROAD 60 FOR ABOUT
AA5818'1.3 MI (2.1 KM) TO THE INTERSECTION OF COUNTY ROAD 609 (82ND AVENUE),
AA5818'TURN RIGHT ON COUNTY ROAD 609 (82ND AVENUE) AND GO SOUTH FOR ABOUT 3.5
AA5818'MI (5.6 KM) TO THE JUNCTION OF SW OSLO ROAD (9TH STREET) ON THE LEFT,
AA5818'TURN LEFT ON COUNTY ROAD 606 (SW OSLO ROAD, 9TH STREET) AND GO EAST
AA5818'FOR ABOUT 1.0 MI (1.6 KM) TO THE JUNCTION OF RANGE LINE ROAD (74TH
AA5818'AVENUE) ON THE RIGHT, TURN RIGHT ON RANGE LINE ROAD (74TH AVENUE) AND
AA5818'GO SOUTH FOR ABOUT 1.0 MI (1.6 KM) TO THE STATION ON THE LEFT, SET IN
```

```
AA5818'THE TOP OF A CONCRETE MONUMENT.
AA5818'
AA5818'LOCATED ABOUT 7.0 FT (2.1 M) EAST OF THE EAST EDGE OF THE PAVEMENT OF
AA5818'RANGE LINE ROAD (74TH AVENUE) AND 3.0 FT (0.9 M) WEST OF A CARSONITE
AA5818'WITNESS POST.
AA5818'
AA5818'NOTE   SET P.K. NAIL AND DISK, PCP LB4108 IN THE EAST FACE OF A WOOD
AA5818'POWER POLE WITH A MAGNETIC AZIMUTH OF 336 DEGREES AT A DISTANCE OF
AA5818'118.39 FT (36.09 M) , SET X-CUT IN THE NORTH SIDE OF THE CURB INLET
AA5818'WITH A MAGNETIC AZIMUTH OF 245 DEGREES AT A DISTANCE OF 39.31 FT
AA5818'(11.98 M) , SET P.K. NAIL AND DISK, PCP LB4108 IN THE EAST FACE OF A
AA5818'WOOD POWER POLE WITH A MAGNETIC AZIMUTH OF 194 DEGREES AT A DISTANCE
AA5818'OF 174.35 FT (53.14 M) .
AA5818
AA5818                          STATION RECOVERY (2005)
AA5818
AA5818'RECOVERY NOTE BY FL DEPT OF ENV PRO 2005 (JLM)
AA5818'THE MARK IS ABOUT 4.7 MI SOUTH OF VERO BEACH, IN SECTION 30, TOWNSHIP
AA5818'33 SOUTH, RANGE 39  EAST.
AA5818'
AA5818'TO REACH THE MARK FROM THE INTERSECTION OF STATE HIGHWAY 60 (20TH
AA5818'AVENUE) AND  INTERSTATE 95 (EXIT 147) NORTHBOUND LANES ON THE WEST
AA5818'SIDE OF VERO BEACH, GO EAST ON  STATE HIGHWAY 60 (20TH AVENUE) FOR
AA5818'2.35 MI TO THE INTERSECTION OF 74TH AVENUE, TURN RIGHT  ON 74TH AVENUE
AA5818'AND GO SOUTH FOR 3.7 MI TO THE INTERSECTION OF OSLO ROAD, CONTINUE
AA5818'SOUTH ON 74TH AVENUE FOR 1.0 MI TO THE JUNCTION OF 17TH STREET ON THE
AA5818'LEFT AND THE MARK  ON THE LEFT, SET IN THE TOP OF A CONCRETE MONUMENT
AA5818'RECESSED 0.3 FT BELOW THE LEVEL OF  THE GROUND AND ABOUT LEVEL WITH
AA5818'74TH AVENUE.
AA5818'
AA5818'LOCATED 39.7 FT EAST-NORTHEAST OF A STORM DRAIN WITH A MAN HOLE COVER,
AA5818'19.3 FT WEST OF A  CARSONITE WITNESS POST AND 19.1 FT EAST OF THE
AA5818'CENTERLINE OF 74TH AVENUE.

*** retrieval complete.
Elapsed Time = 00:00:00
```

The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

```
DATABASE =  ,PROGRAM = datasheet, VERSION = 7.61
1        National Geodetic Survey,   Retrieval Date = OCTOBER 17, 2008
 AF7421 ***********************************************************************
 AF7421  FBN         -  This is a Federal Base Network Control Station.
 AF7421  DESIGNATION -  SEBAPORT
 AF7421  PID         -  AF7421
 AF7421  STATE/COUNTY-  FL/INDIAN RIVER
 AF7421  USGS QUAD   -  SEBASTIAN (1970)
 AF7421
 AF7421                        *CURRENT SURVEY CONTROL
 AF7421  ______________________________________________________________________
 AF7421* NAD 83(2007)-  27 48 34.51062(N)    080 29 55.39318(W)      NO CHECK
 AF7421* NAVD 88     -         5.485  (meters)      18.00   (feet)  ADJUSTED
 AF7421  ______________________________________________________________________
 AF7421  EPOCH DATE  -        2002.00
 AF7421  X           -     931,913.093 (meters)                     COMP
 AF7421  Y           -  -5,568,129.085 (meters)                     COMP
 AF7421  Z           -   2,957,847.113 (meters)                     COMP
 AF7421  LAPLACE CORR-          -1.72  (seconds)                    DEFLEC99
 AF7421  ELLIP HEIGHT-         -22.374 (meters)          (02/10/07) NO CHECK
 AF7421  GEOID HEIGHT-         -27.85  (meters)                     GEOID03
 AF7421  DYNAMIC HT  -           5.477 (meters)      17.97  (feet)  COMP
 AF7421
 AF7421  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AF7421  Type    PID    Designation                      North   East  Ellip
 AF7421  ----------------------------------------------------------------------
 AF7421  NETWORK AF7421 SEBAPORT                          0.33   0.31   0.92
 AF7421  ----------------------------------------------------------------------
 AF7421  MODELED GRAV-     979,161.5   (mgal)                      NAVD 88
 AF7421
 AF7421  VERT ORDER  -  FIRST     CLASS II
 AF7421
 AF7421.This mark is at Sebastian Airport (X26)
 AF7421
 AF7421.The horizontal coordinates were established by GPS observations
 AF7421.and adjusted by the National Geodetic Survey in February 2007.
 AF7421
 AF7421.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AF7421.See National Readjustment for more information.
 AF7421.No horizontal observational check was made to the station.
 AF7421.The horizontal coordinates are valid at the epoch date displayed above.
 AF7421.The epoch date for horizontal control is a decimal equivalence
 AF7421.of Year/Month/Day.
 AF7421
 AF7421.The orthometric height was determined by differential leveling
 AF7421.and adjusted in May 1994.
 AF7421.WARNING-GPS observations at this control monument resulted in a GPS
 AF7421.derived orthometric height which differed from the leveled height by
 AF7421.more than one decimeter (0.1 meter).
 AF7421
 AF7421.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AF7421
 AF7421.The Laplace correction was computed from DEFLEC99 derived deflections.
 AF7421
 AF7421.The ellipsoidal height was determined by GPS observations
 AF7421.and is referenced to NAD 83.
 AF7421
 AF7421.The geoid height was determined by GEOID03.
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AF7421
AF7421.The dynamic height is computed by dividing the NAVD 88
AF7421.geopotential number by the normal gravity value computed on the
AF7421.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AF7421.degrees latitude (g = 980.6199 gals.).
AF7421
AF7421.The modeled gravity was interpolated from observed gravity values.
AF7421
AF7421;                    North         East      Units Scale Factor Converg.
AF7421;SPC FL E     -   385,209.776   249,390.658   MT  0.99997128   +0 14 01.9
AF7421;SPC FL E     - 1,263,809.07    818,209.18    sFT  0.99997128   +0 14 01.9
AF7421;UTM  17      - 3,076,210.326   549,373.806   MT  0.99963009   +0 14 01.9
AF7421
AF7421!             -  Elev Factor  x  Scale Factor =   Combined Factor
AF7421!SPC FL E     -   1.00000351  x   0.99997128  =   0.99997479
AF7421!UTM  17      -   1.00000351  x   0.99963009  =   0.99963360
AF7421
AF7421                          SUPERSEDED SURVEY CONTROL
AF7421
AF7421  NAD 83(1999)-  27 48 34.51081(N)    080 29 55.39316(W) AD(       ) A
AF7421  ELLIP H (04/12/01)  -22.355  (m)                       GP(       ) 4 1
AF7421  NAD 83(1990)-  27 48 34.51025(N)    080 29 55.39291(W) AD(       ) B
AF7421  ELLIP H (09/13/90)  -22.364  (m)                       GP(       ) 4 1
AF7421  NAVD 88 (06/02/94)    5.49   (m)           18.0    (f) LEVELING    3
AF7421  NGVD 29 (09/01/92)    5.919  (m)           19.42   (f) ADJUSTED    1 2
AF7421
AF7421.Superseded values are not recommended for survey control.
AF7421.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AF7421.See file dsdata.txt to determine how the superseded data were derived.
AF7421
AF7421_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNL4937476210(NAD 83)
AF7421_MARKER: F = FLANGE-ENCASED ROD
AF7421_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
AF7421_SP_SET: STAINLESS STEEL ROD IN SLEEVE
AF7421_STAMPING: SEBAPORT 1989
AF7421_MARK LOGO: NGS
AF7421_PROJECTION: FLUSH
AF7421_MAGNETIC: N = NO MAGNETIC MATERIAL
AF7421_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
AF7421+STABILITY: POSITION/ELEVATION WELL
AF7421_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AF7421+SATELLITE: SATELLITE OBSERVATIONS - February 20, 2008
AF7421_ROD/PIPE-DEPTH: 30.5 meters
AF7421_SLEEVE-DEPTH  : 0.91 meters
AF7421
AF7421  HISTORY     - Date     Condition        Report By
AF7421  HISTORY     - 1989     MONUMENTED       NGS
AF7421  HISTORY     - 19910207 GOOD             NGS
AF7421  HISTORY     - 19930210 GOOD             NGS
AF7421  HISTORY     - 19930817 GOOD             GEOBAS
AF7421  HISTORY     - 19940930 GOOD             GCYI
AF7421  HISTORY     - 19951015 GOOD             FLDEP
AF7421  HISTORY     - 19951216 GOOD             NGS
AF7421  HISTORY     - 19980624 GOOD             GCYI
AF7421  HISTORY     - 19990405 GOOD             NIMA
AF7421  HISTORY     - 20040512 GOOD             CREEI
AF7421  HISTORY     - 20080220 GOOD             CREEI
AF7421
AF7421                           STATION DESCRIPTION
AF7421
AF7421'DESCRIBED BY NATIONAL GEODETIC SURVEY 1989
AF7421'THE STATION IS LOCATED ON THE WEST SIDE OF SEBASTIAN, AT THE SEBASTIAN
AF7421'MUNICIPAL AIRPORT, ON THE SOUTHEAST SIDE OF RUNWAY 4-22, BETWEEN
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AF7421'RUNWAY AND AIRPORT BOUNDARY LINE.  OWNERSHIP--CITY OF SEBASTIAN, P.O.
AF7421'BOX 780127, SEBASTIAN FL 32978, JOHN L. VAN ANTWERP - AIRPORT MANAGER,
AF7421'J AND S AVIATION, PHONE 407-589-5858.  NOTE--PERMISSION MUST BE
AF7421'OBTAINED BEFORE ENTERING AIRPORT.
AF7421'TO REACH THE STATION FROM THE INTERSECTION OF U.S. HIGHWAY 1 AND MAIN
AF7421'ST IN SEBASTIAN, GO WESTERLY, THEN SOUTHWESTERLY FOR 1.97 KM
AF7421'(1.20 MI) ON MAIN ST TO A PAVED ROAD RIGHT.  TURN RIGHT AND GO
AF7421'NORTHWEST FOR 0.59 KM (0.35 MI) ON AIRPORT DR E TO A PARKING AREA, J
AF7421'AND S AVIATION STRAIGHT AHEAD.  TURN LEFT AND GO WEST FOR ABOUT 20 M
AF7421'(65.6 FT) TO A GATE.  PASS THROUGH GATE, CONTINUE AHEAD AND GO
AF7421'WESTERLY FOR 0.41 KM (0.25 MI) ON APRON AND TAXIWAY (FORMER EAST-WEST
AF7421'RUNWAY) TO THE SOUTHEAST EDGE OF RUNWAY 4-22.  TURN LEFT AND GO
AF7421'SOUTHWEST FOR 0.68 KM (0.40 MI) ALONG THE SOUTHEAST EDGE OF RUNWAY TO
AF7421'THE STATION.
AF7421'THE STATION IS RECESSED 8 CM BELOW GROUND.  LOCATED 49.07 M
AF7421'(161.0 FT) NORTH-NORTHWEST FROM A 26-CM PINE TREE, 46.79 M (153.5 FT)
AF7421'WEST FROM A 50-CM FORKED PINE TREE, 40.84 M (134.0 FT) NORTHWEST FROM
AF7421'THE BRUSH LINE, 39.81 M (130.6 FT) NORTHWEST FROM A CARSONITE WITNESS
AF7421'POST AT BRUSH LINE, 16.76 M (55.0 FT) SOUTHEAST FROM THE SOUTHEAST
AF7421'EDGE OF RUNWAY 4-22 (150 FEET WIDE AT THIS DATE) AND 2.59 M (8.5 FT)
AF7421'NORTHWEST FROM THE APPROXIMATE CENTER OF A TRACK ROAD.  NOTE--ACCESS
AF7421'TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO CAP.
AF7421'DESCRIBED BY D.F. CALLAHAN.
AF7421
AF7421                          STATION RECOVERY (1991)
AF7421
AF7421'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1991
AF7421'RECOVERED IN GOOD CONDITION.
AF7421
AF7421                          STATION RECOVERY (1993)
AF7421
AF7421'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1993
AF7421'THE STATION IS LOCATED ON THE WEST SIDE OF SEBASTIAN, AT THE SEBASTIAN
AF7421'MUNICIPAL AIRPORT, ON THE SOUTHEAST SIDE OF RUNWAY 4-22, BETWEEN
AF7421'RUNWAY AND AIRPORT BOUNDARY LINE.  OWNERSHIP--CITY OF SEBASTIAN, P.O.
AF7421'BOX 780127, SEBASTIAN FL 32978, JOHN L. VAN ANTWERP - AIRPORT
AF7421'MANAGER, J AND S AVIATION, PHONE 407-589-5858. NOTE--PERMISSION MUST
AF7421'BE OBTAINED BEFORE ENTERING AIRPORT.
AF7421'TO REACH THE STATION FROM THE INTERSECTION OF U.S. HIGHWAY 1 AND MAIN
AF7421'STREET IN SEBASTIAN, GO WESTERLY, THEN SOUTHWESTERLY FOR 1.97 KM
AF7421'(1.20 MI) ON MAIN STREET TO A PAVED ROAD RIGHT.  TURN RIGHT AND GO
AF7421'NORTHWEST FOR 0.59 KM (0.35 MI) ON AIRPORT DRIVE EAST TO A PARKING
AF7421'AREA, J AND S AVIATION STRAIGHT AHEAD.  TURN LEFT AND GO THROUGH
AF7421'GATE, CONTINUE WEST FOR 0.40 KM (0.25 MI) ON APRON AND TAXIWAY
AF7421'(FORMER EAST-WEST RUNWAY)TO THE INTERSECTION OF RUNWAYS 13-31 AND
AF7421'4-22.  TURN LEFT AND GO SOUTHWEST FOR 0.68 KM (0.40 MI) ALONG THE
AF7421'SOUTHEAST EDGE OF RUNWAY 4-22 TO THE STATION ON THE RIGHT.
AF7421'THE STATION IS RECESSED 8 CM BELOW GROUND.  LOCATED 49.07 M
AF7421'(160.99 FT) NORTH-NORTHWEST FROM A 26-CM PINE TREE, 46.79 M
AF7421'(153.51 FT) WEST FROM A 50-CM FORKED PINE TREE, 40.84 M (133.99 FT)
AF7421'NORTHWEST FROM THE BRUSH LINE, 39.81 M (130.61 FT) NORTHWEST FROM A
AF7421'CARSONITE WITNESS POST AT BRUSH LINE, 16.76 M (54.99 FT) SOUTHEAST
AF7421'FROM THE SOUTHEAST EDGE OF RUNWAY 4-22 (150 FEET WIDE AT THIS DATE)
AF7421'AND 2.59 M (8.50 FT) NORTHWEST FROM THE APPROXIMATE CENTER OF A TRACK
AF7421'ROAD.  NOTE--ACCESS TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO CAP.
AF7421
AF7421                          STATION RECOVERY (1993)
AF7421
AF7421'RECOVERY NOTE BY GEOBASE CONTROL INCORPORATED 1993
AF7421'RECOVERED IN GOOD CONDITION.
AF7421
AF7421                          STATION RECOVERY (1994)
AF7421
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AF7421'RECOVERY NOTE BY G.C.Y., INCORPORATED 1994 (MRL)
AF7421'RECOVERED AS DESCRIBED.
AF7421
AF7421                          STATION RECOVERY (1995)
AF7421
AF7421'RECOVERY NOTE BY FL DEPT OF ENV PRO 1995 (JLM)
AF7421'RECOVERED AS DESCRIBED.
AF7421
AF7421                          STATION RECOVERY (1995)
AF7421
AF7421'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1995 (CFS)
AF7421'THE STATION IS LOCATED ON THE WEST SIDE OF SEBASTIAN, AT THE SEBASTIAN
AF7421'MUNICIPAL AIRPORT,ON THE SOUTHEAST SIDE OF RUNWAY 4-22, BETWEEN RUNWAY
AF7421'AND AIRPORT BOUNDARY LINE.  OWNERSHIP --CITY OF SEBASTIAN, 1225 MAIN
AF7421'ST, SEBASTIAN FL 32978, THOMAS W FRAME , CITY MANAGER/AIRPORT MANAGER,
AF7421'SEBASTIAN CITY HALL, PHONE 407-388-8200.  NOTE--PERMISSION MUST BE
AF7421'OBTAINED BEFORE ENTERING AIRPORT.  TO REACH THE STATION FROM THE
AF7421'INTERSECTION OF U.S. HIGHWAY 1 AND MAIN STREET IN SEBASTIAN, GO
AF7421'WESTERLY, THEN SOUTHWESTERLY FOR 1.20 MI (1.93 KM) ON MAIN STREET TO A
AF7421'PAVED ROAD RIGHT.  TURN RIGHT AND GO NORTHWEST FOR 0.35 MI (0.56 KM)
AF7421'ON AIRPORT DRIVE TO A PARKING AREA, J AND S AVIATION STRAIGHT AHEAD.
AF7421'TURN LEFT AND GO WEST FOR ABOUT 65.6 FT (20.0 M) TO A GATE.  PASS
AF7421'THROUGH GATE CONTINUE AHEAD AND GO WESTERLY FOR 0.25 MI (0.40 KM) ON
AF7421'APRON AND TAXIWAY (FORMER EAST-WEST RUNWAY) TO THE INTERSECTIONS OF
AF7421'RUNWAYS 13-31 AND 4-22.  TURN LEFT AND GO SOUTHWEST ALONG SOUTHEAST
AF7421'EDGE OF RUNWAY 4-22 FOR 0.35 MI (0.56 KM) TO THE STATION ON LEFT.
AF7421'LOCATED 161.0 FT (49.1 M) NORTH-NORTHWEST FROM A 27-CM PINE TREE,
AF7421'153.5 FT (46.8 M) WEST FROM A MULTI-FORKED PINE TREE, 134.0 FT (40.8
AF7421'M) NORTHWEST OF BRUSH LINE, 130.6 FT (39.8 M) NORTHWEST OF A CARSONITE
AF7421'WITNESS POST, 130.3 FT (39.7 M) SOUTHEAST OF CENTERLINE OF RUNWAY
AF7421'4-22, AND 8.5 FT (2.6 M) NORTHWEST FROM THE APPROXIMATE CENTER OF A
AF7421'TRACK ROAD.  NOTE -- STATION IS RECESSED 8 CM AND ACCESS TO DATUM
AF7421'POINT IS HAD THROUGH A 5-INCH LOGO CAP.
AF7421
AF7421                          STATION RECOVERY (1998)
AF7421
AF7421'RECOVERY NOTE BY G.C.Y., INCORPORATED 1998 (PA)
AF7421'RECOVERED AS DESCRIBED.
AF7421
AF7421                          STATION RECOVERY (1999)
AF7421
AF7421'RECOVERY NOTE BY NATIONAL IMAGERY + MAPPING AGENCY 1999
AF7421'RECOVERED AS DESCRIBED.
AF7421
AF7421                          STATION RECOVERY (2004)
AF7421
AF7421'RECOVERY NOTE BY CREECH ENGINEERS INC 2004 (SAL)
AF7421'RECOVERY NOTE BY CREECH ENGINEERS, INC. 2004 (DTB) RECOVERED AS
AF7421'DESCRIBED WITH THE FOLLOWING REVISIONS. OWNERSHIP--CITY OF SEBASTIAN,
AF7421'P.O.BOX 780127, SEBASTIAN FL 32978, JASON MILEWSKI - AIRPORT  MANAGER,
AF7421'PHONE 772-388-8208.  NOTE--PERMISSION MUST BE OBTAINED BEFORE ENTERING
AF7421'AIRPORT.
AF7421'
AF7421'REFERENCES-- SET 5/8 INCH IRON ROD AND CAP --- REFERENCE LB 6705 ---
AF7421'ON A MAGNETIC AZIMUTH OF 88 DEGREES AT A DISTANCE OF 31.15 FT (9.49
AF7421'M). SET 5/8 INCH IRON ROD AND CAP --- REFERENCE LB 6705 --- ON A
AF7421'MAGNETIC AZIMUTH OF 194 DEGREES AT A DISTANCE OF 35.21 FT (10.73 M).
AF7421'THIRD RUNWAY MARKER LIGHT (WHITE) FROM THE SOUTHWEST END OF RUNWAY
AF7421'4-22 ON A MAGNETIC AZIMUTH OF 288 DEGREES AT A DISTANCE OF 84.2 FT
AF7421'(25.66 M). SET MAG NAIL AND DISK --- REF. PT. LB 6705 --- IN THE
AF7421'SOUTHWEST EDGE OF PAVEMENT OF RUNWAY 4-22 ON A MAGNETIC AZIMUTH OF DUE
AF7421'NORTH AT A DISTANCE OF 76.15 FT (23.21 M).
AF7421
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AF7421                          STATION RECOVERY (2008)
AF7421
AF7421'RECOVERY NOTE BY CREECH ENGINEERS INC 2008 (JHT)
AF7421'RECOVERED AS DESCRIBED.

*** retrieval complete.
Elapsed Time = 00:00:00
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The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

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DATABASE =  ,PROGRAM = datasheet, VERSION = 7.61
1        National Geodetic Survey,   Retrieval Date = OCTOBER 17, 2008
 AH5710 ***********************************************************************
 AH5710  DESIGNATION -  GPS 117
 AH5710  PID         -  AH5710
 AH5710  STATE/COUNTY-  FL/INDIAN RIVER
 AH5710  USGS QUAD   -  VERO BEACH (1983)
 AH5710
 AH5710                        *CURRENT SURVEY CONTROL
 AH5710  ______________________________________________________________________
 AH5710* NAD 83(2007)-  27 40 57.19625(N)    080 25 46.70401(W)     ADJUSTED
 AH5710* NAVD 88     -         6.345  (meters)      20.82   (feet)  ADJUSTED
 AH5710  ______________________________________________________________________
 AH5710  EPOCH DATE  -        2002.00
 AH5710  X           -     939,715.534 (meters)                     COMP
 AH5710  Y           -  -5,573,464.728 (meters)                     COMP
 AH5710  Z           -   2,945,389.143 (meters)                     COMP
 AH5710  LAPLACE CORR-          -1.70  (seconds)                    DEFLEC99
 AH5710  ELLIP HEIGHT-         -21.367 (meters)          (02/10/07) ADJUSTED
 AH5710  GEOID HEIGHT-         -27.71  (meters)                     GEOID03
 AH5710  DYNAMIC HT  -           6.336 (meters)      20.79  (feet)  COMP
 AH5710
 AH5710  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AH5710  Type    PID    Designation                      North   East  Ellip
 AH5710  ----------------------------------------------------------------
 AH5710  NETWORK AH5710 GPS 117                           0.74   0.65   1.55
 AH5710  ----------------------------------------------------------------
 AH5710  MODELED GRAV-     979,157.7   (mgal)                     NAVD 88
 AH5710
 AH5710  VERT ORDER  -  FIRST     CLASS II
 AH5710
 AH5710.The horizontal coordinates were established by GPS observations
 AH5710.and adjusted by the National Geodetic Survey in February 2007.
 AH5710
 AH5710.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AH5710.See National Readjustment for more information.
 AH5710.The horizontal coordinates are valid at the epoch date displayed above.
 AH5710.The epoch date for horizontal control is a decimal equivalence
 AH5710.of Year/Month/Day.
 AH5710
 AH5710.The orthometric height was determined by differential leveling
 AH5710.and adjusted in November 2007.
 AH5710
 AH5710.Photographs are available for this station.
 AH5710
 AH5710.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AH5710
 AH5710.The Laplace correction was computed from DEFLEC99 derived deflections.
 AH5710
 AH5710.The ellipsoidal height was determined by GPS observations
 AH5710.and is referenced to NAD 83.
 AH5710
 AH5710.The geoid height was determined by GEOID03.
 AH5710
 AH5710.The dynamic height is computed by dividing the NAVD 88
 AH5710.geopotential number by the normal gravity value computed on the
 AH5710.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 AH5710.degrees latitude (g = 980.6199 gals.).
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AH5710
AH5710.The modeled gravity was interpolated from observed gravity values.
AH5710
AH5710;                      North         East      Units Scale Factor Converg.
AH5710;SPC FL E     -   371,162.831   256,262.443   MT  0.99998023   +0 15 53.9
AH5710;SPC FL E     - 1,217,723.39    840,754.37   sFT  0.99998023   +0 15 53.9
AH5710;UTM  17      - 3,062,168.174   556,243.246   MT  0.99963904   +0 15 53.9
AH5710
AH5710!             -  Elev Factor  x  Scale Factor =   Combined Factor
AH5710!SPC FL E     -   1.00000336  x   0.99998023  =   0.99998359
AH5710!UTM  17      -   1.00000336  x   0.99963904  =   0.99964240
AH5710
AH5710:                Primary Azimuth Mark                     Grid Az
AH5710:SPC FL E     -  GPS 118                                  180 05 06.6
AH5710:UTM  17      -  GPS 118                                  180 05 06.6
AH5710
AH5710|---------------------------------------------------------------------|
AH5710| PID    Reference Object                    Distance      Geod. Az   |
AH5710|                                                          dddmmss.s |
AH5710| AH5711 GPS 118                           APPROX. 0.7 KM 1802100.5 |
AH5710|---------------------------------------------------------------------|
AH5710
AH5710                          SUPERSEDED SURVEY CONTROL
AH5710
AH5710  NAD 83(1999)-  27 40 57.19668(N)    080 25 46.70342(W) AD(       ) 1
AH5710  ELLIP H (05/31/01)  -21.361  (m)                       GP(       ) 4 1
AH5710  NAD 83(1990)-  27 40 57.19575(N)    080 25 46.70412(W) AD(       ) 1
AH5710  ELLIP H (12/08/98)  -21.316  (m)                       GP(       ) 4 1
AH5710
AH5710.Superseded values are not recommended for survey control.
AH5710.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AH5710.See file dsdata.txt to determine how the superseded data were derived.
AH5710
AH5710_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNL5624362168(NAD 83)
AH5710_MARKER: DD = SURVEY DISK
AH5710_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AH5710_STAMPING: GPS 117 1998
AH5710_MARK LOGO: FL-061
AH5710_PROJECTION: RECESSED 5 CENTIMETERS
AH5710_MAGNETIC: N = NO MAGNETIC MATERIAL
AH5710_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AH5710+STABILITY: SURFACE MOTION
AH5710_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AH5710+SATELLITE: SATELLITE OBSERVATIONS - November 16, 2005
AH5710
AH5710  HISTORY     - Date     Condition        Report By
AH5710  HISTORY     - 1998     MONUMENTED       GCYI
AH5710  HISTORY     - 20040512 GOOD             CREEI
AH5710  HISTORY     - 20051116 GOOD             FLDEP
AH5710
AH5710                          STATION DESCRIPTION
AH5710
AH5710'DESCRIBED BY G.C.Y., INCORPORATED 1998 (LLY)
AH5710'STATION IS 6.2 MILES (10.0 KM) NORTHEAST OF THE INTERSECTION OF
AH5710'INTERSTATE 95 AND STATE ROAD 60 AND 3.6 MILES (5.8 KM) NORTHWEST OF
AH5710'VERO IN SECTION 21, TOWNSHIP 32 SOUTH, RANGE 39 EAST.  TO REACH FROM
AH5710'THE INTERSECTION OF U.S.  HIGHWAY NO.  1 AND 49TH STREET (LINDSEY
AH5710'ROAD) , GO WEST ON 49TH STREET (LINDSEY ROAD) 1.2 MILES (1.9 KM) TO
AH5710'THE STATION ON THE RIGHT.  SET IN A CONCRETE MONUMENT.  LOCATED ABOUT
AH5710'22.7 FT.  (6.9 M) WEST OF THE APPROXIMATE CENTERLINE OF 43RD AVENUE
AH5710'(CLEMAN AVENUE) , 23.0 FT.  (7.0 M) NORTH OF THE APPROXIMATE
AH5710'CENTERLINE OF 49TH STREET (LINDSEY ROAD) AND 1.0 FT.  (0.3 M) SOUTH OF
AH5710'A CARSONITE WITNESS POST.  NOTE-SET PK NAIL AND DISK, GCY, INC. LB
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AH5710'4108, IN NORTH EDGE OF PAVEMENT OF 49TH STREET (LINDSEY ROAD) WITH A
AH5710'MAGNETIC AZIMUTH OF 126 DEGREES AT A DISTANCE OF 19.48 FT. (5.94 M)
AH5710'SET PK NAIL AND DISK, GCY, INC.  LB 4108, IN NORTH EDGE OF PAVEMENT
AH5710'49TH STREET (LINDSEY ROAD) WITH A MAGNETIC AZIMUTH OF 187 DEGREES AT A
AH5710'DISTANCE OF 9.81 FT.  (2.99 M) SET PK NAIL AND DISK, GCY, INC.  LB
AH5710'4108, IN NORTH EDGE OF PAVEMENT OF 49TH STREET (LINDSEY ROAD) WITH A
AH5710'MAGNETIC AZIMUTH OF 248 DEGREES AT A DISTANCE OF 19.33 FT.  (5.89 M) .
AH5710
AH5710                          STATION RECOVERY (2004)
AH5710
AH5710'RECOVERY NOTE BY CREECH ENGINEERS INC 2004 (SAL)
AH5710'RECOVERY NOTE BY CREECH ENGINEERS, INC. 2004 (DTB) RECOVERED AS
AH5710'DESCRIBED.  ORIGINAL REFERENCE TIES NOT FOUND, NEW TIES ARE TO FOLLOW.
AH5710'REFERENCES-- SET MAG NAIL AND DISK ---REF. PT. LB 6705--- IN SOUTH
AH5710'FACE OF WOOD POWER POLE ON A MAGNETIC AZIMUTH OF 82 DEGREES AT 55.25
AH5710'FT (16.84 M). SET MAG NAIL AND DISK ---REF. PT. LB 6705--- ON THE
AH5710'NORTH EDGE OF PAVEMENT OF 49TH ST. ON A MAGNETIC AZIMUTH OF 124
AH5710'DEGREES AT 17.21 FT (5.25 M). SET MAG NAIL AND DISK ---REF. PT. LB
AH5710'6705--- ON THE NORTH EDGE OF PAVEMENT OF 49TH ST. ON A MAGNETIC
AH5710'AZIMUTH OF 242 DEGREES AT 15.63 FT (4.76 M). SET MAG NAIL AND DISK
AH5710'---REF. PT. LB 6705--- IN THE SOUTHEAST FACE OF A 6 INCH FENCE POST ON
AH5710'A MAGNETIC AZIMUTH OF 310 DEGREES AT 19.75 FT (6.02 M).
AH5710
AH5710                          STATION RECOVERY (2005)
AH5710
AH5710'RECOVERY NOTE BY FL DEPT OF ENV PRO 2005 (JLM)
AH5710'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:00
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The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

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DATABASE =  ,PROGRAM = datasheet, VERSION = 7.61
1        National Geodetic Survey,   Retrieval Date = OCTOBER 17, 2008
 AA5789 ***********************************************************************
 AA5789  DESIGNATION -  GPS 12
 AA5789  PID         -  AA5789
 AA5789  STATE/COUNTY-  FL/INDIAN RIVER
 AA5789  USGS QUAD   -  NORTH OF GUM SLOUGH (1953)
 AA5789
 AA5789                        *CURRENT SURVEY CONTROL
 AA5789  ______________________________________________________________________
 AA5789* NAD 83(2007)-  27 38 24.43307(N)    080 40 43.29739(W)     ADJUSTED
 AA5789* NAVD 88     -        10.250  (meters)      33.63   (feet)  ADJUSTED
 AA5789  ______________________________________________________________________
 AA5789  EPOCH DATE  -        2002.00
 AA5789  X           -     915,834.176 (meters)                     COMP
 AA5789  Y           -  -5,579,654.889 (meters)                     COMP
 AA5789  Z           -   2,941,226.350 (meters)                     COMP
 AA5789  LAPLACE CORR-          -2.12  (seconds)                    DEFLEC99
 AA5789  ELLIP HEIGHT-         -16.929 (meters)          (02/10/07) ADJUSTED
 AA5789  GEOID HEIGHT-         -27.24  (meters)                     GEOID03
 AA5789  DYNAMIC HT  -          10.234 (meters)      33.58  (feet)  COMP
 AA5789
 AA5789  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AA5789  Type    PID    Designation                      North   East  Ellip
 AA5789  ----------------------------------------------------------------
 AA5789  NETWORK AA5789 GPS 12                            0.53   0.45   1.06
 AA5789  ----------------------------------------------------------------
 AA5789  MODELED GRAV-     979,146.1   (mgal)                      NAVD 88
 AA5789
 AA5789  VERT ORDER  -  FIRST     CLASS II
 AA5789
 AA5789.The horizontal coordinates were established by GPS observations
 AA5789.and adjusted by the National Geodetic Survey in February 2007.
 AA5789
 AA5789.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AA5789.See National Readjustment for more information.
 AA5789.The horizontal coordinates are valid at the epoch date displayed above.
 AA5789.The epoch date for horizontal control is a decimal equivalence
 AA5789.of Year/Month/Day.
 AA5789
 AA5789.The orthometric height was determined by differential leveling
 AA5789.and adjusted in May 2008.
 AA5789
 AA5789.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AA5789
 AA5789.The Laplace correction was computed from DEFLEC99 derived deflections.
 AA5789
 AA5789.The ellipsoidal height was determined by GPS observations
 AA5789.and is referenced to NAD 83.
 AA5789
 AA5789.The geoid height was determined by GEOID03.
 AA5789
 AA5789.The dynamic height is computed by dividing the NAVD 88
 AA5789.geopotential number by the normal gravity value computed on the
 AA5789.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 AA5789.degrees latitude (g = 980.6199 gals.).
 AA5789
 AA5789.The modeled gravity was interpolated from observed gravity values.
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AA5789
AA5789;                    North         East      Units Scale Factor Converg.
AA5789;SPC FL E     -   366,371.946   231,706.890   MT  0.99995358   +0 08 56.6
AA5789;SPC FL E     - 1,202,005.29    760,191.69    sFT  0.99995358   +0 08 56.6
AA5789;UTM  17      - 3,057,378.923   531,696.072   MT  0.99961240   +0 08 56.6
AA5789
AA5789!             -  Elev Factor  x  Scale Factor =   Combined Factor
AA5789!SPC FL E     -   1.00000266  x   0.99995358  =   0.99995624
AA5789!UTM  17      -   1.00000266  x   0.99961240  =   0.99961506
AA5789
AA5789:                Primary Azimuth Mark                     Grid Az
AA5789:SPC FL E     -  GPS 11                                   271 52 53.9
AA5789:UTM  17      -  GPS 11                                   271 52 53.9
AA5789
AA5789|---------------------------------------------------------------------|
AA5789| PID    Reference Object                    Distance      Geod. Az   |
AA5789|                                                          dddmmss.s  |
AA5789| AA5788 GPS 11                           APPROX. 0.8 KM 2720150.5  |
AA5789|---------------------------------------------------------------------|
AA5789
AA5789                          SUPERSEDED SURVEY CONTROL
AA5789
AA5789  NAD 83(1999)-  27 38 24.43310(N)    080 40 43.29773(W) AD(       ) 1
AA5789  ELLIP H (06/19/01)  -16.909  (m)                       GP(       ) 4 1
AA5789  NAD 83(1990)-  27 38 24.43214(N)    080 40 43.29782(W) AD(       ) 1
AA5789  ELLIP H (06/26/95)  -16.870  (m)                       GP(       ) 3 1
AA5789  NAVD 88 (02/19/98)   10.328  (m)           33.88   (f) UNKNOWN     2 1
AA5789
AA5789.Superseded values are not recommended for survey control.
AA5789.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AA5789.See file dsdata.txt to determine how the superseded data were derived.
AA5789
AA5789_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNL3169657379(NAD 83)
AA5789_MARKER: DD = SURVEY DISK
AA5789_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
AA5789_STAMPING: GPS 12
AA5789_MARK LOGO: FL-061
AA5789_PROJECTION: RECESSED 18 CENTIMETERS
AA5789_MAGNETIC: M = MARKER EQUIPPED WITH BAR MAGNET
AA5789_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AA5789+STABILITY: SURFACE MOTION
AA5789_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AA5789+SATELLITE: SATELLITE OBSERVATIONS - March 03, 2007
AA5789
AA5789  HISTORY     - Date     Condition        Report By
AA5789  HISTORY     - 1994     MONUMENTED       GCYI
AA5789  HISTORY     - 19941101 GOOD             FLDEP
AA5789  HISTORY     - 20060410 GOOD             INDIV
AA5789  HISTORY     - 20070303 GOOD             FLDEP
AA5789
AA5789                          STATION DESCRIPTION
AA5789
AA5789'DESCRIBED BY G.C.Y., INCORPORATED 1994 (MRL)
AA5789'THE STATION IS ABOUT 17.2 MI (27.7 KM) WEST OF VERO BEACH, 10.0 MI
AA5789'(16.1 KM) SOUTHWEST OF FELLSMERE, 9.4 MI (15.1 KM) SOUTHEAST OF YEEHAW
AA5789'JUNCTION IN SECTION 6, TOWNSHIP 33 SOUTH, RANGE 37 EAST.
AA5789'
AA5789'TO REACH THE STATION FROM THE INTERSECTION OF COUNTY ROAD 512
AA5789'(FELLSMERE ROAD) AND STATE ROAD 60 SOUTH OF FELLSMERE, GO WEST ON
AA5789'STATE ROAD 60 FOR ABOUT 2.0 MI (3.2 KM) TO THE JUNCTION OF A DIRT ROAD
AA5789'ON THE LEFT, (LEVEE ENTRANCE ROAD TO THE ST. JOHNS WATER MANAGEMENT
AA5789'DISTRICT), ON THE WEST SIDE OF THE BRIDGE, TURN LEFT ON THE DIRT ROAD
AA5789'AND GO SOUTH FOR ABOUT 0.05 MI (0.08 KM) TO THE STATION ON THE LEFT,
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AA5789'SET IN THE TOP OF A CONCRETE MONUMENT.
AA5789'
AA5789'LOCATED 25.0 FT (7.6 M) EAST OF THE EAST EDGE OF THE DIRT ROAD AND 3.0
AA5789'FT (0.9 M) WEST OF A CARSONITE WITNESS POST.
AA5789'
AA5789'NOTE   SET P.K. NAIL AND DISK, PCP LB4108 IN THE EAST SIDE OF 0.70 FT
AA5789'(0.21 M) GATE POST ON THE EAST SIDE OF THE DIRT ROAD WITH A MAGNETIC
AA5789'AZIMUTH OF 354 DEGREES AT A DISTANCE OF 154.86 FT (47.20 M) , SET 3/4
AA5789'INCH IRON PIPE AND CAP, GCY, INC. LB4108 ON TOP OF THE LEVEE WITH A
AA5789'MAGNETIC AZIMUTH OF 172 DEGREES AT A DISTANCE OF 44.38 FT (13.53 M) ,
AA5789'SET 3/4 INCH IRON PIPE AND CAP, GCY, INC. LB4108, 10.0 FT (3.0 M) WEST
AA5789'OF THE WEST EDGE OF THE DIRT ROAD AND 15.0 FT (4.6 M) SOUTH OF THE
AA5789'SOUTH EDGE OF A DIRT ROAD RUNNING WEST WITH A MAGNETIC AZIMUTH OF 300
AA5789'DEGREES AT A DISTANCE OF 52.29 FT (15.94 M) .
AA5789
AA5789                          STATION RECOVERY (1994)
AA5789
AA5789'RECOVERY NOTE BY FL DEPT OF ENV PRO 1994 (PBM)
AA5789'THE STATION IS ABOUT 17.5 MI (28.2 KM) WEST OF VERO BEACH ON STATE
AA5789'ROAD 60 AT THE BEGINNING OF LEVEE 78 ON THE SOUTH SIDE OF STATE ROAD
AA5789'60 IN SECTION 6, TOWNSHIP 33 SOUTH, RANGE 37 EAST. TO REACH THE
AA5789'STATION FROM THE JUNCTION OF U.S. HIGHWAY 1 AND STATE ROAD 60 IN VERO
AA5789'BEACH, GO WEST ON STATE ROAD 60 FOR 15.45 MI (24.86 KM) TO THE
AA5789'JUNCTION OF COUNTY ROAD 512 ON THE RIGHT, CONTINUE WEST ON STATE ROAD
AA5789'60 FOR 2.15 MI (3.46 KM) TO A DIRT ROAD ON THE LEFT (THE ENTRANCE TO
AA5789'LEVEE 78 AND LEVEE 79), TURN LEFT ON THE DIRT ROAD AND GO SOUTH ON THE
AA5789'LEVEES (PASSING THROUGH A LOCKED GATE) FOR ABOUT 260.0 FT (79.2 M) TO
AA5789'THE STATION ON THE LEFT, SET IN THE TOP OF A ROUND CONCRETE MONUMENT
AA5789'RECESSED 0.7 FT (21.3 CM) BELOW THE LEVEL OF THE GROUND. LOCATED 0.05
AA5789'MI (0.08 KM) SOUTHWEST OF THE BRIDGE OVER CANAL 5, ABOUT 260.0 FT
AA5789'(79.2 M) SOUTH OF THE CENTERLINE OF STATE ROAD 60, 156.0 FT (47.5 M)
AA5789'SOUTH-SOUTHEAST OF A METAL GATE, 53.2 FT (16.2 M) SOUTHEAST OF A
AA5789'CARSONITE WITNESS POST, 44.6 FT (13.6 M) NORTH OF A CARSONITE WITNESS
AA5789'POST, ABOUT 30.0 FT (9.1 M) EAST OF THE CENTERLINE OF THE LEVEE ROAD
AA5789'AND 3.0 FT (0.9 M) WEST OF A CARSONITE WITNESS POST. NOTE FOR KEY
AA5789'CONTACT TOMMY WALTERS, ST.  JOHNS WATER MANAGEMENT DISTRICT, PALATKA,
AA5789'FL.  PHONE NUMBER (904) 329-4277.
AA5789
AA5789                          STATION RECOVERY (2006)
AA5789
AA5789'RECOVERY NOTE BY INDIVIDUAL CONTRIBUTORS 2006 (KB)
AA5789'RECOVERED IN GOOD CONDITION.
AA5789
AA5789                          STATION RECOVERY (2007)
AA5789
AA5789'RECOVERY NOTE BY FL DEPT OF ENV PRO 2007 (JLM)
AA5789'THE MARK IS ABOUT 17.8 MI WEST OF VERO BEACH, 15.2 MI SOUTHEAST OF
AA5789'YEEHAW JUNCTION, IN  SECTION 1, TOWNSHIP 33 SOUTH, RANGE 36 EAST.
AA5789'
AA5789'TO REACH THE MARK FROM THE INTERSECTION OF U.S. HIGHWAY 441 AND STATE
AA5789'HIGHWAY 60 IN  YEEHAW JUNCTION, GO EAST ON STATE HIGHWAY 60 FOR 0.6 MI
AA5789'TO THE WEST END OF THE BRIDGE  SPANNING THE FLORIDA TURNPIKE, CONTINUE
AA5789'EAST ON STATE HIGHWAY 60 FOR 14.55 MI TO THE  JUNCTION OF A LEVEE ROAD
AA5789'(THE ENTRANCE TO LEVEES 78 AND 79) ON THE RIGHT, TURN RIGHT ON  THE
AA5789'LEVEE ROAD AND GO SOUTH FOR APPROXIMATELY 75.0 FT TO A METAL GATE
AA5789'(PASSING THROUGH  THE GATE), CONTINUE SOUTHEAST FOR 68.0 FT TO THE
AA5789'MARK ON THE LEFT, SET IN THE TOP OF A  ROUND CONCRETE MONUMENT
AA5789'RECESSED 0.7 FT BELOW THE LEVEL OF THE GROUND AND BELOW  THE LEVEL OF
AA5789'STATE HIGHWAY 60.
AA5789'
AA5789'LOCATED 141.0 FT SOUTH OF THE CENTERLINE OF STATE HIGHWAY 60 EASTBOUND
AA5789'LANES, 72.0 FT  NORTH OF THE CENTER OF A METAL GATE, 68.0 FT SOUTHEAST
AA5789'OF A DOUBLE METAL GATE, 7.0 FT  EAST OF THE APPROXIMATE CENTERLINE OF
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AA5789'THE LEVEE ROAD, 1.8 FT WEST OF A CARSONITE  WITNESS POST AND 1.2 FT
AA5789'NORTHWEST OF A 2-INCH PVC PIPE.
AA5789'
AA5789'NOTE A MAGNET WAS EMBEDDED IN THE GROUND ON THE SOUTH SIDE OF THE
AA5789'MONUMENT.

*** retrieval complete.
Elapsed Time = 00:00:01
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APPENDIX B: NEW GROUND CONTROL STATION INFORMATION

This appendix contains the recovery information sheet for the newly established Woolpert GPS control station utilized in the Indian River County Project Area of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

GPS Station Recovery - GPS Log Sheet

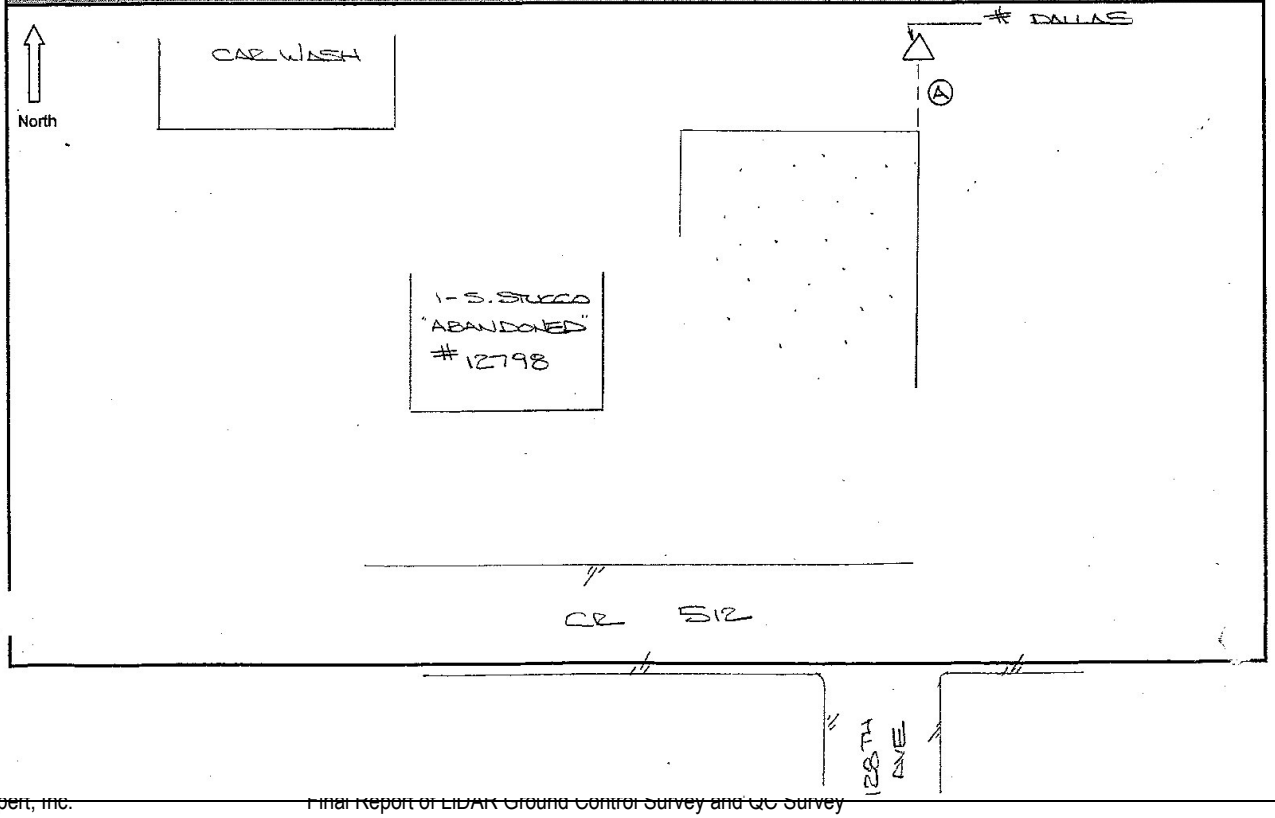
Project Name:	Florida Coastal Mapping Project	Operator Name	S. ROBERTS	Job No.	66517
Station Name:	DALLAS	Date of Survey:	19 NOV 2007	Julian Day	323
		File Name:	INDIANSR1	Session #	BASE
WGS 84 Coordinates		Type of Reciever:	R-8		
Latitude	27-46-05.5	Type of Antenna:	TRIMBLE		
Longitude	80-35-20.4				
Ellip. Height		Antenna Height:	2.000 M	Circle One: USFT / (Meters)	Circle One: (ARP) / Phase Center
Type of Mark:	PIN W/ CAP (S)	Start Time (local):	8:37 AM / 3:48 PM		
Stamping on Mark:	NONE	Weather Condition:	70°± CLOUDY		

To Reach Description: STA. LOCATED @ REAR N.E. COR OF ABANDONED BLDG PROP. #12798. PROP. LOCATED @ CR 512 & 128TH AVE.

Witness Ties:

Reference Object	Distance	Azimuth
1) A- CAP CONC. EXT.	11.5'	
2)		
3)		
4)		

Sketch:



APPENDIX C: FINAL GROUND QA/QC AND GEODETIC CONTROL COORDINATE LISTING

This appendix contains the final coordinate listings for the LiDAR QA/QC Checkpoints, LiDAR Control Points and the geodetic control stations utilized in the Indian River County Project Area of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

INDIAN RIVER COUNTY

HORIZONTAL DATUM: NAD83(1999)
VERTICAL DATUM: NAVD88
UNITS: US SURVEY FEET
STATE PLANE ZONE: FLORIDA EAST 0901
GEOID MODEL: GEOID03
COORDINATE SYSTEM: GRID

****NOTE: ALL ELEVATIONS ARE STATION ELEVATIONS****

STATIONS IN BLUE = CONVENTIONAL SURVEY METHODS
STATIONS IN RED = RAPID STATIC GPS METHODS

LiDAR QA/QC CHECKPOINTS AND LiDAR CONTROL POINTS

GPS Station Name	Grid Northing (US FT)	Grid Easting (US FT)	Station Elevation (US FT)	Y Std. Dev. (US FT)	X Std. Dev. (US FT)	Z Std. Dev. (US FT)	Station Description
500	1248662.20	791378.01	25.25	0.01	0.01	0.03	URBAN
501	1248796.53	791384.90	24.73	0.01	0.01	0.03	LOW GRASS OR BARE EARTH
502	1248906.96	792232.41	24.53	0.01	0.01	0.04	BRUSH
503	1248911.81	792000.37	27.08	0.01	0.01	0.04	LIDAR CONTROL POINT
505	1237724.28	812236.96	20.92	0.01	0.02	0.05	URBAN
506	1237354.56	812487.11	19.51	0.01	0.02	0.05	LOW GRASS OR BARE EARTH
507	1237250.54	812523.36	19.00	0.01	0.02	0.05	BRUSH
508	1237685.47	812289.12	21.98	0.01	0.02	0.05	LIDAR CONTROL POINT
510	1203506.58	819401.93	21.21	0.01	0.02	0.04	URBAN
511	1203514.61	819324.67	20.10	0.01	0.02	0.04	LOW GRASS OR BARE EARTH
512	1203094.05	819481.27	18.88	0.02	0.02	0.05	BRUSH
513	1203128.01	819401.61	21.20	0.02	0.02	0.05	LIDAR CONTROL POINT
515	1192605.27	819308.69	23.97	0.01	0.01	0.04	URBAN
516	1192532.42	819325.00	23.80	0.01	0.02	0.05	LOW GRASS OR BARE EARTH
517	1192691.82	819172.23	23.38	0.01	0.02	0.04	BRUSH
518	1192642.52	819106.61	21.97	0.01	0.02	0.04	LIDAR CONTROL POINT
520	1184872.53	830655.60	20.23	0.02	0.02	0.05	URBAN
521	1178821.78	829933.33	20.21	0.03	0.03	0.07	LOW GRASS OR BARE EARTH
522	1178206.46	829958.02	20.35	0.05	0.02	0.12	BRUSH
523	1185652.80	830659.45	20.11	0.02	0.02	0.04	LIDAR CONTROL POINT
525	1179024.24	849665.95	21.76	0.03	0.03	0.11	URBAN
526	1179018.16	849801.70	21.14	0.06	0.04	0.11	LOW GRASS OR BARE EARTH
527	1179026.66	849585.01	21.58	0.03	0.03	0.09	BRUSH
528	1178995.47	849710.94	23.26	0.04	0.03	0.07	LIDAR CONTROL POINT
530	1199186.90	835057.01	22.02	0.01	0.02	0.04	URBAN
531	1199142.48	835418.20	21.94	0.02	0.02	0.07	LOW GRASS OR BARE EARTH

GPS Station Name	Grid Northing (US FT)	Grid Easting (US FT)	Station Elevation (US FT)	Y Std. Dev. (US FT)	X Std. Dev. (US FT)	Z Std. Dev. (US FT)	Station Description
532	1199263.64	835477.38	21.26	0.01	0.02	0.05	BRUSH
533	1199554.41	835139.66	20.73	0.02	0.02	0.05	LIDAR CONTROL POINT
535	1218555.82	837644.87	20.92	0.01	0.01	0.05	URBAN
536	1218728.96	837544.59	21.72	0.01	0.01	0.04	LOW GRASS OR BARE EARTH
537	1218481.68	837513.67	22.01	0.01	0.01	0.04	BRUSH
538	1218624.18	837460.13	20.80	0.01	0.01	0.04	LIDAR CONTROL POINT
540	1245615.45	827307.09	19.90	0.02	0.02	0.04	URBAN
541	1245501.65	826485.77	21.69	0.02	0.02	0.04	LOW GRASS OR BARE EARTH
542	1245412.63	826574.98	21.20	0.01	0.02	0.04	BRUSH
543	1245615.52	827410.01	20.75	0.02	0.02	0.04	LIDAR CONTROL POINT
545	1262912.34	821564.61	19.25	0.01	0.01	0.02	URBAN
546	1262985.94	821526.70	19.75	0.01	0.01	0.02	LOW GRASS OR BARE EARTH
547	1262890.74	821482.64	21.32	0.01	0.01	0.02	BRUSH
548	1262948.89	821439.71	19.16	0.01	0.01	0.02	LIDAR CONTROL POINT
550	1283672.34	833884.60	5.19	0.02	0.01	0.05	URBAN
551	1283732.80	834012.92	9.31	0.02	0.01	0.05	LOW GRASS OR BARE EARTH
552	1283653.28	834134.72	16.50	0.02	0.01	0.05	BRUSH
553	1283396.59	834011.04	4.69	0.02	0.01	0.05	LIDAR CONTROL POINT
555	1254150.81	847847.46	8.68	0.02	0.02	0.05	URBAN
556	1254154.04	847778.21	8.62	0.02	0.02	0.05	LOW GRASS OR BARE EARTH
557	1247036.20	851171.57	14.14	0.04	0.03	0.07	BRUSH
558	1254026.67	847887.91	8.43	0.02	0.02	0.05	LIDAR CONTROL POINT
560	1236462.16	855893.05	10.83	0.02	0.02	0.07	URBAN
561	1236586.06	855550.29	8.68	0.02	0.02	0.07	LOW GRASS OR BARE EARTH
562	1236373.48	856279.09	14.49	0.02	0.02	0.06	BRUSH
563	1236465.08	855669.30	9.53	0.02	0.02	0.06	LIDAR CONTROL POINT
565	1209717.15	854977.27	7.22	0.02	0.02	0.05	URBAN
566	1209827.90	854762.52	2.68	0.02	0.02	0.05	LOW GRASS OR BARE EARTH
567	1209809.77	854702.10	5.07	0.02	0.02	0.04	BRUSH
568	1209724.30	854887.56	4.97	0.02	0.02	0.04	LIDAR CONTROL POINT
570	1185454.02	871359.81	4.82	0.03	0.02	0.12	URBAN
571	1185603.37	871814.87	4.69	0.06	0.03	0.14	LOW GRASS OR BARE EARTH
572	1183832.30	872948.35	9.63	0.05	0.03	0.08	BRUSH
573	1185147.05	870480.52	5.64	0.03	0.03	0.10	LIDAR CONTROL POINT
6900	1209910.15	854590.62	0.92	N/A	N/A	N/A	FORESTED
6901	1209837.25	854591.16	1.18	N/A	N/A	N/A	FORESTED
6902	1209776.56	854607.90	0.89	N/A	N/A	N/A	FORESTED
6903	1283744.89	833800.44	2.64	N/A	N/A	N/A	FORESTED
6904	1283740.46	833859.11	3.97	N/A	N/A	N/A	FORESTED
6905	1283712.21	833912.13	5.09	N/A	N/A	N/A	FORESTED
6906	1237608.36	812275.56	19.63	N/A	N/A	N/A	FORESTED

GPS Station Name	Grid Northing (US FT)	Grid Easting (US FT)	Station Elevation (US FT)	Y Std. Dev. (US FT)	X Std. Dev. (US FT)	Z Std. Dev. (US FT)	Station Description
6907	1237615.98	812320.79	20.72	N/A	N/A	N/A	FORESTED
6908	1237808.98	812341.09	19.14	N/A	N/A	N/A	FORESTED
6909	1248922.80	791413.57	24.91	N/A	N/A	N/A	FORESTED
6910	1248910.77	791251.44	24.73	N/A	N/A	N/A	FORESTED
6911	1248769.15	791231.68	24.97	N/A	N/A	N/A	FORESTED
6912	1203598.38	819077.91	20.36	N/A	N/A	N/A	FORESTED
6913	1203647.88	819247.20	19.89	N/A	N/A	N/A	FORESTED
6914	1203551.85	819183.55	20.97	N/A	N/A	N/A	FORESTED
6915	1192590.10	819458.88	20.36	N/A	N/A	N/A	FORESTED
6916	1192660.58	819463.00	21.16	N/A	N/A	N/A	FORESTED
6917	1192787.44	819433.01	21.27	N/A	N/A	N/A	FORESTED
6914a	1203373.30	819296.86	21.15	N/A	N/A	N/A	FORESTED
IRX01	1190402.85	802960.17	22.04	0.01	0.01	0.03	LOW GRASS OR BARE EARTH
IRX02	1188078.58	800795.17	23.46	0.01	0.01	0.03	BRUSH
IRX03	1194036.47	801835.04	22.36	0.01	0.01	0.03	LOW GRASS OR BARE EARTH
IRX04LC	1201818.86	803719.73	25.99	0.01	0.01	0.03	LIDAR CONTROL POINT
IRX06LC	1229400.61	818921.61	22.51	0.02	0.02	0.05	LIDAR CONTROL POINT
IRX10	1213391.01	808052.26	29.08	0.02	0.02	0.04	BRUSH
IRX11	1217881.40	806780.17	42.29	0.01	0.01	0.03	LIDAR CONTROL POINT
IRX12	1207854.86	819486.13	20.96	0.01	0.01	0.03	LOW GRASS OR BARE EARTH
IRX14	1206946.55	819463.58	21.79	0.01	0.01	0.03	URBAN
IRX20	1183314.55	804863.12	22.33	0.02	0.01	0.03	LOW GRASS OR BARE EARTH
IRX21	1183269.05	805485.46	23.40	0.01	0.01	0.04	LOW GRASS OR BARE EARTH
IRX23	1182203.87	803337.73	22.48	0.01	0.01	0.03	BRUSH
IRX24	1182130.61	803374.03	24.37	0.01	0.01	0.03	LIDAR CONTROL POINT
IRX25	1229246.56	815559.11	20.53	0.02	0.02	0.03	LOW GRASS OR BARE EARTH
IRX26	1229163.40	819554.97	21.26	0.02	0.02	0.03	LOW GRASS OR BARE EARTH
IRX27	1228951.02	819426.42	21.29	0.02	0.02	0.03	BRUSH

EXISTING NGS CONTROL STATIONS:

GPS Station Name	Grid Northing (US FT)	Grid Easting (US FT)	Station Elevation (US FT)	Y Std. Dev. (US FT)	X Std. Dev. (US FT)	Z Std. Dev. (US FT)	Station Description
SEBAPORT	1263809.09	818209.21	18.00	0.00	0.00	0.00	NGS CONTROL STATION
GPS 117	1217723.43	840754.42	20.82	0.00	0.00	0.00	NGS CONTROL STATION
GPS 12	1202005.39	760191.79	33.46	0.01	0.01	0.05	NGS CONTROL STATION
GPS 44	1178069.28	824559.25	23.17	0.00	0.00	0.00	NGS CONTROL STATION

NEW WOOLPERT CONTROL STATIONS:

GPS Station Name	Grid Northing (US FT)	Grid Easting (US FT)	Station Elevation (US FT)	Y Std. Dev. (US FT)	X Std. Dev. (US FT)	Z Std. Dev. (US FT)	Station Description
DALLAS	1248672.42	789104.64	25.43	0.00	0.00	0.00	WOOLPERT IPC - CONTROL

APPENDIX D: POSITIONAL ACCURACIES

This appendix contains the final positional accuracies for the LiDAR QA/QC Checkpoints (except the forest points) and the LiDAR Control Points for the Indian River County Project Area of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

QA/QA POINTS (NO FOREST POINTS)

METERS

CALCULATED ACCURACY:

0.01	Meters RMSEx
0.01	Meters RMSEy
0.01	Meters RMSExy
0.02	Meters at 95% C.I.
0.02	RMSEz
0.03	Meters at 95% C.I.

US FEET

CALCULATED ACCURACY:

0.02	Feet RMSEx
0.02	Feet RMSEy
0.03	Feet RMSExy
0.05	Feet at 95% C.I.
0.06	RMSEz
0.11	Feet at 95% C.I.

STATION	Vx	Vy	Vxy	Vz
500	0.004	0.003	0.005	0.010
501	0.004	0.003	0.005	0.010
502	0.003	0.003	0.004	0.011
505	0.005	0.004	0.007	0.015
506	0.005	0.004	0.006	0.014
507	0.005	0.004	0.007	0.014
510	0.005	0.004	0.007	0.013
511	0.005	0.004	0.007	0.013
512	0.007	0.006	0.009	0.016
515	0.004	0.003	0.005	0.013
516	0.005	0.004	0.006	0.016
517	0.005	0.004	0.006	0.013
520	0.007	0.006	0.009	0.016
521	0.008	0.009	0.012	0.023
522	0.007	0.014	0.016	0.037
525	0.008	0.010	0.013	0.033
526	0.013	0.018	0.022	0.033
527	0.009	0.010	0.013	0.028
530	0.005	0.004	0.006	0.012
531	0.006	0.005	0.008	0.022
532	0.006	0.005	0.007	0.016
535	0.004	0.004	0.006	0.014
536	0.004	0.003	0.005	0.013
537	0.004	0.003	0.005	0.014
540	0.005	0.005	0.007	0.012
541	0.005	0.005	0.007	0.011
542	0.005	0.005	0.007	0.011
545	0.003	0.003	0.004	0.007
546	0.003	0.003	0.004	0.007
547	0.003	0.003	0.004	0.008

STATION	Vx	Vy	Vxy	Vz
500	0.01	0.01	0.02	0.03
501	0.01	0.01	0.02	0.03
502	0.01	0.01	0.01	0.04
505	0.02	0.01	0.02	0.05
506	0.02	0.01	0.02	0.05
507	0.02	0.01	0.02	0.05
510	0.02	0.01	0.02	0.04
511	0.02	0.01	0.02	0.04
512	0.02	0.02	0.03	0.05
515	0.01	0.01	0.02	0.04
516	0.02	0.01	0.02	0.05
517	0.02	0.01	0.02	0.04
520	0.02	0.02	0.03	0.05
521	0.03	0.03	0.04	0.07
522	0.02	0.05	0.05	0.12
525	0.03	0.03	0.04	0.11
526	0.04	0.06	0.07	0.11
527	0.03	0.03	0.04	0.09
530	0.02	0.01	0.02	0.04
531	0.02	0.02	0.03	0.07
532	0.02	0.01	0.02	0.05
535	0.01	0.01	0.02	0.05
536	0.01	0.01	0.02	0.04
537	0.01	0.01	0.02	0.04
540	0.02	0.02	0.02	0.04
541	0.02	0.02	0.02	0.04
542	0.02	0.01	0.02	0.04
545	0.01	0.01	0.01	0.02
546	0.01	0.01	0.01	0.02
547	0.01	0.01	0.01	0.02

STATION	Vx	Vy	Vxy	Vz
550	0.004	0.006	0.007	0.017
551	0.004	0.006	0.007	0.016
552	0.004	0.006	0.007	0.016
555	0.006	0.007	0.009	0.016
556	0.006	0.007	0.009	0.016
557	0.009	0.012	0.015	0.022
560	0.005	0.006	0.008	0.021
561	0.005	0.006	0.008	0.021
562	0.005	0.006	0.007	0.020
565	0.005	0.007	0.009	0.014
566	0.005	0.007	0.009	0.014
567	0.005	0.007	0.008	0.013
570	0.008	0.009	0.012	0.036
571	0.009	0.018	0.020	0.044
572	0.010	0.015	0.018	0.023
IRX01	0.004	0.004	0.006	0.010
IRX02	0.004	0.004	0.006	0.010
IRX03	0.004	0.004	0.006	0.009
IRX10	0.005	0.005	0.007	0.013
IRX12	0.004	0.004	0.006	0.008
IRX14	0.004	0.004	0.006	0.008
IRX20	0.004	0.005	0.006	0.010
IRX21	0.004	0.004	0.006	0.011
IRX23	0.004	0.004	0.006	0.010
IRX25	0.005	0.005	0.006	0.009
IRX26	0.005	0.005	0.006	0.010
IRX27	0.005	0.005	0.007	0.010
SUMSQ	**0.00**	**0.00**	**0.00**	**0.02**
COUNT	**57.00**	**57.00**	**57.00**	**57.00**
AVG. ERROR	**0.01**	**0.01**	**0.01**	**0.02**
MAX. ERROR	**0.01**	**0.02**	**0.02**	**0.04**
MIN. ERROR	**0.00**	**0.00**	**0.00**	**0.01**
RMSE	**0.01**	**0.01**	**0.01**	**0.02**

STATION	Vx	Vy	Vxy	Vz
550	0.01	0.02	0.02	0.05
551	0.01	0.02	0.02	0.05
552	0.01	0.02	0.02	0.05
555	0.02	0.02	0.03	0.05
556	0.02	0.02	0.03	0.05
557	0.03	0.04	0.05	0.07
560	0.02	0.02	0.03	0.07
561	0.02	0.02	0.03	0.07
562	0.02	0.02	0.02	0.06
565	0.02	0.02	0.03	0.05
566	0.02	0.02	0.03	0.05
567	0.02	0.02	0.03	0.04
570	0.02	0.03	0.04	0.12
571	0.03	0.06	0.07	0.14
572	0.03	0.05	0.06	0.08
IRX01	0.01	0.01	0.02	0.03
IRX02	0.01	0.01	0.02	0.03
IRX03	0.01	0.01	0.02	0.03
IRX10	0.02	0.02	0.02	0.04
IRX12	0.01	0.01	0.02	0.03
IRX14	0.01	0.01	0.02	0.03
IRX20	0.01	0.02	0.02	0.03
IRX21	0.01	0.01	0.02	0.04
IRX23	0.01	0.01	0.02	0.03
IRX25	0.02	0.02	0.02	0.03
IRX26	0.02	0.02	0.02	0.03
IRX27	0.02	0.02	0.02	0.03
SUMSQ	**0.02**	**0.03**	**0.05**	**0.19**
COUNT	**57.00**	**57.00**	**57.00**	**57.00**
AVG. ERROR	**0.02**	**0.02**	**0.03**	**0.05**
MAX. ERROR	**0.04**	**0.06**	**0.07**	**0.14**
MIN. ERROR	**0.01**	**0.01**	**0.01**	**0.02**
RMSE	**0.02**	**0.02**	**0.03**	**0.06**

LiDAR CONTROL POINTS ONLY

METERS

CALCULATED ACCURACY:

0.01	Meters RMSEx
0.01	Meters RMSEy
0.01	Meters RMSExy
0.01	Meters at 95% C.I.
0.02	RMSEz
0.03	Meters at 95% C.I.

STATION	Vx	Vy	Vxy	Vz
503	0.003	0.003	0.004	0.011
508	0.006	0.004	0.007	0.016
513	0.006	0.005	0.007	0.014
518	0.005	0.004	0.006	0.013
523	0.006	0.006	0.008	0.013
528	0.008	0.011	0.013	0.021
533	0.006	0.005	0.008	0.015
538	0.004	0.004	0.006	0.014
543	0.005	0.005	0.007	0.011
548	0.003	0.003	0.004	0.007
553	0.004	0.006	0.007	0.016
558	0.006	0.007	0.009	0.015
563	0.005	0.006	0.007	0.020
568	0.005	0.007	0.008	0.013
573	0.010	0.010	0.014	0.030
IRX04LC	0.004	0.004	0.006	0.009
IRX06LC	0.006	0.006	0.008	0.014
IRX11	0.004	0.004	0.006	0.010
IRX24	0.004	0.004	0.006	0.010
SUMSQ	**0.00**	**0.00**	**0.00**	**0.00**
COUNT	**19.00**	**19.00**	**19.00**	**19.00**
AVG. ERROR	**0.01**	**0.01**	**0.01**	**0.01**
MAX. ERROR	**0.01**	**0.01**	**0.01**	**0.03**
MIN. ERROR	**0.00**	**0.00**	**0.00**	**0.01**
RMSE	**0.01**	**0.01**	**0.01**	**0.02**

US FEET

CALCULATED ACCURACY:

0.02	Feet RMSEx
0.02	Feet RMSEy
0.03	Feet RMSExy
0.04	Feet at 95% C.I.
0.05	RMSEz
0.10	Feet at 95% C.I.

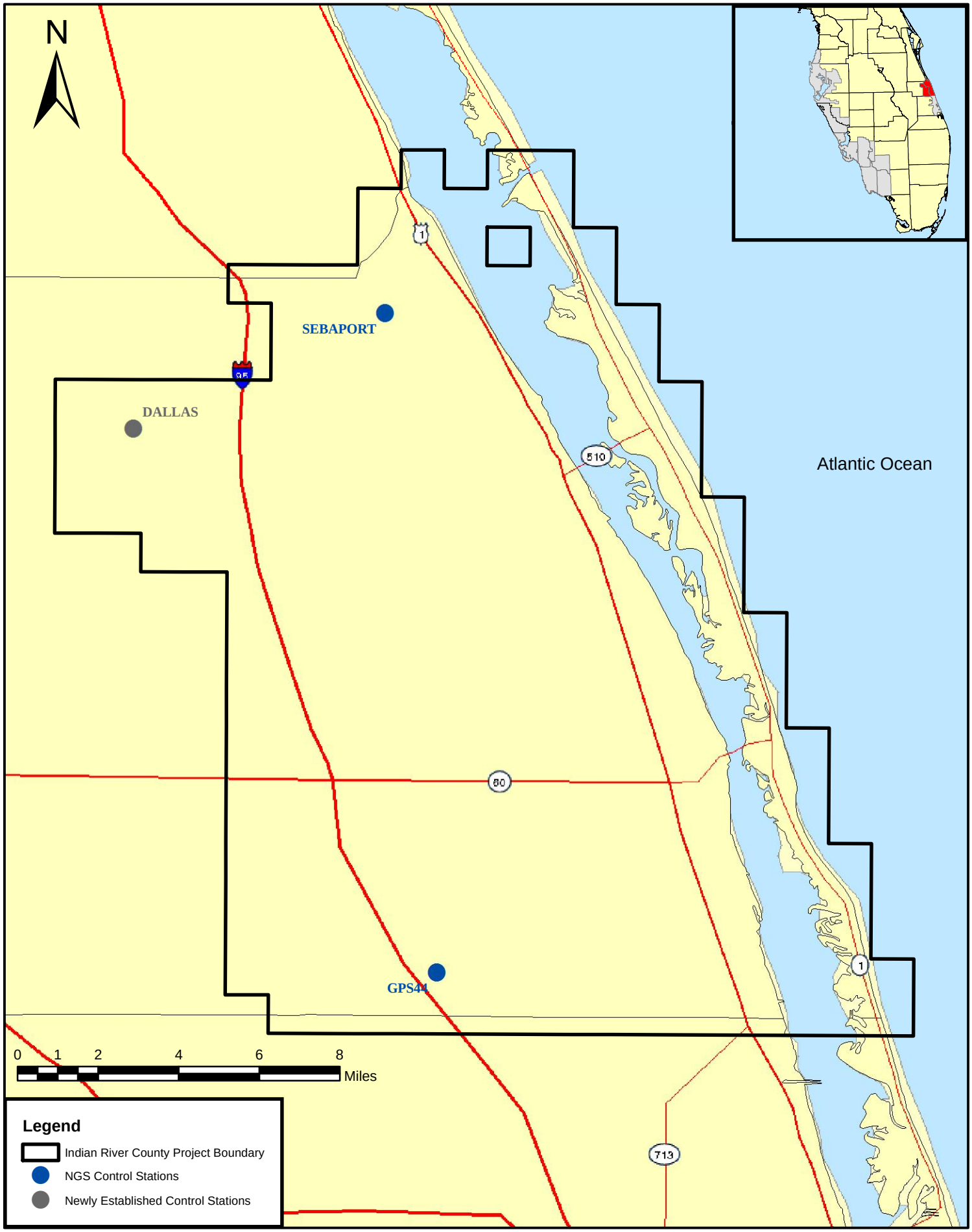
STATION	Vx	Vy	Vxy	Vz
503	0.01	0.01	0.01	0.04
508	0.02	0.01	0.02	0.05
513	0.02	0.02	0.02	0.05
518	0.02	0.01	0.02	0.04
523	0.02	0.02	0.03	0.04
528	0.03	0.04	0.04	0.07
533	0.02	0.02	0.02	0.05
538	0.01	0.01	0.02	0.04
543	0.02	0.02	0.02	0.04
548	0.01	0.01	0.01	0.02
553	0.01	0.02	0.02	0.05
558	0.02	0.02	0.03	0.05
563	0.02	0.02	0.02	0.06
568	0.02	0.02	0.03	0.04
573	0.03	0.03	0.05	0.10
IRX04LC	0.01	0.01	0.02	0.03
IRX06LC	0.02	0.02	0.03	0.05
IRX11	0.01	0.01	0.02	0.03
IRX24	0.01	0.01	0.02	0.03
SUMSQ	**0.01**	**0.01**	**0.01**	**0.05**
COUNT	**19.00**	**19.00**	**19.00**	**19.00**
AVG. ERROR	**0.02**	**0.02**	**0.02**	**0.05**
MAX. ERROR	**0.03**	**0.04**	**0.05**	**0.10**
MIN. ERROR	**0.01**	**0.01**	**0.01**	**0.02**
RMSE	**0.02**	**0.02**	**0.03**	**0.05**

APPENDIX E: LAYOUT MAPS

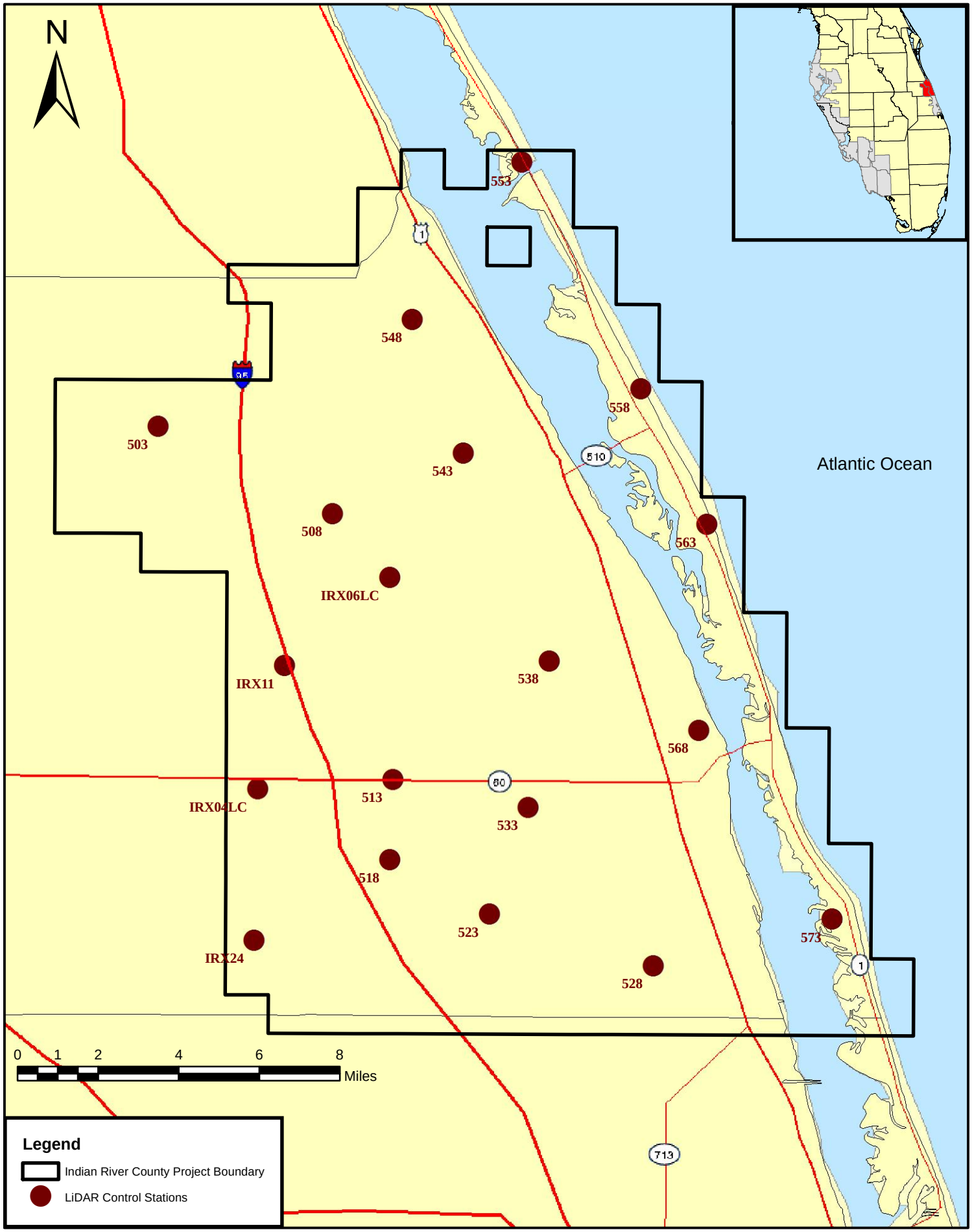
This appendix contains layout maps of the GPS Ground Control Stations, LiDAR Control Points, LiDAR QA/QC Checkpoints (see below) and GPS Network Diagrams for the Indian River County Project Area of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

- GPS Control Stations
- LiDAR Control Points
- Brush Observations
- Forested Observations
- Low Grass or Bare Earth Observations
- Urban Observations
- GPS Network Diagrams

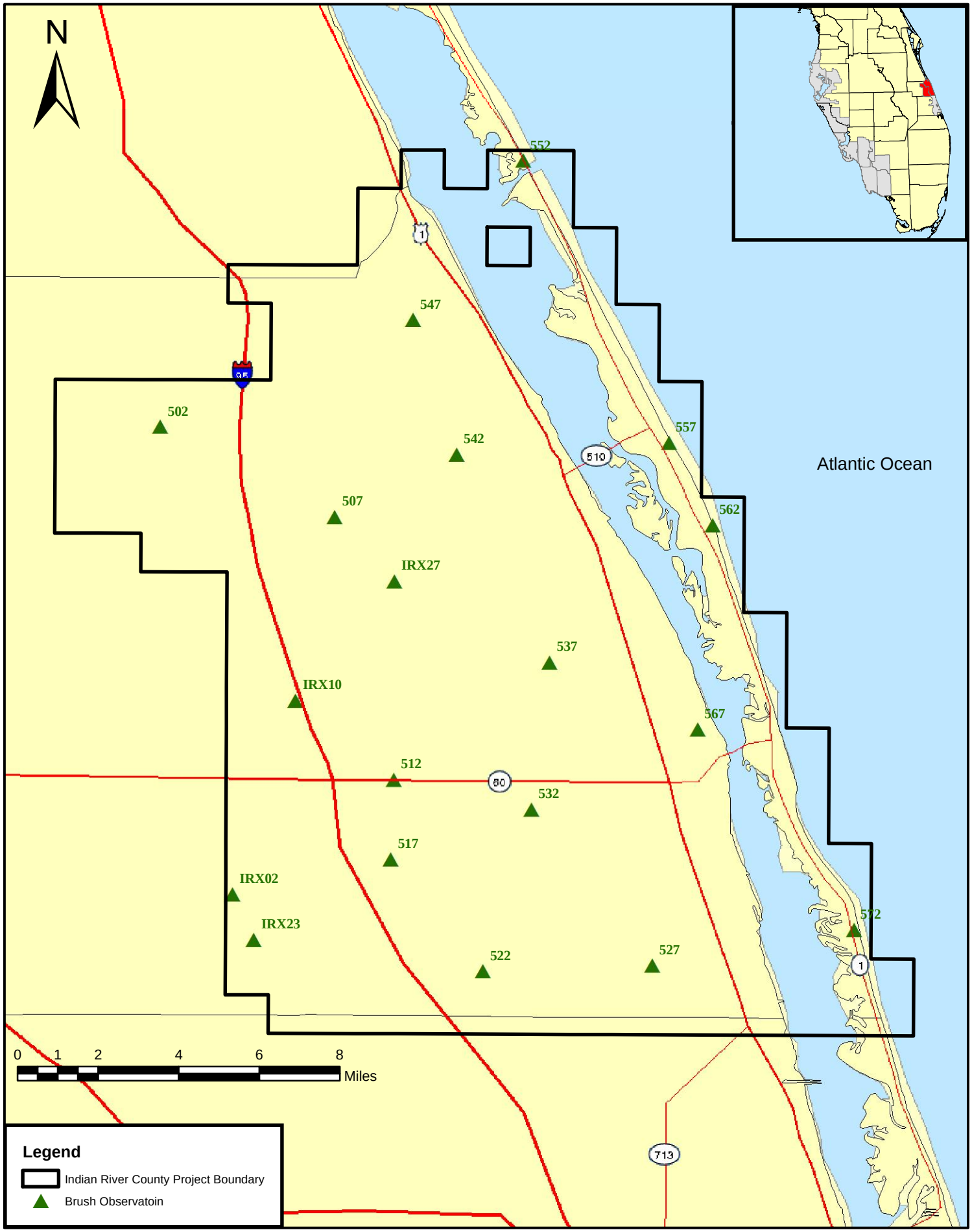
INDIAN RIVER COUNTY - GPS CONTROL STATIONS



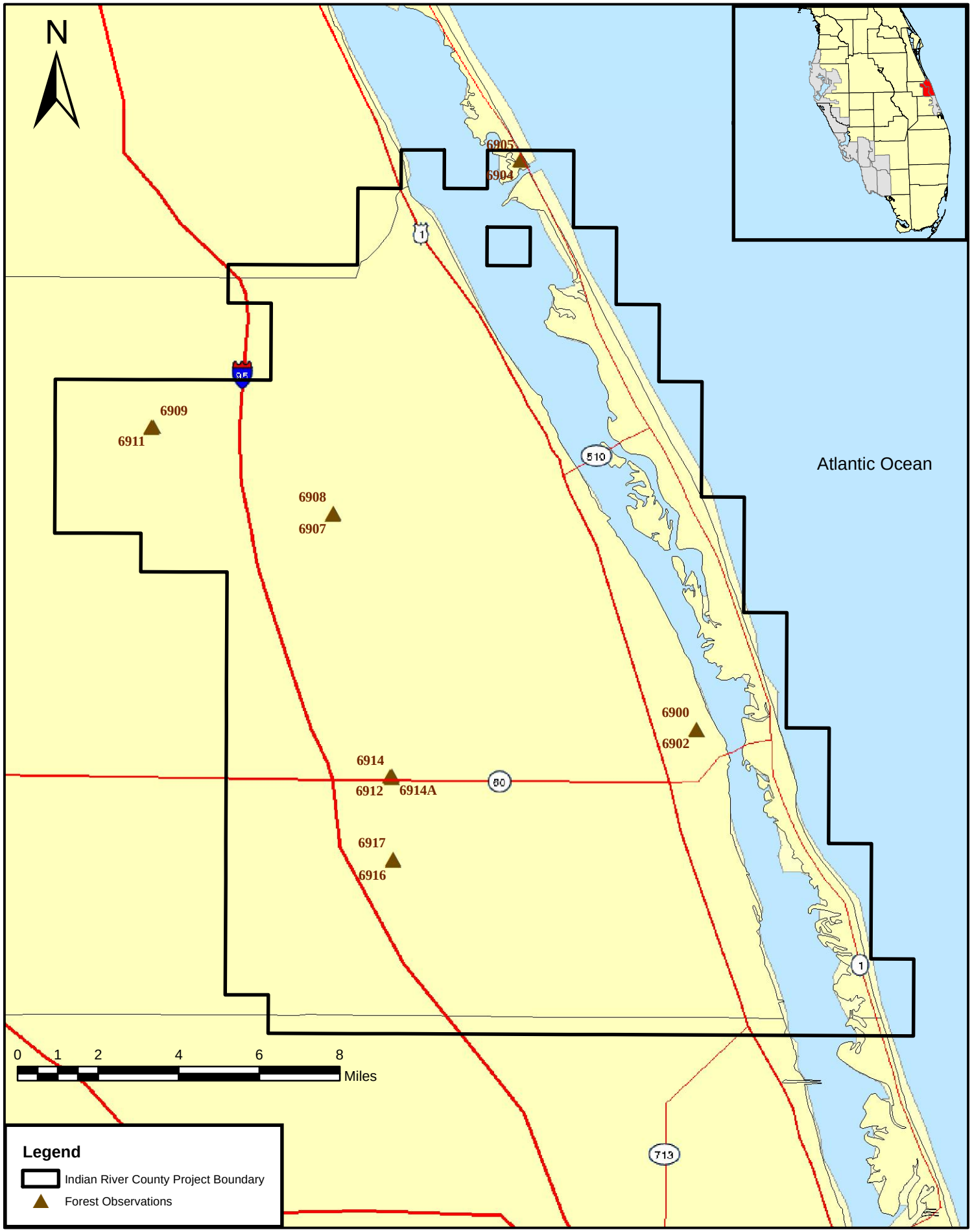
INDIAN RIVER COUNTY - LiDAR CONTROL STATIONS



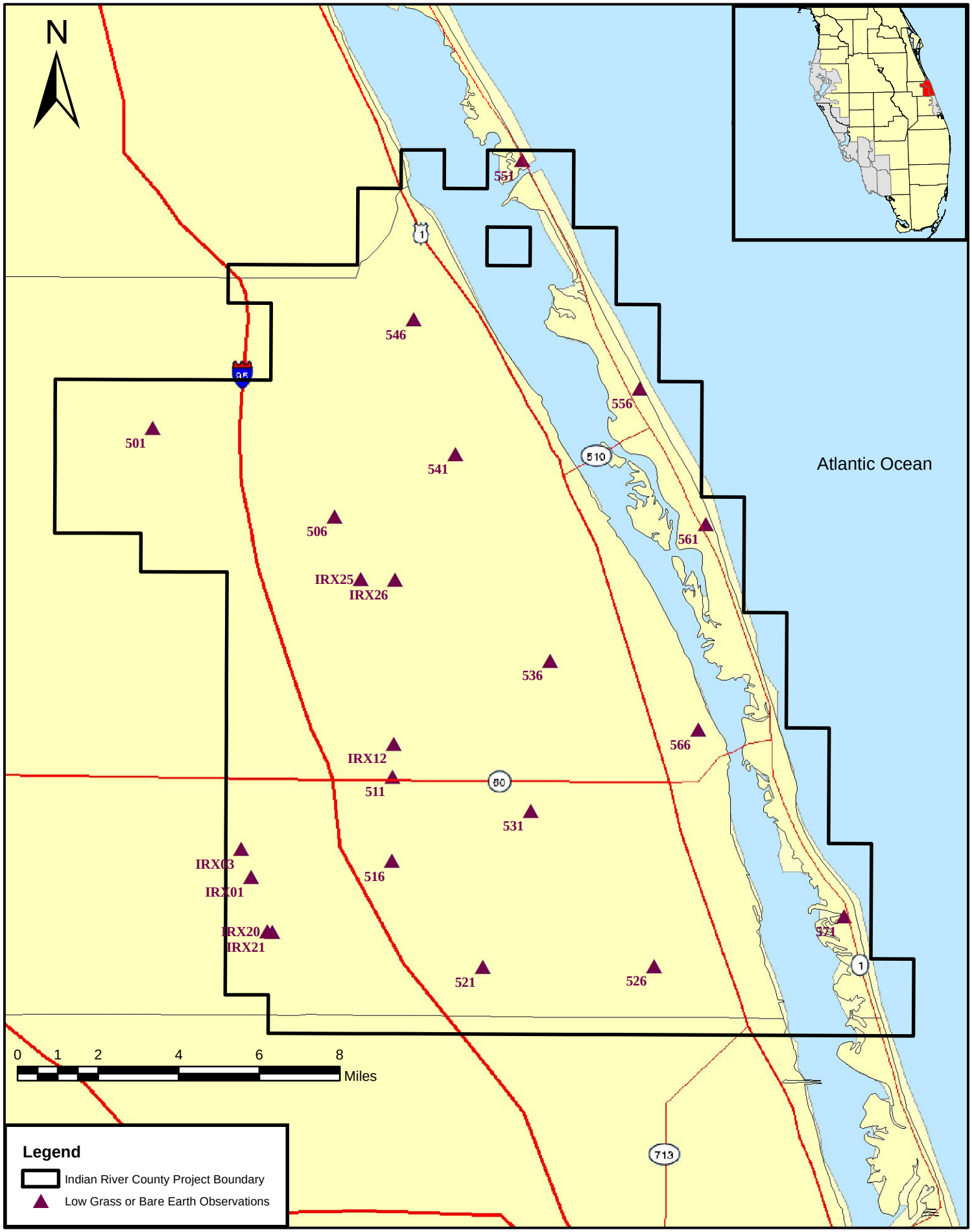
INDIAN RIVER COUNTY - BRUSH



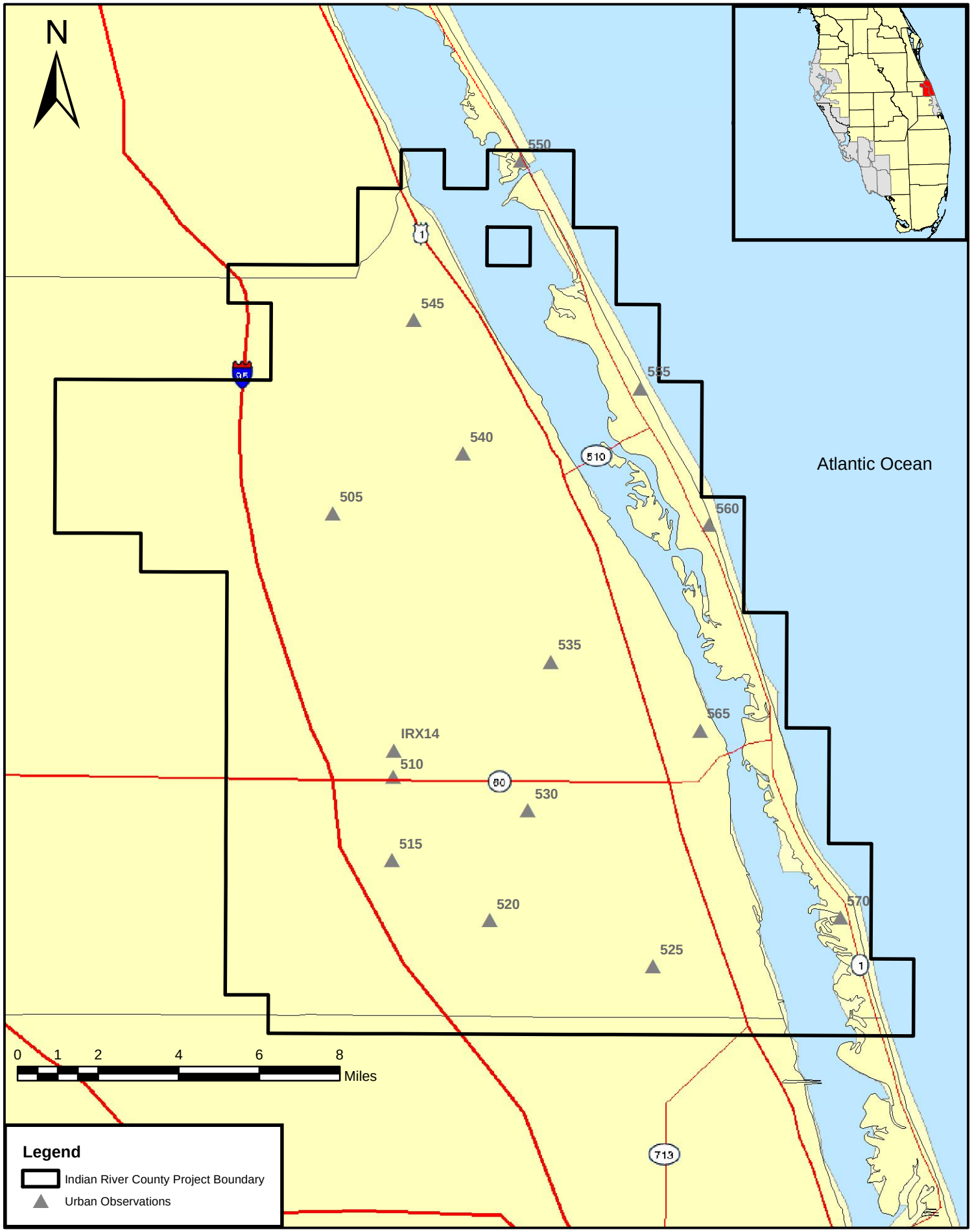
INDIAN RIVER COUNTY - FORESTED

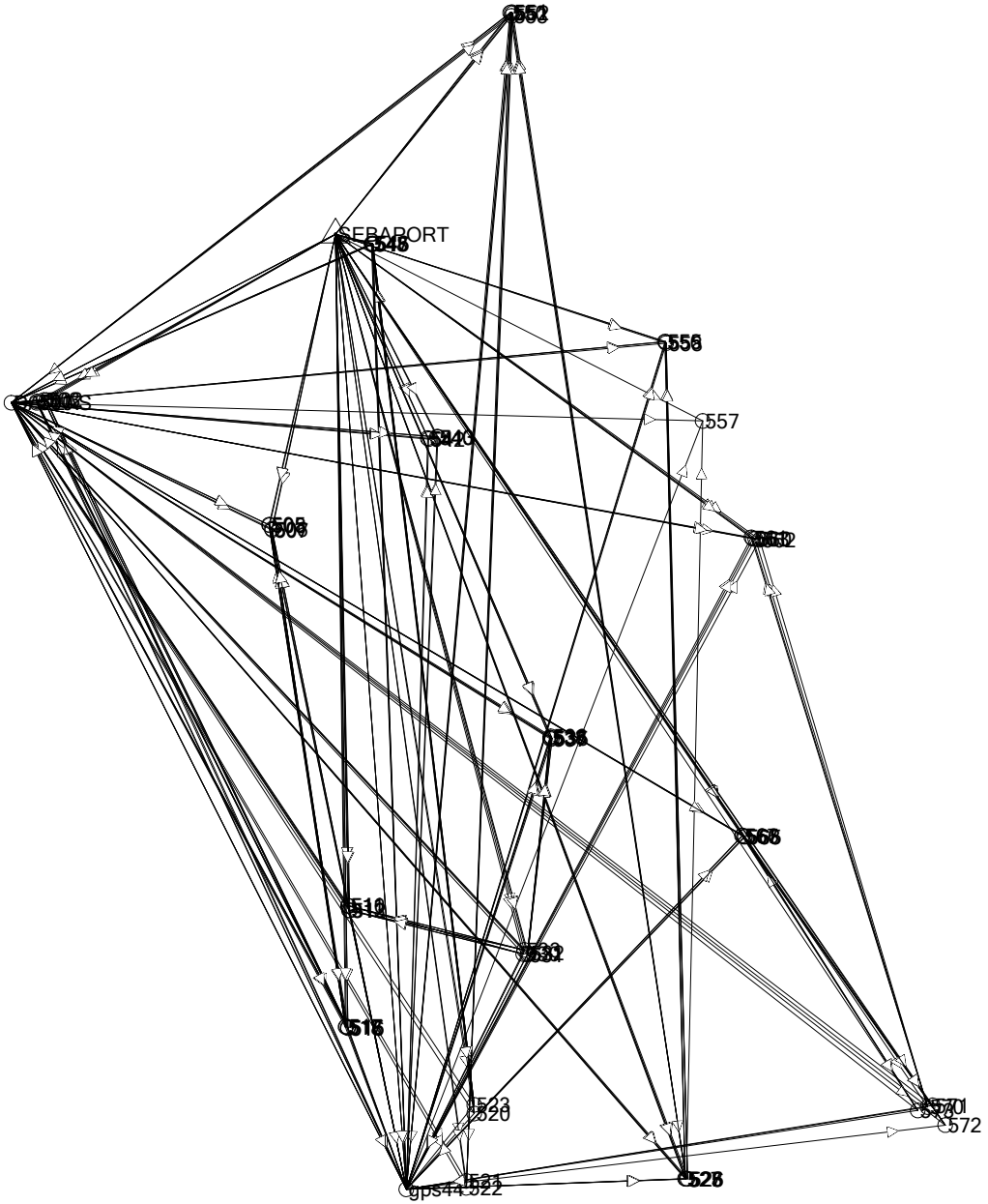


INDIAN RIVER COUNTY - LOW GRASS OR BARE EARTH



INDIAN RIVER COUNTY - URBAN





Field surveyor:
Steve Roberts
Computer operator:
Jim Speelman
Reference:
FLDEM

Scale 1:200000
0 30000 sft
US survey feet

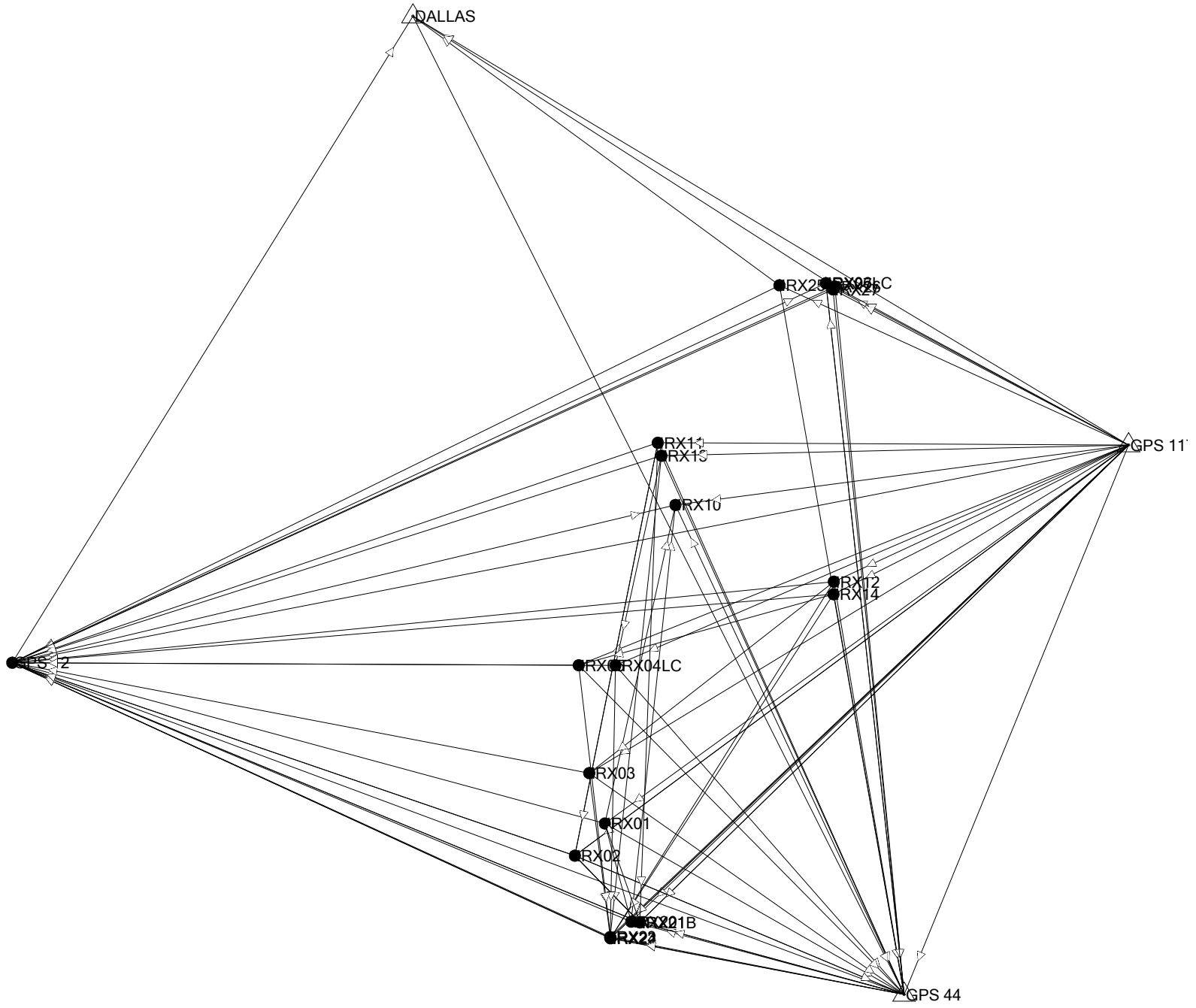
0°00'00.0"

Plot Scale: 1:200000
Printed on 12/22/2008, at 12:23:27 PM

Printed from Trimble Geomatics Office

Site: Not selected, System: US State Plane 1983
Zone: Florida East 0901, Datum: NAD 1983 (Conus)

Project: Indian River
US Feet



Field surveyor:
Steve Roberts
Computer operator:
Jim Speelman
Reference:
FLDEM

Scale 1" to 10417 ft
0 17500 sft
US survey feet

0°00'00.0"

Plot Scale: 1" to 10417 ft
Printed on 12/22/2008, at 1:45:30 PM

Printed from Trimble Geomatics Office

Site: Not selected, System: US State Plane 1983
Zone: Florida East 0901, Datum: NAD 1983 (Conus)

Project: Indian River Extra
US Feet