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

LEE COUNTY BUY-UP

STATE OF FLORIDA
DIVISION OF EMERGENCY MANAGEMENT

CONTRACT NO. 07-HS-34-14-00-22-469
PURCHASE ORDER 3961

DECEMBER 12, 2008

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

LEE COUNTY BUY-UP

STATE OF FLORIDA
DIVISION OF EMERGENCY MANAGEMENT

CONTRACT NO. 07-HS-34-14-00-22-469
PURCHASE ORDER 3961

PREPARED BY:
WOOLPERT, INC.
3504 LAKE LYNDA DRIVE, SUITE 400
ORLANDO, FLORIDA 32817-1484
LB 0006777

DECEMBER 12, 2008

QUALITY

At Woolpert, quality is the cornerstone of our business. We invite your comments and suggestions for improving this document.

TRADEMARKS

All brand names and product names are trademarks or registered trademarks of their respective companies.

NOTICE OF PROPRIETARY INFORMATION

MINIMUM TECHNICAL STANDARDS REPORT OF LiDAR GROUND CONTROL SURVEY

Contract No. 07-HS-34-14-00-22-469
Purchase Order 3961

LEE COUNTY BUY-UP

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

Lee County, Florida
1500 Monroe Street, 4th Floor
Fort Myers, Florida 33901

By:
WOOLPERT, Inc.
Laurel Building
3504 Lake Lynda Drive, Suite 400
Orlando, FL 32817-1484
Tel 407.381.2192 / Fax 407.384.1185
Florida Certificate of Authorization LB 6777

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

Summary of Contents

LiDAR Ground Control Survey and QA/QC Survey Report Page

REPORT OF LiDAR GROUND CONTROL SURVEY
LEE COUNTY BUY-UP
FOR THE
FLORIDA DIVISION OF EMERGENCY MANGEMENT
AND LEE COUNTY, FLORIDA

Introduction

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

- Lee County Buy-Up – Easternmost part of Lee County. (Remainder of Lee County not in Area E or F)

Project Area

Lee County Buy-Up encompassed approximately +/-156 square miles of the easternmost part of Lee County. This area is the remainder of Lee County not in Project Area E or Project Area F and is in addition to the approximately +/-3,774 square miles of 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 +/-156 square-mile project area. All of the field surveying and related activities conformed to the *FEMA Flood Hazard Mapping Program, Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix A* and the *Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy (NSSDA)*, published by the Federal Geographic Data Committee (FGDC-STD-007.3-1998).

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 4, 2008 and January 6, 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
Woolpert, Inc.
Laurel Building
3504 Lake Lynda Drive, Suite 400
Orlando, Florida 32817-1484
Professional Surveyor and Mapper Number 5670

Name of Company

Woolpert, Inc.
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 Cornwall
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 two (2) existing NGS control stations suitable for GPS observations: **H 415** and **W 247.** The NGS Data Sheets for these stations, which contain information such as coordinates, error estimates and to-reach descriptions**,** can be found in Appendix A of this report.

Woolpert field crews also recovered and incorporated one (1) semi-permanent Woolpert control station set for Project Area F of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project. This station, **QUARRY**, was found in a suitable location for both GPS Checkpoint observations and to ensure for a uniform GPS network triangulation consisting of a minimum of 3 GPS base stations. This newly established geodetic control station consisted of an 18-inch long, 5/8-inch diameter rebar with a plastic Woolpert survey cap (LB6777) and was set flush with the ground. The station recovery information sheet for this point can be found in Appendix B of this report.

Woolpert established a total of 11 LiDAR Control Points and 43 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 31 of the 43 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; one (1) Woolpert-owned Trimble Navigation 5800 Series dual-frequency geodetic GPS receiver; one (1) Woolpert-owned Trimble Navigation 5700 Series dual-frequency geodetic GPS receiver and one (1) Woolpert-owned Trimble Navigation 4000 Series dual-frequency geodetic GPS receiver. 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 observed two (2) existing NGS Control Stations and one (1) newly established Woolpert control station 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: **H 415, W 247 and QUARRY.**

Conventional Surveying

Using intervisable pairs of LiDAR QA/QC Points, set with Rapid-Static GPS, Woolpert field crews used a Woolpert-owned Topcon GTS-701 Total Station or a Woolpert-owned Topcon GTS-711 Total Station to acquire twelve (12) LiDAR QA/QC Checkpoints in obscured areas (dense trees/forested) where GPS observations were limited. The final coordinates for all of the LiDAR QA/QC Checkpoints can be found in Appendix C of this report.

Datum Reference and Final Coordinates

All horizontal GPS control was based on the Florida State Plane Coordinate System (West 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/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	H 415 (AD8292), W 247 (AD1509), QUARRY (PROJECT AREA F)

Accuracy Statement

The positional accuracy of the LiDAR Control Points was 0.05-feet (avg. 0.03-feet) horizontally and 0.11-feet (avg. 0.06-feet) vertically at the 95% confidence level. The positional accuracy of the LiDAR QA/QC checkpoints was 0.06-feet (avg. 0.03-feet) horizontally and 0.12-feet (avg. 0.06-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. SEVEN (7) 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.**

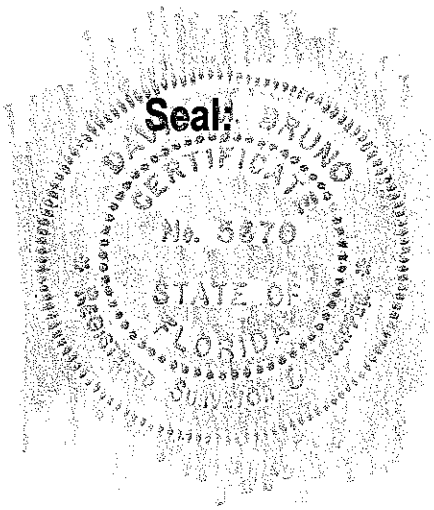
2. **THIS REPORT OF SURVEY CONSISTS OF THIRTY-THREE (33) PAGES AND EACH PAGE SHALL NOT BE CONSIDERED FULL OR COMPLETE UNLESS ATTACHED TO THE OTHER(S). ADDITIONS OR DELETIONS TO SURVEY MAPS AND REPORTS BY OTHER THAN THE SIGNING PARTY OR PARTIES IS PROHIBITED WITHOUT THE WRITTEN CONSENT OF THE SIGNING 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 geodetic control utilized in the Lee County Buy-Up 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 = 7.63
1        National Geodetic Survey,   Retrieval Date = NOVEMBER 12, 2008
 AD8292 ***********************************************************************
 AD8292  DESIGNATION -  H 415
 AD8292  PID         -  AD8292
 AD8292  STATE/COUNTY-  FL/LEE
 AD8292  USGS QUAD   -  OLGA (1987)
 AD8292
 AD8292                        *CURRENT SURVEY CONTROL
 AD8292  ______________________________________________________________________
 AD8292* NAD 83(2007)-  26 42 33.09534(N)    081 37 32.61733(W)      ADJUSTED
 AD8292* NAVD 88     -         4.106  (meters)      13.47   (feet)   ADJUSTED
 AD8292  ______________________________________________________________________
 AD8292  EPOCH DATE  -        2002.00
 AD8292  X           -     830,348.540 (meters)                      COMP
 AD8292  Y           -  -5,640,634.011 (meters)                      COMP
 AD8292  Z           -   2,849,459.629 (meters)                      COMP
 AD8292  LAPLACE CORR-          -0.50  (seconds)                     DEFLEC99
 AD8292  ELLIP HEIGHT-         -20.358 (meters)          (02/10/07) ADJUSTED
 AD8292  GEOID HEIGHT-         -24.46  (meters)                      GEOID03
 AD8292  DYNAMIC HT  -           4.100 (meters)      13.45  (feet)  COMP
 AD8292
 AD8292  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AD8292  Type    PID    Designation                        North   East  Ellip
 AD8292  ----------------------------------------------------------------------
 AD8292  NETWORK AD8292 H 415                               1.88   2.23   4.17
 AD8292  ----------------------------------------------------------------------
 AD8292  MODELED GRAV-     979,076.3   (mgal)                        NAVD 88
 AD8292
 AD8292  VERT ORDER  -  FIRST     CLASS II
 AD8292
 AD8292.The horizontal coordinates were established by GPS observations
 AD8292.and adjusted by the National Geodetic Survey in February 2007.
 AD8292
 AD8292.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AD8292.See National Readjustment for more information.
 AD8292.The horizontal coordinates are valid at the epoch date displayed above.
 AD8292.The epoch date for horizontal control is a decimal equivalence
 AD8292.of Year/Month/Day.
 AD8292
 AD8292.The orthometric height was determined by differential leveling
 AD8292.and adjusted in September 1992.
 AD8292
 AD8292.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AD8292
 AD8292.The Laplace correction was computed from DEFLEC99 derived deflections.
 AD8292
 AD8292.The ellipsoidal height was determined by GPS observations
 AD8292.and is referenced to NAD 83.
 AD8292
 AD8292.The geoid height was determined by GEOID03.
```

```
AD8292
AD8292.The dynamic height is computed by dividing the NAVD 88
AD8292.geopotential number by the normal gravity value computed on the
AD8292.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AD8292.degrees latitude (g = 980.6199 gals.).
AD8292
AD8292.The modeled gravity was interpolated from observed gravity values.
AD8292
AD8292;                    North         East     Units Scale Factor Converg.
AD8292;SPC FL W     -   263,238.859   237,241.471   MT  0.99995829   +0 10 05.6
AD8292;SPC FL W     -   863,642.82    778,349.73   sFT  0.99995829   +0 10 05.6
AD8292;UTM  17      - 2,954,379.134   437,758.735   MT  0.99964783   -0 16 52.5
AD8292
AD8292!             -  Elev Factor  x  Scale Factor =   Combined Factor
AD8292!SPC FL W     -   1.00000320  x   0.99995829  =   0.99996149
AD8292!UTM  17      -   1.00000320  x   0.99964783  =   0.99965103
AD8292
AD8292                          SUPERSEDED SURVEY CONTROL
AD8292
AD8292  NAD 83(1999)-  26 42 33.09553(N)    081 37 32.61770(W) AD(       ) 1
AD8292  ELLIP H (12/12/02)  -20.372  (m)                       GP(       ) 4 1
AD8292  NAVD 88 (12/12/02)    4.11   (m)           13.5    (f) LEVELING    3
AD8292  NGVD 29 (09/01/92)    4.480  (m)           14.70   (f) ADJUSTED    1 2
AD8292
AD8292.Superseded values are not recommended for survey control.
AD8292.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AD8292.See file dsdata.txt to determine how the superseded data were derived.
AD8292
AD8292_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RMK3775954379(NAD 83)
AD8292_MARKER: I = METAL ROD
AD8292_SETTING: 49 = STAINLESS STEEL ROD W/O SLEEVE (10 FT.+)
AD8292_SP_SET: STAINLESS STEEL ROD
AD8292_STAMPING: H 415 1992
AD8292_MARK LOGO: NGS
AD8292_PROJECTION: FLUSH
AD8292_MAGNETIC: I = MARKER IS A STEEL ROD
AD8292_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
AD8292_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AD8292+SATELLITE: SATELLITE OBSERVATIONS - July 06, 2007
AD8292_ROD/PIPE-DEPTH: 14.7 meters
AD8292
AD8292  HISTORY     - Date     Condition        Report By
AD8292  HISTORY     - 1992     MONUMENTED       NGS
AD8292  HISTORY     - 19971106 GOOD             USPSQD
AD8292  HISTORY     - 20020714 GOOD             MAPTEC
AD8292  HISTORY     - 20031031 GOOD             USPSQD
AD8292  HISTORY     - 20070706 GOOD             HOLE
AD8292
AD8292                          STATION DESCRIPTION
AD8292
AD8292'DESCRIBED BY NATIONAL GEODETIC SURVEY 1992
AD8292'21.0 KM (13.05 MI) WESTERLY ALONG STATE HIGHWAY 80 FROM THE COUNTY
AD8292'COURTHOUSE IN LA BELLE, 22.0 M (72.2 FT) EAST OF THE CENTER OF THE
AD8292'MOST EASTERLY DRIVEWAY LEADING TO YODER ALVA FARM, 20.6 M (67.6 FT)
AD8292'NORTH OF THE CENTERLINE OF THE HIGHWAY, 2.2 M (7.2 FT) SOUTH OF A
AD8292'CHAIN-LINK FENCE, 1.2 M (3.9 FT) WEST OF A UTILITY POLE, 0.6 M (2.0
AD8292'FT) EAST OF A WITNESS POST, AND 0.3 M (1.0 FT) BELOW THE LEVEL OF THE
```

```
AD8292'HIGHWAY.  NOTE--ACCESS TO THE DATUM POINT IS THROUGH A 5-INCH LOGO
AD8292'CAP.
AD8292
AD8292                          STATION RECOVERY (1997)
AD8292
AD8292'RECOVERY NOTE BY US POWER SQUADRON 1997
AD8292'RECOVERED IN GOOD CONDITION.
AD8292
AD8292                          STATION RECOVERY (2002)
AD8292
AD8292'RECOVERY NOTE BY MAPTECH INCORPORATED 2002 (CDP)
AD8292'STATION RECOVERY (2002)
AD8292'RECOVERY NOTE BY MAPTECH, INCORPORATED (CDP)  RECOVERED GOOD.
AD8292'
AD8292'
AD8292
AD8292                          STATION RECOVERY (2003)
AD8292
AD8292'RECOVERY NOTE BY US POWER SQUADRON 2003
AD8292'RECOVERED IN GOOD CONDITION.
AD8292
AD8292                          STATION RECOVERY (2007)
AD8292
AD8292'RECOVERY NOTE BY HOLE MONTES AND ASSOCIATES INC 2007 (BRH)
AD8292'RECOVERED IN GOOD CONDITION.

*** 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 = 7.63
1        National Geodetic Survey,   Retrieval Date = NOVEMBER 12, 2008
 AD1509 ***********************************************************************
 AD1509  SACS        -  This is a Secondary Airport Control Station.
 AD1509  DESIGNATION -  W 247
 AD1509  PID         -  AD1509
 AD1509  STATE/COUNTY-  FL/LEE
 AD1509  USGS QUAD   -  FORT MYERS SE (1987)
 AD1509
 AD1509                        *CURRENT SURVEY CONTROL
 AD1509  ______________________________________________________________________
 AD1509* NAD 83(2007)-  26 35 09.63330(N)    081 51 22.32828(W)     ADJUSTED
 AD1509* NAVD 88     -         4.846  (meters)      15.90   (feet)  ADJUSTED
 AD1509  ______________________________________________________________________
 AD1509  EPOCH DATE  -        2002.00
 AD1509  X           -     808,519.411  (meters)                     COMP
 AD1509  Y           -  -5,649,989.043  (meters)                     COMP
 AD1509  Z           -   2,837,261.325  (meters)                     COMP
 AD1509  LAPLACE CORR-          -2.07  (seconds)                     DEFLEC99
 AD1509  ELLIP HEIGHT-         -19.322 (meters)          (02/10/07) ADJUSTED
 AD1509  GEOID HEIGHT-         -24.15  (meters)                     GEOID03
 AD1509  DYNAMIC HT  -           4.838 (meters)      15.87  (feet)  COMP
 AD1509
 AD1509  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
 AD1509  Type    PID    Designation                        North   East  Ellip
 AD1509  ----------------------------------------------------------------------
 AD1509  NETWORK AD1509 W 247                               0.92   0.88   3.25
 AD1509  ----------------------------------------------------------------------
 AD1509  MODELED GRAV-     979,067.5   (mgal)                      NAVD 88
 AD1509
 AD1509  VERT ORDER  -  FIRST     CLASS I
 AD1509
 AD1509.This mark is at Page Field Airport (FMY)
 AD1509
 AD1509.The horizontal coordinates were established by GPS observations
 AD1509.and adjusted by the National Geodetic Survey in February 2007.
 AD1509
 AD1509.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
 AD1509.See National Readjustment for more information.
 AD1509.The horizontal coordinates are valid at the epoch date displayed above.
 AD1509.The epoch date for horizontal control is a decimal equivalence
 AD1509.of Year/Month/Day.
 AD1509
 AD1509.The orthometric height was determined by differential leveling
 AD1509.and adjusted in September 1992.
 AD1509
 AD1509.The X, Y, and Z were computed from the position and the ellipsoidal ht.
 AD1509
 AD1509.The Laplace correction was computed from DEFLEC99 derived deflections.
 AD1509
 AD1509.The ellipsoidal height was determined by GPS observations
```

```
AD1509.and is referenced to NAD 83.
AD1509
AD1509.The geoid height was determined by GEOID03.
AD1509
AD1509.The dynamic height is computed by dividing the NAVD 88
AD1509.geopotential number by the normal gravity value computed on the
AD1509.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
AD1509.degrees latitude (g = 980.6199 gals.).
AD1509
AD1509.The modeled gravity was interpolated from observed gravity values.
AD1509
AD1509;                    North         East     Units Scale Factor Converg.
AD1509;SPC FL W     -   249,544.505   214,323.685   MT  0.99994371   +0 03 51.7
AD1509;SPC FL W     -   818,713.93    703,160.29   sFT  0.99994371   +0 03 51.7
AD1509;UTM  17      - 2,940,868.415   414,740.950   MT  0.99968974   -0 22 59.6
AD1509
AD1509!             -  Elev Factor  x  Scale Factor =   Combined Factor
AD1509!SPC FL W     -   1.00000304  x   0.99994371  =   0.99994675
AD1509!UTM  17      -   1.00000304  x   0.99968974  =   0.99969277
AD1509
AD1509                          SUPERSEDED SURVEY CONTROL
AD1509
AD1509  NAD 83(1999)-  26 35 09.63344(N)    081 51 22.32906(W) AD(       ) 1
AD1509  ELLIP H (01/17/02)  -19.277  (m)                       GP(       ) 4 2
AD1509  NAD 83(1990)-  26 35 09.63156(N)    081 51 22.32816(W) AD(       ) 1
AD1509  ELLIP H (01/05/98)  -19.236  (m)                       GP(       ) 4 2
AD1509  NAVD 88 (06/15/91)    4.829  (m)           15.84   (f) UNKNOWN     1 1
AD1509  NGVD 29 (09/01/92)    5.205  (m)           17.08   (f) ADJUSTED    1 1
AD1509
AD1509.Superseded values are not recommended for survey control.
AD1509.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AD1509.See file dsdata.txt to determine how the superseded data were derived.
AD1509
AD1509_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RMK1474140868(NAD 83)
AD1509_MARKER: DB = BENCH MARK DISK
AD1509_SETTING: 34 = SET IN THE FOOTINGS OF SMALL/MEDIUM STRUCTURES
AD1509_SP_SET: OLD BEACON TOWER FOOTING
AD1509_STAMPING: W 247 1965
AD1509_MARK LOGO: CGS
AD1509_MAGNETIC: O = OTHER; SEE DESCRIPTION
AD1509_STABILITY: C = MAY HOLD, BUT OF TYPE COMMONLY SUBJECT TO
AD1509+STABILITY: SURFACE MOTION
AD1509_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AD1509+SATELLITE: SATELLITE OBSERVATIONS - September 12, 2005
AD1509
AD1509  HISTORY     - Date     Condition        Report By
AD1509  HISTORY     - 1965     MONUMENTED       CGS
AD1509  HISTORY     - 1976     GOOD             NGS
AD1509  HISTORY     - 1981     GOOD             USGS
AD1509  HISTORY     - 19920407 GOOD             NGS
AD1509  HISTORY     - 19960209 SEE DESCRIPTION  NGS
AD1509  HISTORY     - 20031105 GOOD             USPSQD
AD1509  HISTORY     - 20031107 GOOD             USPSQD
AD1509  HISTORY     - 20050912 GOOD             MCKIM
AD1509
AD1509                          STATION DESCRIPTION
AD1509
```

```
AD1509'DESCRIBED BY COAST AND GEODETIC SURVEY 1965
AD1509'5.8 MI S FROM FORT MYERS.
AD1509'ABOUT 0.15 MILE SOUTHWEST ALONG MAIN STREET AND MC GREGOR
AD1509'BOULEVARD FROM THE COURTHOUSE AT FORT MYERS, THENCE ABOUT 4.3
AD1509'MILES SOUTH ALONG U.S. HIGHWAY 41, THENCE ABOUT 1.3 MILES EAST
AD1509'AND NORTH ALONG AIRPORT ROAD, AT PAGE FIELD AIRPORT, IN SECTION
AD1509'1, R 24 E, T 45 S, ALONG THE EAST SIDE OF THE AIRFIELD, ABOUT
AD1509'1.0 MILE BY ROAD NORTHEAST OF THE ADMINISTRATION BUILDING, AT
AD1509'A SLIGHT CURVE IN THE ROAD THAT FOLLOWS ALONG THE EAST SIDE OF
AD1509'THE FIELD, SET IN THE TOP AND AT THE WEST CORNER OF THE CONCRETE
AD1509'BASE FOR THE NORTHWEST LEG OF THE PRESENT DAY BEACON LIGHT, 63
AD1509'FEET EAST OF THE CENTER LINE OF THE ROAD LEADING TO THE NORTH AND
AD1509'25 FEET NORTH OF THE CENTER LINE OF THE ROAD LEADING EAST AND
AD1509'ABOUT 2 FEET ABOVE THE LEVEL OF THE ROAD.
AD1509
AD1509                          STATION RECOVERY (1976)
AD1509
AD1509'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1976
AD1509'RECOVERED IN GOOD CONDITION.
AD1509
AD1509                          STATION RECOVERY (1981)
AD1509
AD1509'RECOVERY NOTE BY US GEOLOGICAL SURVEY 1981
AD1509'RECOVERED IN GOOD CONDITION.
AD1509
AD1509                          STATION RECOVERY (1992)
AD1509
AD1509'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1992
AD1509'IN FORT MYERS, AT THE INTERSECTION OF IDLEWILD ROAD AND SIXTH STREET,
AD1509'IN TOP OF AND 0.2 M (0.7 FT) EAST OF THE WEST EDGE OF THE MOST
AD1509'NORTHWESTERLY OF 4 CONCRETE FOOTINGS FOR AN AIRPORT BEACON (BEACON
AD1509'REMOVED), IN THE SOUTHWEST CORNER OF THE LAWN OF THE LEE COUNTY
AD1509'DEPARTMENT OF TRANSPORTATION, 34.5 M (113.2 FT) WEST OF THE EXTENDED
AD1509'CENTERLINE OF THE STREET, 19.1 M (62.7 FT) EAST OF THE CENTER OF A
AD1509'PAVED ROAD, 12.9 M (42.3 FT) NORTH OF THE CENTERLINE OF THE ROAD, 6.3
AD1509'M (20.7 FT) SOUTH OF THE SOUTH CURB OF A PARKING LOT, 0.3 M (1.0 FT)
AD1509'ABOVE THE LEVEL OF THE ROAD, 0.3 M (1.0 FT) SOUTH OF A WITNESS POST,
AD1509'0.2 M (0.7 FT) SOUTH OF THE NORTH EDGE OF THE CONCRETE BASE, AND THE
AD1509'FOOTING IS 0.06 M (0.20 FT) BELOW THE GROUND SURFACE.
AD1509
AD1509                          STATION RECOVERY (1996)
AD1509
AD1509'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (CFS)
AD1509'THE STATION IS LOCATED OUTSIDE THE EASTERN BOUNDARY OF PAGE FIELD ON
AD1509'THE SOUTH SIDE OF FORT MYERS.  IT IS SET ON THE NORTH SIDE OF IDLEWILD
AD1509'ROAD IN FRONT OF THE LEETRAN (LEE COUNTY TRANSIT) FACILITY BETWEEN 6TH
AD1509'STREET AND EAST AIRPORT ROAD.  OWNERSHIP -- LEETRAN, 10715 EAST
AD1509'AIRPORT ROAD, FORT MYERS, FL 33907.  TRANSIT MANAGER MR. LARRY
AD1509'RALSTON, TELEPHONE (941) 275-8726 TO REACH THE STATION FROM THE
AD1509'JUNCTION OF INTERSTATE HIGHWAY 75 AND STATE HIGHWAY 884 AT INTERSTATE
AD1509'HIGHWAY 75 EXIT 22 EAST OF FORT MYERS, GO WEST ON STATE HIGHWAY 884
AD1509'(COLONIAL BLVD) FOR 3.25 MI (5.23 KM) TO STATE HIGHWAY 739 (METO
AD1509'PARKWAY) ON THE LEFT, TURN LEFT AND GO SOUTHERLY ON THE METOR PARKWAY
AD1509'FOR 0.85 MI (1.37 KM) TO IDLEWILD ROAD ON THE RIGHT.  TURN RIGHT ON
AD1509'IDLEWILD ROAD AND GO WEST FOR 0.1 MI (0.2 KM) CROSSING A RAILROAD
AD1509'TRACK AND TEN MILE CANAL TO A FOUR WAY STOP WITH 6TH STREET ON THE
AD1509'LEFT.  CONTINUE STRAIGHT AHEAD FOR 0.05 MI (0.08 KM) TO THE STATION ON
```

```
AD1509'THE RIGHT NEAR THE CORNER OF IDLEWILD ROAD AND EAST AIRPORT ROAD. THE
AD1509'STATION IS A STANDARD U.S.C.  AND G.S.  BENCH MARK DISK SET IN THE
AD1509'NORTHWEST CORNER OF AN OLD 3-FT SQUARE CONCRETE FOOTING FOR A BEACON
AD1509'TOWER WHICH IS 4-INCHED BELOW THE SURFACE.  THERE IS A SCRATCH THRU
AD1509'THE 24 IN 247.  THE STATION IS WITHIN 0.2 MI (0.3 KM) OF PAGE FIELD
AD1509'GATES 4, 5, AND 6B.  IT IS 20.0 M (65.6 FT) EAST OF THE PROJECTED
AD1509'CENTERLINE OF EAST AIRPORT ROAD, 13.55 M (44.46 FT) EAST OF THE CENTER
AD1509'OF DRAIN GRATE IN EAST AIRPORT ROAD, 12.8 M (42.0 FT) NORTH OF THE
AD1509'CENTERLINE OF IDLEWILD ROAD, 9.59 M (31.46 FT) SOUTHEAST OF THE
AD1509'SOUTHWEST CORNER OF PARKING LOT, 8.88 M (29.13 FT) EAST-SOUTHEAST OF
AD1509'IDLEWILD ROAD AND EAST AIRPORT ROAD STREET SIGN, 6.41 M (21.03 FT)
AD1509'SOUTH OF SOUTH CURB OF PARKING LOT, 2.87 M (9.42 FT) NORTH OF THE
AD1509'NORTHWEST CORNER OF OLD 3-FT SQUARE CONCRETE FOOTING, AND 0.27 M (0.89
AD1509'FT) SOUTH OF A WITNESS POST.  THIS IS A SECONDARY AIRPORT CONTROL
AD1509'STATION.  WJR
AD1509
AD1509                          STATION RECOVERY (2003)
AD1509
AD1509'RECOVERY NOTE BY US POWER SQUADRON 2003
AD1509'RECOVERED IN GOOD CONDITION.
AD1509
AD1509                          STATION RECOVERY (2003)
AD1509
AD1509'RECOVERY NOTE BY US POWER SQUADRON 2003
AD1509'RECOVERED IN GOOD CONDITION.
AD1509
AD1509                          STATION RECOVERY (2005)
AD1509
AD1509'RECOVERY NOTE BY MCKIM AND CREED 2005 (BRH)
AD1509'RECOVERED IN GOOD CONDITION.

*** retrieval complete.
Elapsed Time = 00:00:01
```

APPENDIX B: NEW GROUND CONTROL STATION INFORMATION

This appendix contains the recovery information sheet for the newly established GPS control station utilized in the Lee County Buy-Up 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 LAMB	**Job No.**	66517
Station Name:	QUARRY	**Date of Survey:**	13 DEC 07	**Julian Day**	347
		File Name:	QUARRY	**Session #**	1
WGS 84 Coordinates		**Type of Reciever:**	TRIMBLE		
Latitude	N 26° 28' 32.90"	**Type of Antenna:**	R8-2/.5800		
Longitude	W 081° 42' 43.33"				
Ellip. Height	-59.732'	**Antenna Height:**	2.0m	Circle one: USFT / Meters	Circle one: ARP / Phase Center
Type of Mark:	D,W W/ CAP				
Stamping on Mark:	WOOLPERT	**Start Time (local):**	9:00AM		
		Weather Condition:	~80°/CLEAR		

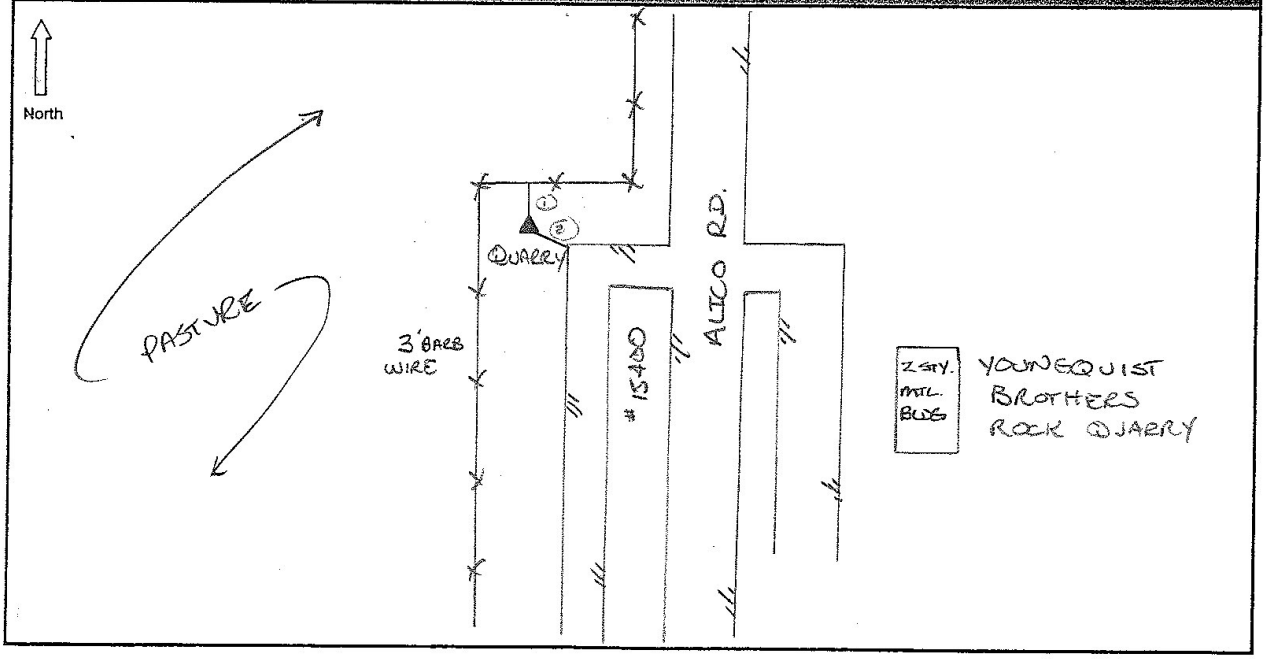
To Reach Description:

STATION QUARRY IS LOCATED JUST WEST OF ALICO RD AT ENTRANCE TO YOUNGQUIST BROTHERS ROCK QUARRY.

Witness Ties:

Reference Object	Distance	Azimuth
1) TO 3' BARB WIRE FENCE	49'	
2) TO NW CORNER OF PAV.	50'	
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 Lee County Buy-Up Project Area of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

LEE COUNTY BUY-UP AREA

HORIZONTAL DATUM: NAD83(1999)
VERTICAL DATUM: NAVD88
UNITS: US SURVEY FEET
STATE PLANE ZONE: FLORIDA WEST 0902
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

PHOTO 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
605	863860.33	775678.27	12.56	0.02	0.04	0.07	URBAN
606	863914.19	775888.89	14.57	0.01	0.02	0.05	LOW GRASS OR BARE EARTH
607	863748.00	776143.85	12.40	0.02	0.02	0.05	BRUSH
608	864207.12	774374.74	10.71	0.03	0.02	0.05	LIDAR CONTROL POINT
610	839646.45	777739.65	21.37	0.02	0.02	0.06	URBAN
611	839640.73	777212.80	20.53	0.02	0.03	0.07	LOW GRASS OR BARE EARTH
612	839652.81	776916.14	21.13	0.02	0.03	0.06	BRUSH
613	839860.22	787601.10	23.11	0.02	0.02	0.05	LIDAR CONTROL POINT
615	818884.10	763409.99	28.40	0.02	0.02	0.05	URBAN
616	818907.07	763329.82	30.37	0.02	0.02	0.05	LOW GRASS OR BARE EARTH
617	818733.60	763014.66	27.72	0.02	0.02	0.05	BRUSH
618	818860.10	763276.09	28.05	0.02	0.02	0.05	LIDAR CONTROL POINT
620	803308.35	767757.91	30.42	0.02	0.02	0.05	URBAN
621	803329.19	767719.14	28.38	0.02	0.02	0.04	LOW GRASS OR BARE EARTH
622	803414.89	767767.68	28.37	0.01	0.01	0.04	BRUSH
623	803324.80	767869.10	30.18	0.02	0.02	0.04	LIDAR CONTROL POINT
625	769625.39	777917.48	28.41	0.02	0.03	0.09	URBAN
626	760508.86	776257.43	23.27	0.02	0.02	0.05	LOW GRASS OR BARE EARTH
627	760393.38	776293.64	23.05	0.02	0.02	0.05	BRUSH
628	769611.52	777994.35	27.99	0.02	0.03	0.09	LIDAR CONTROL POINT
631	778199.49	795601.86	28.33	0.02	0.02	0.06	LOW GRASS OR BARE EARTH
632	778080.63	795639.81	28.08	0.02	0.02	0.05	BRUSH
633	776648.63	798919.81	29.29	0.02	0.02	0.05	LIDAR CONTROL POINT
635	800887.07	787149.63	29.16	0.01	0.02	0.05	URBAN
636	800844.34	787146.17	32.36	0.01	0.02	0.05	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
637	800748.67	787163.31	28.77	0.01	0.02	0.05	BRUSH
638	800796.23	787252.03	28.33	0.01	0.02	0.05	LIDAR CONTROL POINT
640	827885.12	795293.95	25.97	0.02	0.01	0.04	URBAN
641	827913.83	795812.97	24.84	0.02	0.01	0.04	LOW GRASS OR BARE EARTH
642	828041.80	795490.11	25.51	0.02	0.01	0.04	BRUSH
643	827888.71	795531.93	25.75	0.02	0.01	0.04	LIDAR CONTROL POINT
645	854857.87	795341.35	20.23	0.04	0.04	0.09	URBAN
646	854876.56	795396.59	19.12	0.05	0.04	0.11	BRUSH
647	855670.27	797694.04	20.10	0.03	0.02	0.06	LOW GRASS OR BARE EARTH
648	854695.43	797682.76	20.92	0.02	0.03	0.08	LIDAR CONTROL POINT
LEE600	875835.30	781766.32	16.63	0.02	0.03	0.08	LOW GRASS OR BARE EARTH
LEE601	868553.66	781865.41	15.96	0.03	0.03	0.06	URBAN
LEE602	868506.00	781906.29	15.51	0.02	0.02	0.05	BRUSH
LEE603	868500.17	781782.07	16.08	0.02	0.02	0.05	LIDAR CONTROL POINT
LEE651	869672.72	794331.68	13.77	0.02	0.02	0.07	BRUSH
LEE652	869642.95	793765.22	13.98	0.04	0.02	0.07	LIDAR CONTROL POINT
LEE653	869602.08	794374.52	14.87	0.04	0.02	0.06	LOW GRASS OR BARE EARTH
6500	769552.16	778176.60	26.57	N/A	N/A	N/A	FORESTED
6501	769523.68	778127.23	26.13	N/A	N/A	N/A	FORESTED
6502	769459.96	778067.89	26.37	N/A	N/A	N/A	FORESTED
6503	802923.10	767781.80	27.80	N/A	N/A	N/A	FORESTED
6504	803073.78	767735.15	27.66	N/A	N/A	N/A	FORESTED
6505	803180.97	767593.71	27.65	N/A	N/A	N/A	FORESTED
6506	827766.63	795512.56	25.38	N/A	N/A	N/A	FORESTED
6507	827762.22	795557.67	25.28	N/A	N/A	N/A	FORESTED
6508	827810.48	795563.47	25.24	N/A	N/A	N/A	FORESTED
6509	863849.08	775231.74	10.46	N/A	N/A	N/A	FORESTED
6510	863730.92	775380.41	11.77	N/A	N/A	N/A	FORESTED
6511	863751.93	775938.01	11.49	N/A	N/A	N/A	FORESTED

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
H 415	863642.84	778349.69	13.47	0.00	0.00	0.00	NGS CONTROL STATION
W 247	818713.94	703160.22	15.90	0.00	0.00	0.00	NGS CONTROL STATION

EXISTING 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
QUARRY	778732.83	750368.10	26.23	0.00	0.00	0.00	GPS BASE STATION - AREA F

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 Lee County Buy-Up Project Area of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

LEE CO BUYUP POSITIONAL ACCURACIES CALCULATIONS

ALL QA/QC POINTS (EXCEPT FORESTED POINTS)

CALCULATED ACCURACY:

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

CALCULATED ACCURACY:

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

METERS

STATION	Vx	Vy	Vxy	Vz
605	0.011	0.005	0.01	0.021
606	0.006	0.004	0.01	0.015
607	0.007	0.006	0.01	0.017
610	0.007	0.005	0.01	0.019
611	0.008	0.006	0.01	0.022
612	0.008	0.006	0.01	0.019
615	0.006	0.005	0.01	0.015
616	0.006	0.005	0.01	0.014
617	0.006	0.005	0.01	0.014
620	0.005	0.005	0.01	0.015
621	0.005	0.005	0.01	0.014
622	0.004	0.004	0.01	0.013
625	0.009	0.006	0.01	0.027
626	0.007	0.006	0.01	0.016
627	0.007	0.006	0.01	0.016
631	0.006	0.007	0.01	0.019
632	0.006	0.007	0.01	0.017
635	0.005	0.004	0.01	0.017
636	0.005	0.004	0.01	0.016
637	0.005	0.004	0.01	0.016
640	0.004	0.005	0.01	0.013
641	0.004	0.005	0.01	0.013
642	0.004	0.005	0.01	0.012
645	0.012	0.012	0.02	0.028
646	0.011	0.014	0.02	0.033
647	0.007	0.008	0.01	0.019
LEE600	0.008	0.006	0.01	0.023
LEE601	0.008	0.009	0.01	0.019
LEE602	0.006	0.006	0.01	0.015

US FEET

STATION	Vx	Vy	Vxy	Vz
605	0.04	0.02	0.04	0.07
606	0.02	0.01	0.02	0.05
607	0.02	0.02	0.03	0.05
610	0.02	0.02	0.03	0.06
611	0.03	0.02	0.03	0.07
612	0.03	0.02	0.03	0.06
615	0.02	0.02	0.03	0.05
616	0.02	0.02	0.03	0.05
617	0.02	0.02	0.03	0.05
620	0.02	0.02	0.02	0.05
621	0.02	0.02	0.02	0.04
622	0.01	0.01	0.02	0.04
625	0.03	0.02	0.03	0.09
626	0.02	0.02	0.03	0.05
627	0.02	0.02	0.03	0.05
631	0.02	0.02	0.03	0.06
632	0.02	0.02	0.03	0.05
635	0.02	0.01	0.02	0.05
636	0.02	0.01	0.02	0.05
637	0.02	0.01	0.02	0.05
640	0.01	0.02	0.02	0.04
641	0.01	0.02	0.02	0.04
642	0.01	0.02	0.02	0.04
645	0.04	0.04	0.05	0.09
646	0.04	0.05	0.06	0.11
647	0.02	0.03	0.04	0.06
LEE600	0.03	0.02	0.03	0.08
LEE601	0.03	0.03	0.04	0.06
LEE602	0.02	0.02	0.03	0.05

STATION	Vx	Vy	Vxy	Vz
LEE651	0.007	0.007	0.01	0.022
LEE653	0.007	0.011	0.01	0.018
SUMSQ	**0.00**	**0.00**	**0.00**	**0.01**
COUNT	**31.00**	**31.00**	**31.00**	**31.00**
AVG ERROR	**0.01**	**0.01**	**0.01**	**0.02**
MAX ERROR	**0.01**	**0.01**	**0.02**	**0.03**
MIN ERROR	**0.00**	**0.00**	**0.01**	**0.01**
RMSE	**0.01**	**0.01**	**0.01**	**0.02**

STATION	Vx	Vy	Vxy	Vz
LEE651	0.02	0.02	0.03	0.07
LEE653	0.02	0.04	0.04	0.06
SUMSQ	**0.02**	**0.01**	**0.03**	**0.11**
COUNT	**31.00**	**31.00**	**31.00**	**31.00**
AVG ERROR	**0.02**	**0.02**	**0.03**	**0.06**
MAX ERROR	**0.04**	**0.05**	**0.06**	**0.11**
MIN ERROR	**0.01**	**0.01**	**0.02**	**0.04**
RMSE	**0.02**	**0.02**	**0.03**	**0.06**

LiDAR CONTROL POINTS ONLY

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.

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.

METERS

STATION	Vx	Vy	Vxy	Vz
608	0.006	0.009	0.011	0.015
613	0.006	0.007	0.009	0.014
618	0.006	0.005	0.008	0.014
623	0.005	0.005	0.007	0.013
628	0.009	0.006	0.011	0.027
633	0.007	0.006	0.009	0.017
638	0.005	0.004	0.007	0.016
643	0.004	0.005	0.006	0.012
648	0.008	0.007	0.011	0.026
LEE603	0.005	0.006	0.008	0.015
LEE652	0.007	0.011	0.013	0.020
SUMSQ	**0.000**	**0.000**	**0.001**	**0.003**
COUNT	**11.000**	**11.000**	**11.000**	**11.000**
AVG ERROR	**0.006**	**0.006**	**0.009**	**0.017**
MAX ERROR	**0.009**	**0.011**	**0.013**	**0.027**
MIN ERROR	**0.004**	**0.004**	**0.006**	**0.012**
RMSE	**0.006**	**0.007**	**0.009**	**0.018**

US FEET

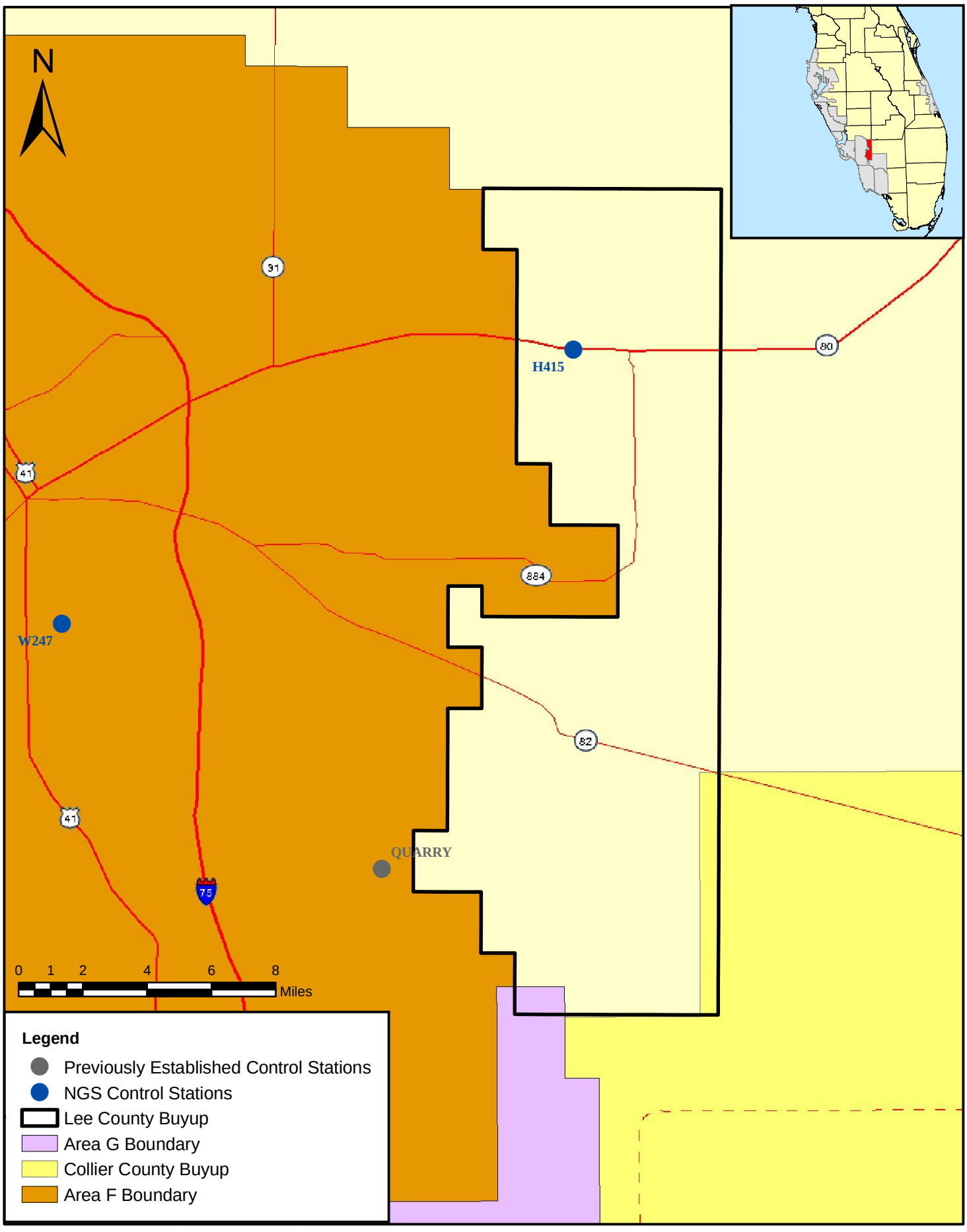
STATION	Vx	Vy	Vxy	Vz
608	0.02	0.03	0.04	0.05
613	0.02	0.02	0.03	0.05
618	0.02	0.02	0.03	0.05
623	0.02	0.02	0.02	0.04
628	0.03	0.02	0.03	0.09
633	0.02	0.02	0.03	0.05
638	0.02	0.01	0.02	0.05
643	0.01	0.02	0.02	0.04
648	0.03	0.02	0.04	0.08
LEE603	0.02	0.02	0.02	0.05
LEE652	0.02	0.04	0.04	0.07
SUMSQ	**0.00**	**0.01**	**0.01**	**0.04**
COUNT	**11.00**	**11.00**	**11.00**	**11.00**
AVG ERROR	**0.02**	**0.02**	**0.03**	**0.06**
MAX ERROR	**0.03**	**0.04**	**0.04**	**0.09**
MIN ERROR	**0.01**	**0.01**	**0.02**	**0.04**
RMSE	**0.02**	**0.02**	**0.03**	**0.06**

APPENDIX E: LAYOUT MAPS

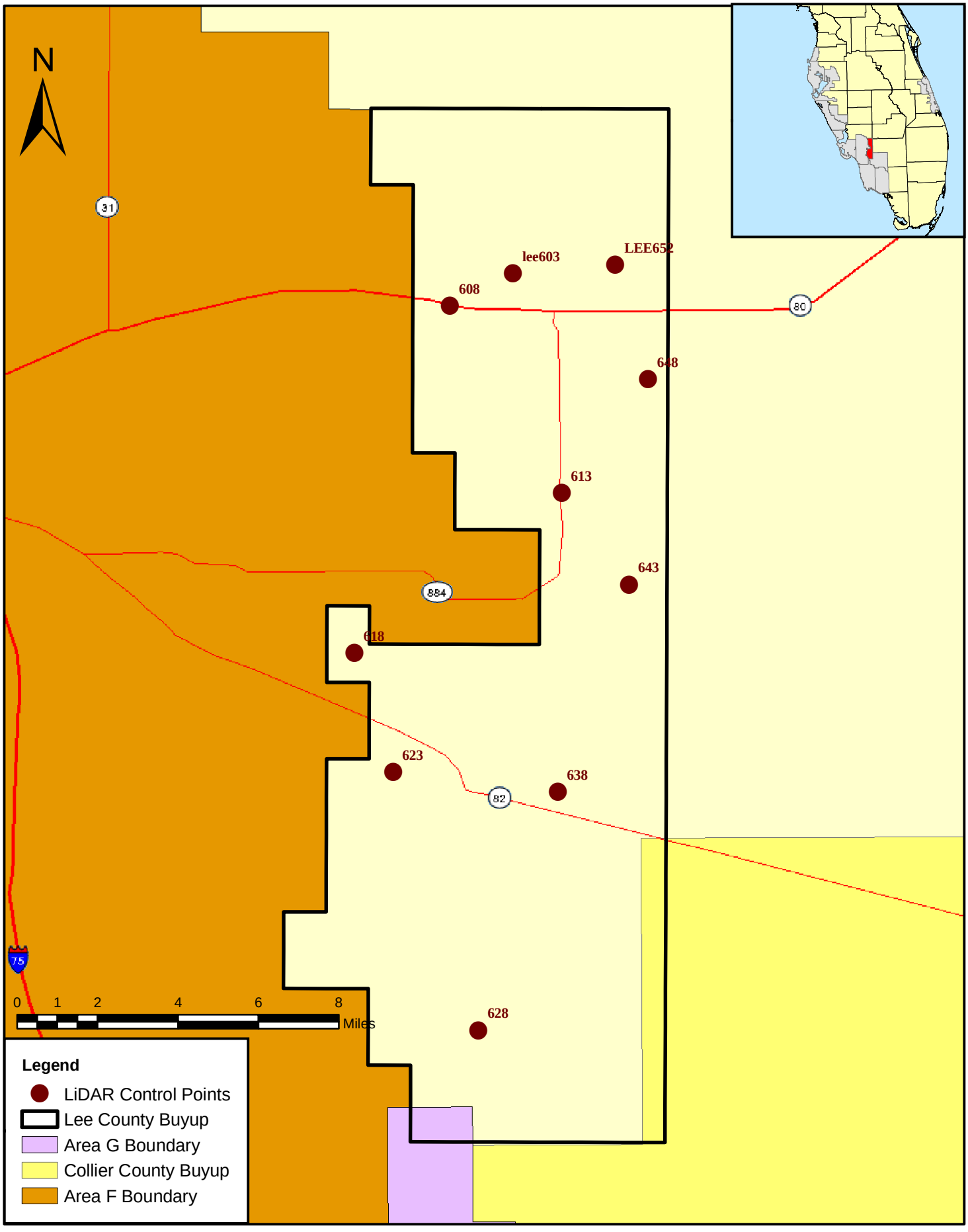
This appendix contains layout maps of the GPS ground control stations, LiDAR Control Points and LiDAR QA/QC Checkpoints (see below) for the Lee County Buy-Up Project Area of the FY2007 State of Florida Division of Emergency Management Ground Control QA/QC Survey Mapping Project.

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

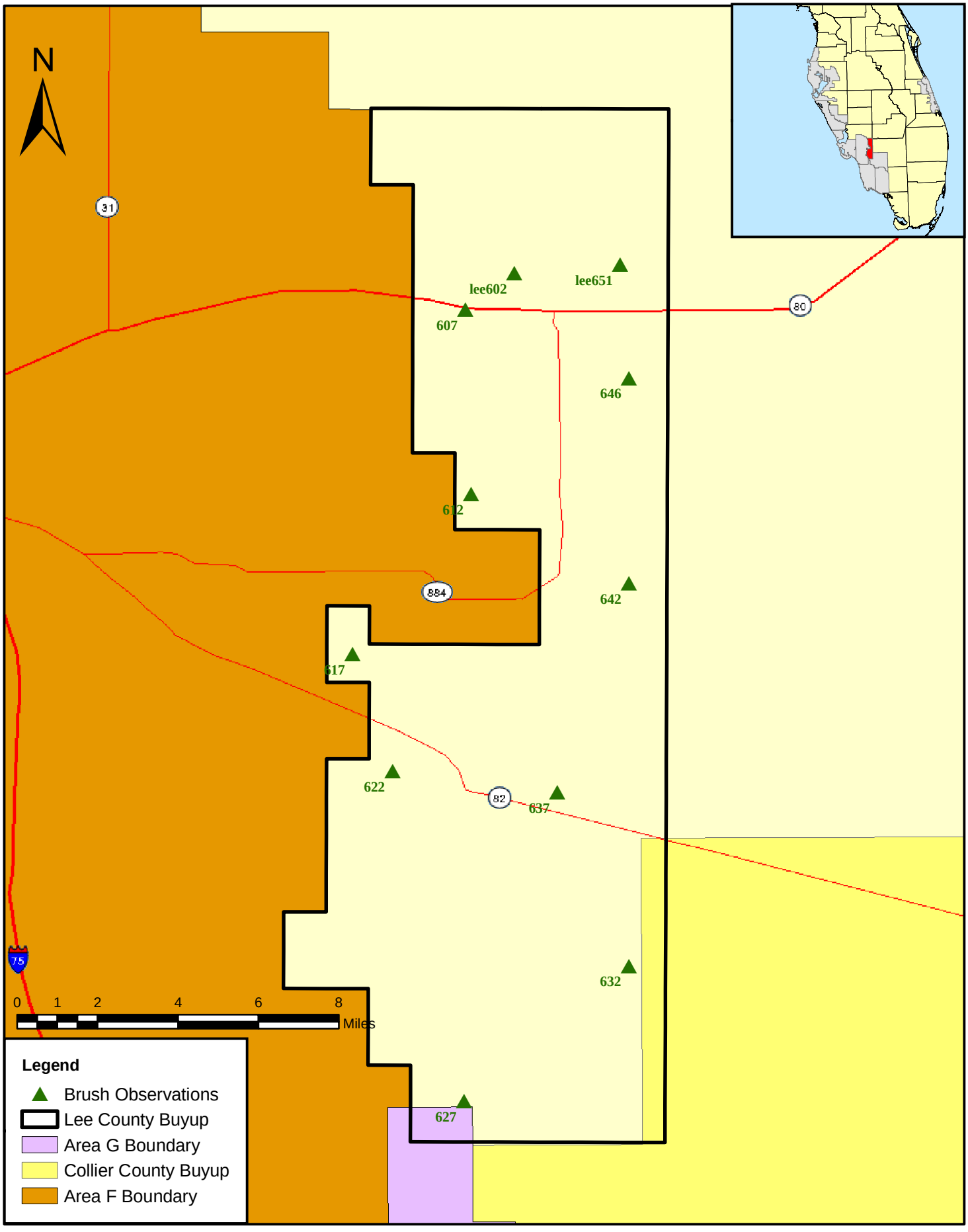
LEE COUNTY BUYUP - GPS CONTROL STATIONS



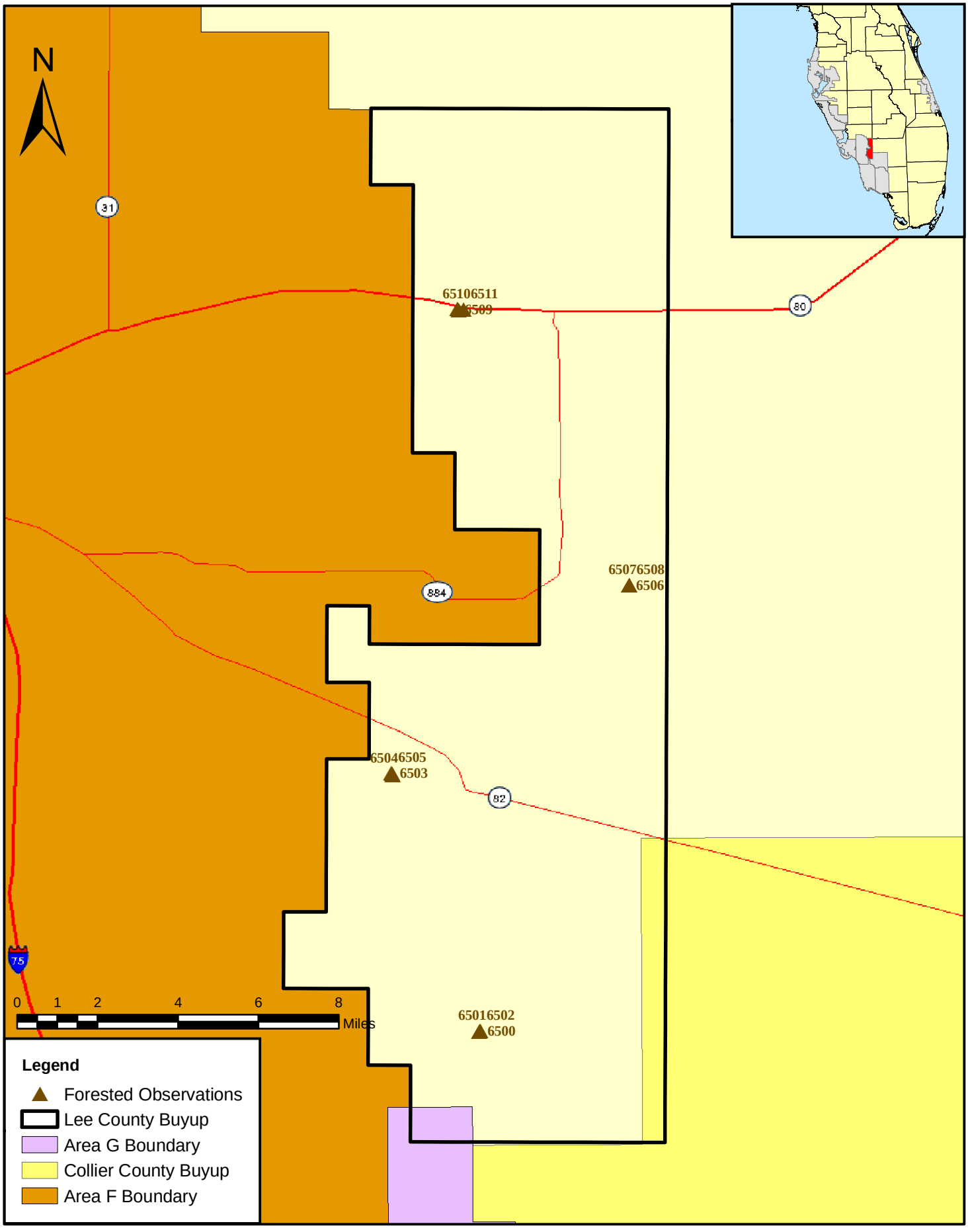
LEE COUNTY BUYUP - LiDAR CONTROL POINTS



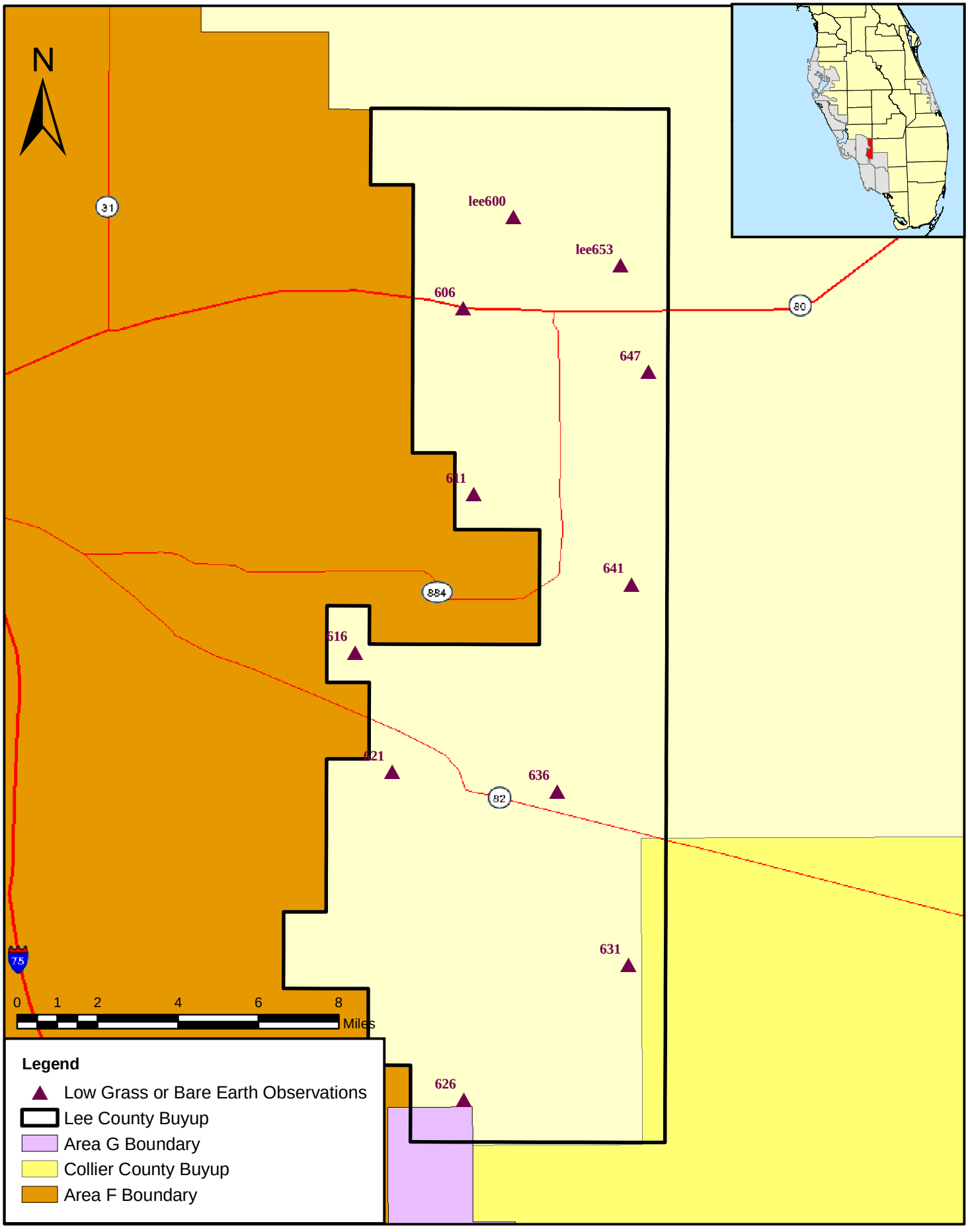
LEE COUNTY BUYUP - BRUSH



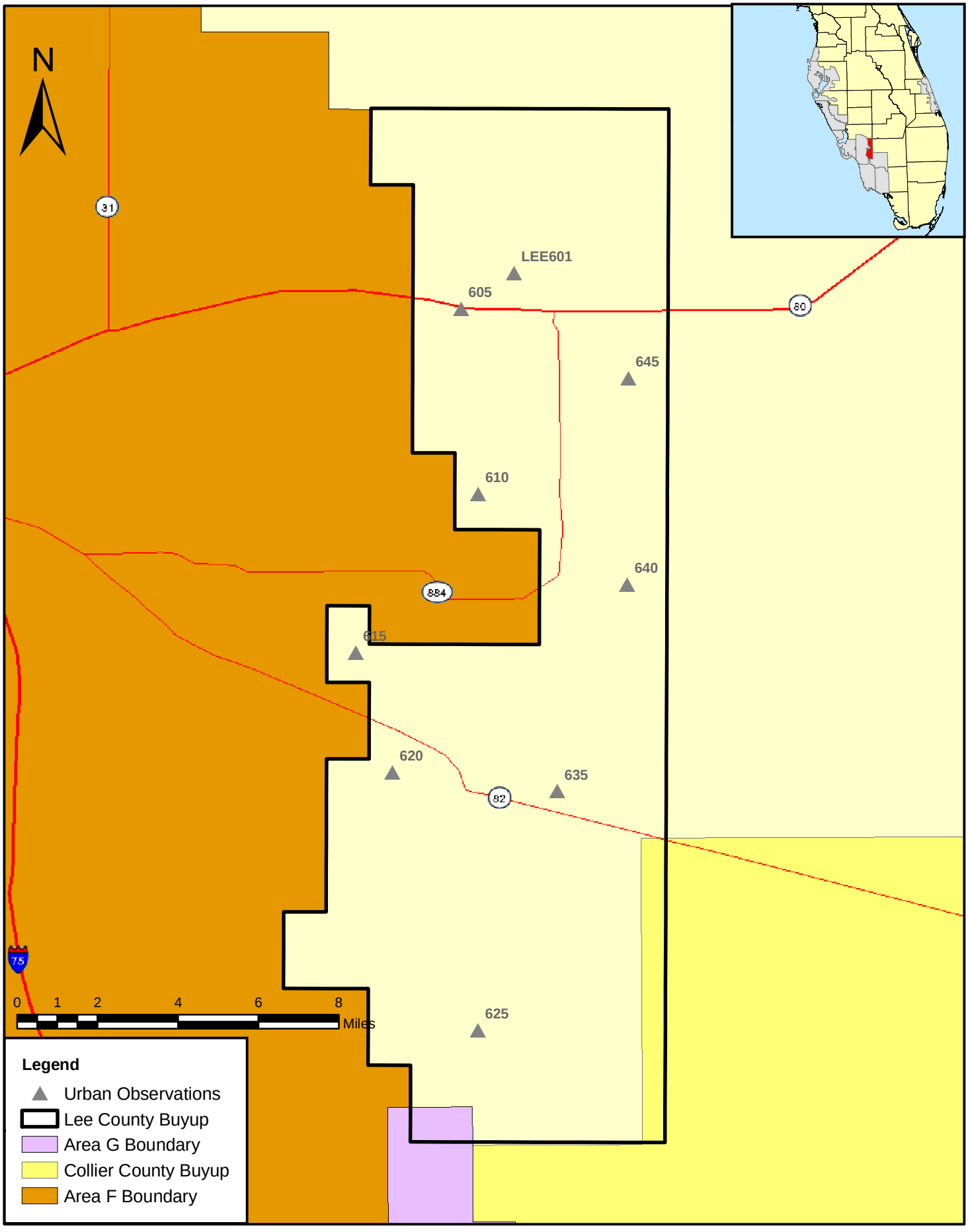
LEE COUNTY BUYUP - FORESTED

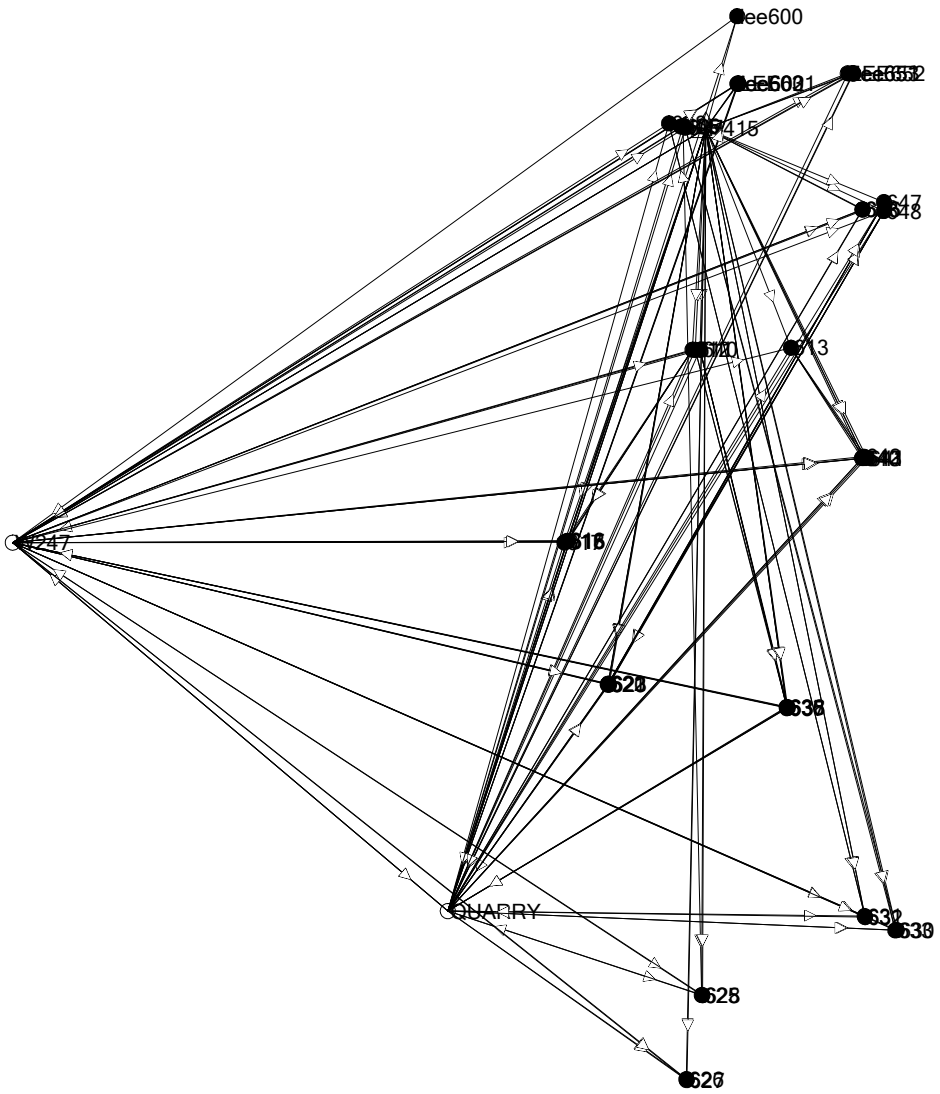


LEE COUNTY BUYUP - LOW GRASS OR BARE EARTH



LEE COUNTY BUYUP - BRUSH





Field surveyor:
Woolpert, Inc.
Computer operator:
J. Speelman
Reference:

Scale 1:250000
0 35000 sft
US survey feet

0°00'00.0"

Plot Scale: 1:250000
Printed on 12/11/2008, at 3:52:14 PM

Printed from Trimble Geomatics Office

Site: Not selected, System: US State Plane 1983
Zone: Florida West 0902, Datum: NAD 1983 (Conus)

Project: Lee County Buy Up
USFeet Template