Surveyor's Report

Specific Purpose Survey
Well Sites POF 24, POH 2,
POS 7 and POS 6.

SFWMD Work Order Number: 4500015866

Contractors Project No. 07050.06

Report Date: 04/14/08

Submittal: Final

Prepared for:

South Florida Water Management District

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OVERVIEW OF THE PROJECT

PURPOSE

This survey request consists of the establishment of elevations to third order National Geodetic Survey (NGS) Standards at well sites POF 24, POH S, POS 7 and POS 6, Polk County, Florida:

The objective of this Work Order is to:

1. Establish new elevations NGVD 1929 and NAVD 1988 on the well(s).
2. Set a site benchmark with in 500' of the well.

The services listed in this report were performed under the direction of a Professional Surveyor and Mapper (PSM) registered in the State of Florida in accordance with Chapter 472 of the Florida Statutes.

LOCATION OF PROJECT

The project is located in Polk County, Florida.

ITEMS DELIVERED TO THE DISTRICT

The following items were delivered to the District with this report.

A CD containing the following:

- The survey report in Microsoft Word format.
- Digital photos.
- Scanned copies of field notes.
- Any other digital files associated with the survey.
- Completed District benchmark description sheet for all set marks.
- Completed Excel benchmark spread sheet
- Completed Excel well activation sheet
- CorpsMet 95 Meta Data Report.

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provided by the South Florida Water Management District in a file named "NGVD29.txt" when applicable, otherwise NGS superseded values or South Florida Water Management District's Benchmark Data Base values were used. The measurement unit for all horizontal and vertical distances is U.S. survey feet unless otherwise stated.

LEVELING METHODS

CONFIGURATION OF LEVEL RUN

Third-Order leveling procedures were used to establish the elevation(s) on the well measuring point(s) and the site benchmark.

Benchmark POF 24 2007 (the site benchmark) was used as the primary vertical control for establishing the elevations on the measuring points and site as-builts. A level loop was run starting at NGS benchmark K-106, through NGS benchmark POL 16 FLDNR, through the site benchmark POF 24 2007 and back to Benchmark K-106.

The SFWMD maximum allowable misclosure for this type of run is 0.03' multiplied by the square root of the length of the level line in miles.

EQUIPMENT USED

All leveling during the project was performed with a Leica NA1 conventional level and a three-section, fiberglass level rod.

GPS METHODS

INTRODUCTION

A GPS horizontal value for the site benchmark was required as part of this contract. The site benchmark was occupied for a minimum of fifteen minutes for rapid static processing to obtain sub-meter accuracy.

The following instrumentation was used for the GPS observation:

(1) Trimble 5700 receiver/antenna

DATA PROCESSING

Data Acquisition

Data was downloaded from the receiver using Trimble Geomatics Office, version 1.62 (TGO). The DAT file was then sent to the National Geodetic Survey program OPUS RS (On-line Positioning User Service rapid static) for processing. Each data file submitted to OPUS RS is processed with respect to 3 CORS sites. The sites selected may not be the nearest to the static session but are selected by distance, number of observations, site stability, etc. The results of the three baselines are then added together and averaged to obtain the unknown station(s) (site benchmark POF 24 2007) values. Those values for the site benchmark (latitude and longitude) are shown in the corresponding vertical control section below.

VERTICAL CONTROL

K-106	Elevation:	**NAVD 1988**	**61.463'**	**NGVD 1929**	**62.67'**
PID - AF7634	Latitude	27° 57' 33.88807"	from NGS Data Sheet		From SFWMD benchmark data base
State/County FL/Polk	Longitude	- 81° 24' 48.85158"			
USGS QUAD Hesperides (1972)					
Vertical Order Second Class I Horizontal Order First					

The mark is about 14.7 mi (23.7 km) east-northwest of Lake Wales, in Section 15, Township 29 South, Range 29 East. To reach the mark from the intersection of State Road 27 and State Road 60 in Lake Wales, go east-southeast on State Road 60 for 7.3 mi (11.7 km) to the junction of Mammoth Grove Road on the left, turn left on Mammoth Grove Road and go north for 2.05 mi (3.30 km) to the junction of Camp Mack Road on the right, turn right on Camp Mack Road and go north for 0.25 mi (0.40 km) to a curve east, continue east on Camp Mack Road for 2.3 mi (3.7 km) to the junction of Barney Keen Road (Boy Scout Road) on the right, continue northeasterly on Camp Mack Road for 3.0 mi (4.8 km) to the mark on the right, a stainless steel rod driven into the ground with a NGS logo cap recessed 1.2 ft (0.4 m) below the level of the ground and below the level of Camp Mack Road, the datum point is recessed 0.3 ft (9.1 cm) below the level of the NGS logo cap. Located 26.2 ft (8.0 m) northwest of a barbwire fence, 25.8 ft (7.9 m) northwest of a carsonite witness post, 22.6 ft (6.9 m) northwest of power pole number fpc b11498, 21.0 ft (6.4 m) southeast of the approximate centerline of Camp Mack Road and 9.8 ft (3.0 m) southeast of the southeast edge of the pavement and 1.0 ft (0.3 m) northwest of a carsonite witness post. note access to the datum point is had through a 5-inch NGS logo cap.

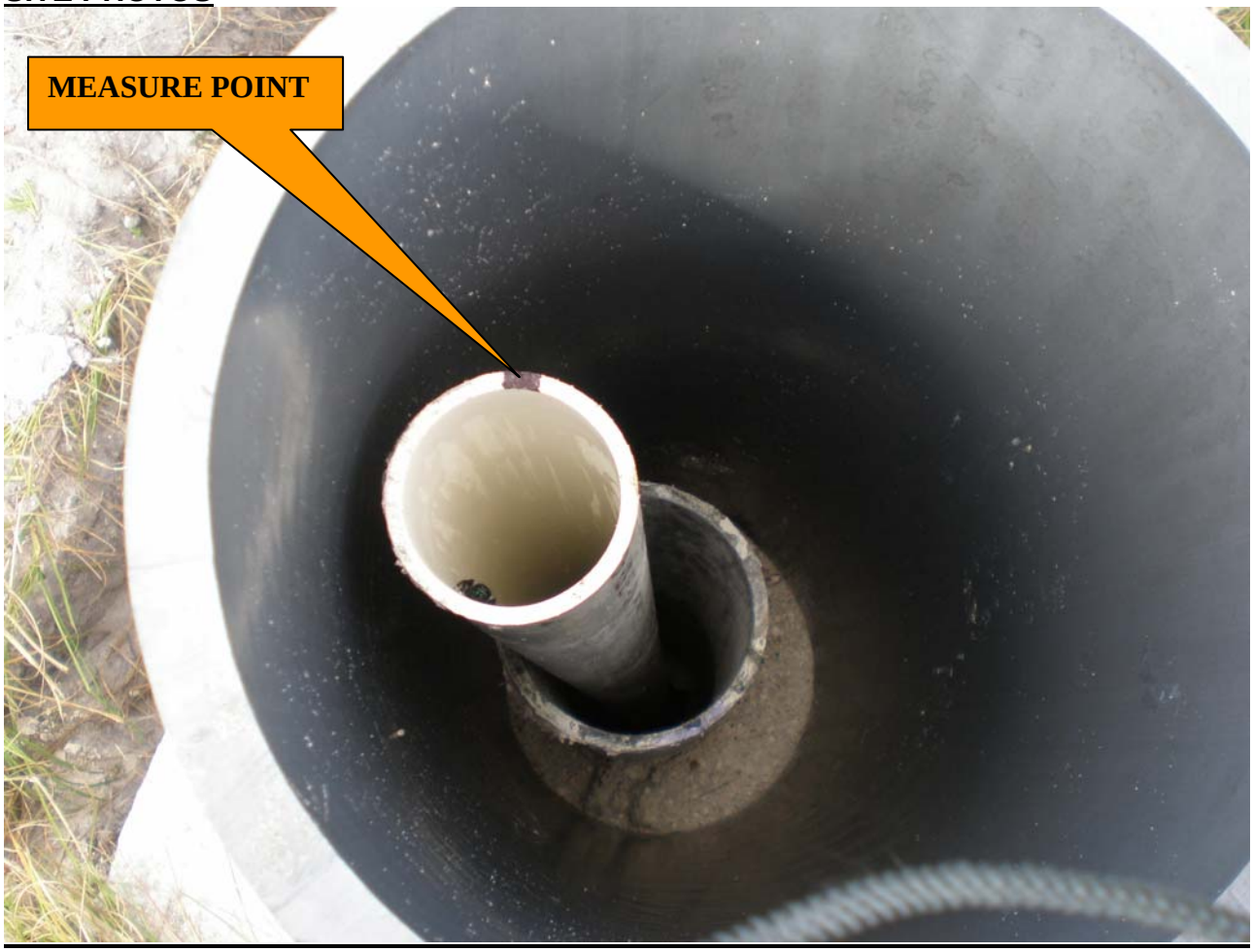
VERTICAL CONTROL

POL 16 FLDNR	Elevation:	**NAVD 1988**	**63.317'**	**NGVD 1929**	**64.52'**
PID - AH8769	Latitude	27° 57' 33.88807"	from NGS Data Sheet		Superseded value from NGS Data Sheet
State/County FL/Polk	Longitude	- 81° 24' 48.85158"			
USGS QUAD Hesperides (1972)					
Vertical Order Second Class I Horizontal Order First		14.75 mi E.N.E. from Lake Wales. Begin in Lake Wales at the State Highway 60 bridge over the SCL Railroad, go 8.25 miles east on Highway 60 to the intersection of Boy Scout Road, go 3.7 miles north on Boy Scout Road to Camp Mack Road, go 2.8 miles east on Camp Mack Road to the mark. The mark bears 24.0 feet north of the centerline of Camp Mack Road, 70.0 feet west of the centerline of a dirt road (Rolling Meadow Ranch Road), and 7.1 feet west of power pole 621-1.			

VERTICAL CONTROL

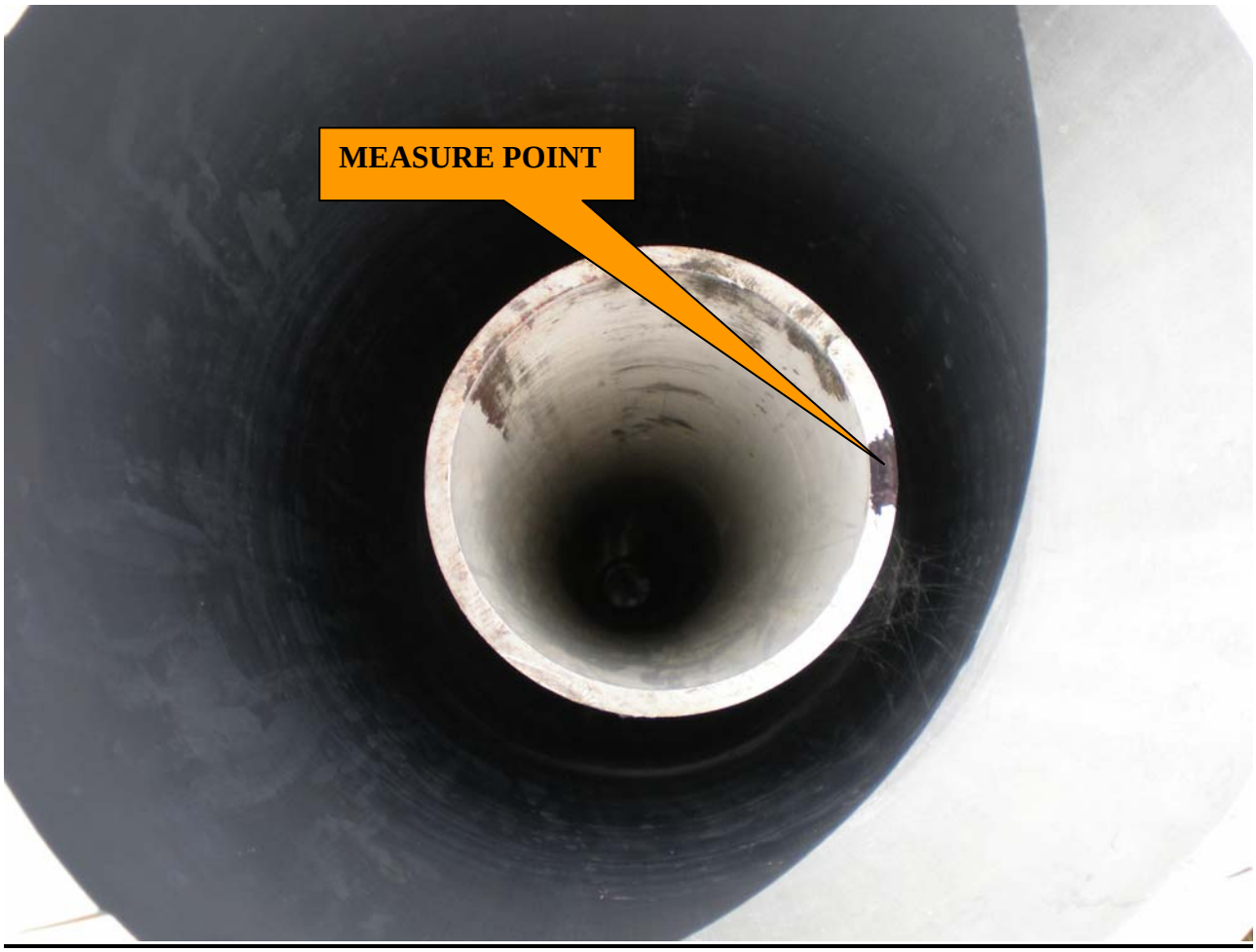
SITE BENCHMARK POF 24 2007	Elevation:	**NAVD 1988**	**65.469'**	**NGVD 1929**	**66.675'**
	Latitude	27° 58' 16.6"	From level run described above		From level run described above
State/County FL/Polk	Longitude	-81° 25' 03.3"			
USGS QUAD Hesperides (1972)					
Vertical Order 3 Horizontal Order 3		The mark is in Polk County in Section 9, Township 29 South, Range 29 East. To reach the mark from the intersection of State Road 27 and State Road 60 in Lake Wales, go east-southeast on State Road 60 for 8.2 mi to the junction of Boy Scout Road (Barney Keen Road) on the left, turn left on Boy Scout Road (Barney Keen Road) and go north approx. 3.6 mi. to the junction of Camp Mack Road, turn right on Camp Mack Road and go northeast approx. 3.0 mi. to the junction of a rock road on the left, turn left on to the rock road and go north, then west, then north approx. 1.2 mi. to well site POF 24, POH 2, POS 6 POS 7 and Snively's and the benchmark. The mark is a 3-1/2" brass SFWMD disk set in concrete, in line with east-west line of a 6' chain link fence, 2.45' east of the southeast corner of the chain link fence.			

SITE PHOTOS



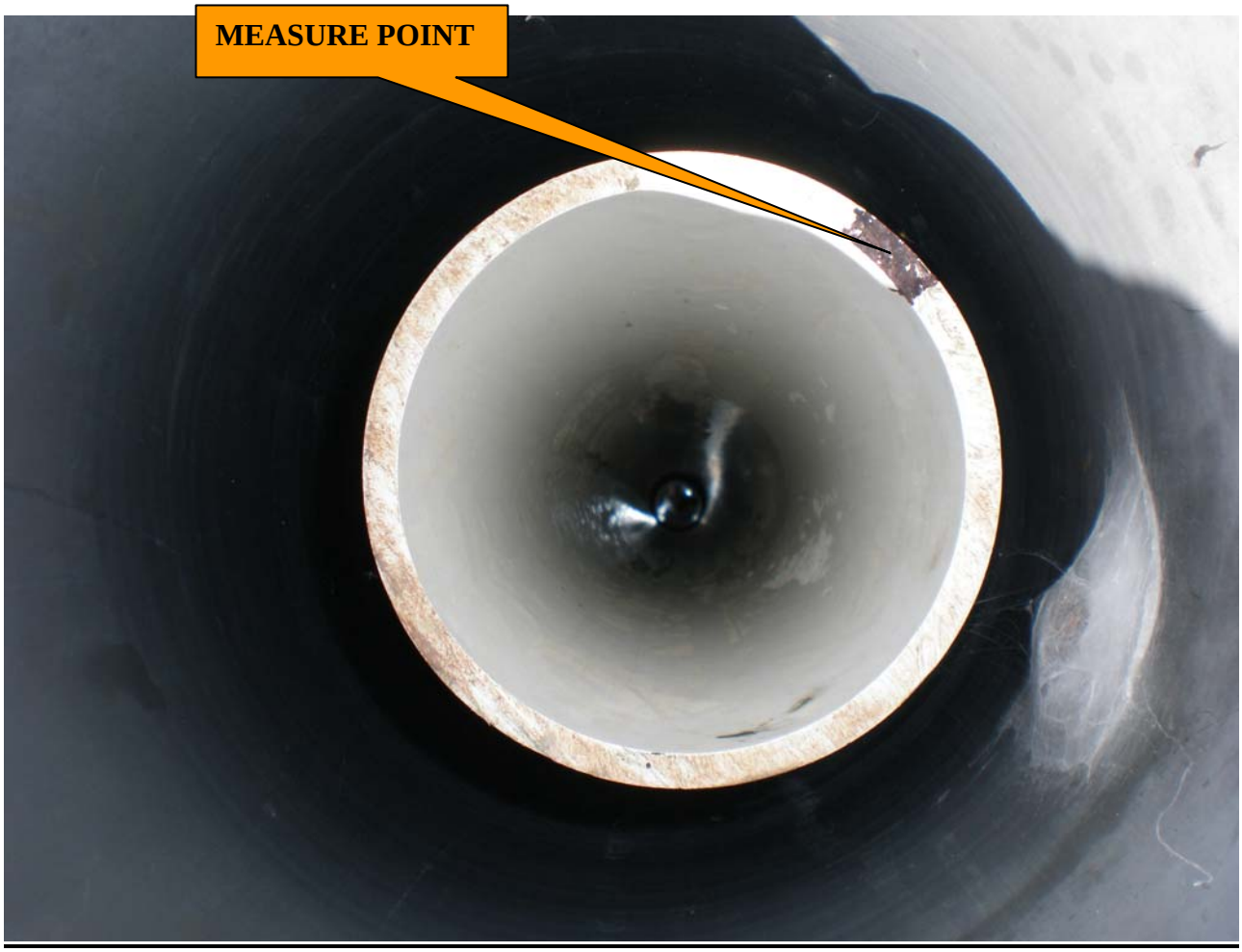
Well POF 24 Measuring Point

SITE PHOTOS



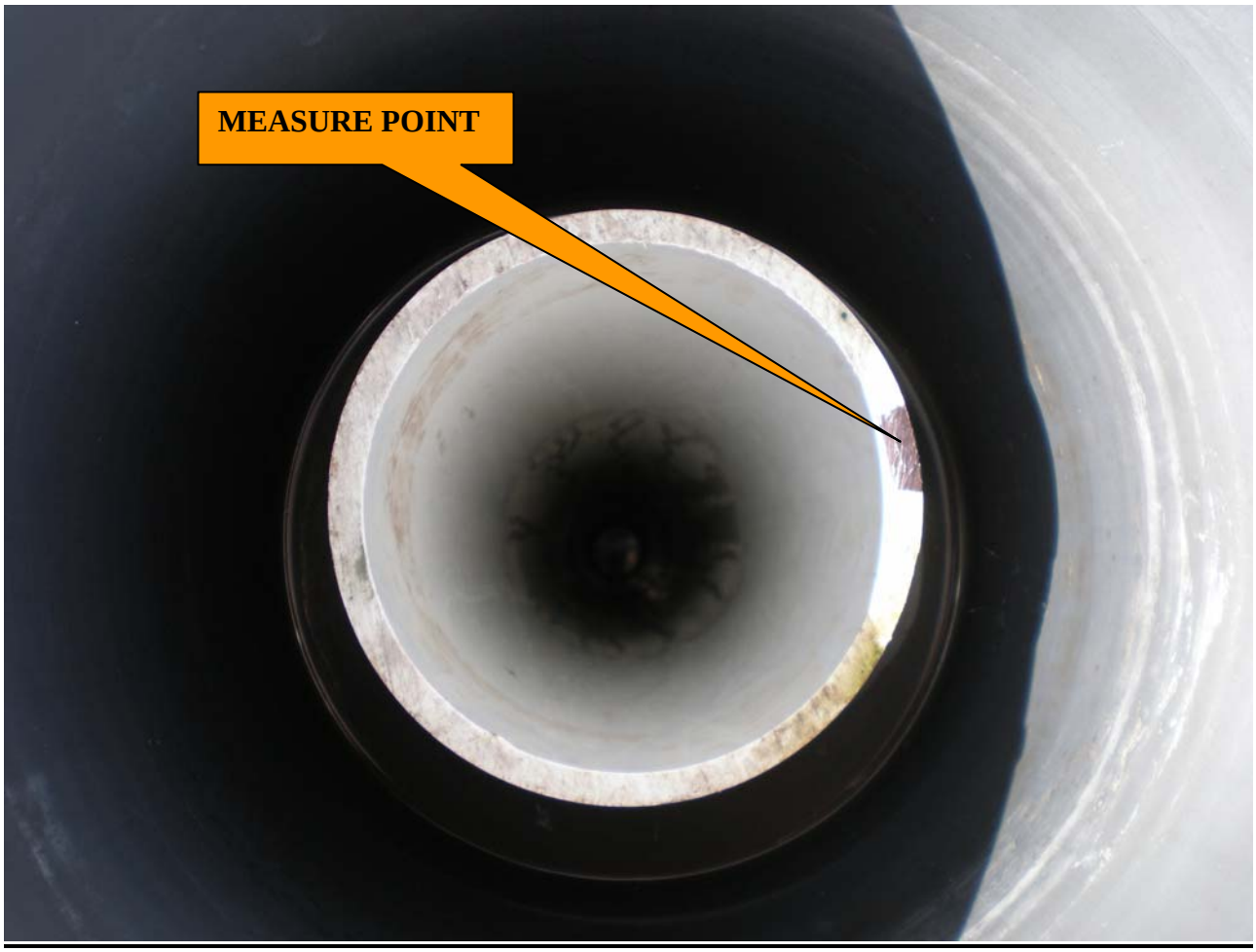
Well POH 2 Measuring Point

SITE PHOTOS



Well POS 6 Measuring Point

SITE PHOTOS



Well POS 6 Measuring Point

PROJECT RESULTS

Well POF 24	Well POH 2	Well POS 7	Well POS 6
Reference mark: **Set mark on top PVC pipe encased in gray pipe.** **New Information at the site:** **Wrote the following information on the cap for the PVC well pipe.** Mark El. **69.10'** **NGVD 29** Initials: **K&A** Date:**11/19/07** Offset **1.206'** **Previous Information at the site:** Reference Mark Elevation(s) El. **None** Date: **None** Initials: **None** Reference Mark location **Same As noted above**	Reference mark: **Set mark on top PVC pipe encased in gray pipe.** **New Information at the site:** **Wrote the following information on the cap for the PVC well pipe.** Mark El. **68.95'** **NGVD 29** Initials: **K&A** Date:**11/19/07** Offset **1.206'** **Previous Information at the site:** Reference Mark Elevation(s) El. **None** Date: **None** Initials: **None** Reference Mark location **Same As noted above**	Reference mark: **Set mark on top PVC pipe encased in gray pipe.** **New Information at the site:** **Wrote the following information on the cap for the PVC well pipe.** Mark El. **68.85'** **NGVD 29** Initials: **K&A** Date:**11/19/07** Offset **1.206'** **Previous Information at the site:** Reference Mark Elevation(s) El. **None** Date: **None** Initials: **None** Reference Mark location **Same As noted above**	Reference mark: **Set mark on top PVC pipe encased in gray pipe.** **New Information at the site:** **Wrote the following information on the cap for the PVC well pipe.** Mark El. **69.18'** **NGVD 29** Initials: **K&A** Date:**11/19/07** Offset **1.206'** **Previous Information at the site:** Reference Mark Elevation(s) El. **None** Date: **None** Initials: **None** Reference Mark location **Same As noted above**
DTW (Distance to water inside well) **Unable to obtain, well was dry at tim of survey.** Reference mark: **N/A** El. **N/A** (NGVD 29) Measurement to water: **N/A** Date: **N/A** Time: **N/A** **Ground Elevation next to Well** **67.11' (NGVD 1929) (on concrete pad).** **66.6' (NGVD 1929) (grass next to concrete pad).**	**DTW** (Distance to water inside well) Reference mark: **Same as noted above** El. **61.0'** (NGVD 29) Measurement to water: **7.9** Date: **11/19/07** Time: **11:19 a.m.** **Ground Elevation next to Well** **67.00' (NGVD 1929) (on concrete pad).** **66.1' (NGVD 1929) (grass next to concrete pad).**	**DTW** (Distance to water inside well) Reference mark: **Same as noted above** El. **61.1'** (NGVD 29) Measurement to water: **7.7** Date: **11/19/07** Time: **11:21 a.m.** **Ground Elevation next to Well** **67.00' (NGVD 1929) (on concrete pad).** **66.2' (NGVD 1929) (grass next to concrete pad).**	**DTW** (Distance to water inside well) Reference mark: **Same as noted above** El. **61.1'** (NGVD 29) Measurement to water: **8.1** Date: **11/19/07** Time: **11:23 a.m.** **Ground Elevation next to Well** **67.19' (NGVD 1929) (on concrete pad).** **66.8' (NGVD 1929) (grass next to concrete pad).**

Comments

Elevations shown hereon are NGVD 1929 datum unless noted otherwise.
Party Chief: D. Ferels Field Book: 279 Pages 42-52
Bench Mark: "POF 24 2007" El. 65.469', Vertical Datum: NAVD1988
El. 66.675', Vertical Datum: NGVD1929
Offset: 1.206' SFWMD VALUE (subtract this value to convert to NAVD 1988)
Offset: 1.206' NGS VALUE (subtract this value to convert to NAVD 1988)
The offset values referred to as "SFWMD VALUE" and "NGS VALUE" were derived by subtracting the NAVD 1988 value from the NGVD 1929 value at benchmark K-106. The NGVD 1929 value for benchmark K-106 was obtained from the South Florida Water Management District's Benchmark Data Base..

NAVD 88 - North American Vertical Datum of 1988
NGVD29 -National Geodetic Vertical Datum of 1929
NAD 83 -99 (Horizontal Datum) North American Datum
NGS - National Geodetic Survey
SFWMD - South Florida Water Management District
PVC - Polyvinyl Chloride
L.B. - Licensed Business
RTK – Real Time Kinematic
K&A – Keith and Associates
PSM – Professional Surveyor & Mapper
USGS – United States Geological Survey
QUAD – Quadrangle Map
PID - Permanent Identifier

SURVEYOR'S CERTIFICATION

I hereby certify that this Specific Purpose 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.

Keith and Associates, Inc.
L.B. number 6860

By: 

Date of Survey
November 19, 2007

Michael M. Mossey, PSM
Professional Surveyor and Mapper
State of Florida
Certificate No. 5660