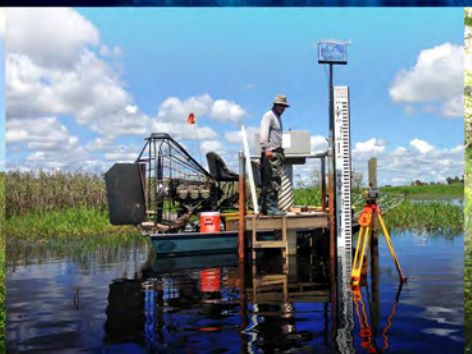
PREPARED FOR

SPECIFIC PURPOSE SURVEY
SURVEYOR'S REPORT
VERTICAL DATUM UPGRADE PROJECT

WO# 4600002187-WO08

SAP PO# 9500006234

WGI™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Purpose of Project:

Procure all materials to construct and install 108 staff gauges calibrated to the North American Vertical Datum of 1988 (NAVD88) at various sites identified by the Vertical Datum Project Manager. Establish a NAVD88 Reference Elevation on the inside deck of existing Telemetry Stations and stamp site specific data onto a brass tag, using a steel stamp die set. The brass tags were delivered to SFWMD and would be installed by SFWMD Field Personnel during site inspections.

Accuracy:

Staff gauges have been set (adjusted) to the nearest two hundredth (.02') of a foot, and reference elevations established to the nearest hundredth (.01') of a foot. Elevations have been transferred from provided bench mark using a digital level, steel tape, and redundant measurements.

Bench Marks:

A bench mark was provided by SFWMD at each location, unless otherwise noted, and used to establish the reference elevation and calibrate each staff gauge.

Survey Equipment Used:

Topcon DL-502 (Digital Level)
Fiberglass Digital Level Rods
Conventional Level Rod
GPS Equipment - Topcon GR3

Vertical Datum Factor:

The reference elevations and staff gauges, in this report, have been correctly calibrated to the North American Vertical Datum of 1988. The datum conversion to the National Geodetic Vertical Datum of 1929 (NGVD 29), as shown herein and engraved on each gauge, were provided by the SFWMD VDUP Project Manager.

Completion Date:

Staff Gauge installation, calibration, and the establishment of telemetry station reference elevation was completed on July 30, 2015.

Construction:

Each Staff Gauge is attached to a 4" O.D. galvanized steel pipe with stainless steel hardware. The pipes were driven to a depth to achieve required stability, to a minimum of 10', unless otherwise noted. Sections of pipes were driven by jack hammer, and attached together with a galvanized threaded coupling.

Details of Staff Gauges

Part 1 - Homestead

Staff Gauge Detail Summary: Homestead 90

Gauges completed:

Staff Gauge Site	Latitude	Longitude	Bench-mark Used	Benchmark Elevation NAVD88	Well Head Reference BM Elevation	Conversion Elevation to NGVD29
S382_H	27.400900	80.419000	S382	23.296	25.247	1.47
S382_T	27.400600	80.418100	S382	23.296	36.448	1.47
PD04F	27 23 04.792	81 03 53.193	PD04F	27.97	35.558	1.19
PD05F	27 23 18.4	81 06 17.1	PD05F	30.06	35.716	1.18
S149_H	25.592154	80.361811	S149	7.425	9.231	1.53
S149_T	25.592163	80.360707	S149	7.425	9.971	1.53
S122_H	25.594421	80.348484	S122	4.99	NONE	1.54
S122_T	25.594388	80.347765	S122	4.99	NONE	1.54
S148_H	25.570038	80.383240	S148	7.576	10.939	1.53
S148_T	25.570041	80.382569	S148	7.576	9.843	1.53
S195_H	25.552144	80.397137	S195	6.57	NONE	1.53
S195_T	25.551548	80.396513	S195	6.57	NONE	1.53
S165_H	25.542608	80.409500	S165	7.565	11.441	1.53
S165_T	25.542608	80.409500	S165	7.565	11.441	1.53
S166_H	25.518386	80.432362	S166	8.585	12.286	1.52
S166_T	25.518221	80.432336	S166	8.585	10.486	1.52
S21_H	25.543174	80.331152	R710	7.18	10.43	1.47
S21_T	25.542950	80.330821	R710	7.18	9.937	1.47
S21A_H	25.519290	80.346789	R722	5.33	9.281	1.53
S21A_T	25.519288	80.345856	R722	5.33	9.30	1.53
S20G_H	25.489535	80.347315	R724	5.33	9.401	1.53
S20G_T	25.489550	80.346534	R724	5.33	9.381	1.53
S20F_H	25.470256	80.346844	R725	5.26	11.016	1.53
S20F_T	25.470256	80.346289	R725	5.26	10.711	1.53
S179_H	25.473816	80.414603	S179	6.93	10.845	1.53
S179_T	25.473815	80.414163	S179	6.93	10.851	1.53
S20_H	25.367199	80.376598	AZ MK MODEL1972	5.74	7.232	1.53
S20_T	25.367198	80.376255	AZ MK MODEL1972	5.74	7.13	1.53
S338_H	25.660928	80.481576	PR36	9.791	10.151	1.56
S338_T	25.660949	80.481048	PR36	9.791	10.741	1.56
G211_H	25.659842	80.497796	G211	6.37	11.276	1.56
G211_T	25.659406	80.497755	G211	6.37	10.706	1.56

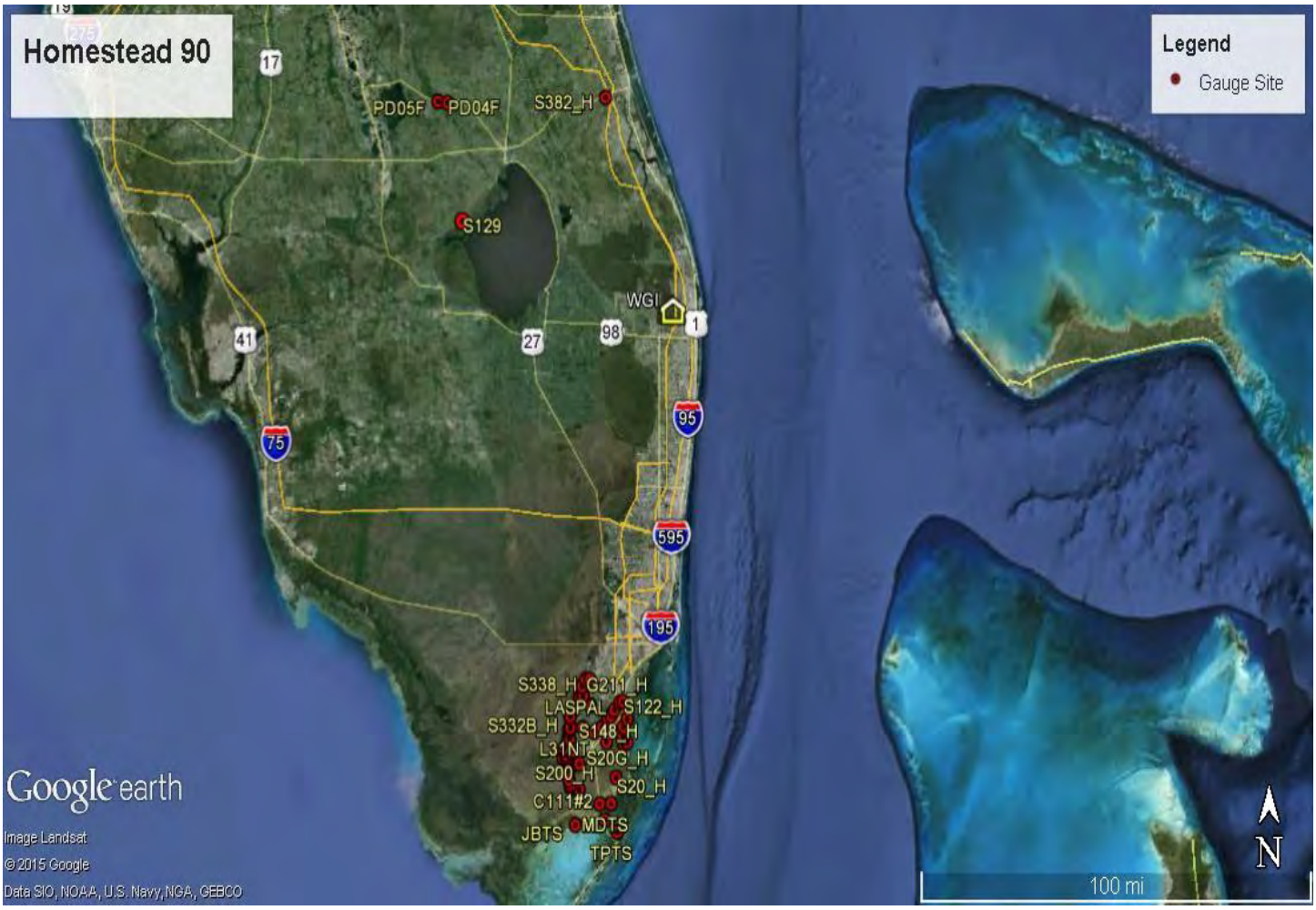
Staff Gauge Site	Latitude	Longitude	Bench-Mark Used	Benchmark Elevation NAVD88	Well Head Reference BM Elevation	Conversion Elevation to NGVD29
LPC1	25.640795	80.513113	LASPAL	5.64	10.36	1.56
S331_H	25.611474	80.509094	FCE4520	10.062	19.844	1.56
S331_T	25.610724	80.509616	FCE4520	10.062	19.789	1.56
S173_H	25.611474	80.509094	FCE4520	10.062	NONE	1.56
S173_T	25.610724	80.509616	FCE4520	10.062	NONE	1.56
S357_H	25.608301	80.524270	S357A	8.35	10.73	1.56
S357_T	25.607191	80.524229	S357A	8.35	14.42	1.56
S194_H	25.583210	80.478693	FCE4521	13.88	NONE	1.55
S194_T	25.583198	80.477942	FCE4521	13.88	NONE	1.55
S332B_H	25.549839	80.560382	S332B	9.84	12.383	1.57
S332B_T	25.549672	80.560749	S332B	9.84	NONE	1.57
S332BN_T	25.550444	80.561889	S332B	9.84	13.019	1.57
L31NT	25.516312	80.559876	S332C	10.234	8.934	1.55
S332C_H	25.515151	80.560120	S332C	10.234	12.14	1.55
S332CS_T	25.515868	80.567063	S332C TW	11.80	12.755	1.56
DS3	25.509444	80.566667	S332C TW	11.80	11.56	1.56
S196_H	25.516987	80.511620	PR29	6.438	NONE	1.54
S196_T	25.516999	80.511087	PR29	6.438	NONE	1.54
S167_H	25.502887	80.465342	S167	8.493	12.382	1.52
S167_T	25.502967	80.464410	S167	8.493	9.116	1.52
S176_H	25.482917	80.562734	J510	9.467	13.495	1.55
S176_T	25.482241	80.562737	J510	9.467	13.484	1.55
S332D_H	25.483018	80.563204	H504	9.508	10.74	1.55
S332D_T	25.483027	80.564226	H504	9.508	10.76	1.55
S332DX1_T	25.483370	80.570410	FCE4512	9.13	12.231	1.55
BERM3_H	25.454561	80.584946	K504	7.00	10.803	1.57
BERM3_T	25.454484	80.584952	K504	7.00	10.48	1.57
S200_H	25.444233	80.559852	S200	9.876	9.673	1.57
S200_T	25.444256	80.560868	S200	9.876	12.999	1.57
C111#3	25.434080	80.573934	N504	6.89	NONE	1.57
C111#4	25.425615	80.573884	N504	6.89	NONE	1.58
S175_H	25.418123	80.573730	PR19	12.413	9.64	1.58
S175_T	25.417416	80.573737	PR19	12.413	9.631	1.58
S332_H	25.422161	80.589862	S332	7.942	NONE	1.58
S332_T	25.422028	80.590461	S332	7.942	NONE	1.58
C111#5	25.409526	80.572882	N504	6.89	NONE	1.58
S199_H	25.403308	80.559589	EG2	9.11	10.365	1.58
S199_T	25.403318	80.558566	EG2	9.11	12.627	1.58

Staff Gauge Site	Latitude	Longitude	Bench-mark Used	Benchmark Elevation NAVD88	Well Head Reference BM Elevation	Conversion Elevation to NGVD29
S177_H	25.403022	80.558267	J511	7.444	11.529	1.58
S177_T	25.403315	80.558562	J511	7.444	11.519	1.58
S178_H	25.408353	80.524169	PR16	4.98	8.442	1.56
S178_T	25.408031	80.523857	PR16	4.98	6.538	1.56
C111#1	25.388875	80.566239	Q504	3.54	NONE	1.58
C111#2	25.360094	80.566005	BM1 AJ4	1.99	NONE	1.58
CSSSD1	25.346581	80.559331	CSSSD1	1.86	7.74	1.58
CSSSD2	25.337450	80.559900	CSSSD2	2.57	8.66	1.58
CSSSD3	25.329350	80.536417	CSSSD3	1.89	7.79	1.57
S18C_H	25.330975	80.524853	J514	6.514	10.432	1.56
S18C_T	25.330210	80.524830	J514	6.514	10.481	1.56
BBCW10	25.472151	80.332113	R725	5.26	5.32/5.34	1.53
MDTS	25.278729	80.395057	MD1	2.29	5.473	1.55
MBTS	25.239417	80.421694	K316	12.74	3.207	1.55
TPTS	25.206510	80.374779	TPTS 2015	0.12	3.663	1.56
JBTS	25.224566	80.540061	JB1	1.23	4.66	1.55

- **All Elevations shown are NAVD 88**

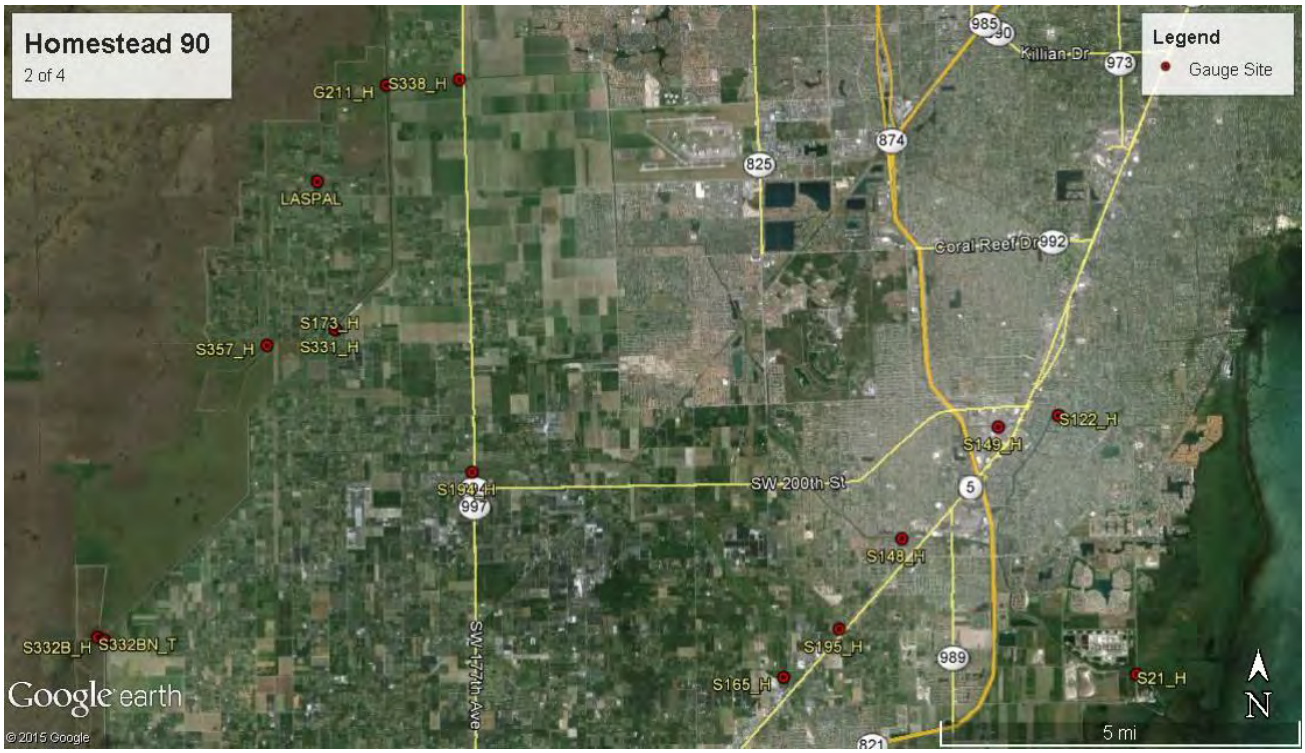
Project Location Maps:

Overall Site



Site Close Up 1 of 4:

Site Close Up 2 of 4:



Site Close Up 3 of 4:

Site Close Up 4 of 4:

Stage Recorder Site: BBCW10

Party Chief: Jose Mendoza	**Field Book Number:** 602/ BK 9	**Page Number:** 5 & 6
Benchmark Elevation (NAVD 88): 5.26	**Date of Field Work:** June 24, 2015	**Datum Offset to NGVD 29:** +1.53
Benchmark Agency: Dade Co.	**Benchmark Type:** Brass Disk	**Benchmark Stamp:** DCBM R725
Reference Elevation (NAVD88):		**Existing Tag Elevation (Datum):**
Latitude: 25.472151		**Longitude:** 80.332113
Notes: See page 2 for ground elevations at platform.		
Removed Old Board: Existing gauge removed.		

Photographs:

Overall Site:

Benchmark Location:

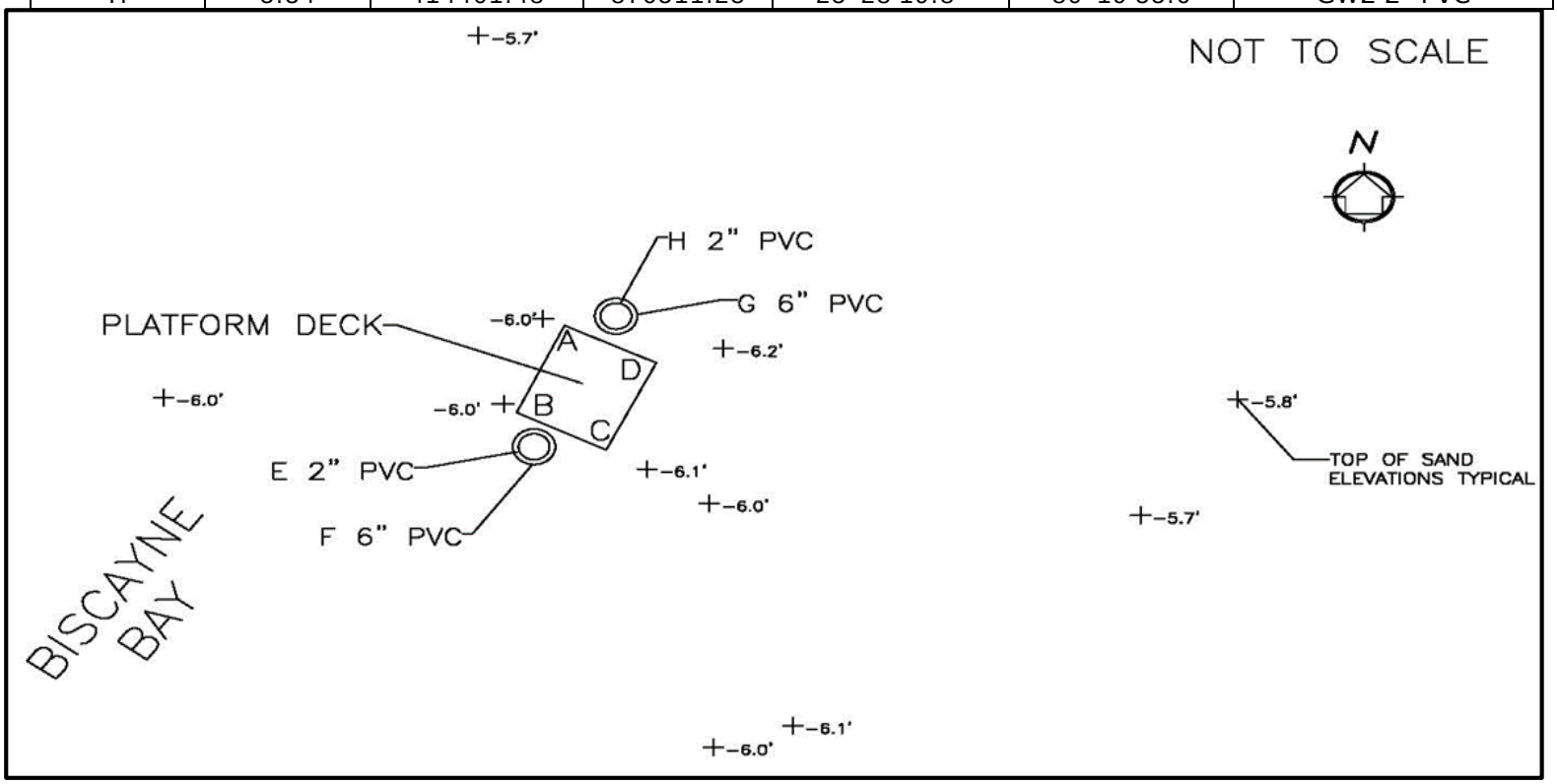
Benchmark Close Up:

New Staff Gauge:
Front View:

Side View:

Stage Recorder Site: BBCW10

LOCATION	NAVD88 ELEV.	NORTHING	EASTING	LAT.	LONG.	DESCRIPTION
A	4.9	414396.34	876506.26	25°28'19.7"	-80°19'55.6"	WOOD DECK CORNER
B	4.7	414394.04	876510.88	25°28'19.7"	-80°19'55.6"	WOOD DECK CORNER
C	4.9	414399.41	876513.46	25°28'19.7"	-80°19'55.5"	WOOD DECK CORNER
D	4.9	414401.71	876508.74	25°28'19.8"	-80°19'55.6"	WOOD DECK CORNER
E	5.32	414394.94	876507.73	25°28'19.7"	-80°19'55.6"	GW1 2″ PVC
F	5.94	414395.19	876507.98	25°28'19.7"	-80°19'55.6"	GW1 6″ PVC
G	5.79	414401.65	876511.25	25°28'19.8"	-80°19'55.6"	GW2 6″ PVC
H	5.34	414401.48	876511.23	25°28'19.8"	-80°19'55.6"	GW2 2″ PVC



SOUTH FLORIDA WATER MANAGEMENT DISTRICT

DESIGNATION BBCW10	**PROJECT** VDUP
ESTABLISHED BY WANTMAN GROUP **RECOVERED BY**	**SURVEYOR** DEREK ZEMAN **DATE** JUNE 23, 2015

GEOGRAPHIC POSITION

SECTION 16	**TOWNSHIP** 57S	**RANGE** 40E
COUNTY MIAMI-DADE	**NAME OF QUADRANGLE** ARSENICKER KEYS	

HORIZONTAL DATUM: **1927** (**1983**) **Other**_____ (circle one) ZONE (**E**) or **W**

VERTICAL DATUM: **MSL** **1929** (**1988**) **Other** _____ (circle one)

CONTROL ACCURACY: **HORIZONTAL** **1** **2** (**3**) _____(circle one) **VERTICAL** **1** **2** **3** **GPS**

STATE PLANE COORDINATES	**X** 876507.54	**Y** 414398.97	**NAVD 88 ELEV.** **4.88** **NGVD 29 ELEV.** _____

LATITUDE	**LONGITUDE**

RECOVERY DESCRIPTION

Stamping: LB7055

To Reach: FROM STRUCTURE S-20 AT THE INTERSECTION OF L-31E(BISCAYNE TRAIL) AND SW 97th AVE. GO EAST 0.4 MILES TO BOAT RAMP THEN BY BOAT FOR 0.5 MILES TO PLATFORM BENCH MARK IS A MAG NAIL AND DISK SET IN THE WOOD FRAME OVER THE LADDER

NOTE: BENCH MARK ELEVATION DERIVED FROM DOUBLE GPS RTK OBSERVATIONS. HOLDING BENCH MARKS F 61 1(PID#AC1178) & R725(PID#AC1180)

Notable Land marks: PLATFORM FOR BBCW10

FIELD BOOK 602 #9 **PAGE** 5-6

SKETCH

Stage Recorder Site: BBCW10 GW1

Party Chief: Jose Mendoza	**Field Book Number:** 602/ BK 9	**Page Number:** 5 & 6
Benchmark Elevation (NAVD 88): 5.26	**Date of Field Work:** June 24, 2015	**Datum Offset to NGVD 29:** +1.53
Benchmark Agency: Dade Co.	**Benchmark Type:** Brass Disk	**Benchmark Stamp:** DCBM R725
Reference Elevation (NAVD88): 5.32		**Existing Tag Elevation (Datum):** 6.90 NGVD29
Latitude: 25.472151		**Longitude:** 80.332113
Notes: Datum difference SFWMD +1.53 Field 1.58 Well Elevation RTK (multiple observations and base setups) derived.		
Removed Old Board:		

Photographs:

Overall Site:

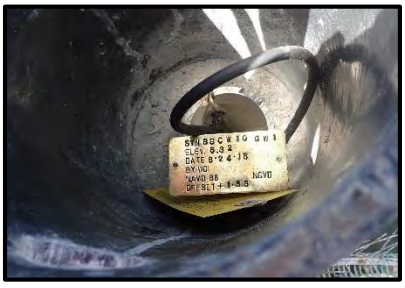
Benchmark Location:

Benchmark Close Up:

Brass Tag Close Up:

Reference Mark:

Brass Tag & Reference:



Stage Recorder Site: BBCW10 GW2

Party Chief: Jose Mendoza	**Field Book Number:** 602/ BK 9	**Page Number:** 5 & 6
Benchmark Elevation (NAVD 88): 5.26	**Date of Field Work:** June 24, 2015	**Datum Offset to NGVD 29:** +1.53
Benchmark Agency: Dade Co.	**Benchmark Type:** Brass Disk	**Benchmark Stamp:** DCBM R725
Reference Elevation (NAVD88): 5.34		**Existing Tag Elevation (Datum):** 6.90 NGVD29
Latitude: 25.472151		**Longitude:** 80.332113
Notes: Datum difference SFWMD +1.53 Field 1.56 Well Elevation RTK (multiple observations and base setups) derived.		
Removed Old Board:		

Photographs:

Overall Site:

Benchmark Location:

Benchmark Close Up:

Brass Tag Close Up:

Reference Mark:

Brass Tag & Reference:

Stage Recorder Site: BBCW10 WQ1S

Party Chief: Jose Mendoza	**Field Book Number:** 602/ BK 9	**Page Number:** 5 & 6
Benchmark Elevation (NAVD 88): 5.26	**Date of Field Work:** September 28, 2015	**Datum Offset to NGVD 29:** +1.53
Benchmark Agency: Dade Co.	**Benchmark Type:** Brass Disk	**Benchmark Stamp:** DCBM R725
Reference Elevation (NAVD88): 8.06		**Existing Tag Elevation (Datum):** 9.63 NGVD29
Latitude: 25.472151		**Longitude:** 80.332113
Notes: Datum difference SFWMD +1.53 Field 1.57 Well Elevation RTK (multiple observations and base setups) derived.		
Removed Old Board:		

Photographs:

Overall Site:

Benchmark Location:

Benchmark Close Up:

Brass Tag Close Up:

Reference Mark:

Brass Tag & Reference:

Project Results

Deliverable Items to South Florida Water Management District:

The following items were delivered to South Florida Water Management District with this Surveyor's Report. Neither the report nor the items listed below are complete without the other.
A CD Containing the following digital information:

- Survey Report in PDF Format
- Digital Photos of Set Staff Gauges
- Electronic Copy of Field Notes in PDF Format

Legend:

BM – Bench Mark
NAVD 88 – North American Vertical Datum of 1988
NGVD 29 – National Geodetic Vertical Datum of 1929
NGS – National Geodetic Survey
SFWMD – South Florida Water Management District
ACOE – Army Corp of Engineers
O.D. – Outside Diameter

Survey Notes:

1. Survey map & report, or copies thereof, are not valid without the signature and the original raised seal of a Florida Licensed Surveyor and Mapper.
2. Additions or deletions to the survey maps or reports by other than the signing party or parties are prohibited without the written consent of the signing party or parties.
3. The purpose of the survey is to show results of establishing reference elevations and calibrating staff gauges, as shown herein.
4. Latitude and longitude, as shown on Staff Gauge Detail Summary Chart pages, was provided by the District and not verified as part of this survey.
5. Pursuant to client's request, the face boards of old NGVD 29 staff gauges were removed when possible. Posts were not removed.
6. New 4" galvanized posts were driven to a minimum depth of 10' below ground, unless otherwise noted in field notes. All pipes were structurally stable and plumb at time of installation.

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 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. All NAVD88 staff gauges were calibrated to a vertical accuracy of +/- 0.02' and reference elevations calibrated to a vertical accuracy of +/- 0.01'.

Wantman Group, Inc.
L.B. Number 7055

Wantman Group, Inc.
2035 Vista Parkway
West Palm Beach, FL 33411
PH: (561) 687-2220

By: _____
Derek G. Zeman, PSM
State of Florida
Certificate No. LS5655

6-23-15 SFWMD

MENDOZA BBCW 10

WILLIAMS MOVED BASE HI 13.69

NUNEZ

10502Δ		431624.625 871774.699	EL 6.748 (579#8P554)
10503Δ	10526	N0.058 W0.032 C0.003	
	10508B		
10504	10527	✓ SHOT ON DECK	
10505	10528		
10506	10529		
10507	10530		

B SHOT'S @ WELL REF LAST PG

	10531	HR 13.37	✓ ON GROUND SHOTS
	10539V		25' ROD
10503Δ	10540		S0.069 W0.055 F0.073

6-24-15 31011071.08

602 #9
6

GPS28

DL17

+	HI	-	ELEV	DESC
			4.88	
3.61	8.491			
		2.55	5.94	GW1-6" @ REF PT
		3.17	5.321	GW1-2" @ REF PT
		2.70	5.791	GW2-6" @ REF PT
		3.15	5.34	GW2-2" @ REF PT
		9.71	-1.219	TOP OF CUPPLING
	BROKE 5.61		2.88	TOP OF SET GAUGE
	SETUP			
6.04	8.92	4.04	4.88