

SURVEYOR'S REPORT

Specific Purpose Survey of the United States Geological Survey Recorder Well G-973 in Miami-Dade County, Florida

Prepared for:

South Florida Water Management District

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Prepared by:

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Florida Professional Surveyor and Mapper
License Number 5666
State of Florida

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> Field Date: June 05, 2019 Report Date: June 10, 2019

TABLE OF CONTENTS

Title	Page
Cover Sheet	1
Table of Contents	2
Purpose	3
Location of Project	3
Surveyor's Report	4
Project Datum's Leveling and GPS Methods Equipment used	4 4 4
Vertical Control Points	5 & 6
Benchmarks summary	5 & 6
Field Notes	6
Project Results	7
Surveyor's Notes	9
Surveyor's Certificate	10
SFWMD Site Form	11

PURPOSE

The purpose of this survey is to set an Elevation Reference Mark (Benchmark) being a mag nail and washer and to establish a North American Vertical Datum of 1988 (NAVD 88) elevation on said Benchmark and on an additional Reference Point with a Brass plate, both at United States Geological Survey Well **G-973**.

LOCATION OF PROJECT

The United States Geological Survey's Recorder Well **G-973** is located in Section 5, Township 53 South, Range 40 East, Miami-Dade County, Florida.



General Location (Intended Display scale is "Not to Scale")

PROJECT VERTICAL DATUM

The project vertical datum is the North American Vertical Datum (NAVD) of 1988.

To convert the NAVD 88 elevation to the National Geodetic Vertical Datum of 1929 at station **G-973 add 1.55**'. These values are based on Corpscon 6.0.1 a US. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the US. Army Corps of Engineers South Atlantic Division, Jacksonville FI.

PROJECT HORIZONTAL DATUM

The project horizontal datum is the North American Datum 83 (NAD 83(2011)) (EPOCH:2010.0000).

LEVELING METHODS

The leveling for this project was performed in accordance with standard survey practice using conventional third order methods, techniques and equipment.

The allowable error (.05 √miles) on this project meets or exceeds third order closures as required by SFWMD for this project per executed SOW for 4600003705-WO04 and discussions with SFWMD. A level loop was run from the NGS Benchmark 87 93 A 39 (PID AB7776), through the well site, and to the NGS Benchmark 87 91 C 28 (PID AA5357). The measurements were collected using an Automatic Level and were hand written in Biscayne Engineering Co, Inc. Field Book 2981 pages 46-48, dated March 28, 2019 and Field Book 2981 pages 66-,70 June 05, 2019, reduced and adjusted electronically. Additional data was manually recorded in the field book.

GPS METHODS

Latitude and Longitude for Benchmark G-973 were established by observing a 3-minute session of GPS data on March 28, 2019, using a Trimble R-8-S and The Florida Permanent Reference Network (FPRN). The FPRN network consists of nearly 100 Continuously Operating Reference Stations (CORS) located throughout Florida.

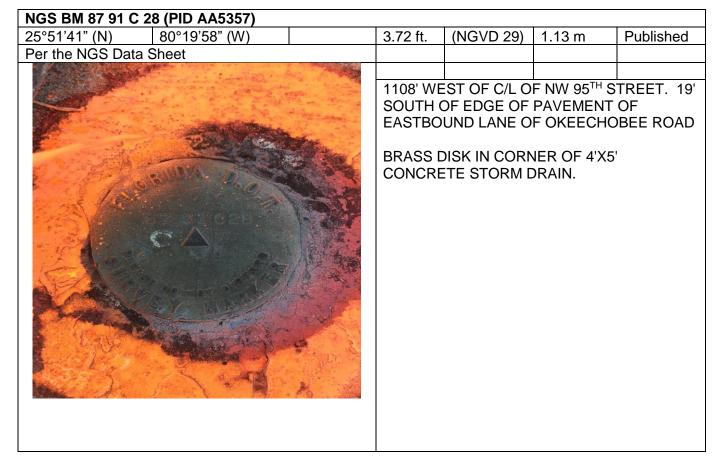
EQUIPMENT USED

- Trimble GPS unit R-8-S, Serial Number 5625R066118.
- TOPCON DL-502 digital level Serial Number 512386 and a folding bar code rod.
- TOPCON Total Station ES 103, Serial Number ZQ000748.
- TOPCON Auto-level ATG3, Serial Number 5F9515.

VERTICAL CONTROL POINT

The Vertical Control point utilized and set as part of this survey is the:

25°52'30" (N)	80°21'03" (W)	6.14 ft.	(NAVD88)	1.87 m	Published
Per the NGS Dat	a Sheet				
		O SE MILL		/ 105TH \\/\	7. 35' SW OF
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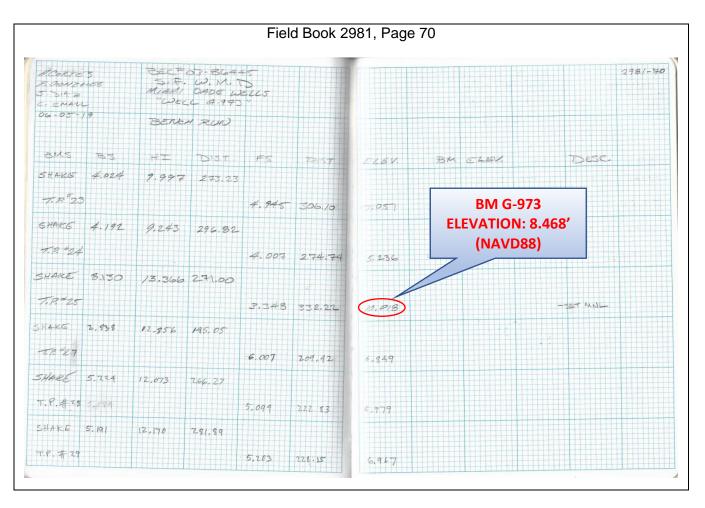


SURVEYOR'S REPORT

BM: G-973 (Set as part	of this survey)				
25°52'10.67 (N)	80°21'19.55" (W)	8.468 ft.	(NAVD88)	2.58 m	Level run
		10.018ft.	(NGVD29)	3.05 m	Converted
	NAME OF TAXABLE PARTY.		1.55 ft.		Corpscon
11			(conversion		6.0.1
10			factor)		

MAG NAIL AND WASHER BEC 0129.

SET IN CONCRETE LIGHT POLE BESIDE WELL SHELTER.



PROJECT RESULTS

Overall Site



(Oblique not to scale)

SURVEYOR'S REPORT

Tabular Form

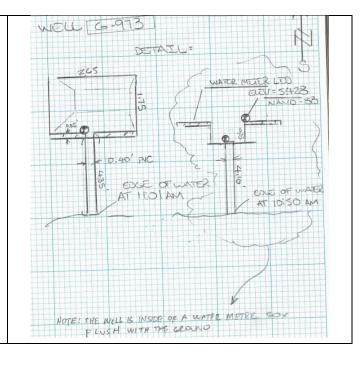
Reference and Ground Elevations: NAVD88					
Well	Ground Elevation	Reference	Elevation	Comn	nents
G-973	5.15 ft.	5.21 ft.		Top o	f 6" PVC PIPE
Offset to NGVI	D29: +1.55' (See Proje	ect Vertical [Datum Note	s in Pa	ge: 4)
Well diameter			Casing ma	aterial	DTW
6"			Metal		4.10 ft. (03/28/19 at 10:50 AM)

USGS Published: (Per USGS Report Site #: 255209080212801 G-973) (NGVD29)				
Well	Ground Elevation	Reference Elevation	Comments	
G-973	-	6.867 ft.	Top of casing	

Source & Site	NAVD88	NGVD29	NGVD29 (Corpscon)
Benchmark			
87 93 A 39 NGS)	6.14 ft. (Published)		
87 91 C 28 (NGS)	3.72 ft. (Published)		
G-973 (SFWMD)	8.468 ft. (Measured)		10.018 ft. (Converted)
RM-1	7.766 ft. (Measured)		
RM-2	4.937 ft. (Measured)		

Well Photos and Diagrams





Well Photos and Diagrams (Continued)



Side view (Oblique Not to scale)



Top view (Not to scale)

Surveyor's Notes:

- 1. All measurements herein are in United States Survey feet and decimal thereof, unless otherwise specified.
- 2. Underground utilities were not located as part of this survey.
- 3. This survey report or copies thereof are not valid without the original signature and seal of a Florida licensed Surveyor and Mapper.
- 4. Additions or deletions to this survey report by other than the signing party (or parties) is prohibited without written consent of the signing party (or parties).
- 5. To convert from NAVD 88 to NGVD 29 add 1.55 feet. This value is based on Corpscon 6.0.1 a U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville Fl.
- 6. Date of last field work: June 05, 2019, BEC job No. 03-86445.
- 7. SFWMD Data records (on file at the District's headquarters):
 - A. Electronic Data files:

Miscellaneous picture files

B. Conventional reporting

Field Book: 2981, Pages: 46-48 and 66-71

Abbreviations:

EI. - Elevation

DTW - Distance to the water table inside the well

M-DC - Miami-Dade County

NAVD 88 - North American Vertical Datum of 1988 NGVD 29 - National Geodetic Vertical Datum of 1929

NGS - National Geodetic Survey

PSM - Professional Surveyor & Mapper

PID - Permanent Identifiers

SFWMD - South Florida Water Management District

USGS - United States Geological SurveyBEC - Biscayne Engineering Company, Inc.

SURVEYOR'S CERTIFICATION

In my professional opinion this Specific Purpose Survey meets applicable portions of the Standards of Practice set forth by the Florida Board of Professional Surveyors and Mappers in Chapter 5J-17, Florida Administrative Code. This report is prepared for the sole and specific use of the South Florida Water Management District and is not assignable.

Last date of Survey June 05, 2019



Mike Bartholomew, PSM, President Florida Professional Surveyor and Mapper License Number 5666 State of Florida Biscayne Engineering Company, Inc. LB No 0129 529 West Flagler Street, Miami, FL. 33130 Tel (305) 324-7671



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 4/18

DESIGNATION: G-973 PROJECT: G-973 ESTABLISHED BY: SOUTH FLORIDA WATER MANAGEMENT SURVEYOR: Mike Bartholomew DATE: 06/17/19 RECOVERED BY: BISCAYNE ENGINEERING CO. GEOGRAPHIC POSITION **TOWNSHIP 53 SECTION 05 RANGE 40 EAST** SOUTH NAME OF QUADRANGLE: HIALEAH (1994) COUNTY: MIAMI-DADE GEOGRAPHIC INDEX OF QUAD: 1983 2022 Other (circle one) ZONE (E) or W HORIZONTAL DATUM: 1927 1929 **1988** 2022 Other (circle one) VERTICAL DATUM: MSL 2 (3) VERTICAL ACCURACY: 1 NAVD 88 EL. 5.495 STATE PLANE COORDINATE (N) Y= 382594.498 (E) X= 807522.874 NGVD 29 EL. 7.070

CORPSCON 6.0.1 CONVERSION FACTOR (NAVD88 TO NGVD29): (A U.S. Army Corps of Engineers Engineering Research and Development Center Topographic Engineering Center Alexandria, Virginia Windows-based program to convert coordinates and elevations between datum's using vertcon05.txt and vertcon05.05 files supplied by the U.S. Army Corps of Engineers South Atlantic Division, Jacksonville Fl.)

ACTUAL NGS or (ngvd29.txt file)

OPUS Ortho Height

LATITUDE: 25° 52' 10.67" (N) LONGITUDE: 80° 21' 19.55" (W) (Source) GPS RTK (FPRN)

RECOVERY DATA

Stamping: G-973 BEC 0129

To Reach:

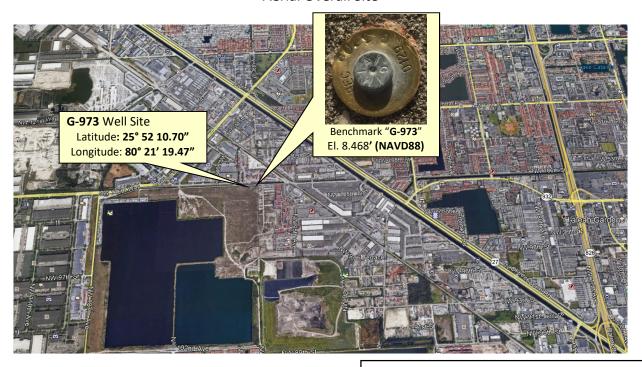
NOTABLE LAND MARKS:

NGS-SOURCE BENCHMARKS: 87 91 C 28, 87 93 A 39

FIELD BOOK PAGE 2981-70

PICTURES

Aerial Overall Site



NOT TO SCALE (Google Earth product)



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 4/18

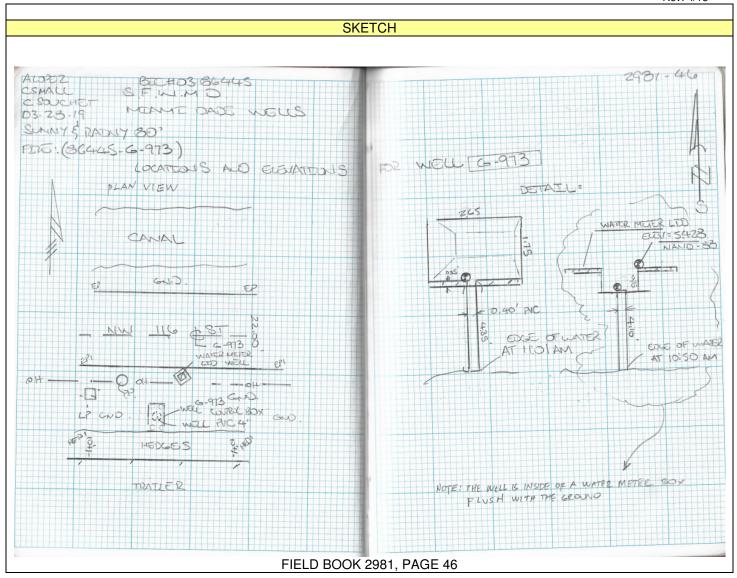
Overall Site





SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 4/18



Office

Project

11 June 2019

INPUT

State Plane, NAD83 0901 - Florida East, U.S. Feet Vertical - NAVD88, U.S. Feet

OUTPUT

Geographic, NAD83 Vertical - NGVD29 (Custom), U.S. Feet

G-973

1/1

Northing/Y: 558827.3205
Easting/X: 868111.9099

Latitude: 25 52 10.66661 **Longitude:** 80 21 19.54615

Elevation/Z: 10.002

Elevation/Z: 8.45

Convergence: 0 16 52.50696 Scale Factor: 0.999992687 Combined Factor: 0.999996199

Office

Project

11 June 2019

INPUT

State Plane, NAD83 0901 - Florida East, U.S. Feet Vertical - NAVD88, U.S. Feet

OUTPUT

Geographic, NAD83 Vertical - NGVD29 (Custom), U.S. Feet

BM # 1

1/2

Northing/Y: 558829.9487 Easting/X: 868202.6094 Elevation/Z: 4.776

Latitude: 25 52 10.68823 Longitude: 80 21 18.55305

Elevation/Z: 6.328

Convergence: 0 16 52.94054 **Scale Factor:** 0.999992732 **Combined Factor:** 0.999996419

BM#2

2/2

Northing/Y: 558825.5687 Easting/X: 868422.4558 Elevation/Z: 5.680

Latitude: 25 52 10.63415 Longitude: 80 21 16.14644

Convergence: 0 16 53.99016

Elevation/Z: 7.232

Scale Factor: 0.999992839 **Combined Factor:** 0.999996483

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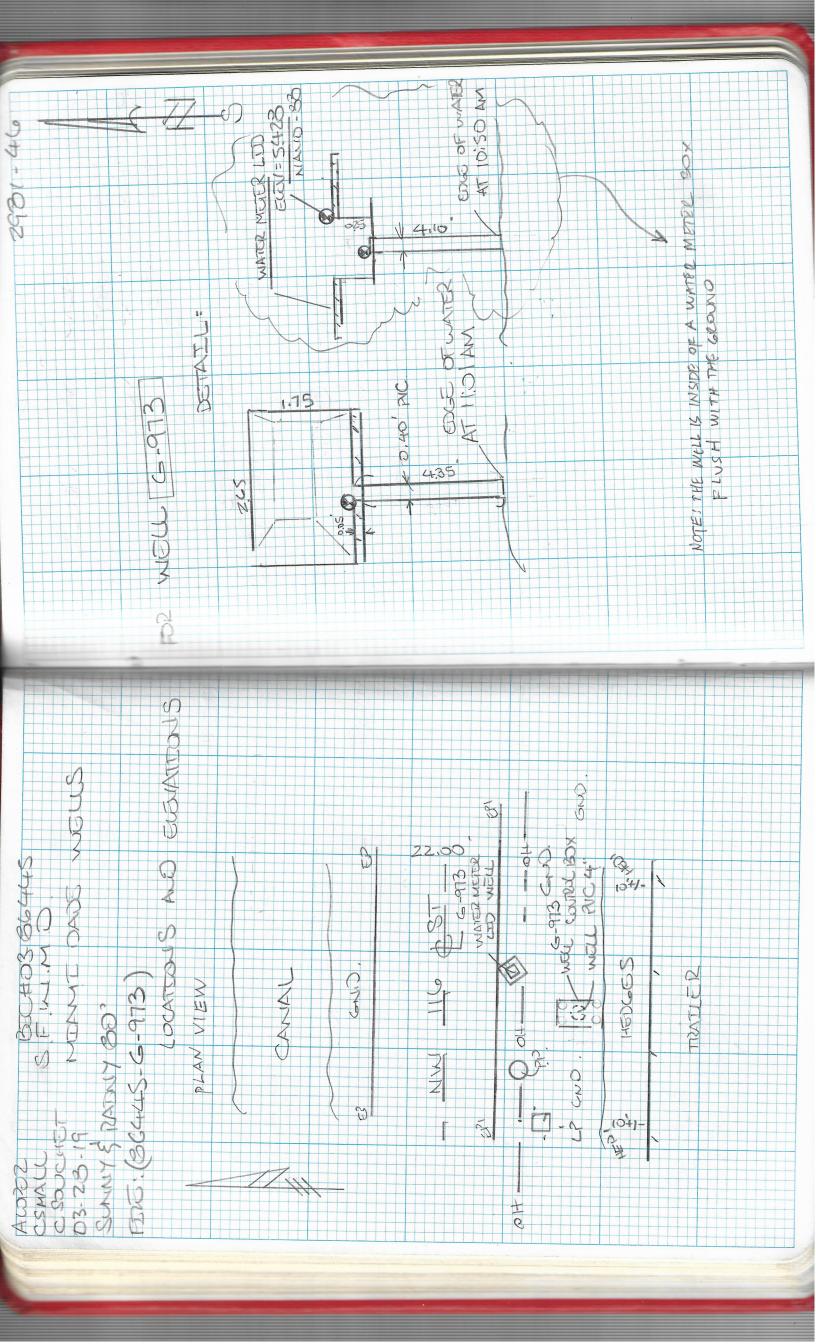
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5,102		8.77.2		
51.822 501.45				
	62 1			

		BR455 015C	
	6,990 B.M. E.UEV	3,768 879/028 3,724	
P. Exitalization of the contract of the contra	SM S	8.4 8791cz 8 NAVD88	



AT 12:33 PM THRU 2:33 PM AT 10:10 AM THRU 12:10 PM SOME DANGER \$ 60 . . CSMAN

The NGS Data Sheet

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

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PROGRAM = datasheet95, VERSION = 8.12.5.3
        National Geodetic Survey, Retrieval Date = JUNE 11, 2019
AA5357 DESIGNATION - 87 91 C 28
 AA5357 PID
                    - AA5357
AA5357 STATE/COUNTY- FL/MIAMI-DADE
 AA5357 COUNTRY
 AA5357 USGS QUAD
                    - HIALEAH (1994)
 AA5357
                               *CURRENT SURVEY CONTROL
AA5357
 AA5357
 AA5357* NAD 83(1986) POSITION- 25 51 41.
                                             (N) 080 19 58.
                                                               (W)
                                                                     SCALED
 AA5357* NAVD 88 ORTHO HEIGHT -
                                   1.135 (meters)
                                                        3.72 (feet) ADJUSTED
 AA5357
 AA5357 GEOID HEIGHT
                                 -25.039 (meters)
                                                                     GEOID12B
 AA5357 DYNAMIC HEIGHT
                                   1.133 (meters)
                                                        3.72 (feet) COMP
 AA5357 MODELED GRAVITY -
                             979,042.3
                                                                     NAVD 88
                                         (mgal)
 AA5357
 AA5357 VERT ORDER
                        - FIRST
                                    CLASS II
AA5357
AA5357. The horizontal coordinates were scaled from a topographic map and have
AA5357.an estimated accuracy of +/- 6 seconds.
AA5357. The orthometric height was determined by differential leveling and
 AA5357.adjusted by the NATIONAL GEODETIC SURVEY
 AA5357.in April 2001.
 AA5357
 AA5357.WARNING-Repeat measurements at this control monument indicate possible
AA5357.vertical movement.
AA5357. Significant digits in the geoid height do not necessarily reflect accuracy.
 AA5357.GEOID12B height accuracy estimate available here.
 AA5357
 AA5357. The dynamic height is computed by dividing the NAVD 88
 AA5357.geopotential number by the normal gravity value computed on the
 AA5357.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 AA5357.degrees latitude (g = 980.6199 \text{ gals.}).
 AA5357
AA5357. The modeled gravity was interpolated from observed gravity values.
AA5357
 AA5357;
                           North
                                         East
                                                Units Estimated Accuracy
 AA5357;SPC FL E
                        169,430.
                                      266,880.
                                                      (+/- 180 meters Scaled)
 AA5357_U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ668605(NAD 83)
AA5357
 AA5357
                                SUPERSEDED SURVEY CONTROL
AA5357
AA5357.No superseded survey control is available for this station.
AA5357
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AA5357 MARKER: DD = SURVEY DISK

AA5357 SETTING: 30 = SET IN A LIGHT STRUCTURE

AA5357_SP_SET: STORM DRAIN AA5357_STAMPING: 87 91 C 28 AA5357 MARK LOGO: FLDT

AA5357 MAGNETIC: N = NO MAGNETIC MATERIAL

AA5357_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY AA5357_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AA5357+SATELLITE: SATELLITE OBSERVATIONS - January 16, 2005

AA5357

AA5357 HISTORY - Date Condition Report By
AA5357 HISTORY - 1991 MONUMENTED FLDT
AA5357 HISTORY - 19950905 GOOD NGS
AA5357 HISTORY - 20050116 GOOD BAKER

AA5357

AA5357 STATION DESCRIPTION

AA5357

AA5357'DESCRIBED BY NATIONAL GEODETIC SURVEY 1995 (RLT)

AA5357'THE MARK IS ABOUT 16.7 MI (26.9 KM) NORTH-NORTHWEST OF MIAMI, 2.6 MI AA5357'(4.2 KM) WEST OF HIALEAH IN SECTION 3, TOWNSHIP 52 SOUTH, RANGE 40 AA5357'EAST. TO REACH THE MARK FROM THE INTERSECTION OF U.S. HIGHWAY 27 AND AA5357'THE EASTBOUND LANES OF INTERSTATE 75 (ALLIGATOR ALLEY), GO SOUTH ON AA5357'U.S. HIGHWAY 27 FOR 5.90 MI (9.49 KM) TO THE INTERSECTION OF STATE AA5357'HIGHWAY 818 (GRIFFIN ROAD), CONTINUE SOUTH ON U.S. HIGHWAY 27 FOR 3.55 AA5357'MI (5.71 KM) TO THE INTERSECTION OF PINES BOULEVARD, CONTINUE SOUTH ON AA5357'U.S. HIGHWAY 27 FOR 7.75 MI (12.47 KM) TO THE DADE-BROWARD COUNTY AA5357'LINE, CONTINUE SOUTH ON U.S. HIGHWAY 27 TO THE JUNCTION OF STATE AA5357'HIGHWAY 997, CONTINUE SOUTH ON U.S. HIGHWAY 27 FOR 8.15 MI (13.12 KM) AA5357'TO THE JUNCTION OF NW 105TH WAY, CONTINUE SOUTHWEST ON U.S. HIGHWAY 27 AA5357'FOR 0.85 MI (1.37 KM) TO MARK ON THE RIGHT, SET ON THE TOP OF THE EAST AA5357'CORNER OF A 7.4 FT (2.3 M) X 6.4 FT (2.0 M) STORM DRAIN. ALSO 0.9 MI AA5357'(1.4 KM) NORTH OF THE INTERSECTION OF U.S. HIGHWAY 27 AND STATE AA5357'HIGHWAY 826 (PALMETTO EXPRESSWAY). LOCATED 47.0 FT (14.3 M) SOUTHWEST AA5357'OF THE CENTERLINE OF U.S. HIGHWAY 27, 20.0 FT (6.1 M) SOUTHWEST OF THE AA5357'EDGE OF THE ASPHALT, 10.4 FT (3.2 M) NORTHEAST OF A FLDOT METAL AA5357'WITNESS POST AND 8.7 FT (2.7 M) NORTHEAST OF THE METAL GUARDRAIL.

AA5357

AA5357 STATION RECOVERY (2005)

AA5357

AA5357'RECOVERY NOTE BY M BAKER JR INCORPORATED 2005 (RH) AA5357'RECOVERED IN GOOD CONDITION.

*** retrieval complete. Elapsed Time = 00:00:04

The NGS Data Sheet

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

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PROGRAM = datasheet95, VERSION = 8.12.5.3
        National Geodetic Survey, Retrieval Date = JUNE 11, 2019
AB7776 DESIGNATION - 87 93 A 39
                    - AB7776
AB7776 PID
AB7776 STATE/COUNTY- FL/MIAMI-DADE
AB7776 COUNTRY
                       US
AB7776 USGS QUAD
                    - HIALEAH (1994)
AB7776
                               *CURRENT SURVEY CONTROL
AB7776
 AB7776
 AB7776* NAD 83(1986) POSITION- 25 52 30.
                                             (N) 080 21 03.
                                                                (W)
                                                                     SCALED
 AB7776* NAVD 88 ORTHO HEIGHT -
                                                              (feet) ADJUSTED
                                   1.870 (meters)
                                                        6.14
 AB7776
AB7776 GEOID HEIGHT
                                 -25.001 (meters)
                                                                     GEOID12B
 AB7776 DYNAMIC HEIGHT
                                   1.867 (meters)
                                                        6.13 (feet) COMP
AB7776 MODELED GRAVITY -
                             979,042.5
                                                                     NAVD 88
                                         (mgal)
 AB7776
AB7776 VERT ORDER
                        - FIRST
                                     CLASS II
AB7776
AB7776. The horizontal coordinates were scaled from a topographic map and have
AB7776.an estimated accuracy of +/- 6 seconds.
AB7776. The orthometric height was determined by differential leveling and
AB7776.adjusted by the NATIONAL GEODETIC SURVEY
AB7776.in March 1997.
AB7776
 AB7776.Significant digits in the geoid height do not necessarily reflect accuracy.
 AB7776.GEOID12B height accuracy estimate available <a href="here">here</a>.
AB7776. The dynamic height is computed by dividing the NAVD 88
AB7776.geopotential number by the normal gravity value computed on the
 AB7776.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 AB7776.degrees latitude (g = 980.6199 \text{ gals.}).
AB7776. The modeled gravity was interpolated from observed gravity values.
AB7776
AB7776;
                           North
                                         East
                                                 Units Estimated Accuracy
AB7776;SPC FL E
                        170,930.
                                      265,060.
                                                   MT (+/- 180 meters Scaled)
AB7776
 AB7776 U.S. NATIONAL GRID SPATIAL ADDRESS: 17RNJ650620(NAD 83)
AB7776
                                SUPERSEDED SURVEY CONTROL
AB7776
AB7776
AB7776.No superseded survey control is available for this station.
AB7776_MARKER: DD = SURVEY DISK
AB7776 SETTING: 30 = SET IN A LIGHT STRUCTURE
AB7776_SP_SET: STORM DRAIN
```

AB7776_STAMPING: 87 93 A 39

AB7776_MARK LOGO: FLDT

AB7776 MAGNETIC: N = NO MAGNETIC MATERIAL

AB7776_STABILITY: D = MARK OF QUESTIONABLE OR UNKNOWN STABILITY AB7776_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR

AB7776+SATELLITE: SATELLITE OBSERVATIONS - August 03, 1993

AB7776

AB7776 HISTORY - Date Condition Report By AB7776 HISTORY - 1993 MONUMENTED FLDT AB7776 HISTORY - 19930803 GOOD NGS

AB7776

AB7776 STATION DESCRIPTION

AB7776

AB7776'DESCRIBED BY NATIONAL GEODETIC SURVEY 1993 (RLT)

AB7776'THE MARK IS ABOUT 18.0 MI (29.0 KM) NORTH-NORTHWEST OF MIAMI, 4.0 MI AB7776'(6.4 KM) NORTHWEST OF HIALEAH IN SECTION 33, TOWNSHIP 52 SOUTH, RANGE AB7776'40 EAST. TO REACH THE MARK FROM THE INTERSECTION OF U.S. HIGHWAY 27 AB7776'AND THE EASTBOUND LANES OF INTERSTATE 75 (ALLIGATOR ALLEY), GO SOUTH AB7776'ON U.S. HIGHWAY 27 FOR 5.90 MI (9.49 KM) TO THE INTERSECTION OF STATE AB7776'HIGHWAY 818 (GRIFFIN ROAD), CONTINUE SOUTH ON U.S. HIGHWAY 27 FOR 3.55 AB7776'MI (5.71 KM) TO THE INTERSECTION OF PINES BOULEVARD, CONTINUE SOUTH ON AB7776'U.S. HIGHWAY 27 FOR 7.75 MI (12.47 KM) TO THE DADE-BROWARD COUNTY AB7776'LINE, CONTINUE SOUTH ON U.S. HIGHWAY 27 TO THE JUNCTION OF STATE AB7776'HIGHWAY 997, CONTINUE SOUTH ON U.S. HIGHWAY 27 FOR 7.5 MI (12.1 KM) TO AB7776'THE MARK ON THE RIGHT, SET ON THE TOP OF THE NORTH CORNER OF A 7.4 FT AB7776'(2.3 M) X 6.4 FT (2.0 M) STORM DRAIN. ALSO 0.65 MI (1.05 KM) AB7776'NORTHWEST OF THE JUNCTION OF NW 105TH WAY. LOCATED 36.0 FT (11.0 M) AB7776'SOUTHWEST OF THE CENTERLINE OF U.S. HIGHWAY 27, 8.5 FT (2.6 M) WEST OF AB7776'THE EDGE OF THE ASPHALT AND 7.3 FT (2.2 M) NORTHEAST OF THE METAL AB7776'GUARDRAIL.

*** retrieval complete. Elapsed Time = 00:00:04