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Land Surveying & Mapping Services • Sub-Surface Utility Designation & Location Services • GPS Asset Inventories • Geographic Information Systems

## Survey and Map Report

Provided by:

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Telephone: (407) 292-8580  
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Licensed Business #2108

Professional Surveyor and Mapper (PSM) in responsible charge: Gary B. Krick (PSM #4245)  
Certified to: South Florida Water Management District (hereinafter referred to as DISTRICT)  
Subject Name: 2011 Restoration Department Science Aerial Imagery  
Date of Survey: April 14, 2011 (final day of setting and surveying aerial targets)  
Reference #: 54352  
File Names SFWMD - 2011 RSD Aerial Imagery - Aerial Targets Final Coord\_LOLZ-STAs.txt and  
SFWMD - 2011 RSD Aerial Imagery - Aerial Targets Final Coord\_KRB-KRF-Lake Marion & Lake  
Jackson.txt

### Purpose

The purpose of the project was to obtain digital aerial imagery of the Loxahatchee Impoundment Landscape Assessment Area (LILA), the DISTRICT's Storm Water Treatment Areas (STAs), C-4 Basin (C4), the Kissimmee River Basin (KRB), Kissimmee River Floodplain (KRF) Lake Marian and Lake Jackson littoral zones, the Lake Okechobee Littoral Zones (LOLZ) which includes Taylor Creek and Lemkin Creek, and the Water Conservation Area 3 (WCA3), all for the purpose of vegetation mapping. The total area to be imaged encompasses approximately 1910 square miles of lakes and wetlands located throughout south Florida.

### Aerial Targets

Southeastern Surveying and Mapping Corporation (SSMC) obtained horizontal and vertical positions for Thirty-four (34) Aerial Target control points through Global Positioning System (GPS) static observations methods. The targets were placed (or recovered in the case of targets set during the 2009 Watershed Management Project or the 2010 Everglades Restoration Department Project) by SSMC at strategic positions at the direction of the consultant photogrammetrist, Aerial Cartographics of America, Inc. (ACA), who was responsible for providing the DISTRICT the contractually required digital aerial imagery.

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The dataset was developed for ACA to assess the accuracy of the Airborne GPS (ABGPS) and Inertial Measurement Unit (IMU) rectified imagery and to be used as additional control for image blocks requiring aero-triangulation procedures.

### **Field Observation Procedures for Fast Static GPS Aerial Targets**

1. TOPCON HiPER PRO Dual-frequency GPS Receivers set to a 10° elevation mask and a One (1) second-epochs recording interval were used. (Note: the manufacturer's performance specifications for this model of receiver list Horizontal accuracy of 3 millimeters + 0.5 parts per million and Vertical accuracy of 5 millimeters + 0.5 parts per million).
2. Data was logged using field computers to eliminate memory limitations on the GPS Receivers.
3. PS Receiver was set on the aerial targets using a 2-meter fixed height rod/with bipod and a Station Data Log Sheet was completed by the field crew.
4. The Field Team took multiple digital photographs of the areas to be surveyed.
5. GPS raw data was logged for One (1) hour (see item 6 for specifications).
6. The raw data was sent to the National Geodetic Survey (NGS) via email, who operates Online Positioning Users Service (OPUS). The OPUS Rapid Static (OPUS-RS) version utilizes an internal processing program to obtain geodetic quality positioning results from user data sets as short as 15 minutes. The files were delivered in the TPS file format. Prior to delivery of data to NGS, the files were analyzed to ensure the correct point name, antenna type and antenna reference points (ARP) were utilized, and also that at least one hour datasets were collected without interruption.
7. GPS Receiver was checked by the field crew every 15 minutes to ensure proper operation.
8. NGS subsequently delivered an OPUS solution report in the form of a TXT email.
9. The latitude, longitude and elevations in meters provided by NGS were converted to North American Datum of 1983 (NAD83) State Plane Florida East U.S. feet coordinates using the U.S. Army Corps of Engineers Corpscon version 6.0.1 software by the GPS Coordinator. Elevations were referenced to North American Vertical Datum of 1988 (NAVD 88) U.S. feet.
10. Reports were then generated in both PDF and TXT (comma delimited) file formats, with the compiled northings, eastings and elevations extracted from the OPUS solution reports. The compiled report also included each point name, the horizontal and vertical datum references, projections and units of measurement.

The final horizontal and vertical values for each Aerial Target or Post Identification station is relative to North American Datum (NAD) 1983 (CORS96), State Plane Coordinate System, Florida East Zone 901, and North American Vertical Datum of 1988 (NAVD88).

Note: Aerial Targets points AT122, AT127, AT136, AT137 AT138, and AT139 and were established in the 2009 Watershed Management Project and AT228, AT229, AT235 were established in the 2010 Everglades Restoration Department Project. All of the points listed were recovered to have the vinyl fabric replaced or to be repainted.

### **Accuracy Statement**

The horizontal accuracy of the dataset met or exceeded Second Order Class II as set forth in the FGDC (Federal Geographic Data Committee) Geospatial Positioning Accuracy Standards, PART 4, Standards for Architecture, Engineering and Construction (A/E/C) and Facilities Management (FGDC-SDT-007.4-2002), as shown on page 4-11, Table A-1, Minimum Closure Standards for Engineering and Construction Control Surveys, being a ratio of distance misclosure of 1:20,000. The equipment utilized for this task was TOPCON HiPER PRO Dual-frequency GPS Receivers set to a 10° elevation mask with recording intervals of One (1) second-epochs. The manufacturer's performance specifications for TOPCON HiPER PRO GPS receiver list horizontal accuracy of 3 millimeters + 0.5 parts per million). The aforementioned accuracy requirements were specified in the DISTRICT's Statement of Work (SOW) for this project.

The vertical accuracy of the dataset met or exceeded Third Order as set forth in the FGDC Geospatial Positioning Accuracy Standards, PART 4, Standards for A/E/C and Facilities Management (FGDC-SDT-007.4-2002), as shown on page 4-11, Table A-2, Minimum Elevation Closure Standards for Vertical Control Surveys, being 0.05' of the square root of the number of the distance in miles. The manufacturer's performance specifications for the TOPCON HiPER PRO GPS receiver list vertical accuracy of 5 millimeters + 0.5 parts per million).

The geodetic values of the dataset were achieved by rigorously controlled methods of GPS static observations that exceeded the criteria set forth by OPUS-RS for this type of survey.

The survey data provided by Aerial Cartographics of America, Incorporated is not certified by this document.

This survey is neither full nor complete without the Survey and Map Report and is not valid without the signature and original raised seal of a Florida Licensed Surveyor and Mapper.

All work was accomplished under the supervision of a Professional Surveyor and Mapper pursuant to Chapter 472, Florida Statutes.

This Control Survey was done under my responsible charge and meets the Minimum Technical Standards of the Florida Board of Professional Surveyors and Mappers, Chapter 5J17.050-17.052, Florida Administrative Code, pursuant to Section 472.027, Florida Statutes.

Date: June 23, 2011

Signed: 

Gary B. Krick, PSM  
Florida Professional Surveyor & Mapper

LS0004245

AERIAL TARGET COORDINATES & ELEVATIONS  
LAKE OKEECHOBEE LITTORAL ZONE (LOLZ)  
STORMWATER TREATMENT AREAS (STAS)

PROJECT: 2011 EVERGLADES RESTORATION DEPARTMENT AERIAL IMAGERY  
SSMC JOB NUMBER: 54352  
HORIZONTAL DATUM: NAD 83  
VERTICAL DATUM: NAVD88  
UNTIS: U.S. FEET  
STATE PLANE COORDINATES PROJECTION: FL EAST(901)

| POINT | NORTHING   | EASTING   | ELEVATION | CODE  |
|-------|------------|-----------|-----------|-------|
| 107   | 1040549.32 | 742932.59 | 25.68     | AT107 |
| 122   | 737780.52  | 760535.14 | 11.13     | AT122 |
| 127   | 726585.12  | 694668.81 | 23.12     | AT127 |
| 136   | 852693.52  | 837263.13 | 15.18     | AT136 |
| 137   | 823297.02  | 836959.20 | 18.68     | AT137 |
| 138   | 833931.67  | 879310.86 | 27.83     | AT138 |
| 139   | 854659.37  | 885307.25 | 20.47     | AT139 |
| 201   | 1084092.99 | 708683.35 | 24.78     | AT201 |
| 216   | 988433.77  | 772691.54 | 18.04     | AT216 |
| 218   | 1016292.38 | 687279.29 | 20.69     | AT218 |
| 219   | 959055.69  | 617626.78 | 15.66     | AT219 |
| 220   | 911415.55  | 624156.24 | 15.21     | AT220 |
| 221   | 852269.42  | 745530.70 | 14.93     | AT221 |
| 222   | 893099.78  | 757079.78 | 10.72     | AT222 |
| 228   | 750190.79  | 758343.98 | 12.91     | AT228 |
| 229   | 759444.07  | 826488.99 | 15.49     | AT229 |
| 230   | 727406.23  | 807598.16 | 15.48     | AT230 |
| 235   | 773413.27  | 673604.34 | 19.83     | AT235 |
| 236   | 774172.19  | 697924.79 | 11.70     | AT236 |

AERIAL TARGET COORDINATES & ELEVATIONS  
KISSIMMEE RIVER BASIN (KRB),  
KISSIMMEE RIVER FLOODPLAIN (KRF),  
LAKE MARION & LAKE JACKSON

PROJECT: 2011 EVERGLADES RESTORATION DEPARTMENT AERIAL IMAGERY  
SSMC JOB NUMBER: 54352  
HORIZONTAL DATUM: NAD 83  
VERTICAL DATUM: NAVD88  
UNTIS: U.S. FEET  
STATE PLANE COORDINATES PROJECTION: FL EAST(901)

| POINT | NORTHING    | EASTING    | ELEVATION | CODE   |
|-------|-------------|------------|-----------|--------|
| 140   | 1259487.289 | 552352.969 | 114.92    | AT0140 |
| 141   | 1209552.398 | 564660.120 | 116.03    | AT0141 |
| 142   | 1261935.600 | 582949.204 | 55.617    | AT0142 |
| 143   | 1297873.452 | 624502.652 | 66.329    | AT0143 |
| 144   | 1231159.822 | 603262.881 | 52.936    | AT0144 |
| 145   | 1202883.027 | 624608.027 | 55.830    | AT0145 |
| 146   | 1177939.840 | 597320.346 | 43.753    | AT0146 |
| 147   | 1143122.938 | 585633.092 | 60.512    | AT0147 |
| 148   | 1114175.893 | 618326.282 | 35.095    | AT0148 |
| 149   | 1232740.310 | 658214.972 | 70.577    | AT0149 |
| 150   | 1202633.262 | 683106.830 | 68.054    | AT0150 |
| 151   | 1138251.665 | 691880.636 | 65.731    | AT0151 |
| 152   | 1108662.704 | 657715.177 | 38.934    | AT0152 |
| 153   | 1085039.471 | 648819.187 | 30.249    | AT0153 |
| 154   | 1054978.700 | 650221.703 | 30.951    | AT0154 |