



Post Office Box 1469 ♦ Palm City, FL 34991
Martin: 772.286.8083 ♦ Fax: 772.283.6174
Statewide: 800.386.1066 www.gcyinc.com

SURVEYOR'S REPORT

Specific Purpose Survey of the United States
Geological Survey Well **PB 683**
in
Palm Beach County, Florida

Prepared for:

South Florida Water Management District

3301 Gun Club Road
West Palm Beach, Florida 33406

Prepared by:

Peter Andersen, PSM, Vice President
Florida Professional Surveyor and Mapper
License Number 5199
State of Florida

GCY, Inc. LB 4108
PO Box 1469/1505 SW Martin Highway
Palm City, Florida 33491/33490
772-286-8083

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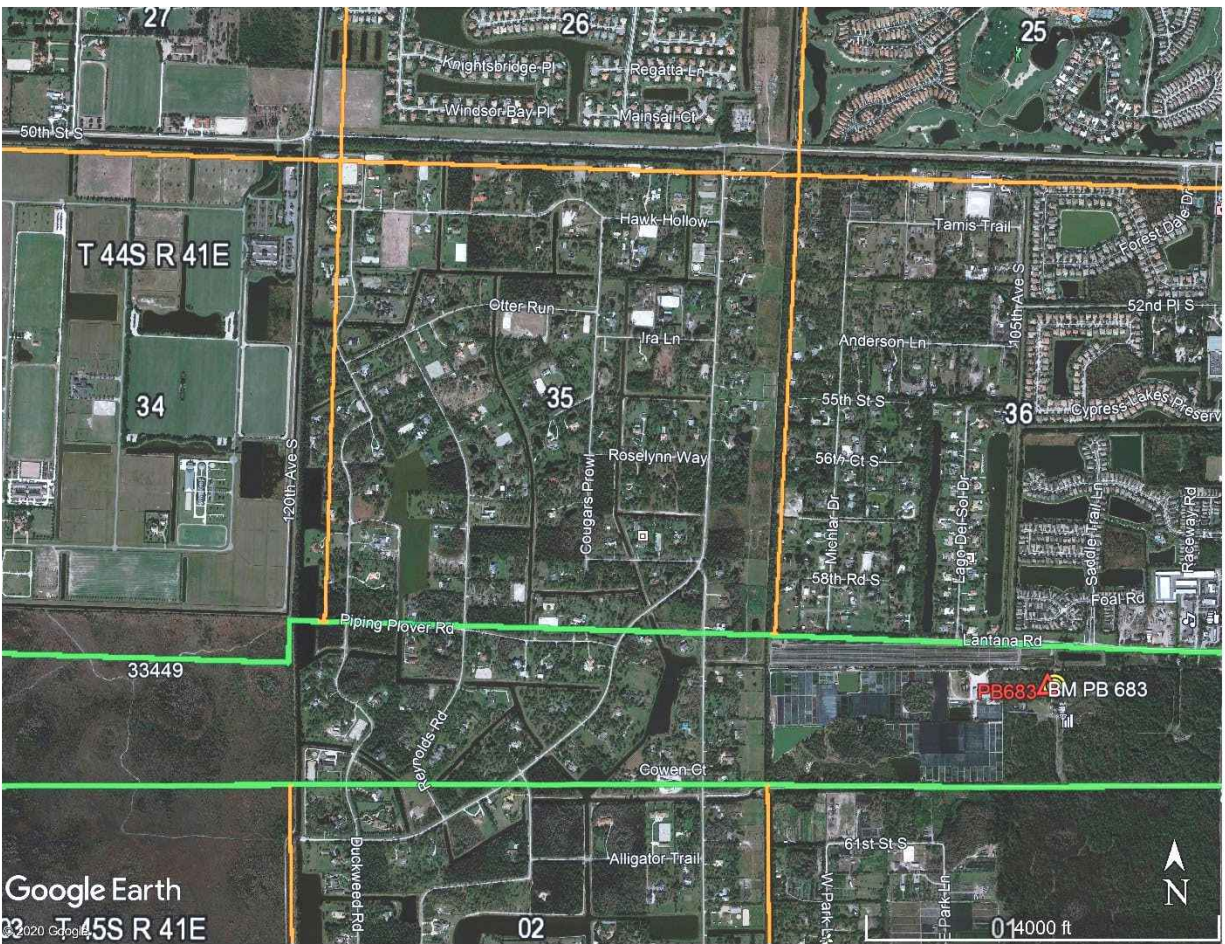
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PURPOSE

The Purpose of this survey is to set an Elevation Referenced Mark (Benchmark) using the guidelines for a National Geodetic Survey (NGS), Class "C" concrete monument and to establish a North American Vertical Datum of 1988 (NAVD 88) on said Benchmark and on an additional Reference Point with a Brass Plate, both at United States Geological Survey Well "PB 683".

LOCATION OF PROJECT

The United States Geological Survey Well "PB 683" is located in the Section 37, Township 44 South, Range 41 East, Palm Beach County, Florida.



General Location (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 (NGVD) of 1929 at **Station PB 683 add 1.476**. These values are based on Corpscon 6.0.1, a U.S. Army Corps of Engineers, Engineering Research and Development Center Windows based program to convert coordinates and elevations between datums using the updated vertcon05.txt and the vertcone.05 files supplied by the U.S Army Corps of Engineers. South Atlantic Division, Jacksonville, Florida.

PROJECT HORIZONTAL DATUM

The project horizontal datum is the State Plane Coordinate System, Florida East Zone, North American Datum 83, adjustment of 2011.

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 on this project meets or exceeds closures as required by SFWMD (.02 √ miles) per executed SOW for 4600003703 WO07.

Leveling was run from SFWMD Benchmark "PB 683 1999" through SFWMD BM "PB 1641" and Palm Beach County Benchmark "Kilby" and closing on Palm Beach County Benchmark "Keating". Leveling was done using a Leica DNA 10 digital level S/N 331745

GPS METHODS

Latitude and longitude for the New Benchmark "PB 683" were established by observing a 4.5 hour Static Session on March 31, 2020 using a Trimble 5700 dual frequency receiver S/N 0220381397. The data from this session was sent to the NGS "OPUS" site for post processing on April 30, 2020 and a report was received from the "OPUS" site the same day.

Surveyors' 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 1.476 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: March 31, 2020, GCY job No. 18-1020-07.
7. SFWMD Data records (on file at the District's headquarters):
 - A. Electronic Data files:
Miscellaneous picture files
Digital level run
File names: XXXXXX.DAT
 - B. Conventional reporting
Field Book: 1863 pages 32-36

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.

March 31, 2020

Last date of Survey



Peter Andersen, PSM, Vice President
Florida Professional Surveyor and Mapper
License Number 5199
State of Florida
GCY, Inc. LB No 4108

NOTE:

This is an electronically signed and sealed document pursuant to Chapter 5J-17.062, Florida Administrative Code. The printed survey map or report or copies thereof are not valid without the original signature and seal of a Florida licensed surveyor or mapper.





SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Rev. 1/19

U.S.G.S. Station Name: PB 683	U.S.G.S. Station Number: 263524080124301	Agency: GCY, INC.	Date of Field Work: 3/31/2020
Party Chief: LAPOLLA	Field Book: GCY 1863	Page(s): 32-36	Report Prepared by: ANDERSEN

SITE SPECIFIC DATA

Site Benchmark: PB 683	Benchmark Elevation(s) (NAVD88): 16.232	Corpscon 6.0.1 Conversion Factor (NAVD88 to NGVD29) + 1.476	
Well Reference Elevation (NAVD88): 19.40	DTW: 5.33 (03/ 31/ 2020 at 11:00 AM)	Ground Elevation (NAVD88): 16.8	Pad Elevation (NAVD88): N/A

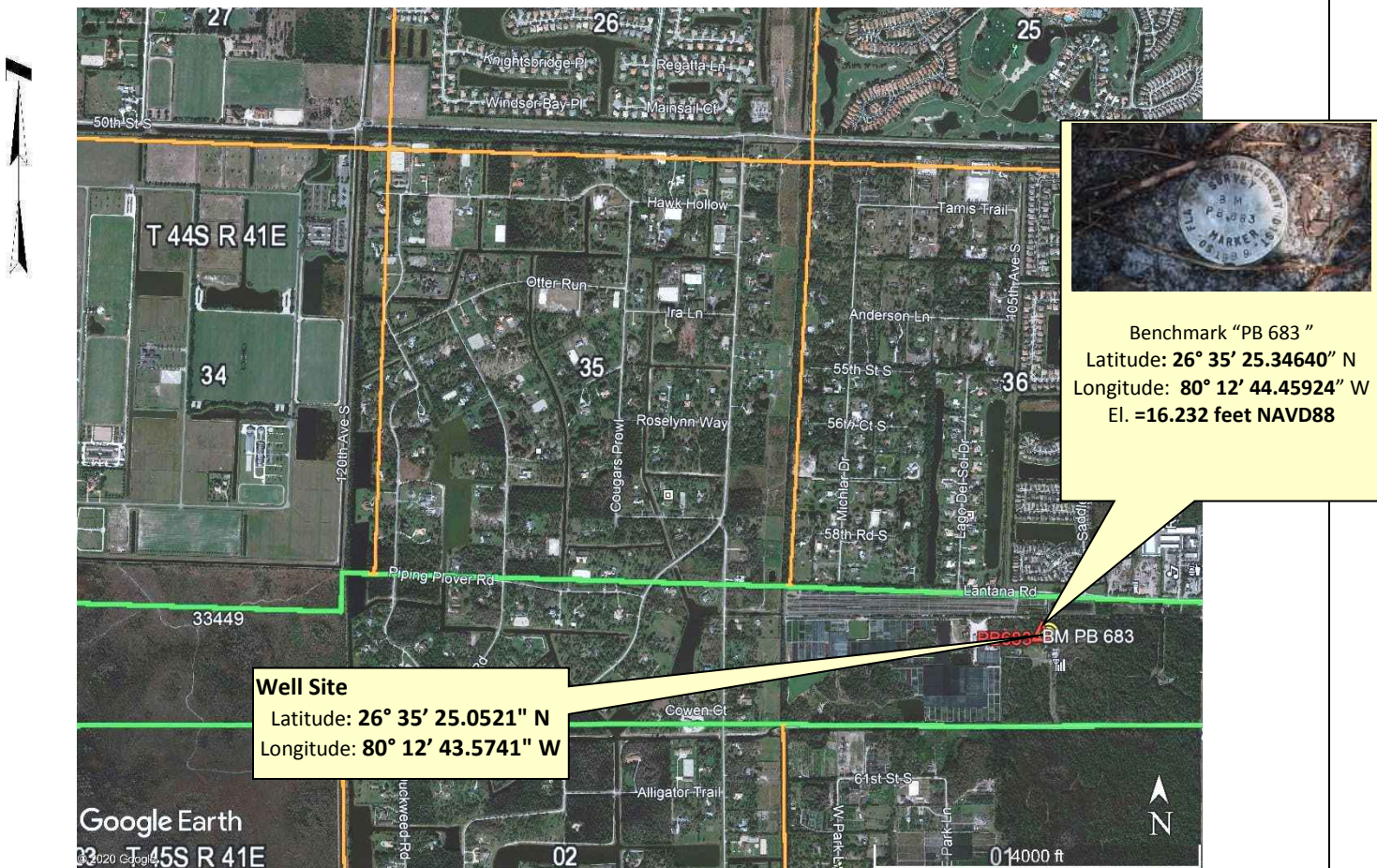
GEOGRAPHIC DATA

Section 37	Township 44 S	Range 41 E
Well Latitude: 26° 35' 25.0521" N	Well Longitude: 80° 12' 43.5741" W	Location Source: RTK GPS
State Plane Coordinates:	Northing (Y) = 821036.813	Easting (X) = 913649.189

Notes: NAVD88 – North American Vertical Datum of 1988; NGVD29- National Geodetic Vertical Datum of 1929; 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.

PICTURES

Aerial of Overall Well Site



Not to scale (GoogleEarth product)



Well Site and Well Head



Well: "PB 683"
Reference Point: MAGIC MARKER BOX

Reference Point El. = 19.40 feet NAVD88

Distance to Water = 5.33 feet from reference point (3/ 31/ 2020 at 11:00 AM)





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New Aluminum Tag





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USGS RMs none



Site Benchmark

Site Benchmark Overall Photo



Site BM:



Latitude: $26^{\circ} 35' 25.34640''$ N
Longitude: $80^{\circ} 12' 44.45924''$ W
NAVD88 EL = 16.232





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Source Benchmarks



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"SFWMD PB 683 1999" Benchmark Datasheet

SFWMD Vertical Control: Vertical

TYPE	Vertical
DESIGNATION	PB683
NAVD_ELEV	
NGVD_ELEV	18.29
LONG_DD_83	-80.21
LAT_DD_83	26.59
HOW_TO_REACH	
DESCRIPTION	B.M. P.B. 683 IS A S.F.W.M.D. ALUMINUM DISK SET IN A 1 1/4" (INCHES) GALVANIZED PIPE WITH CONCRETE, STAMPED "B.M. P.B. 683, 1999". TO REACH THE BENCH MARK: FROM THE INTERSECTION OF LANTANA ROAD & A DIRT ROAD RUNNING WESTERLY, GO 0.10 MILE SOUTH ALONG S.R.7 (441). GO 0.45 MILE WEST ALONG DIRT ROAD. THE BENCH IS AT 11.0' (FEET) EAST OFF DIRT ROAD & 1.5' (FEET) NORTHWEST OF WELL.



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"PALM BEACH COUNTY BM KEATING" Benchmark Datasheet

Vertical Control Points: KEATING

NAME	KEATING
NGVD_1929	0.00
SECTION_	37
TOWNSHIP	44 1/2
RANGE	41
MEMO_	THE STATION IS LOCATED 0.25 MILE SOUTH OF THE INTERSECTION OF LANTANA ROAD AND STATE ROAD 7 (US 441) ON THE WEST SIDE IN THE CONCRETE BASE OF A LAMP POST. THE STATION IS A P.B.C. BRASS DISK SET IN THE EAST SIDE OF SAID LAMP POST BASE AND STAMPED
NAVD88_FEE	18.78
NGVD_29_AG	
MONUMENT_T	P.B.C. BRASS DISK
NAVD_88_AG	PBCO
APPROXIMAT	26 35 12.3
APPROXIM_1	80 12 22.8
SECNAME	44.54137
GPS User	
GPS Date	



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Field Notes (1 of 5)

LANTANA WPTV TV 4445

STA	TOTAL DIST	ELEV	ADJ	DESC
OLD SFWMD BM PB 683	0	16.83'		SFWMD BM "PB 683 1999" NAVD 88 = 16.83'
1	30.32'	17.10'		Exc 1/2" I.R. SET IN CONC. 32" W. OF WELL BM 1863-32A
2	48.21'	17.215'		Exc 1/2" I.R. SET IN CONC. 14.25' W. OF WELL BM 1863-32B
NEW BM PB 683	121.97'	16.232'		NEW BM PB 683 BM 1863-32C SET 1 1/2" (c.p.) IRON PIPE + ALUMI CAP. " SFWMD PB 683 LB 4108 2020" I.P. IS 3' LONG w/ CONC COLLAR + GRATED CAP. 80' N60°W FROM WELL PB 683
BM PB 1641	349.83'	17.468'		✓ TO SFWMD BM 1641 NAVD 88 = 17.61' Elev. = 17.142 (SOME SIDE OF C.M. IS BEING WASHED OUT. 1/3 IS YESABLE)
(Cont. on pg. 33)				

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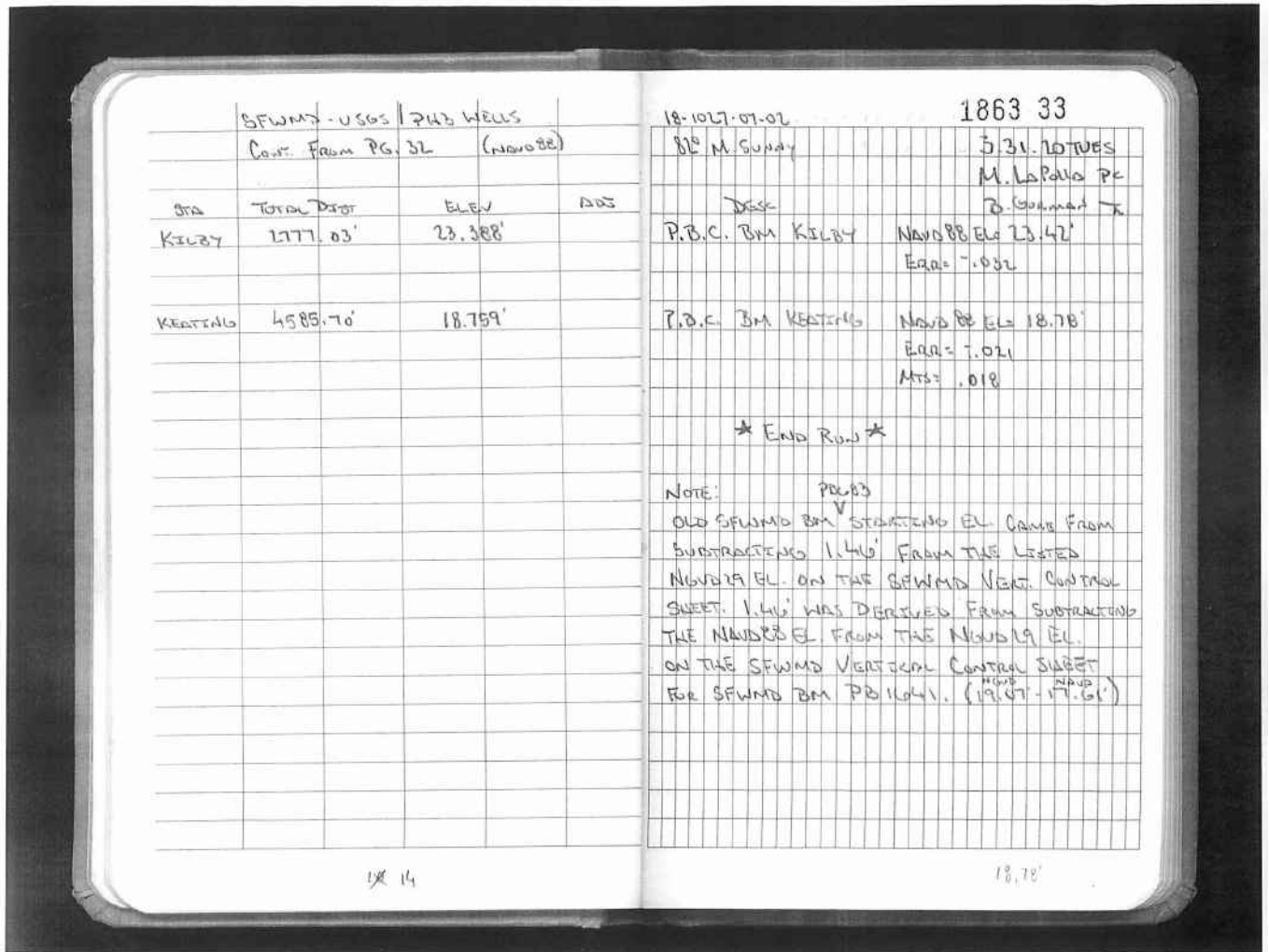
PB 1641
17.61'



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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Field Notes (2 of 5)

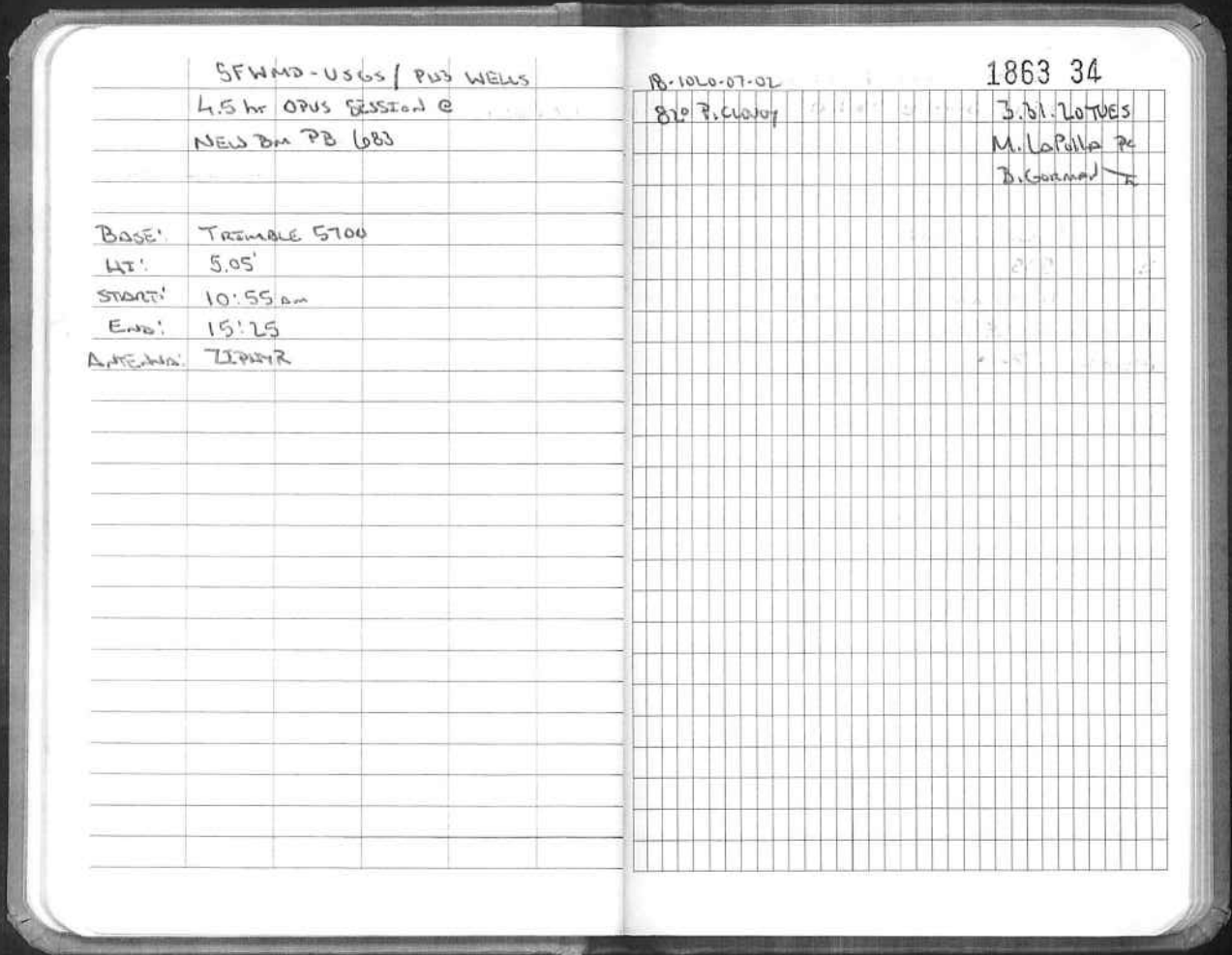




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Field Notes (3 of 5)





SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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Field Notes (4 of 5)

SFWMD - USGS / PWS WELLS		18-1026-07-02	1863 35
WELL DATA @ PB 683 (NAD83)		83° M. S. J. J. J.	3.31.2013
WELL DIAMETER = 6" Iron		PICTURES:	M. LaBilla PC
PICTURE: 101-1189			J. Guzman T
D.T.W. = 5.33'	TIME: 11:00 AM	WELL PB 683:	Bm 1863-32A
	DATE: 03/31/2010	101-1190 BRASS TAG	101-1183
		101-1191	101-1184
		101-1192	101-1185 LOOKING WEST
MEASURING POINT = 19.40'		101-1193 LOOKING EAST	
TOP OF WATER = 14.07'		101-1194 " "	Bm 1863-32B
WELL HEAD CASING:			101-1180
STEEL Box w/ LEADED LID, STEEL BASE		NEW Bm PB 683	101-1181
(L) 1.70' x (W) 1.70' x (H) 1.35'		101-1195	101-1182 LOOKING EAST
		101-1196	SFWMD Bm PB 1041
		101-1197 LOOKING SW TO WELL AREA	101-1198
			101-1199
GPS: FILE: SFWMD USGS PWS WELLS 2 (T23)		OLD Bm PB 683	101-1200 LOOKING NORTH
10041 WELL PB 683		101-1186	
N. 821030.813		101-1187	
E. 913649.189		101-1188 LOOKING EAST	
015 = +1.46'			

Field Notes (5 of 5)



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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LOSTANA WPTV TO MOST

SFWDMD-USGS / Plus Wells					
"M.T." + NG Bench Rod (NAVA 88)					
Sta	+	HS	-	EL	Dist
Φ	5.171			17.10'	
	5.12				
	5.068				
	(5.119)	22.219'			
S.S.1			5.40	16.819'	
			2.927		
			2.82		
			2.71		
1		(2.819)		19.40'	
	3.009				
	2.862				
	2.714				
	(2.801)	22.262'	5.121		
			5.048		
			4.972		
2		(5.047)		17.215'	

181020-07-02 1863 36

82P P. C. 0009 J. Bl. LOTUS

M. LoBillo PE

D. Gorman PE

Desc: Bm 1863-32A NAVA 88 EL= 17.10'

NG @ WELL PB 683

MEASUREMENT POINT @ WELL PB 683
 (Bm 1863-32A) BLACK MARKER BOX W/ "X" @ OLD
 USGS "BLACK+RED" Box. EAST SIDE OF WELL
 OPENING ON TOP OF STEEL BORE.

✓ TO Bm 1863-32B NAVA 88 EL= 17.215'
 GRAD. FLAT

★ END RUN ★

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South Florida Water Management District Benchmark Datasheet

Designation: PB 683 Project Name: USGS PAHSE 3 WELLS Type: V State Plane Zone: FL East
Stamping: PB 683 LB4108 2020 Field Book Name: GCY 1863 Field Book Page: 32-36
Established By: GCY, INC. Recovered By: Recovery Date:
Surveyor: ANDERSEN Established Date: 03/31/20 Status: New

GEOGRAPHIC POSITION INFORMATION

Section: 37 Township: 44 SOUTH Range: 41 EAST
County: PALM BEACH Quadrangle: GREEN ACRES CITY Quad Index: 1282 NGS Source BM(s):
NAD83 Adj. Year: 2011 Vertical Datum: NAVD1988 Horizontal Datum: NAD1983 NGS PID(s):
NAVD88 Elevation (feet): 16.232 NGVD29 Elevation (feet): 17.708 2022 Elevation: NGS NAVD88 Elev (ft):
NAVD88 Class: NGVD29 Class: Other Elevation: NGS NAVD88 Elev (m):
NAVD88 Order: 3RD NGVD29 Order: 3RD Other Elevation Type: NGS 2022 Elev (ft):
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)
Vertical Datum Offset: + 1.476 Actual NGS Elevation or ngvd29.txt file: OPUS Ortho Height: 16.02
Northing (Y) (feet): 821066.032 Easting (X) (feet): 913568.652 Source of Latitude & Longitude: OPUS SOLUTION
Latitude: 26 35 25.3464 Longitude: 80 12 44.45924
Latitude (Decimal Degrees): 26.590374 Longitude (Decimal Degrees): -80.21234979

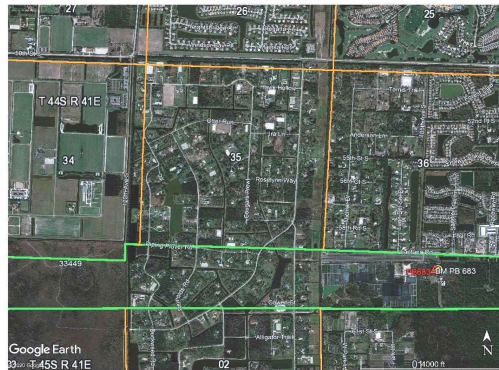
RECOVERY DATA

How to Reach: FROM THE INTERSECTION OF LANTANA RD AND US 441, GO SOUTH ON US 441 APPROXIMATELY 200 FEET TO AN UN-NAMED ROAD ON THE RIGHT; TURN RIGHT ON SAID UN-NAMED ROAD AND PROCEED 2000 FEET TO A DIRT ROAD TO THE LEFT. THE GATE HAS A COMBINATION LOCK (1022), PROCEED SOUTH THROUGH THE GATE ABOUT 165 FEET TO THE STATION ON THE RIGHT. STATION IS ABOUT 55 FEET WEST OF THE DIRT ROAD AT THE EASTERLY SIDE OF A CLEARING. STATION IS A STANDARD SFWMD DISK IN A 1 1/2" IRON PIPE WITH A CONCRETE COLLAR RECESSED APPROXIMATELY 0.5 FEET.

Description/Notes:
Notable Landmarks:
Other Source Benchmarks:

PICTURES

Aerial View of Overall Site



PICTURES

Site Sketch



From: opus
To: Pete Andersen
Subject: OPUS solution : 13970910.t01 OP1588282648692
Date: Thursday, April 30, 2020 5:43:01 PM

FILE: 13970910.t01 OP1588282648692

NGS OPUS SOLUTION REPORT
=====

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: petea@gcyinc.com DATE: April 30, 2020
RINEX FILE: 13970910.20o TIME: 21:42:46 UTC

SOFTWARE: page5 1801.18 master95.pl 160321 START: 2020/03/31 14:49:00
EPHEMERIS: igs20992.eph [precise] STOP: 2020/03/31 19:25:00
NAV FILE: brdc0910.20n OBS USED: 5607 / 10342 : 54%
ANT NAME: TRM39105.00 NONE # FIXED AMB: 96 / 134 : 72%
ARP HEIGHT: 1.539 OVERALL RMS: 0.025(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) ITRF2014 (EPOCH:2020.2478)

X: 970229.196(m) 0.201(m) 970228.369(m) 0.201(m)
Y: -5624255.409(m) 0.233(m) -5624253.821(m) 0.233(m)
Z: 2837693.102(m) 0.119(m) 2837692.938(m) 0.119(m)

LAT: 26 35 25.34640 0.050(m) 26 35 25.36645 0.050(m)
E LON: 279 47 15.54076 0.186(m) 279 47 15.52106 0.186(m)
W LON: 80 12 44.45924 0.186(m) 80 12 44.47894 0.186(m)
EL HGT: -20.842(m) 0.275(m) -22.440(m) 0.275(m)
ORTHO HGT: 4.883(m) 0.322(m) [NAVD88 (Computed using GEOID18)]

UTM COORDINATES STATE PLANE COORDINATES

UTM (Zone 17) SPC (0901 FL E)
Northing (Y) [meters] 2941308.021 250261.427
Easting (X) [meters] 578429.513 278456.282
Convergence [degrees] 0.35257778 0.35257778
Point Scale 0.99967594 1.00001714
Combined Factor 0.99967921 1.00002041

US NATIONAL GRID DESIGNATOR: 17RNK7842941308(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DF7050	MTNT MIAMI TNT CORS ARP	N255156.760	W0805425.186	106124.5
DP6859	FLF1 FL FOUNDATION 1 CORS ARP	N253655.240	W0802309.913	109410.4
DF9225	ZMA1 MIAMI WAAS 1 CORS ARP	N254928.585	W0801909.066	85508.6

NEAREST NGS PUBLISHED CONTROL POINT

AD6699 LANTANA WPTV TV MAST N263521.770 W0801242.510 122.6

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

*110001+00000000000000A1 32...1+0000000000050316 331.21+0000000000004840
390...+0000000000000005 391.21+0000000000000000
*110002+00000000000000B1 32...1+00000000000099675 332.21+0000000000004257
390...+0000000000000005 391.21+0000000000000000
*110003+00000000000000B2 32...1+00000000000050649 336.21+0000000000004346
390...+0000000000000005 391.21+0000000000000000
*110004+00000000000000A2 32...1+00000000000099427 335.21+0000000000004930
390...+0000000000000005 391.21+0000000000000000
*410005+00000000?.....1
*110006+000000OLD PB 683 83..51+00000000000016830
*110007+000000OLD PB 683 32...1+00000000000014408 331.21+0000000000005487
390...+0000000000000005 391.21+0000000000000000
*110008+0000000000000001 32...1+00000000000015914 332.21+0000000000005217
390...+0000000000000005 391.21+0000000000000000 71....+00000BM 1863 32A
*110009+0000000000000001 573..1-0000000000001506 574..1+00000000000030322
83..21+00000000000017100
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390...+0000000000000005 391.21+0000000000000000
*110056+000000000KEATING 32...1+0000000000110034 332.21+000000000004933
390...+0000000000000005 391.21+0000000000000000
*110057+000000000KEATING 573..1+0000000000006734 574..1+0000000004585704
83..21+0000000000018759

Palm City

30 April 2020

INPUT

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

OUTPUT

Geographic, fhpgn - Florida HPGN
Vertical - NGVD29 (Custom), U.S. Feet

WELL PB 683

1/1

Northing/Y: 821036.813

Latitude: 26 35 25.05213

Easting/X: 913649.189

Longitude: 80 12 43.57411

Elevation/Z: 0

Elevation/Z: 1.476

Convergence: 0 21 09.67077

Scale Factor: 1.000017190

Combined Factor: 1.000021227

Remark: