2015

CivilSurv Design Group, Inc.
2400 Rhode Island Avenue
Fort Pierce, Florida 34950
Ph: (772) 323-2244
Fax: (772) 323-2245
www.civilsurv.com

Report Issue Date: September 28, 2015

Prepared For

SPECIFIC PURPOSE SURVEY

STAFF GAUGE AND REFERENCE ELEVATION REPORT

This document contains a surveyor's report and certification as to the accuracy of the methods used to determine NAVD88 elevations for staff gauges and stilling well reference elevations set by CivilSurv Design Group, Inc.

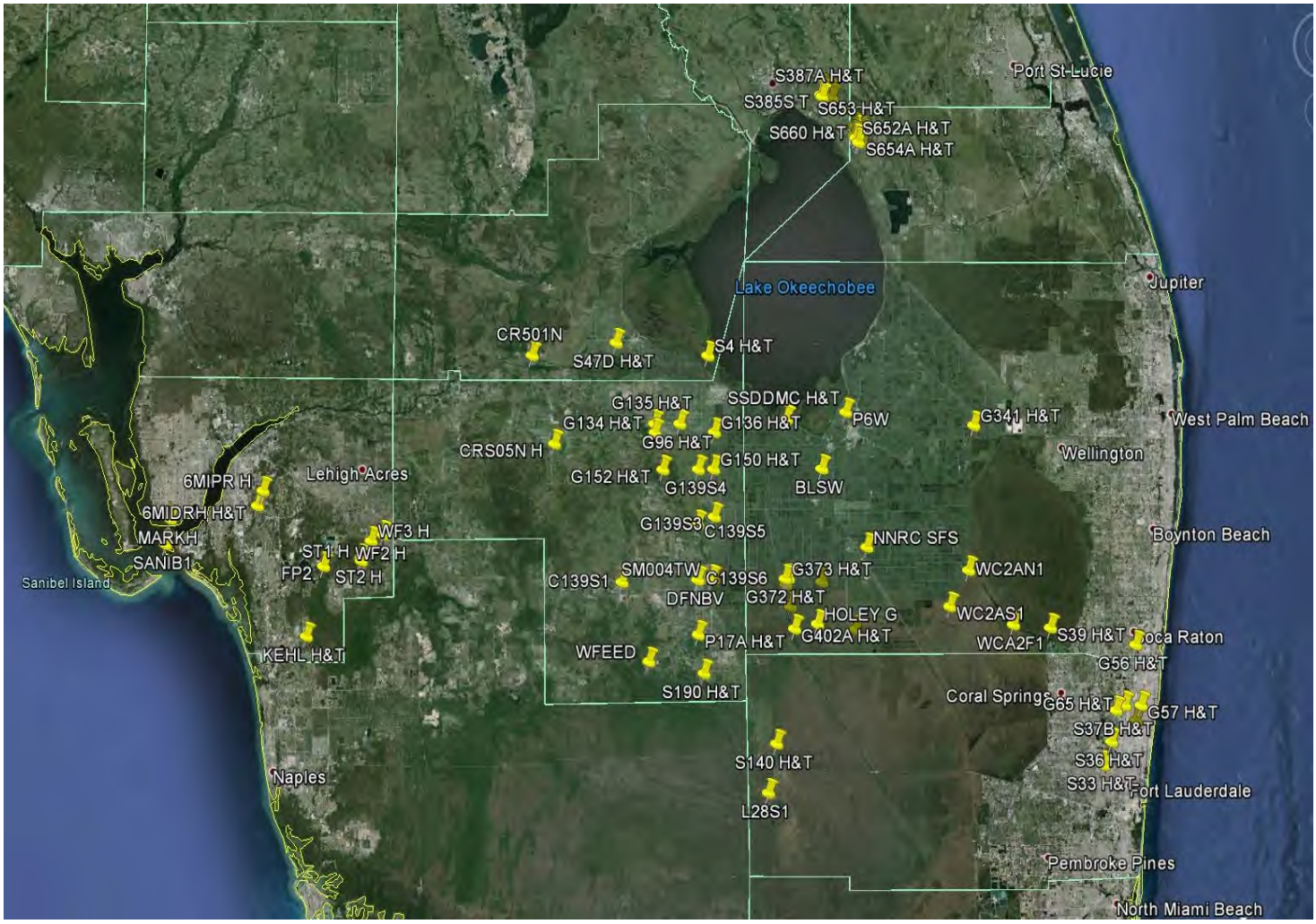
SOUTH FLORIDA WATER MANAGEMENT DISTRICT
INFRASTRUCTURE MANAGEMENT BUREAU - SURVEY AND MAPPING SECTION
STAFF GAUGE INSTALLATION & RECALIBRATION SERVICES
HYDRAULIC & HYDROLOGY. DISCIPLINES #8. CONTRACT #4600002182

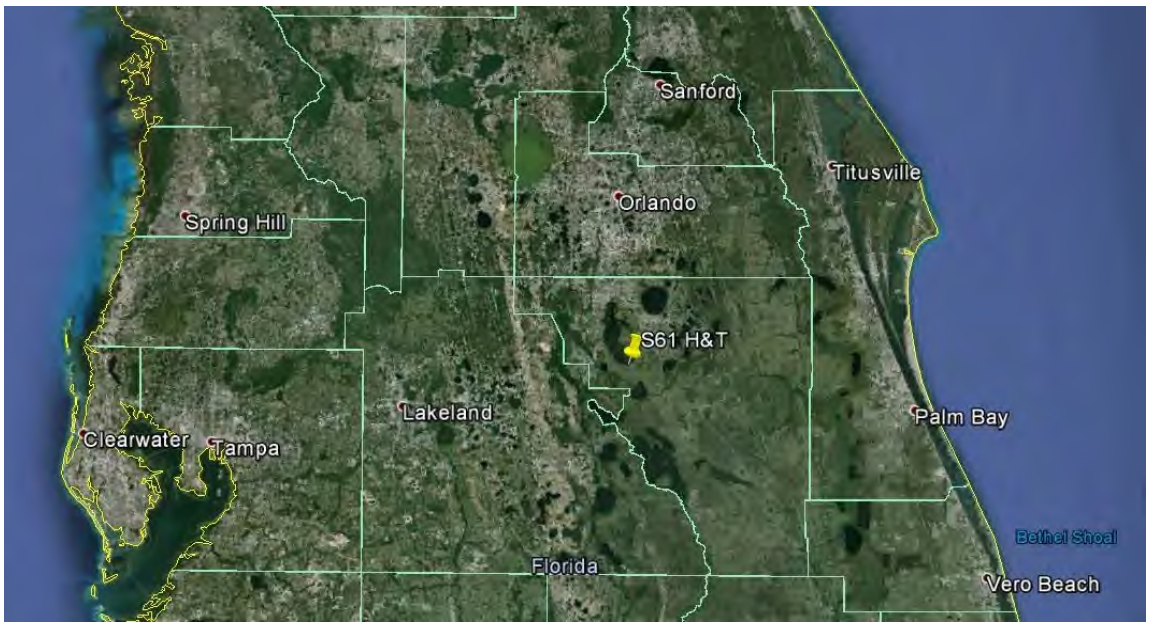
TABLE OF CONTENTS

OVERVIEW OF THE PROJECT

STAFF GAUGE DETAILS:

PROJECT LOCATION MAP
NOT TO SCALE





STAFF GAUGE AND REFERENCE ELEVATIONS DETAIL SUMMARY:

Gauge information provided by South Florida Water Management District, except as noted.

Staff Gauge Site	Latitude	Longitude	Benchmark Used	Benchmark Elevation	Datum Offset to NGVD29	Stilling Well Reference Elevations *
BLSW	26°36'35.247	80°44'27.206"	F488	13.87	1.43	18.00
S385S_T	27°12'20.192	80°44'32.118"	S387A	32.48	1.26	24.821
S385W_T	27°12'45.12	80°44'10.12"	S385	27.33	1.26	29.932
S386A_H	27°12'06.69	80°43'13.38"	S386A	34.26	1.27	NA
S386A_T	27°12'06.662	80°43'13.423"	S386A	34.26	1.27	NA
S386B_H	27°12'32.936	80°43'23.971"	S386B	33.97	1.27	37.87
S386B_T	27°12'32.893	80°43'24.188"	S386B	33.97	1.27	NA
S387A_H	27°12'10.357	80°44'21.983"	S387A	32.48	1.26	36.36
S387A_T	27°12'10.38	80°44'22.221"	S387A	32.48	1.26	NA
S387AS_T	27°12'48.188	80°43'32.656"	S386B	33.97	1.27	37.153
S387B_H	27°12'35.669	80°44'12.56"	S387B	32.61	1.26	36.56
S387B_T	27°12'35.757	80°44'12.869"	S387B	32.61	1.26	NA
S387C_H	27°12'57.316	80°43'58.493"	S387C	32.56	1.26	36.49
S387C_T	27°12'57.429	80°43'58.729"	S387C	32.56	1.26	NA
S650_H	27°09'26.840"	80°40'35.550"	S650	32.93	1.28	30.93
S650_TW1	27°09'24.800"	80°40'35.700"	S650	32.93	1.28	38.45
S650_TW2	27°09'24.800"	80°40'35.700"	S650	32.93	1.28	38.41
S650_TW3	27°09'24.800"	80°40'35.700"	S650	32.93	1.28	38.41
S651_H	27°09'16.786"	80°40'25.038"	S651	33.502	1.28	36.342
S651_T	27°09'16.839"	80°40'25.089"	S651	33.502	1.28	36.339
S652A_H	27°08'13.565"	80°40'25.289"	S652A	30.056	1.26	32.90
S652A_T	27°08'13.601"	80°40'25.340"	S652A	30.056	1.26	32.89
S660_H	27°07'47.830"	80°40'06.451"	S654A	30.001	1.26	22.887
S660_T	27°07'46.670"	80°40'08.255"	S654A	30.001	1.26	22.877
S653_H	27°09'01.303"	80°40'01.622"	S653	33.493	1.28	36.30
S653_T	27°09'01.342"	80°40'01.672"	S653	33.493	1.28	36.31
S654A_H	27°07'47.092"	80°40'00.827"	S654A	30.001	1.26	32.90
S654A_T	27°07'47.147"	80°40'00.865"	S654A	30.001	1.26	32.88
S655_H	27°08'44.141"	80°39'35.714"	S655	33.511	1.28	36.29
S655_T	27°08'44.177"	80°39'35.758"	S655	33.511	1.28	36.29
S656A_H	27°07'46.626"	80°39'37.782"	S656A	29.996	1.26	32.91
S656A_T	27°07'46.598"	80°39'37.834"	S656A	29.996	1.26	32.87
S61_H	28°08'25.52"	81°21'07.52"	OS129	60.93	1.05	64.56
S61_T	28°08'25.52"	81°21'07.52"	OS129	60.93	1.05	64.55
FP2 GW	26°27'04.286	81°42'18.266"	LEE6	17.73	1.18	21.87
G341_H	26°40'43.351	80°26'45.099"	G341	15.225	1.45	16.15
G341_T	26°40'43.36	80°26'41.764"	G341	15.225	1.45	16.51
LSRW1	27°9'19.47"	80°40'38.76"	S651	33.502	1.28	NA
LSRW2	27°8'57.83"	80°40'38.89"	S651	33.502	1.27	NA
LSRW3	27°8'38.76"	80°40'38.89"	S651	33.502	1.27	NA
LSRW4	27°8'29.17"	80°40'38.89"	S651	33.502	1.27	NA
P6W	26°41'59.42	80°41'37.999"	L14PC1ABM1	16.91	1.41	15.92
SSDDMC_H	26°41'17.672	80°48'29.011"	SSDD	15.09	1.41	12.24
SSDDMC_T	26°41'16.527	80°48'32.122"	SSDD	15.09	1.41	21.49
G96_H	26°40'51.829"	81°00'57.611"	N554	26.49	1.35	NA

Staff Gauge Site	Latitude	Longitude	Benchmark Used	Benchmark Elevation	Datum Offset to NGVD29	Stilling Well Reference Elevations ✱
G96_T	26°40'51.864"	81°00'54.936"	N554	26.49	1.35	NA
G134_H	26°39'58.751"	81°03'50.783"	MILLSNO1	20.92	1.35	NA
G134_T	26°40'00.513"	81°03'49.635"	MILLSNO1	20.92	1.35	NA
G135_H	26°40'49.782"	81°03'51.923"	N455H	26.02	1.35	NA
G135_T	26°40'51.033"	81°03'51.639"	N455H	26.02	1.35	NA
G136_H	26°40'03.112"	80°56'58.514"	N455	24.37	1.37	18.66
G136_T	26°40'03.292"	80°56'55.719"	N455	24.37	1.37	18.89
SFCD5E	26°41'20.363"	80°48'34.31"	SFCD	12.281	1.41	14.92
CRS05N_H	26°38'55.69"	81°15'30.756"	SITE5	29.813	1.33	35.513
G402A_H	26° 21'17.7"	80°47'34.644"	G402A2	13.48	1.44	19.13
G402A_T	26°21'18.225"	80°47'33.082"	G402A2	13.48	1.44	19.13
S4_H	26°47'22.661"	80°57'43.842"	GL2	28.23	1.35	34.45
S4_T	26°47'24.693"	80°57'42.184"	GL2	28.23	1.35	34.54
S47D_H	26°48'35.837"	81°08'21.975"	FCE1557	17.388	1.32	23.63
S47D_T	26°48'34.41"	81°08'22.208"	FCE1557	17.388	1.32	23.61
S7Z	26°29'05.263"	80°39'11.199"	S7Z	16.87	1.44	19.08
CR501N	26°47'19.852"	81°18'05.150"	HEN49B	23.14	1.21	21.94
CR501N GW	26°47'19.852"	81°18'05.150"	HEN49B	23.14	1.21	21.957
G150_H	26°36'31.092"	80°57'00.675"	HEN28	26.22	1.38	20.31
G150_T	26°36'32.781"	80°57'00.593"	HEN28	26.22	1.38	20.37
G152_H	26°36'27.264"	81°02'56.922"	G152	24.45	1.37	NA
G152_T	26°36'27.305"	81°02'54.756"	G152	24.45	1.37	NA
G402B_H	26°23'26.953"	80°48'05.616"	G402B2	14.23	1.43	19.73
G402B_T	26°23'27.38"	80°48'03.887"	G402B2	14.23	1.43	9.73
G402C_H	26°25'32.028"	80°48'35.298"	G402C2	13.44	1.43	19.30
G402C_T	26°25'32.418"	80°48'33.372"	G402C2	13.44	1.43	19.11
C139S3	26°31'59.407"	80°56'54.483"	L207	17.18	1.39	20.86
C139S4	26° 36'30.91"	80°58'46.738"	C139S4	18.656	1.38	23.34
C139S5	26°31'16.646"	80°58'51.174"	C139S5A	23.50	1.39	26.24
G57_H	26°13'51.062"	80°07'18.785"	S665	7.58	1.58	14.37
G57_T	26°13'50.169"	80°07'16.799"	S665	7.58	1.58	10.77
G65_H	26°13'51.155"	80°09'35.314"	G65HW	12.787	1.58	15.87
G65_T	26°13'51.471"	80°09'11.25"	G65HW	12.787	1.58	13.72
G373_H	26°26'08.143"	80°48'41.795"	G373	15.40	1.43	17.38
G373_T	26°26'05.883"	80°48'41.152"	G373	15.40	1.43	17.44
S190_H	26°17'02.056"	80°58'04.85"	FCE2852	18.96	1.41	22.72
S190_T	26°17'00.623"	80°58'04.524"	FCE2852	18.96	1.41	22.70
C139S1	26°25'43.205"	81°07'36.596"	DF11	22.74	1.37	26.87
C139S6	26°25'59.975"	80°58'38.228"	FLGPS65	19.577	1.38	22.312
DFNBV	26°25'57.691"	80°58'49.219"	FLGPS65	19.577	1.38	26.322
G56_H	26°19'40.279"	80°07'51.153"	FCDBM3	11.622	1.56	15.61
G56_T	26°19'40.278"	80°07'50.153"	FCDBM3	11.622	1.56	15.62
G372_H	26°26'08.374"	80°48'28.084"	G372A	15.573	1.43	16.57
G372_T	26°26'07.89"	80°48'19.671"	G372B	18.48	1.43	21.15
G372S_H	26°26'09.71"	80°48'18.76"	G372B	18.478	1.43	17.06
MARKH	26°31'25.486"	82°00'17.391"	MARKERH	2.78	1.17	6.77
PC17A_H	26°20'43.262"	80°58'46.924"	PC17A	21.29	1.40	23.94
PC17A_T	26°20'43.207"	80°58'45.601"	PC17A	21.29	1.40	21.19
SANIB1W	26°28'59.737"	82°00'49.216"	SANIBELBR1	2.82	1.17	5.42
SANIB2W	26°28'59.737"	82°00'49.216"	SANIBELBR1	2.82	1.17	5.42

Staff Gauge Site	Latitude	Longitude	Benchmark Used	Benchmark Elevation	Datum Offset to NGVD29	Stilling Well Reference Elevations ✱
S39_H	26°21'22.371"	80°17'51.93"	FCE3943	22.365	1.52	22.50
S39_T	26°21'20.042"	80°17'50.14"	FCE3943	22.365	1.52	15.20
S33_H	26°08'08.83"	80°11'41.577"	FCE789	9.952	1.58	13.815
S33_T	26°08'08.8"	80°11'38.476"	FCE789	9.952	1.58	13.805
S36_H	26°10'23.401"	80°10'45.479"	FCE3091	10.072	1.58	16.17
S36_T	26°10'23.498"	80°10'43.366"	FCE3091	10.072	1.58	16.13
SM004T	26°26'02.52"	80°57'12.78"	SM4	14.70	1.38	21.13
ST1_H	26°27'36.662"	81°37'55.952"	ST1	27.728	1.22	33.348
ST1 GW	26°27'36.662"	81°37'55.952"	ST1	27.728	1.22	31.058
ST2_H	26°27'52.128"	81°37'56.438"	ST4	28.504	1.22	33.364
ST2 GW	26°27'52.128"	81°37'56.438"	ST4	28.504	1.22	30.94
WF2_H	26°30'06.77"	81°35'24.16"	LC10	30.686	1.22	34.436
WF2 GW	26°30'06.77"	81°35'24.16"	LC10	30.686	1.22	31.916
KEHL_H	26°20'20.539"	81°44'16.003"	A005	13.79	1.21	21.41
KEHL_T	26°20'20.545"	81°44'16.521"	A005	13.79	1.21	21.38
S37A_H	26°12'22.349"	80°07'55.126"	E664	8.035	1.58	7.66
S37A_T	26°12'22.432"	80°07'52.678"	E664	8.035	1.58	9.86
S37B_H	26°13'26.802"	80°10'13.443"	N665	10.075	1.57	13.945
S37B_T	26°13'23.93"	80°10'13.196"	N665	10.075	1.57	13.955
S140_H	26°10'18.139"	80°49'40.479"	FCE3119	25.94	1.45	27.35
S140_T	26°10'18.226"	80°49'37.021"	FCE3119	25.94	1.45	27.35
SMSB	26°26'03.361"	80°56'58.779"	SM4	14.70	1.38	21.25
WF3_H	26°29'32.73"	81°36'46.15"	LC4	31.64	1.21	33.07
WF3 GW	26°29'32.73"	81°36'46.15"	LC4	31.64	1.21	31.46
6MIDRH_H	26°32'51.276"	81°50'04.295"	A027	17.59	1.16	21.13
6MIDRH_T	26°32'45.276"	81°50'04.295"	A027	17.59	1.16	21.13
6MIPR	26°34'13.272"	81°49'26.293"	6MIPR	17.82	1.15	22.00
HOLEY	26°21'45.095"	80°44'55.366"	HOLEYHL12	14.025	1.44	18.45
HOLEY GW	26°21'45.095"	80°44'55.366"	HOLEYHL12	14.025	1.44	18.83
HOLEY1	26°25'47.272"	80°44'25.207"	HOLEY1	9.70	1.44	17.79
HOLEY1 GW	26°25'47.272"	80°44'25.207"	HOLEY1	9.70	1.44	18.08
HOLEY2	26°21'15.12"	80°40'30.409"	HOLEY2	11.23	1.45	17.81
HOLEY2 GW	26°21'15.12"	80°40'30.409"	HOLEY2	11.23	1.45	18.04
L28S1	26°05'37.32"	80°50'35.224"	G501	16.02	1.46	16.84
WC2AN1	26°26'51.93"	80°27'21.921"	WCA2AN1	14.57	1.40	18.49
WC2AS1	26°23'24.808"	80°29'33.081"	WCA2AS1	14.48	1.44	18.50
WCA2F1	26°21'39.204"	80°22'09.66"	WCA2F1	13.65	1.48	16.42
WCA2F1 GW	26°21'39.204"	80°22'09.66"	WCA2F1	13.65	1.48	16.48
WFEED	26°18'08.908"	81°04'28.207"	L28WF	18.82	1.38	22.61

Note:
✱Denotes information developed in this survey by CivilSurv Design Group, Inc.
NA – Not Applicable; no reference elevation at this gauge
NAVD88 – North American Vertical Datum of 1929
NGVD29 – National Geodetic Vertical Datum of 1929

Specific Purpose Survey Report

Purpose:

To assemble, install and calibrate 124 staff gauges to NAVD88 datum; and establish a benchmark – also referred to as a reference elevation (RE) – on the platform of associated headwater and tail water telemetry stations. Field Surveys for these gauges completed during the period of December 4, 2014 through September 18, 2015.

Leveling methods:

Leveling methods: Conventional differential leveling was performed in accordance with Florida Administrative Code 5J-17.051(3)(b)15.a. The maximum error of closure for this type of leveling is 0.05' x √ Distance in miles. The error of closure achieved for the leveling performed meets or exceeds this specification.

Equipment used:

Wild NA-1 Level

Vertical Datum:

The staff gauges listed in this report have been correctly calibrated to the North American Vertical Datum 1988 (NAVD88) as of September 18, 2015.

Sources of Data:

Benchmarks were provided by South Florida Water Management District. Information on the specific benchmarks can be obtained from the S.D.E.R.A. Website: http://my.sfwmd.gov/sderawebapp/gis/sderamain.jsp

Surveyor's Note:

Vertical closures obtained by comparison to converted existing NGVD'29 reference elevation tags. Party Chief and Field Book information reported herein is for consultant reference only. Each site had multiple crew visits, and stamping date is one of the on-site days.

Surveyor's Certificate:

This staff gauge elevations and stilling well reference elevations Specific Purpose Survey (consisting of a cover, Table of Contents, and 142 numbered pages) is certified to the South Florida Water Management District. This report is not valid without the original signature and raised seal of a Florida licensed Surveyor and Mapper. All staff gauges contained in this Surveyor's Report were calibrated to a vertical accuracy of +/- 0.05'.

This is to certify that this staff gauge elevations and stilling well reference elevations Specific Purpose Survey Report was made under my responsible charge and complies with the applicable standards of practice for surveys set forth by the Florida Board of Professional Surveyors and Mappers in chapter 5J-17, Florida Administrative Code, pursuant to section 472.027, Florida Statutes.

Report Issue Date: September 28, 2015

[signature]

John N. Breed, PSM No. 4089
President
CivilSurv Design Group, Inc.
Certificate of Authorization Number: LB-7805

28 SEPTEMBER 2015
Date

Site Name	HOLEY	Date of Field Work 7/22/2015
Party Chief CORBETT	**Field Book Name/Number** 813	**Page Number** 78
Site Benchmark Name HOLEYHL12	**Benchmark Elevation (NAVD88)** 14.025	**Datum Offset to NGVD29** 1.44
Reference Elevation (NAVD 88) 18.45	**Existing Tag Elevation (Datum)** 19.64 (NGVD'29)	
Notes: EXISTING TAG IS ILLEGIBLE.		

Photographs: (Size 2"x2" minimum)

1 – Overall Site
(Recorder Well, Staff Gauge, etc.)

2 – Benchmark Close Up

3 – Benchmark Location

4 - Brass Tag Close Up

5 - Brass Tag + Reference Mark

6 – Staff Gauge (Front and Side Views)

Front:

Side:

Site Name	HOLEY GW	Date of Field Work 7/22/2015
Party Chief	**Field Book Name/Number**	**Page Number**
CORBETT	813	78
Site Benchmark Name	**Benchmark Elevation (NAVD88)**	**Datum Offset to NGVD29**
HOLEYHL12	14.025	1.44
Reference Elevation (NAVD 88)	**Existing Tag Elevation (Datum)**	
18.83	20.03 (NGVD'29)	
Notes:		

Photographs: (Size 2"x2" minimum)

1 – Overall Site
(Recorder Well, Staff Gauge, etc.)

2 – Benchmark Close Up

3 – Benchmark Location

4 - Brass Tag Close Up

5 - Brass Tag + Reference Mark

6 – Staff Gauge (Front and Side Views)

Front:

Side:

Site Name	HOLEY1	Date of Field Work 9/17/2015
Party Chief HOUSTON	**Field Book Name/Number** 811	**Page Number** 77
Site Benchmark Name HOLEY1	**Benchmark Elevation (NAVD88)** 9.70	**Datum Offset to NGVD29** 1.44
Reference Elevation (NAVD 88) 17.79	**Existing Tag Elevation (Datum)** 19.18 (NGVD'29)	
Notes:		

Photographs: (Size 2"x2" minimum)

1 – Overall Site
(Recorder Well, Staff Gauge, etc.)

2 – Benchmark Close Up

BENCHMARK UNDER WATER

3 – Benchmark Location

4 - Brass Tag Close Up

5 - Brass Tag + Reference Mark

6 – Staff Gauge (Front and Side Views)

Front:

Side:

Site Name	HOLEY1 GW	Date of Field Work 9/17/2015
Party Chief	**Field Book Name/Number**	**Page Number**
HOUSTON	811	77
Site Benchmark Name	**Benchmark Elevation (NAVD88)**	**Datum Offset to NGVD29**
HOLEY1	9.70	1.44
Reference Elevation (NAVD 88)	**Existing Tag Elevation (Datum)**	
18.08	19.56 (NGVD'29)	
Notes:		

Photographs: (Size 2"x2" minimum)

1 – Overall Site
(Recorder Well, Staff Gauge, etc.)

2 – Benchmark Close Up

BENCHMARK UNDER WATER

3 – Benchmark Location

4 - Brass Tag Close Up

5 - Brass Tag + Reference Mark

6 – Staff Gauge (Front and Side Views)

Front:

Side:

Site Name	HOLEY2	Date of Field Work 7/21/2015
Party Chief CORBETT	**Field Book Name/Number** 813	**Page Number** 77
Site Benchmark Name HOLEY2	**Benchmark Elevation (NAVD88)** 11.23	**Datum Offset to NGVD29** 1.45
Reference Elevation (NAVD 88) 17.81	**Existing Tag Elevation (Datum)** 19.20 (NGVD'29)	
Notes: EXISTING BRASS TAG IS ALMOST ILLEGIBLE.		

Photographs: (Size 2"x2" minimum)

1 – Overall Site
(Recorder Well, Staff Gauge, etc.)

2 – Benchmark Close Up

3 – Benchmark Location

4 - Brass Tag Close Up

5 - Brass Tag + Reference Mark

6 – Staff Gauge (Front and Side Views)

`Front:

Side:

Site Name	HOLEY2 GW	Date of Field Work 7/21/2015
Party Chief CORBETT	**Field Book Name/Number** 813	**Page Number** 77
Site Benchmark Name HOLEY2	**Benchmark Elevation (NAVD88)** 11.23	**Datum Offset to NGVD29** 1.45
Reference Elevation (NAVD 88) 18.04	**Existing Tag Elevation (Datum)** 19.46 (NGVD'29)	
Notes:		

Photographs: (Size 2"x2" minimum)

1 – Overall Site
(Recorder Well, Staff Gauge, etc.)

2 – Benchmark Close Up

3 – Benchmark Location

4 - Brass Tag Close Up

5 - Brass Tag + Reference Mark

6 – Staff Gauge (Front and Side Views)

Front:

Side: