
Surveyor's Report

Hydrology - Everglades Wells

NMI Project No. 1078.010

Report Date: September 15th, 2006

Submittal: One of One

Prepared for:

**South Florida Water Management
District**



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OVERVIEW OF THE PROJECT

PURPOSE

The purpose of the Everglades Wells Project is to establish vertical control marks near each monitoring well. The monitoring wells are divided into two groups. The first group is located along Tamiami Trail. They are near established benchmarks which enabled us to utilize standard level runs to determine the elevations on those wells. The second group is located in remote areas of the Everglades. The remoteness of these wells meant that GPS observations were the only way to establish elevations on them. Also, due to the terrain, the Everglades sites were only accessible by airboat or helicopter.

The first group of wells in this project also further tests the application of Federal Geodetic Control Subcommittee (FGCS) Second-Order, Class II leveling procedures with Third-Order equipment. The goal of this hybrid pairing of procedures and equipment is to produce leveling measurements that will be acceptable to the National Geodetic Survey (NGS) and used in future vertical adjustments throughout the District.

This project utilizes uncalibrated “off-the-shelf” fiberglass level rods. Such rods are not currently approved by NGS for precise leveling (Second-Order Class II and above) for three primary reasons:

1. The fiberglass material used to construct the rods is less dimensionally stable than rods constructed of Invar metal.
2. The fiberglass rods are not individually calibrated by the manufacturer to identify scale errors across the length of the rod.
3. The fiberglass rods are a three-section snap-together style that will, over time, wear at the connection points creating error in measurements on the top two sections.

While these limitations make the rods unsuitable for the extreme precision required in First-Order and Second-Order, Class I leveling, it is the hypothesis of this project that such rods can deliver Second-Order, Class II precisions. Fiberglass rods are commonly used by surveyors today. In contrast, Invar level rods are expensive and specialized equipment only used by surveyors working on the highest precision vertical control surveys. By demonstrating that fiberglass level rods such as those used in this project are suitable for Second-Order, Class II leveling the District will benefit from the increased number of consultants using these rods. As a result, more level lines run within the District should meet NGS’s requirements for inclusion in future vertical adjustments, further refining the elevation models used for water control.

LOCATION OF PROJECT

The project is located in the Everglades. Following is a map and legend of the area.



1. 3A10
2. 3ANE
3. 3AS3W1
4. 3BS1W1
5. BCA19
6. BCA20
7. BCNPA06
8. BCNPA08
9. SGT5W1
10. SGT5W2
11. SGT5W3

ITEMS DELIVERED TO THE CLIENT

The following items are delivered to the client with this report. Neither the report nor the items listed below are complete without the other.

1. Paper and electronic copy of field notes
2. Paper and electronic copy of all computation sheets
3. CORPSMET file for each site
4. Paper and electronic copy of site photographs
5. Paper copy of South Florida Water Management District Benchmark Description
6. Paper and electronic copy of NGS Blue Book submittal

VERTICAL DATUM FOR THE PROJECT

The vertical datum for the project is the North American Vertical Datum of 1988. For correlation with older data sets, the elevations of the benchmarks are also shown in the National Geodetic Vertical Datum (NGVD) of 1929. The NGVD 29 elevations were derived using data provided by the South Florida Water Management District in a file named “NGVD29.TXT” when applicable, otherwise NGS superseded values were used. The linear unit for all elevations is the meter unless otherwise stated.

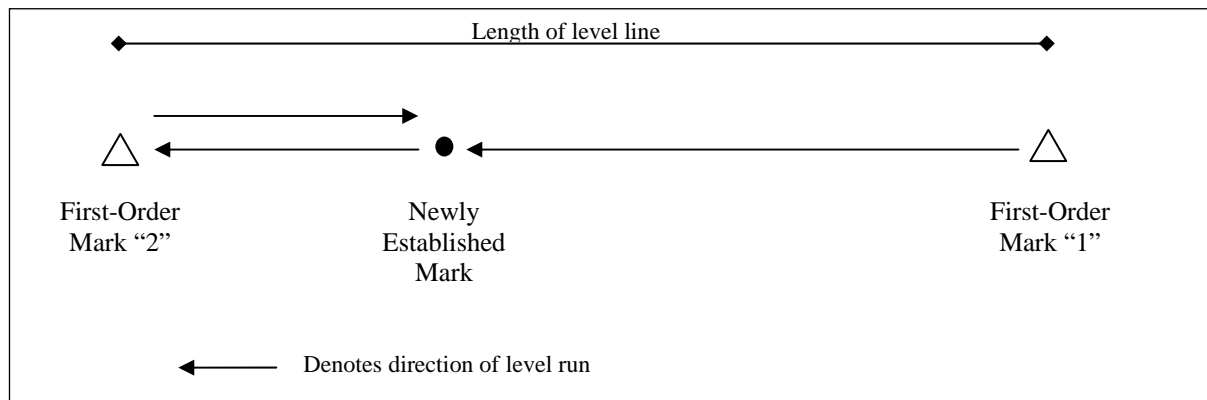
LEVELING METHODS

CONFIGURATION OF LEVEL RUNS

The leveling for the project was performed in accordance with the Federal Geodetic Control Subcommittee standard for Second-Order, Class II geodetic leveling. A brief description of the procedures used follows.

For each level line, two existing First or Second Order vertical marks were used. The run was started at one of the First or Second Order marks and continued through the newly established mark near the structure and closed on the second First or Second Order vertical mark. The run was then looped back from the second First or Second Order mark to the newly established mark (see Figure 1 below).

Figure 1 Typical Level Run Pattern



The FGCS maximum allowable misclosure for this type of run is eight millimeters multiplied by the length of the line in kilometers.

EQUIPMENT USED

All leveling during the project was performed with a Leica DNA03 digital level and Leica three-section, fiberglass bar-code level rods. Information and technical specification for the Leica DNA03 digital level are available at <http://www.leica-geosystems.com>.

GPS METHODS

INTRODUCTION

Due to the remote locations of the monuments located in the Everglades, it was decided that GPS observations were the only way to find elevation data on them. It was also determined that the most efficient mode of travel would be by helicopter, except for wells 3A10 and 3ANE. These two wells were only accessible by airboat.

The GPS observations for the project were performed in accordance with the Guidelines for Establishing GPS-Derived Ellipsoidal Heights (National Geodetic Survey Technical Memorandum NOS NGS-58).

GPS observations were conducted over five days:

- Tuesday, July 22nd, 2006
- Wednesday, August 23rd, 2006
- Thursday, August 24th, 2006
- Friday, August 25th, 2006
- Wednesday, September 6th, 2006

The following instrumentation was used for the GPS observations:

- (1) Trimble 4800 receiver/antennas
- (2) Trimble 5800 receiver/antenna
- (2) Trimble R8 receiver/antennas

DATA PROCESSING

Data Acquisition

Data was downloaded from receivers to a desktop computer through the Trimble Geomatics Office software, version 1.63 (TGO).

Data Quality

The quality of the data was checked using the Timeline feature in the TGO software. Areas of the data that showed cycle slips were disabled. Due to minor problems with baseline processing, the Signal-to-Noise Ratio (SNR) was investigated for each satellite during each observation. Areas of data that had high SNR were removed before processing the baselines.

Baseline Processing

Baselines were processed using TGO. For each session, (n-1) baselines were selected that produced fixed integer solutions with the lowest possible RMS values.

Adjustment

The ADJUST software package from NGS was used for the network adjustment. The B-file, G-file and Serfil were exported from TGO. Initial positions and ellipsoidal heights of new marks were supplied in the creation of the B-file. Both the B-file and G-file were checked using the file-checking utilities that are a part of the ADJUST software package. The B-file was edited to conform to the structure and data content necessary to remove any errors found in the file-checking utilities. This included using NAVD 88 as the vertical datum and GEOID03 for the geoid.

After all files were checked and found to be satisfactory, a minimally-constrained adjustment was performed with no weighting applied. The ellipsoid and orthometric heights of the non-fixed control points were then checked against their published values. When these heights did not correlate well with the published values, they were removed from the adjustment. This was the case with the NGS benchmark U 501 in the final day of observations.

Using the standard deviation of unit weight from the first minimally-constrained adjustment, standard errors were scaled using the MODGEE program. A second minimally-constrained adjustment was performed with satisfactory results.

For the constrained horizontal adjustment, the published horizontal position and orthometric height for the control stations were fixed. The modified G-file, using the scaled standard errors, was used for this adjustment. The network adjustment was performed and no major shifts in position were found.

A minimally-constrained vertical adjustment was performed, with the horizontal position and orthometric height of a single control station being fixed. Again, the scaled G-file was used for this vertical adjustment. The orthometric heights of the non-fixed control points were checked against their published values.

A fully-constrained vertical adjustment was then performed with the published horizontal position and orthometric height of all accepted control stations being fixed.

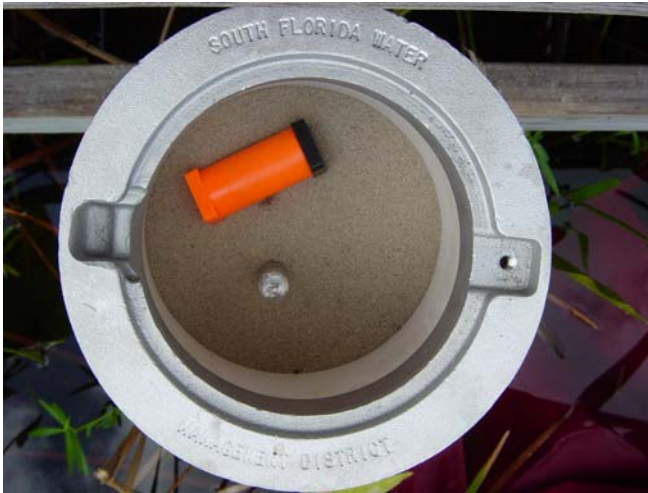
Lastly, a final minimally-constrained adjustment with accuracies was performed, with little change in the statistics.

Although no major shifts in position were found in any of the networks following the adjustment in ADJUST, the residuals were unusually high in the adjustment results for some of the networks. This is most likely due to multi-path from the solar panel at each well location. These residuals are out of tolerance for NGS blue booking. Acceptable results were achieved with wells SGT5W1, SGT5W2, SGT5W3, BCA19 & BCA20. These wells will be submitted to NGS for blue booking.

PROJECT RESULTS

The following tables list the elevations established for each new mark, the level run misclosure, “to-reach” description for each mark and a photo of the mark. All elevations are in US Survey Feet.

3A10		Elevation:	13.23	(NAVD 88)	14.67	(NGVD 29)
Bench Mark 1:	Z 497		11.25 ft	(NAVD 88)	12.72 ft	(NGVD 29)
Bench Mark 2:	U 501		25.24 ft	(NAVD 88)	26.68 ft	(NGVD 29)
Bench Mark 3:	FLGPS 64 AZ MK		9.80 ft	(NAVD 88)	11.25 ft	(NGVD 29)
Bench Mark 4:	N 410 X		12.70 ft	(NAVD 88)	14.16 ft	(NGVD 29)
Monitoring Well:	Reference Mark		16.91 ft	(NAVD 88)	18.35 ft	(NGVD 29)



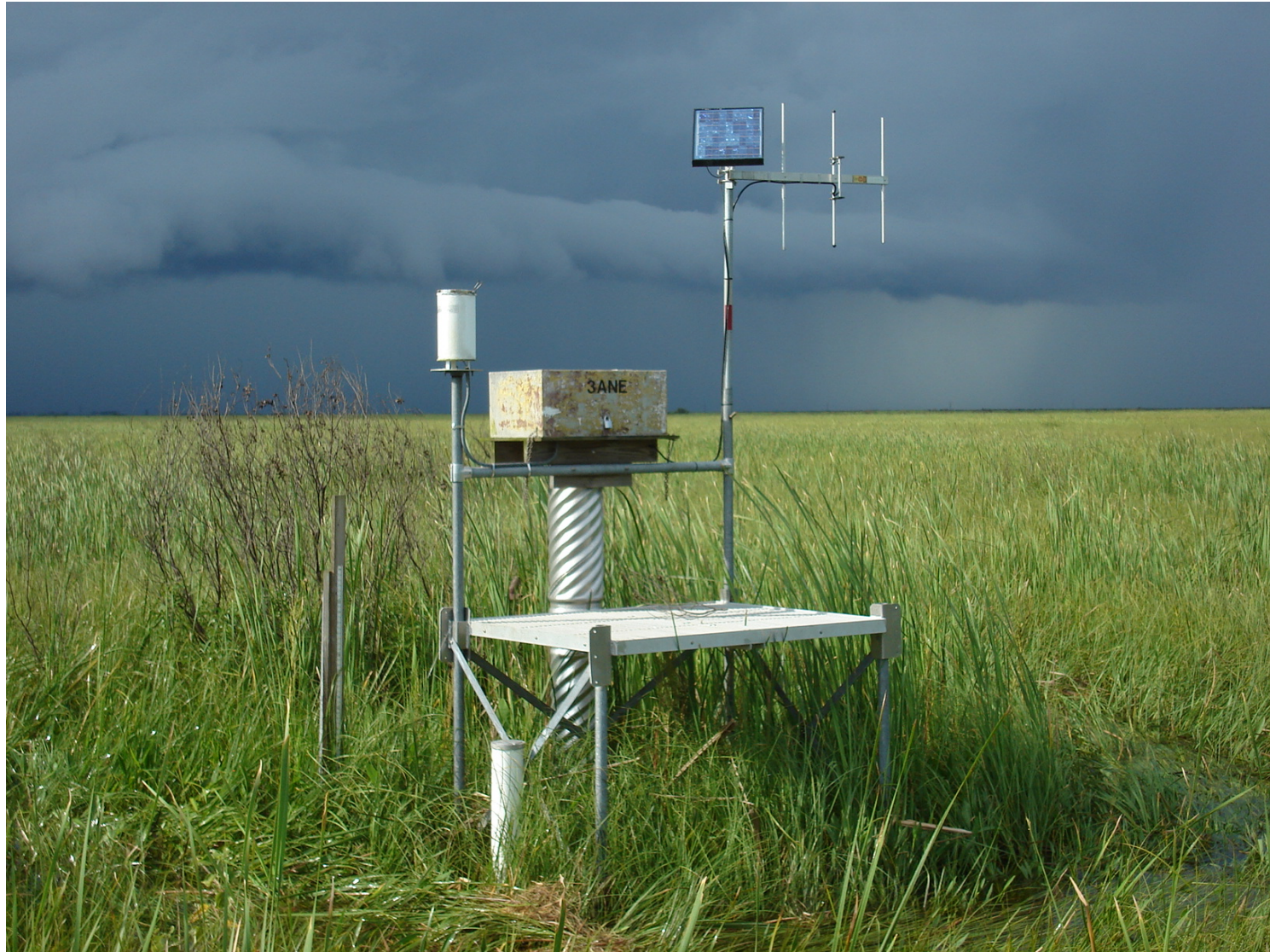
To Reach 3A10:
 FROM THE JUNCTION OF US 27 AND INTERSTATE 75. GO NORTH ON US 27 FOR 2.5 MILES TO AIRBOAT TOUR FACILITY ON RIGHT. GO EAST FOR +/-450 FEET TO BOAT RAMPS. FROM BOAT RAMPS HEAD 18.65 MILES BY AIRBOAT AT AN AZIMUTH OF 287° 41' 38" TO MARK.. LOCATED 0.50 FEET EAST OF EAST EDGE OF PLATFORM, 2.5 FEET SOUTH OF NORTHEAST CORNER OF PLATFORM, AND IS RECESSED 0.5 FEET BELOW PLATFORM. MAGNET PLACED INSIDE 6 INCH PVC CASING. ROD DEPTH IS 4.75 FEET.
 "3A10" IS A SOUTH FLORIDA WATER MANAGEMENT DISTRICT (SFWMD) 9/16 INCH STAINLESS STEEL ROD SET INSIDE A 6 INCH PVC PIPE ENCLOSURE COVERED WITH AN ACCESS HATCH.

3ANE		Elevation:	11.25 ft	(NAVD 88)	12.71 ft	(NGVD 29)
Bench Mark 1:	Z 497		11.25 ft	(NAVD 88)	12.72 ft	(NGVD 29)
Bench Mark 2:	U 501		25.24 ft	(NAVD 88)	26.68 ft	(NGVD 29)
Bench Mark 3:	FLGPS 64 AZ MK		9.80 ft	(NAVD 88)	11.25 ft	(NGVD 29)
Bench Mark 4:	N 410 X		12.70 ft	(NAVD 88)	14.16 ft	(NGVD 29)
Monitoring Well:	Reference Mark		17.14 ft	(NAVD 88)	18.60 ft	(NGVD 29)



To Reach 3ANE:
 FROM THE JUNCTION OF US 27 AND INTERSTATE 75. GO NORTH ON US 27 FOR 2.5 MILES TO AIRBOAT TOUR FACILITY ON RIGHT. GO EAST FOR +/-450 FEET TO BOAT RAMPS. FROM BOAT RAMPS HEAD 12.15 MILES BY AIRBOAT AT AN AZIMUTH OF 300° 48' 24" TO MARK.
 LOCATED 4.6 FEET SOUTHWEST OF CORRIGATED PIPE FOR MONITORING WELL, 0.55 FEET WEST OF WEST EDGE OF PLATFORM, AND IS RECESSED 2.5 FEET BELOW PLATFORM. MAGNET PLACED INSIDE 6 INCH PVC CASING. ROD DEPTH IS 15.12 FEET.
 "3ANE" IS A SOUTH FLORIDA WATER MANAGEMENT DISTRICT (SFWMD) 9/16 INCH STAINLESS STEEL ROD SET INSIDE A 6 INCH PVC PIPE ENCLOSURE COVERED WITH AN ACCESS HATCH.

3ANE



Nick Miller, Inc.
Date of Photo: September 6, 2006
View: Looking at the well facing north

3ANE



Nick Miller, Inc.

Date of Photo: September 6, 2006

View: Close-up of the well showing the contractor's markings

1078.010

STAINLESS STEEL ROD
SET TO REFUSAL
3ANE STILLING WELL

SFWMD

G. RAGER III
N. KHAN

WED. SEPT. 6TH 2006
90°F, CLOUDY

20
SFWMD-16R

- MONUMENT SET TO REFUSAL @ 15.12 FT.

- COORDINATES TO 3ANE MONUMENT
LAT: 26° 16' 07.92"
LONG: 80° 36' 52.37"

- COORDINATES TO 3ANE STILLING WELL
LAT: 26° 16' 07.92"
LONG: 80° 36' 52.37"

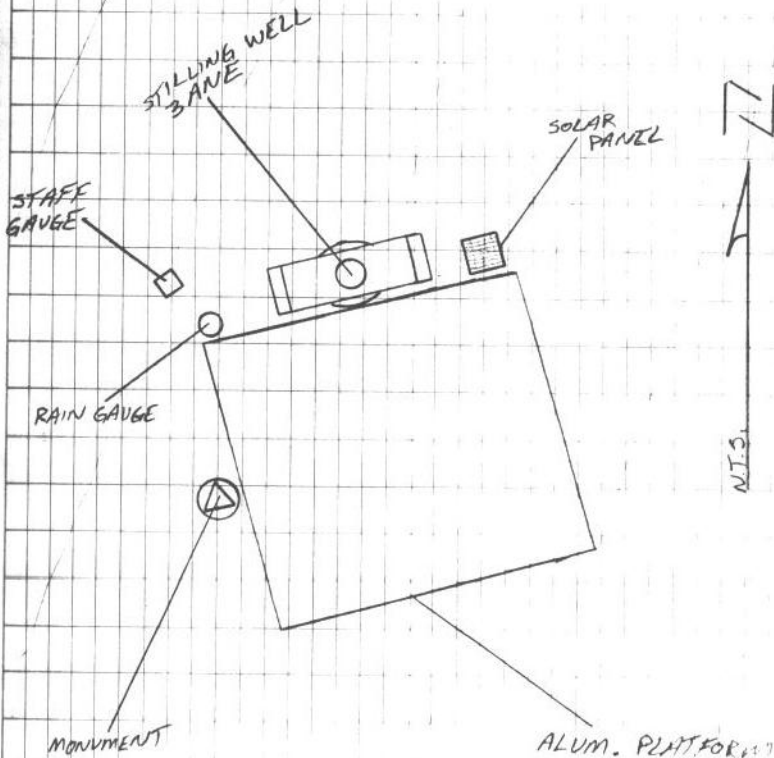
- MONUMENT SET 4.6 FT. SW OF STILLING WELL
" " " 2.5 FT. BELOW PLATFORM
" " " 0.52 FT. SW OF PLATFORM

- PICTURE #S 101-0050, 52, 53, 54, 55, 56, 57, 58

- STAFF GAUGE @ 11.30 FT @ 10:30 A.M.

- ROD RECESSED 0.8' AND A MAGNET
WAS SET INSIDE LOGO CAP.

- REFERENCE MARK IS 5.885' ABOVE
BENCH MARK (HIGHER
IN ELEVATION)



Identification_Information:

Citation:

Citation_Information:

Originator: Nick Miller, Inc. (comp.)
Originator: Stephen M. Gordon, PSM(ed.)
Publication_Date: 20060628
Publication_Time: Unknown
Title: S. F. W. M. D. Monitoring Well 3ANE
Edition: 1
Publication_Information:

Publication_Place: West Palm Beach, FL
Publisher: South Florida Water Management District

Description:

Abstract:

South Florida Water Management District
Monitoring Well 3ANE.

Purpose:

To determine as built dimensions relative to NAVD 88 and
NGVD 29 vertical datum

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 20060913

Currentness_Reference: Publication Date

Status:

Progress: Complete

Maintenance_and_Update_Frequency: Unknown

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -080D 50M 26.4S
East_Bounding_Coordinate: -080D 31M 47.5S
North_Bounding_Coordinate: +26D 19M 29.6S
South_Bounding_Coordinate: +26D 08M 45.0S

Keywords:

Theme:

Theme_Keyword_Thesaurus: Tri - Service Spatial Data Standard
Theme_Keyword: Improvement
Theme_Keyword: Geodetic/Cadastral

Place:

Place_Keyword_Thesaurus: None
Place_Keyword: S. F. W. M. D. Monitoring Well 3ANE
Place_Keyword: Sec. 14, Twp. 48 S., Rge. 37 E
Place_Keyword: Broward County, Florida
Place_Keyword_Thesaurus: Geographic Names Information System
Place_Keyword: Florida
Place_Keyword: Broward County
Place_Keyword: Deem City

Access_Constraints: None

Use_Constraints: None

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Howard Ehmke

Contact_Organization: South Florida Water Management

District

Contact_Position: Project Manager

Contact_Address:

Address_Type: mailing and physical address

Address: 3301 Gun Club Road

City: West Palm Beach

State_or_Province: Florida

Postal_Code: 33406

Country: USA

Contact_Voice_Telephone: 561-682-6672

Contact_Electronic_Mail_Address: hehmke@sfwmd.gov

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report: N/A

Logical_Consistency_Report:

Horizontal data was established using mapping grade GPS

3ANE.met

equipment. Vertical data was established using NGS control points Z 497, N 410 X, FLGPS 64 AZ MK & U 501. Coordinates are in the Florida State Plane Coordinate System, East Zone, NAD 83/90. Elevations are in the NAVD 88 and the NGVD 29.

Completeness Report:

Horizontal location taken at site benchmark
Lat. +26D 16M 08S
Long. -080D 36M 52S
N 703,610 ft
E 782,513 ft
Site Benchmark.
"3ANE" is a South Florida Water Management District (SFWMD) 9/16 inch stainless steel rod set inside a 6 inch PVC pipe enclosure covered with an access hatch.
FROM THE JUNCTION OF US 27 AND INTERSTATE 75. GO NORTH ON US 27 FOR 2.5 MILES TO AIRBOAT TOUR FACILITY ON RIGHT. GO EAST FOR +/-450 FEET TO BOAT RAMPS. FROM BOAT RAMPS HEAD 12.15 MILES BY AIRBOAT AT AN AZIMUTH OF 300° 48' 24" TO MARK. LOCATED 4.6 FEET SOUTHWEST OF CORRIGATED PIPE FOR MONITORING WELL, 0.55 FEET WEST OF THE WEST EDGE OF PLATFORM, AND IS RECESSED 2.5 FEET BELOW PLATFORM. MAGNET PLACED INSIDE 6 INCH PVC CASING. ROD DEPTH IS 15.12 FEET.
Benchmark Elevation is 11.25 feet (NAVD 88).
Well Elevation (3ANE) is 17.14 feet (NAVD 88) as observed at the existing reference mark for the well which is a black mark at the top of a pipe at the center of the recorder box floor.
NGVD 29 minus NAVD 88 equals 1.46 feet. The NGVD 1929 value was taken from a VERTCON orthometric height conversion for the coordinates of benchmark.
Vertical Control used U 501 El. 7.693 (m) (NAVD 88) El. 8.133 (m) (NGVD 29), Z 497 El. 3.430 (m) (NAVD 88) El. 3.878 (m) (NGVD 29), N 410 X El. 3.871 (m) (NAVD88) El. 4.317 (m) (NGVD 29), FLGPS 64 AZ MK El. 2.987 (m) (NAVD88) El. 3.429 (m) (NGVD 29)

Positional Accuracy:

Horizontal Positional Accuracy:

Horizontal Positional Accuracy Report:

The horizontal position of Site Benchmark "3ANE" was established using a mapping grade GPS receiver (Trimble Pro XR in accordance with the Florida Minimum Technical Standards (Chapter 61G17-6, Florida Administrative Code).

Quantitative Horizontal Positional Accuracy Assessment:

Horizontal Positional Accuracy Value: 3 to 5 meters

Horizontal Positional Accuracy Explanation: The intended

positional accuracy for this survey is 3 to 5 meters more or less.

Vertical Positional Accuracy:

Vertical Positional Accuracy Report:

A static GPS survey was conducted to find the vertical location of the monument. The survey was designed in accordance with the standards of the FGCC manual and Ronnie Taylor of NGS. The control used for this survey was U 501, Z 497, FLGPS 64 AZ MK, N 410 X.

Quantitative Vertical Positional Accuracy Assessment:

Vertical Positional Accuracy Value: N/A

Vertical Positional Accuracy Explanation: N/A

Lineage:

Process Step:

Process Description:

The horizontal work was performed using a Trimble Pro XR GPS receiver (mapping grade). The vertical data was found by using Trimble 4800, 5800 & R8 GPS receivers in a static GPS network.

Process Date: 20060906

Metadata Reference Information:

Metadata_Date: 20060913

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Stephen M. Gordon

Contact_Organization: Nick Miller, Inc.

Contact_Position: Project Surveyor

Contact_Address:

Address_Type: mailing and physical address

Address: 2560 RCA Blvd., Suite 105

City: Palm Beach Gardens

State_or_Province: Florida

Postal_Code: 33410

Country: USA

Contact_Voice_Telephone: 561-627-5200

Contact_Facsimile_Telephone: 561-627-0983

Contact_Electronic_Mail_Address: sgordon@nickmillerinc.com

Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: 2.0

Metadata_Time_Convention: Local time

Metadata_Access_Constraints: South Florida Water Management District controls access.

Metadata_Use_Constraints: Per South Florida Water Management District

Metadata_Security_Information:

Metadata_Security_Handling_Description: None




Metadata_Security_Classification: Unclassified

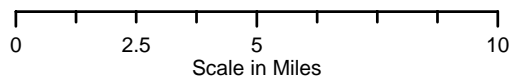
Metadata_Security_Classification_System: Structure

Wells 3A10 & 3ANE Session 1



Legend




-  Well
-  Control
-  Baselines

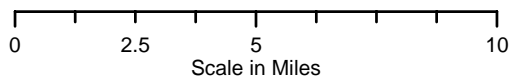


Wells 3A10 & 3ANE Session 2



Legend

-  Well
-  Control
-  Baselines





Station Designation: (check applicable: ___ FBN ___ CBN ___ PAC ___ SAC ___ BM)
3ANE-1

Station PID, if any:

Date (UTC): 6, 9, 2006

General Location:

Airport ID, if any:

Station 4-Character ID:

Day of Year:

Project Name:

SFWMD MONITORING WELLS

Project Number:

GPS-1078.010

Station Serial # (SSN):

Session ID:(A,B,C etc)

1A

NAD83 Latitude
26° 16' 07.92"

NAD83 Longitude
80° 36' 52.37"

NAD83 Ellipsoidal Height
 meters

Agency Full Name: NICK MILLER INC

Observation Session Times (UTC):
 Sched. Start 1030 Stop 1145
 Actual Start 1043 Stop 1149

Epoch Interval=15 Seconds
 Elevation Mask = 10 Degrees

NAVD88 Orthometric Ht. meters
 GEOID99 Geoid Height meters

Operator Full Name: GLENN RAGER III

Phone #: (561) 627-5200

e-mail address: INFO@NICKMILLERINC.COM

Receiver Brand & Model:

TRIMBLE R8

P/N: 50158-66
 S/N: 4507144966
 Firmware Version:

Antenna Code*, Brand & Model:

TRIMBLE R8

P/N: 50158-66
 S/N: 4507144966
 Cable Length, meters:

Antenna plumb before session? N Circle
 Antenna plumb after session? N Yes or No
 Antenna oriented to true North? N -If no,
 Weather observed at antenna ht. N explain
 Antenna ground plane used? N "

Antenna radome used? Y If yes,
 Eccentric occupation (>0.5 mm)? Y describe.
 Any obstructions above 10°? Y Use
 Radio interference source nearby Y Vis. form

CamCorder Battery, 12V DC, 110V AC, Other

Vehicle is Parked 8,000 meters S (direction) from antenna.

Tripod or Antenna Mount: Check one:

Fixed-Leg Tripod, Collapsible-leg tripod, Fixed Mount

Brand & Model: SECO CARBON GPS POLE

P/N:

S/N:

Last Adjustment date: N/A

Psychrometer (if used) Brand & Model:

P/N:

S/N:

Last Calibration or check Date:

**** ANTENNA HEIGHT ****

Before Session Begins:
Meters Feet

After Session Ends:
Meters Feet

A= Datum point to Top of Tripod (Tripod Height)

B=Additional offset to ARP if any (Tribrach/Spacer)

H= Antenna Height = A + B

= Datum Point to Antenna Reference Point (ARP)

7.300

7.300

Meters = Feet x (0.3048)

Height Entered into Receiver = _____ meters.

Note &/or sketch ANY unusual conditions.

Be Very Explicit as to where and how Measured!

Barometer (if used) Brand & Model:

S/N:

Weather Data

Weather Codes

Time (UTC)

Dry-Bulb Temp Fahrenheit Celsius

WetBulb Temp Fahrenheit Celsius

Rel. % Humidity

Atm. Pressure inches Hg millibar

Before

0111

1043

Middle

0111

1100

After

0111

1149

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s):

(Standard NGS Format = aaaaddds.xxx)
 where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension

Updated Station Description: Attached Submitted earlier
 Visibility Obstruction Form: Attached Submitted earlier
 Photographs of Station: Attached Submitted earlier
 Pencil Rubbing of Mark: Attached

LOG CHECKED BY:

Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80° F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)
Examples:	00000 = No problem, good visibility, normal temp, clear, calm wind			12121 = Problems, poor visibility, hot, overcast, moderate wind		



Station Designation: (check applicable: ___ FBN ___ CBN ___ PAC ___ SAC BM) D/m/Y
3 ANE - Z 6, 9, 2006

General Location: Airport ID, if any: Station 4-Character ID: Day of Year:

Project Name: **SFWMD MONITORING WELLS** Project Number: **GPS- 1078.010** Station Serial # (SSN): Session ID:(A,B,C etc) **2A**

NAD83 Latitude 26° 16' 07.92"	NAD83 Longitude 80° 36' 52.37"	NAD83 Ellipsoidal Height meters	Agency Full Name: NICK MILLER INC. Operator Full Name: GLENN RAGER III Phone #: (561) 627-5200 e-mail address: INFO@NICKMILLERINC.com
Observation Session Times (UTC): Sched. Start 1230 Stop 1345	Epoch Interval = 15 Seconds Elevation Mask = 10 Degrees	NAVD88 Orthometric Ht. meters	
Actual Start 1230 Stop 1345		GEOID99 Geoid Height meters	

Receiver Brand & Model: TRIMBLE R8 P/N: 50158-66 S/N: 4507144966 Firmware Version:	Antenna Code*, Brand & Model: TRIMBLE R8 P/N: 50158-66 S/N: 4507144966 Cable Length, meters:	Antenna plumb before session? <input checked="" type="radio"/> (N) Circle Antenna plumb after session? <input checked="" type="radio"/> (N) Yes or No Antenna oriented to true North? <input checked="" type="radio"/> (N) -If no, Weather observed at antenna ht. <input checked="" type="radio"/> (N) explain Antenna ground plane used? <input checked="" type="radio"/> (N) " Antenna radome used? <input checked="" type="radio"/> (Y/N) If yes, Eccentric occupation (>0.5 mm)? <input checked="" type="radio"/> (Y/N) describe. Any obstructions above 10°? <input checked="" type="radio"/> (Y/N) Use Radio interference source nearby <input checked="" type="radio"/> (Y/N) Vis. form
<input type="checkbox"/> CamCorder Battery, <input type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input checked="" type="checkbox"/> Other Vehicle is Parked 8000 meters S (direction) from antenna.		

Tripod or Antenna Mount: Check one: <input type="checkbox"/> Fixed-Leg Tripod, <input type="checkbox"/> Collapsible-leg tripod, <input checked="" type="checkbox"/> Fixed Mount Brand & Model: SECO CARBON GPS POLE P/N: S/N: Last Adjustment date: N/A	** ANTENNA HEIGHT **	Before Session Begins:	After Session Ends:
Psychrometer (if used) Brand & Model:	A= Datum point to Top of Tripod (Tripod Height)	Meters	Meters
P/N: S/N: Last Calibration or check Date:	B=Additional offset to ARP if any (Tribraich/Spacer)	Feet	Feet
	H= Antenna Height = A + B	7.300	7.300
	= Datum Point to Antenna Reference Point (ARP)		
	Meters = Feet x (0.3048) Height Entered into Receiver = _____ meters.	Note &/or sketch ANY unusual conditions. Be Very Explicit as to where and how Measured!	

Barometer (if used) Brand & Model: S/N:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp		WetBulb Temp		Rel. % Humidity	Atm. Pressure	
				Fahrenheit	Celsius	Fahrenheit	Celsius		inches Hg	millibar
	Before	01111	1230							
	Middle	01111	1310							
	After	01111	1345							


Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): (Standard NGS Format = aaaadddd.xxx) where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension	Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached	LOG CHECKED BY:
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Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80° F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)
Examples:	00000 = No problem, good visibility, normal temp, clear, calm wind		12121 = Problems, poor visibility, hot, overcast, moderate wind			

D. / m / Y

	Station Designation: (check applicable: __ FBN __ CBN __ PAC __ SAC <input checked="" type="checkbox"/> BM)	Station PID, if any:	Date (UTC)
	3 ANE-4	General Location: Airport ID, if any:	6, 9, 2006
Project Name: SFWMD MONITORING WELLS	Project Number: GPS-1078.010	Station 4-Character ID:	Day of Year:

NAD83 Latitude 26° 16' 07.92"	NAD83 Longitude 80° 36' 52.37"	NAD83 Ellipsoidal Height meters	Agency Full Name: NICK MILLER INC.
Observation Session Times (UTC): Scheduled Start 1615 Stop 1715	Epoch Interval = 15 Seconds	NAVD88 Orthometric Ht. meters	Operator Full Name: GLENN RAGERTE
Actual Start 1615 Stop 1705	Elevation Mask = 10 Degrees	GEOID99 Geoid Height meters	Phone #: (561) 627-5200
Receiver Brand & Model: TRIMBLE R8		Antenna Code*, Brand & Model: TRIMBLE R8	

P/N: 50158-66 S/N: 4507144966 Firmware Version:	P/N: 50158-66 S/N: 4507144966 Cable Length, meters:	Antenna plumb before session? <input checked="" type="checkbox"/> (N) Circle	Antenna plumb after session? <input checked="" type="checkbox"/> (N) Yes or No
<input type="checkbox"/> CamCorder Battery, <input type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input checked="" type="checkbox"/> Other	Vehicle is Parked 8000 meters S (direction) from antenna.	Antenna oriented to true North? <input checked="" type="checkbox"/> (N) -If no, explain	Weather observed at antenna ht. <input checked="" type="checkbox"/> (N)
		Antenna ground plane used? <input checked="" type="checkbox"/> (N)	
		Antenna radome used? <input checked="" type="checkbox"/> (N) If yes, describe.	Eccentric occupation (>0.5 mm)? <input checked="" type="checkbox"/> (N) Use
		Any obstructions above 10°? <input checked="" type="checkbox"/> (N) Use	Radio interference source nearby <input checked="" type="checkbox"/> (N) Vis. form

Tripod or Antenna Mount: Check one. <input type="checkbox"/> Fixed-Leg Tripod, <input type="checkbox"/> Collapsible-leg tripod, <input checked="" type="checkbox"/> Fixed Mount Brand & Model: SECO CARBON GPS POLE P/N: S/N: Last Adjustment date: N/A Psychrometer (if used) Brand & Model: P/N: S/N: Last Calibration or check Date:	** ANTENNA HEIGHT **		Before Session Begins:		After Session Ends:	
			Meters	Feet	Meters	Feet
	A = Datum point to Top of Tripod (Tripod Height)					
	B = Additional offset to ARP if any (Tribrach/Spacer)					
H = Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)			7.300		7.300	
Meters = Feet x (0.3048)		Note &/or sketch ANY unusual conditions.				
Height Entered Into Receiver = _____ meters.		Be Very Explicit as to where and how Measured!				

Barometer (if used) Brand & Model:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp		WetBulb Temp		Rel. % Humidity	Atm. Pressure	
				Fahrenheit	Celsius	Fahrenheit	Celsius		inches Hg	millibar
S/N:	Before	02122	1615							
	Middle	02122	1645							
	After	02122	1705							


Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

ENDED SESSION FEW MINUTES EARLY DUE TO SEVERE WEATHER CONDITIONS.

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): (Standard NGS Format = aaaaddds.xxx) where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension	Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached	LOG CHECKED BY:
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Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F - 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)
Examples:	00000 = No problem, good visibility, normal temp, clear, calm wind		12121 = Problems, poor visibility, hot, overcast, moderate wind			

 April 16, 2003	Station Designation: (check applicable: ___ FBN ___ CBN ___ PAC ___ SAC <input checked="" type="checkbox"/> BM) FLGPS 64AZMK	Station PID, if any: AD7926	Date (UTC): 09-06-06
	General Location: LONE PALM HEAD	Airport ID, if any:	Station 4-Character ID:

Project Name: SFWMND MONITORING WELLS	Project Number: 1078.008 GPS-	Station Serial # (SSN):	Session ID:(A,B,C etc) 9B
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NAD83 Latitude 26° 10' 06.94681	NAD83 Longitude 80° 50' 26.37534	NAD83 Ellipsoidal Height -21.67 meters NAVD88 Orthometric Ht. 2.987 meters GEOID99 Geoid Height -24.67 meters	Agency Full Name: NICK MILLER INC. Operator Full Name: JASON CAMPBELL Phone #: (561) 627-5200 e-mail address:
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Observation Session Times (UTC): Sched. Start 2:30 Stop 3:30 Actual Start 2:17 Stop 3:30	Epoch Interval = 15 Seconds Elevation Mask = 10 Degrees	Receiver Brand & Model: TRIMBLE TSCE CONTROLLER P/N: 45185-10 S/N: 00029497 Firmware Version:	Antenna Code*, Brand & Model: TRIMBLE 5800 P/N: 53620-66 S/N: 4450141400 Cable Length, meters:	Antenna plumb before session? <input checked="" type="checkbox"/> (N) Circle Antenna plumb after session? <input checked="" type="checkbox"/> (N) Yes or No Antenna oriented to true North? <input checked="" type="checkbox"/> (N) -If no, explain Weather observed at antenna ht. <input checked="" type="checkbox"/> (N) Antenna ground plane used? <input checked="" type="checkbox"/> (N)
<input checked="" type="checkbox"/> CamCorder Battery, <input type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input type="checkbox"/> Other	Vehicle is Parked 20 meters N (direction) from antenna.	Antenna radome used? <input type="checkbox"/> (N) If yes, describe. Eccentric occupation (>0.5 mm)? <input type="checkbox"/> (N) Use Any obstructions above 10°? <input type="checkbox"/> (N) Vis. form Radio interference source nearby <input type="checkbox"/> (N)		

Tripod or Antenna Mount: Check one: <input type="checkbox"/> Fixed-Leg Tripod, <input checked="" type="checkbox"/> Collapsible-leg tripod <input type="checkbox"/> Fixed Mount Brand & Model: F.L.T. P/N: S/N: Last Adjustment date: N/A	** ANTENNA HEIGHT **	Before Session Begins: Meters Feet	After Session Ends: Meters Feet
Psychrometer (if used) Brand & Model: P/N: S/N: Last Calibration or check Date:	A= Datum point to Top of Tripod (Tripod Height)		
	B= Additional offset to ARP if any (Tribrach/Spacer)		
	H= Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)	2.0574 6.75	2.0574 6.75
	Meters = Feet x (0.3048) Height Entered Into Receiver = 2.0574 meters.	Note &/or sketch ANY unusual conditions. Be Very Explicit as to where and how Measured!	

Barometer (if used) Brand & Model: S/N:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit Celsius	WetBulb Temp Fahrenheit Celsius	Rel. % Humidity	Atm. Pressure Inches Hg millibar
	Before	0010	2:16				
	Middle	0010	2:40				
	After	0010	3:30				


Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): (Standard NGS Format = aaaadddd.xxx) where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension	Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached	LOG CHECKED BY:
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Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)

Examples: 00000 = No problem, good visibility, normal temp, clear, calm wind 12121 = Problems, poor visibility, hot, overcast, moderate wind

	Station Designation: (check applicable: __ FBN __ CBN __ PAC __ SAC <input checked="" type="checkbox"/> BM)	Station PID, if any:	Date (UTC):
	U 501	AJ 65.30	09-06-06
General Location:	Airport ID, if any:	Station 4-Character ID:	Day of Year:
NORTH OF LONE PALM		U 501	

Project Name:	Project Number:	Station Serial # (SSN):	Session ID:(A,B,C etc)
SFWMD MONITORING WELLS	1078.008 GPS-		10 A

NAD83 Latitude	NAD83 Longitude	NAD83 Ellipsoidal Height	Agency Full Name:
26° 15' 35"	80° 49' 48"	meters	NICK MILLER INC.
Observation Session Times (UTC):	Epoch Interval=	NAVD88 Orthometric Ht.	Operator Full Name:
Sched. Start 12:45 Stop 1:45	15 Seconds	7.693 meters	JASON CAMPBELL
Actual Start 12:28 Stop 1:45	Elevation Mask =	GEOID99 Geoid Height	Phone #: (561)627-5200
	10 Degrees	-24.76 meters	e-mail address:

Receiver Brand & Model:	Antenna Code*, Brand & Model:	Antenna plumb before session?	<input checked="" type="checkbox"/> (N) Circle
TRIMBLE SC5E CONTROLLER	TRIMBLE 5800	Antenna plumb after session?	<input checked="" type="checkbox"/> (N) Yes or No
P/N: 45185-10	P/N: 53620-66	Antenna oriented to true North?	<input checked="" type="checkbox"/> (N) -If no, explain
S/N: 00029497	S/N: 4450141400	Weather observed at antenna ht.	<input checked="" type="checkbox"/> (N)
Firmware Version:	Cable Length, meters:	Antenna ground plane used?	<input checked="" type="checkbox"/> (N)
<input checked="" type="checkbox"/> CamCorder Battery, <input type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input type="checkbox"/> Other	Vehicle is Parked 10 meters S (direction) from antenna.	Antenna radome used?	<input checked="" type="checkbox"/> (N) If yes, describe.
		Eccentric occupation (>0.5 mm)?	<input checked="" type="checkbox"/> (N) Use
		Any obstructions above 10°?	<input checked="" type="checkbox"/> (N) Vis. form
		Radio interference source nearby?	<input checked="" type="checkbox"/> (N)

Tripod or Antenna Mount: Check one: <input type="checkbox"/> Fixed-Leg Tripod, <input checked="" type="checkbox"/> Collapsible-leg tripod, <input type="checkbox"/> Fixed Mount Brand & Model: F.L.T. P/N: S/N: Last Adjustment date: N/A Psychrometer (if used) Brand & Model: P/N: S/N: Last Calibration or check Date:	** ANTENNA HEIGHT **		Before Session Begins:		After Session Ends:	
			Meters	Feet	Meters	Feet
	A= Datum point to Top of Tripod (Tripod Height)					
	B= Additional offset to ARP if any (Tribrach/Spacer)					
	H= Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)		1.8959	6.22	1.8959	6.22

Barometer (if used) Brand & Model:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp		WetBulb Temp		Rel. % Humidity	Atm. Pressure	
				Fahrenheit	Celsius	Fahrenheit	Celsius		inches Hg	millibar
S/N:	Before	00100	12:40							
	Middle	00110	1:20							
	After	00110	1:45							

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s):	Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier	LOG CHECKED BY:
(Standard NGS Format = aaaadddd.xxx) where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension	Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier	
	Photographs of Station: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier	
	Pencil Rubbing of Mark: <input type="checkbox"/> Attached	

Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80° F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)

Examples: 00000 = No problem, good visibility, normal temp, clear, calm wind 12121 = Problems, poor visibility, hot, overcast, moderate wind

GPS OBSERVATION LOG
April 19, 2003

Station Designation: (check applicable: <input type="checkbox"/> FBN <input type="checkbox"/> CBN <input type="checkbox"/> PAC <input checked="" type="checkbox"/> SAC <input type="checkbox"/> BM)	Station PID, if any:	Date (UTC):
<u>U501</u>	<u>AJ6530</u>	<u>09-06-06</u>
General Location:	Airport ID, if any:	Station 4-Character ID:
<u>NORTH OF LONE PALM</u>		<u>U501</u>

Project Name:	Project Number:	Station Serial # (SSN):	Session ID:(A,B,C etc)
<u>SFWMND MONITORING WELLS</u>	<u>1078.008</u> GPS-		<u>1013</u>

NAD83 Latitude	NAD83 Longitude	NAD83 Ellipsoidal Height	Agency Full Name:
<u>26° 15' 35"</u>	<u>80° 49' 48"</u>	meters	<u>NICK MILLER INC.</u>
Observation Session Times (UTC):	Epoch Interval = <u>15</u> Seconds	NAVD88 Orthometric Ht.	Operator Full Name:
Sched. Start <u>4:15</u> Stop <u>5:15</u>	Elevation Mask = <u>10</u> Degrees	<u>7.693</u> meters	<u>JASON CAMPBELL</u>
Actual Start <u>4:01</u> Stop <u>5:15</u>		GEOID99 Geoid Height	Phone #: <u>(561) 627-5200</u>
		<u>-24.76</u> meters	e-mail address:

Receiver Brand & Model:	Antenna Code*, Brand & Model:	Antenna plumb before session? <input checked="" type="radio"/> N) Circle
<u>TRIMBLE TSCC CONTROLLER</u>	<u>TRIMBLE 5800</u>	Antenna plumb after session? <input checked="" type="radio"/> N) Yes or No
P/N: <u>45185-10</u>	P/N: <u>53620-66</u>	Antenna oriented to true North? <input checked="" type="radio"/> N) -If no, explain
S/N: <u>00029497</u>	S/N: <u>4450141400</u>	Weather observed at antenna ht. <input checked="" type="radio"/> N) "
Firmware Version:	Cable Length, meters:	Antenna ground plane used? <input checked="" type="radio"/> N) "
<input checked="" type="checkbox"/> CamCorder Battery, <input type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input type="checkbox"/> Other	Vehicle is Parked <u>16</u> meters <u>S</u> (direction) from antenna.	Antenna radome used? <input checked="" type="radio"/> Y) If yes, describe.
		Eccentric occupation (>0.5 mm)? <input checked="" type="radio"/> Y) Use
		Any obstructions above 10°? <input checked="" type="radio"/> Y) Use
		Radio interference source nearby <input checked="" type="radio"/> Y) Vis. form

Tripod or Antenna Mount: Check one: <input type="checkbox"/> Fixed-Leg Tripod, <input checked="" type="checkbox"/> Collapsible-leg tripod, <input type="checkbox"/> Fixed Mount Brand & Model: <u>F.L.T.</u> P/N: S/N: Last Adjustment date: <u>N/A</u> Psychrometer (if used) Brand & Model: P/N: S/N: Last Calibration or check Date:	** ANTENNA HEIGHT **		Before Session Begins:	After Session Ends:		
			Meters	Feet	Meters	Feet
	A = Datum point to Top of Tripod (Tripod Height)					
	B = Additional offset to ARP if any (Tribrach/Spacer)					
	H = Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)		<u>1.8974</u>	<u>6.225</u>	<u>1.8974</u>	<u>6.225</u>

Meters = Feet x (0.3048)
Height Entered Into Receiver = 1.8974 meters. Note &/or sketch ANY unusual conditions. Be Very Explicit as to where and how Measured!

Barometer (if used) Brand & Model: S/N:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit	Dry-Bulb Temp Celsius	WetBulb Temp Fahrenheit	WetBulb Temp Celsius	Rel. % Humidity	Atm. Pressure inches Hg	Atm. Pressure millibar
	Before		<u>00110</u>	<u>4:00</u>						
	Middle		<u>00110</u>	<u>4:32</u>						
	After		<u>00110</u>	<u>5:10</u>						

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): (Standard NGS Format = aaaadddd.xxx) where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension	Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached	LOG CHECKED BY:
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Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80° F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)

Examples: 00000 = No problem, good visibility, normal temp, clear, calm wind 12121 = Problems, poor visibility, hot, overcast, moderate wind

GPS OBSERVATION LOG
April 16, 2003

Station Designation: (check applicable: FBN CBN PAC SAC BM) **Z-497**

Station PID, if any: _____ Date (UTC): **6 Sept. 2006**

General Location: **SUNRISE FL.** Airport ID, if any: _____ Station 4-Character ID: _____ Day of Year: _____

Project Name: **SFWMD MONITORING WELLS** Project Number: **1078** Station Serial # (SSN): _____ Session ID:(A,B,C etc) _____
GPS-

NAD83 Latitude: _____ NAD83 Longitude: _____ NAD83 Ellipsoidal Height: _____ meters
NAVD88 Orthometric Ht. _____ meters
GEOID99 Geoid Height _____ meters

Agency Full Name: **NICK MILLER INC**
Operator Full Name: **JOSH Szoboszki**
Phone #: **(561) 627-5200**
e-mail address: **info@NICKMILLERINC.COM**

Observation Session Times (UTC):
Sched. Start **11:00** Stop **12:15**
Actual Start **10:21** Stop **11:45**

Epoch Interval = **15** Seconds
Elevation Mask = **10** Degrees

Receiver Brand & Model: **TRIMBLE R8** Antenna Code*, Brand & Model: **TREMBLE R8**

P/N: **45145-16** S/N: **431219192** Firmware Version: _____
Cable Length, meters: **2m**

CamCorder Battery, 12V DC, 110V AC, Other Vehicle is Parked **15** meters **W** (direction) from antenna.

Antenna plumb before session? (N) Circle Yes or No
Antenna plumb after session? (N) Yes or No
Antenna oriented to true North? (N) -If no, explain
Weather observed at antenna ht. (N) explain
Antenna ground plane used? (N) "

Antenna radome used? (Y/N) If yes, describe.
Eccentric occupation (>0.5 mm)? (Y/N) Use
Any obstructions above 10°? (Y/N) Use
Radio interference source nearby (Y/N) Vis. form

Tripod or Antenna Mount: Check one:
 Fixed-Leg Tripod, Collapsible-leg tripod, Fixed Mount

Brand & Model: **FLORIDA LEVEL & TRANSIT**
P/N: _____ S/N: _____
Last Adjustment date: **N/A**

Psychrometer (if used) Brand & Model: _____
P/N: _____ S/N: _____
Last Calibration or check Date: _____

**** ANTENNA HEIGHT ****

	Before Session Begins:		After Session Ends:	
	Meters	Feet	Meters	Feet
A = Datum point to Top of Tripod (Tripod Height)				
B = Additional offset to ARP if any (Tribrach/Spacer)				
H = Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)		5.94		5.94

Meters = Feet x (0.3048)
Height Entered Into Receiver = _____ meters. Note &/or sketch ANY unusual conditions. Be Very Explicit as to where and how Measured!

Barometer (if used) Brand & Model: S/N: _____	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit Celsius		WetBulb Temp Fahrenheit Celsius		Rel. % Humidity	Atm. Pressure inches Hg millibar	
	Before	00010	10:21							
	Middle	00010	11:15							
	After	00010	11:45							

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.


Data File Name(s): _____ Updated Station Description: Attached Submitted earlier
Visibility Obstruction Form: Attached Submitted earlier
Photographs of Station: Attached Submitted earlier
Pencil Rubbing of Mark: Attached

(Standard NGS Format = aaaadddd.xxx)
where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension

LOG CHECKED BY: _____

Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80° F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)

Examples: 00000 = No problem, good visibility, normal temp. clear, calm wind 12121 = Problems, poor visibility, hot, overcast, moderate wind

 GPS OBSERVATION LOG April 16, 2003	Station Designation: (check applicable: <input type="checkbox"/> FBN <input type="checkbox"/> CBN <input type="checkbox"/> PAC <input checked="" type="checkbox"/> SAC <input type="checkbox"/> BM) Z-497	Station PID, if any:	Date (UTC): 6, SEPT 2006
	General Location: SUNRISE, FL.	Airport ID, if any:	Station 4-Character ID:

Project Name: SKUMD MONITORING WELLS	Project Number: 1078 GPS-	Station Serial # (SSN):	Session ID:(A,B,C etc)
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NAD83 Latitude 0	NAD83 Longitude 0	NAD83 Ellipsoidal Height meters	Agency Full Name: NICK MILLER INC. Operator Full Name: JOSE SOUTHWELL Phone #: (561) 621-8200 e-mail address: INFO@NICKMILLERINC.COM
Observation Session Times (UTC): Sched. Start 14:30 Stop 15:30 Actual Start 14:22 Stop 15:30	Epoch Interval = 15 Seconds Elevation Mask = 10 Degrees	NAVD88 Orthometric Ht. meters GEOID99 Geoid Height meters	

Receiver Brand & Model: TRIMBLE R8 P/N: 45145-46 S/N: 4312119192 Firmware Version: <input type="checkbox"/> CamCorder Battery, <input type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input type="checkbox"/> Other	Antenna Code*, Brand & Model: TRIMBLE R8 P/N: 45145-16 S/N: 4312119192 Cable Length, meters: 2m Vehicle is Parked 16 meters S (direction) from antenna.	Antenna plumb before session? <input checked="" type="checkbox"/> (Y/N) Circle Antenna plumb after session? <input checked="" type="checkbox"/> (Y/N) Yes or No Antenna oriented to true North? <input checked="" type="checkbox"/> (Y/N) -If no, explain Weather observed at antenna ht. <input checked="" type="checkbox"/> (Y/N) Antenna ground plane used? <input checked="" type="checkbox"/> (Y/N)
		Antenna radome used? <input type="checkbox"/> (Y/N) If yes, describe. Eccentric occupation (>0.5 mm)? <input type="checkbox"/> (Y/N) Use Any obstructions above 10°? <input type="checkbox"/> (Y/N) Radio interference source nearby <input type="checkbox"/> (Y/N) Vis. form

Tripod or Antenna Mount: Check one: <input type="checkbox"/> Fixed-Leg Tripod, <input type="checkbox"/> Collapsible-leg tripod, <input type="checkbox"/> Fixed Mount Brand & Model: FLORIDA LEVEL CENTER P/N: S/N: Last Adjustment date: Psychrometer (if used) Brand & Model: P/N: S/N: Last Calibration or check Date:	** ANTENNA HEIGHT **		Before Session Begins: Meters Feet		After Session Ends: Meters Feet	
	A= Datum point to Top of Tripod (Tripod Height)					
	B= Additional offset to ARP if any (Tribrach/Spacer)					
	H= Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)			5.94		5.94

Meters = Feet x (0.3048) Note &/or sketch ANY unusual conditions.
 Height Entered Into Receiver = _____ meters. Be Very Explicit as to where and how Measured!

Barometer (if used) Brand & Model: S/N:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit Celsius		WetBulb Temp Fahrenheit Celsius		Rel. % Humidity	Atm. Pressure inches Hg millibar	
		Before	0000	14:25						
	Middle	0000	15:00							
	After	0000	15:30							

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): (Standard NGS Format = aaaaddds.xxx) where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension	Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached	LOG CHECKED BY:
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Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
1	did occur	Fair, 7-15 miles	Hot, over 80° F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph	
2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)	

Examples: 00000 = No problem, good visibility, normal temp, clear, calm wind 12121 = Problems, poor visibility, hot, overcast, moderate wind

GPS OBSERVATION LOG
April 16, 2003

Station Designation: (check applicable: FBN CBN PAC SAC BM) **N-410X**

Station PID, if any: **AD8127**

Date (UTC): **6 Sept, 2006**

General Location: **Broward FL**

Airport ID, if any:

Station 4-Character ID:

Day of Year:

Project Name: **SFWMD MONITORING WELLS**

Project Number: **1078**

Station Serial # (SSN):

Session ID:(A,B,C etc)

NAD83 Latitude: **26° 19' 29.618"**

NAD83 Longitude: **080° 31' 47.4939"**

NAD83 Ellipsoidal Height: **-21.05** meters

Agency Full Name: **Nick Miller Inc.**

Operator Full Name: **Josh Seidman**

NAVD88 Orthometric Ht.: **3.871** meters

Phone #: **(561) 627-5200**

Observation Session Times (UTC):
Sched. Start **12:30** Stop **13:45**

Epoch Interval = **15** Seconds

Actual Start **12:27** Stop **13:45**

Elevation Mask = **10** Degrees

GEOD99 Geoid Height: **-24.92** meters

e-mail address: **wfo@nickmillerinc.com**

Receiver Brand & Model: **TRIMBLE R8**

Antenna Code*, Brand & Model: **TRIMBLE R8**

Antenna plumb before session? (Y) (N) Circle

Antenna plumb after session? (Y) (N) Yes or No

Antenna oriented to true North? (Y) (N) -if no, explain

Weather observed at antenna ht. (Y) (N) "

Antenna ground plane used? (Y) (N) "

P/N: **4511546**

S/N: **4312119192**

Firmware Version:

Antenna radome used? (Y) (N) If yes, describe.

Eccentric occupation (>0.5 mm)? (Y) (N) Use

Any obstructions above 10°? (Y) (N) Use

Radio interference source nearby (Y) (N) Vis. form

CamCorder Battery, 12V DC, 110V AC, Other

Vehicle is Parked **10** meters **NW** (direction) from antenna.

Tripod or Antenna Mount: Check one:
 Fixed-Leg Tripod, Collapsible-leg tripod, Fixed Mount

Brand & Model: **FLORIDA LEVEL & TRAJUST**

P/N:

S/N:

Last Adjustment date:

Psychrometer (if used) Brand & Model:

P/N:

S/N:

Last Calibration or check Date:

**** ANTENNA HEIGHT ****

	Before Session Begins:		After Session Ends:	
	Meters	Feet	Meters	Feet
A = Datum point to Top of Tripod (Tripod Height)				
B =Additional offset to ARP if any (Tribrach/Spacer)				
H = Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)		5.875		5.875

Meters = Feet x (0.3048)

Height Entered Into Receiver = _____ meters.

Note &/or sketch ANY unusual conditions. Be Very Explicit as to where and how Measured!

Barometer (if used) Brand & Model: S/N:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit Celsius	WetBulb Temp Fahrenheit Celsius	Rel. % Humidity	Atm. Pressure inches Hg millibar
	Before	00010	12:27				
	Middle	00010	1:15				
	After	00010	1:45				

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s):

(Standard NGS Format = aaaadddd.xxx)
where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension

Updated Station Description: Attached Submitted earlier

Visibility Obstruction Form: Attached Submitted earlier


Photographs of Station: Attached Submitted earlier

Pencil Rubbing of Mark: Attached

LOG CHECKED BY:

Table of Weather Codes	CODE	PROBLEM	VISIBILITY	TEMPERATURE	CLOUD COVER	WIND
	0	did not occur	Good, over 15 miles	Normal, 32° F- 80° F	Clear, below 20%	Calm, under 5mph (8km/h)
	1	did occur	Fair, 7-15 miles	Hot, over 80°F (27 C)	Cloudy, 20% to 70%	Moderate, 5 to 15 mph
	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)

Examples: 00000 = No problem, good visibility, normal temp, clear, calm wind 12121 = Problems, poor visibility, hot, overcast, moderate wind

 GPS STATION OBSERVATION LOG April, 16, 2003	Station Designation: (check applicable: <input type="checkbox"/> FBN <input type="checkbox"/> CBN <input type="checkbox"/> PAC <input type="checkbox"/> SAC <input checked="" type="checkbox"/> BM) N 410 X	Station PID, if any: AD8127	Date (UTC): 6 SEPT 2006
	General Location: BROWARD, FL.	Airport ID, if any:	Station 4-Character ID:

Project Name: SCUMD MONITORING WEBS	Project Number: 1078 GPS-	Station Serial # (SSN):	Session ID:(A,B,C etc)
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NAD83 Latitude 26° 19' 29.618"	NAD83 Longitude 080° 31' 41.4939"	NAD83 Ellipsoidal Height -21.05 meters NAVD88 Orthometric Ht. 3.871 meters GEOID99 Geoid Height -24.92 meters	Agency Full Name: NICK MILLER INC. Operator Full Name: Nick Miller Phone #:(781) 627-5000 e-mail address: info@nickmillerinc.com
Observation Session Times (UTC): Sched. Start 16:15 Stop 17:15 Actual Start 16:12 Stop 17:10	Epoch Interval = 15 Seconds Elevation Mask = 10 Degrees		

Receiver Brand & Model: TRIMBLE NR P/N: 4514046 S/N: 4312119192 Firmware Version: <input type="checkbox"/> CamCorder Battery, <input type="checkbox"/> 12V DC, <input type="checkbox"/> 110V AC, <input type="checkbox"/> Other	Antenna Code*, Brand & Model: P/N: 4514046 S/N: 4312119192 Cable Length, meters: 2m Vehicle is Parked 10 meters NW (direction) from antenna.	Antenna plumb before session? (Y/N) Circle Antenna plumb after session? (Y/N) Yes or No Antenna oriented to true North? (Y/N) -If no, Weather observed at antenna ht. (Y/N) explain Antenna ground plane used? (Y/N) " Antenna radome used? (Y/N) If yes, Eccentric occupation (>0.5 mm)? (Y/N) describe. Any obstructions above 10°? (Y/N) Use Radio interference source nearby (Y/N) Vis. form
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Tripod or Antenna Mount: Check one: <input type="checkbox"/> Fixed-Leg Tripod, <input checked="" type="checkbox"/> Collapsible-leg tripod <input type="checkbox"/> Fixed Mount Brand & Model: P/N: S/N: YESSON 6000 Last Adjustment date:	** ANTENNA HEIGHT **	Before Session Begins: Meters Feet	After Session Ends: Meters Feet
Psychrometer (if used) Brand & Model: P/N: S/N: Last Calibration or check Date:	A= Datum point to Top of Tripod (Tripod Height)		
	B=Additional offset to ARP if any (Tribrach/Spacer)		
	H= Antenna Height = A + B = Datum Point to Antenna Reference Point (ARP)	6.075	6.075
	Meters = Feet x (0.3048) Height Entered Into Receiver = _____ meters.	Note &/or sketch ANY unusual conditions. Be Very Explicit as to where and how Measured!	

Barometer (if used) Brand & Model: S/N:	Weather Data	Weather Codes	Time (UTC)	Dry-Bulb Temp Fahrenheit Celsius	WetBulb Temp Fahrenheit Celsius	Rel. % Humidity	Atm. Pressure inches Hg millibar
		Before	0010	16:15			
	Middle	0010	16:45				
	After	0010	17:15				

Remarks, Comments on Problems, Sketches, Pencil Rubbing, etc:

Weather codes are required. Weather data are optional but encouraged. *Antenna code comes from ant_info file furnished by project coordinator.

Data File Name(s): (Standard NGS Format = aaaadddd.xxx) where aaaa=4-Character ID, ddd=Day of Year, s=Session ID, xxx=file dependant extension	Updated Station Description: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Visibility Obstruction Form: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Photographs of Station: <input type="checkbox"/> Attached <input type="checkbox"/> Submitted earlier Pencil Rubbing of Mark: <input type="checkbox"/> Attached	LOG CHECKED BY:
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	2	- not used -	Poor, under 7 miles	Cold, below 32° F (0 C)	Overcast, over 70%	Strong, over 15 mph (24km/h)

Examples: 00000 = No problem, good visibility, normal temp, clear, calm wind 12121 = Problems, poor visibility, hot, overcast, moderate wind

SURVEYOR'S CERTIFICATION

In my professional opinion, this report of survey meets applicable portions of the Minimum Technical Standards set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 61-G17, Florida Administrative Code. This report is prepared for the sole and specific use of the South Florida Water Management District and is not assignable.

NICK MILLER, INC.
DBPR Authorization No. 4318

September 6th, 2006

Date of Survey

By: _____

Stephen M. Gordon, PSM
Professional Surveyor and Mapper
State of Florida
Certificate No. 5974

U . S D E P A R T M E N T O F C O M M E R C E

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL GEODETIC SURVEY

Charles W. Challstrom
Director

PROJECT REPORT
GPS-Derived Orthometric Heights and Mark Setting

Summer 2006

Ronnie L. Taylor
National Geodetic Survey, NOAA
National Ocean Service Advisor, Florida

PROJECT TITLE

Hydrology - Everglades Wells

ESTABLISH BENCH MARKS NEAR WELLS IN THE EVERGLADES
STARTING HEIGHT IS BASED ON NAVD 88 HEIGHTS.

JOB CODE **AA**

PROJECT REPORT

I. INTRODUCTION

A. Authority

Bench Mark Setting and finding GPS-Derived Orthometric Heights was authorized by a contract between the South Florida Water Management District and Nick Miller Incorporated.

B. Purpose

The purpose of this leveling project was to establish precise NAVD 88 heights near existing Ground Water Monitoring Wells for use by the South Florida Water Management District and the citizens of the State of Florida.

II. PROJECT AREA

A. Locality

This project is located in the Everglades of southern Florida.

B. Terrain

The terrain is flat to rolling.

C. Specifications

FGCS Specifications and Procedures to Incorporate Electronic Digital/Bar-Code Leveling Systems were followed.

D. Monumentation

Monuments are 9/16" stainless steel rods driven to refusal with a PVC enclosure and an access cap. A magnetic device was either placed in or near the monuments. Please see descriptions for magnetic placements.

E. Instrumentation

Trimble 4800, Trimble 5800 and Trimble R8 GPS receivers.

III. COMMENTS

A. Reconnaissance

See the To-Reach Descriptions included, for a clear access to all stations.

B. Specifications

There were no deviations from the NGS Guidelines for Establishing GPS-Derived Orthometric Heights.

C. Problems

The Trimble 4800 GPS receiver malfunctioned after the first session of the second day. Only the first session was used from that receiver. J 502 had to be observed as control in place of TIEBACK AZ MK since another surveying firm was using that point at the time of our session. Also, Z 497 was used in the place of Y 497 do to an additional obstruction.

IV. Closures

A. **Status**

All records will be kept at Nick Miller, Inc. For information on these records please contact Stephen M. Gordon at (561)627-5200.

For question concerning the collection or processing of this data please call Ronnie L. Taylor or Randy Wegner at (850)245-2606.

B. **Attachments**

The following are included in this package:

Disk containing the following data files is attached:

- Field Logs
- R-file
- G-file
- Serfil
- B-file
- D-file
- Minimally-constrained adjustment
- Constrained adjustment
- Minimally-constrained vertical adjustment
- Constrained vertical adjustment
- Final free adjustment
- Final B-file