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TECO TAMPA ELECTRIC AN EMERA COMPANY

ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

Big Bend Power Station

Economizer Ash and Pyrite Pond System

13031 Wyandotte Road

Gibsonton, FL 33572

Prepared for

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ACRONYMS

BBS	Big Bend Power Station
CCR	Coal Combustion Residuals
CCR Rule	Coal Combustion Residuals Rule
CFR	Code of Federal Regulations
EAPPS	Economizer Ash and Pyrite Pond System
GWPS	Groundwater Protection Standard
PE	Professional Engineer
RCRA	Resource Conservation and Recovery Act
SP	Statistical Analysis Plan
SSI	Statistically Significant Increase
TEC	Tampa Electric Company
USEPA	United States Environmental Protection Agency

1. BACKGROUND

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published 40 Code of Federal Regulations (CFR) Parts 257 and 261: Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule (USEPA, 2015). This regulation addresses the safe disposal of coal combustion residuals (CCR) as solid waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA) and is referred to herein as the CCR Rule. The CCR Rule became effective on October 14, 2015. The rule provides national minimum criteria for "the safe disposal of CCR in new and existing CCR landfills, surface impoundments, and lateral expansions, design and operating criteria, groundwater monitoring and corrective action, closure requirements and post closure care, and recordkeeping, notification, and internet posting requirements." The groundwater monitoring requirements of the CCR Rule apply to the economizer ash and pyrite pond system (EAPPS) at Tampa Electric Company's (TEC) Big Bend Power Station (BBS) in southeast Hillsborough County, Gibsonton, Florida (**Figure 1**).

This document has been prepared to meet the requirements of 40 CFR 257.90(e) concerning the Annual Groundwater Monitoring and Corrective Action reporting required by the CCR Rule for the EAPPS and BBS. At a minimum, the annual groundwater monitoring and corrective action report must contain the information described below and the information required by 257.90(e)(1) through (5), to the extent available:

> *"For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by § 257.105(h)(1)"*

This annual report covers the period January 1, 2018 through December 31, 2018. Sections of this report that are required by the CCR Rule but are not applicable for the reporting period, contain the text "Not applicable for this annual reporting period".

Site features, geology, lithology, design of the CCR monitoring well network, the Sampling and Analysis Plan including requirements, procedures, documentation, laboratory analytical procedures and quality control, and the Quality Assurance Plan are provided in the *CCR Rule Groundwater Monitoring Program Plan (GWMP), Big Bend Power Station*, (October 2016).

2. SITE DESCRIPTION

2.1 Site Setting

The BBS is located on the eastern shore of Tampa Bay in Sections 9, 10, 15, and 16, Township 31, Range 19 East of the Gibsonton Quadrangle, with the center of the facility at approximately 27˚47'36" north latitude and 82˚24'16" west longitude and encompasses approximately 1,492 acres. Topography at the Site ranges from approximately sea level (along the western portion of the BBS) to approximately 10 feet mean sea level (MSL) near the eastern portions of the property along U.S. Highway 41. The location of the BBS and the components of the EAPPS, namely the north and south economizer ash ponds and the suction pond, are shown on **Figures 1** and **2**.

Construction of BBS began in the late 1960s on two dredge/fill peninsulas. Four coal-fired power generating units are present at the BBS and were placed into service in 1970, 1973, 1976, and 1985. Units 1, 2, and 3 are wet-bottom slag-tap type units that originally used saltwater slag-handling systems and electrostatic precipitators for stack gas emissions control. However, these units are now operating as freshwater systems that allow more internal water recycling. Unit 4 is a dry-bottom unit with a closed-loop freshwater bottom ash-sluice system. All units are equipped with electrostatic precipitators and stack gasses are treated with limestone flue gas desulfurization (FGD) and selective catalytic reduction (SCR) systems.

2.2 CCR Units

The EAPPS was built in the early 1980s to support the operation of Big Bend Unit 4 and consists of three lined ponds. The EAPPS is considered one CCR unit by 40 CFR 257.53 and is located approximately 1,000 feet southeast of the active power generating units (**Figure 1**). The north economizer ash pond and economizer ash suction pond are still in operation. The south economizer ash pond has been converted to dry storage of material excavated from the south recycle pond when it was reconstructed and lined in 2010.

The pond bottom and dike crest elevations for each pond are reportedly 5.5 ft NGVD and 31 ft, NGVD respectively. The South Economizer Ash Pond contains an estimated 337,400 cubic yards (cy) of CCR material over a surface area of 7.2 acres. The north pond contains an estimated 90,000 cy of CCR material (Geosyntec, 2016) over a surface area of 5.4 acres. The suction pond has a surface area of 1.6 acres, receives decant water from the north and south economizer ash ponds, and contains only minor amounts of settleable CCR fines material.

2.3 Summary of Site Geology and Hydrogeology

The units that form the hydrogeologic framework in the region include the surficial aquifer system (SAS), the Intermediate Confining Unit (ICU), and the upper Floridan aquifer system (UFAS). Based on Site-specific data as well as hydrogeologic studies of west-central Florida, the intermediate aquifer system has not been identified as being present at this location (Tihanksy and Knochenmus, 2001).

The SAS sediments consist of Pleistocene shell deposits and terrace sands. Due to the irregular surface of the underlying limestone, the SAS varies in thicknesses but typically ranges between 20 and 30 feet (ft) thick in the area of the Site (SWFWMD, 2010). Groundwater (the water table) in the SAS is unconfined. The groundwater flow direction in the SAS is generally towards Tampa Bay as the discharge point; however, flow direction is influenced by various surface water features including ponds, drainage ditches, canals, and small creeks locally. Upward vertical flow gradients from the UFAS to the SAS are common based on historical data trends, and in certain cases can lead to artesian conditions (ECT, 2003; 2007).

The ICU resides within the undifferentiated Hawthorn Group. Due to the absence of the intermediate aquifer system, the permeable strata are absent and consequently the less permeable, fine grained clastic clay units are generally more prevalent. These clay units with varying silt, sand content, and marls comprise the semi-confining unit that separates the SAS and the UFAS.

The UFAS consists of a continuous series of carbonate units and is composed of the limestone sequences that occur in the Tampa Member of the Arcadia Formation of the Hawthorn Group as well as the underlying Suwannee Limestone and other carbonate strata. The Tampa Member encompasses sandy limestone containing varying amounts of clays and marls. The thickness of the UFAS may exceed 1,200 ft beneath the facility. Groundwater in the UFAS generally flows regionally from northeast to southwest towards Tampa Bay.

The *GWMP* may be consulted for additional details regarding the regional and Site-specific geology and hydrogeology.

2.4 Aquifer System Description

2.4.1 Identification of Uppermost Aquifer

The uppermost aquifer is defined by 40 CFR 257.53 as the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. The uppermost aquifer at the Site is the SAS.

2.4.2 Groundwater Flow Direction

A surface water feature, Jackson Branch, to the north/northeast of the EAPPS appears to influence local groundwater flow toward the stream in contrast to the general groundwater flow direction at the BBS, which is east to west. The groundwater flow direction near the EAPPS is generally north/northeast; this flow direction was also observed during the April 2018 (**Figure 3**) and September 2018 (**Figure 4**) detection monitoring events.

2.4.3 Groundwater Flow Rates

The average linear velocity of groundwater in the SAS at the EAPPS ranges from 0.03 to 0.07 ft/day[1]. This flow velocity corresponds to a range of flow velocities from approximately 12 to 27 feet per year.

[1] Based on average hydraulic conductivity of 3.4 feet/day for SAS deposits, a porosity of 0.2 for sand, and horizontal hydraulic gradients between 0.002 and 0.004.

3. GROUNDWATER MONITORING SYSTEM

The groundwater monitoring system (GMS) installed at the EAPPS was designed to monitor the water quality in the SAS upgradient of the EAPPS to evaluate background concentrations and downgradient of the EAPPS to evaluate the potential effects of a release. The documentation for the design, installation, and development of these wells is found in *Groundwater Monitoring Well Design, Installation, Development, and Decommissioning Report, October 2017*. The GMS consists of two background monitoring wells (identified as BBS-CCR-BW1 and BBS-CCR-BW2) located hydraulically upgradient of EAPPS. The background monitoring wells will be used to derive background concentrations for Appendix III constituents. Three monitoring wells (identified as BBS-CCR1, BBS-CCR-2, and BBS-CCR-3) are located at the waste boundary and at the "hydraulically downgradient perimeter (i.e., the edge) of the CCR unit or at the closest practical distance from this location" [80 FR 21400]. The screen intervals are at or below the actual depth of CCR material in the upper portion of the SAS and therefore meet the performance standards specified in 257.91(a) through (d). The locations of the monitoring wells comprising the GMS are shown on **Figure 2**.

3.1 Status of the Groundwater Monitoring and Corrective Action Program

Groundwater monitoring was initiated at the EAPPS in June 2016 in accordance with the requirements of 40 CFR 257.90(b). Ten sampling events were conducted as part of baseline monitoring between June 2016 and August 2017. The first detection monitoring event was conducted in October 2017 and resulted in statistically significant increases (SSIs) in groundwater pH above the established upper prediction limit at two downgradient monitoring wells. An Alternate Source Demonstration (ASD) was prepared in April 2018 to document that the SSIs for pH were not associated with a release of CCR from the EAPPS. Therefore, detection monitoring resumed with sampling events in April and September 2018.

3.2 Identification of Monitoring Wells Installed, Abandoned, or Decommissioned -257.90 (E)(2)

The monitoring wells comprising the GMS for compliance with the CCR Rule were installed in May 2016 to meet the groundwater monitoring system requirements in 257.91. A monitoring well construction summary is provided in **Table 1.**

In 2018, no additional monitoring wells were installed, and none of the existing monitoring wells in the GMS were abandoned or decommissioned.

4. SUMMARY OF 2018 CCR RULE ACTIVITIES COMPLETED

4.1 Requirements Completed

The actions completed during this reporting period are summarized below.

- As required by §257.94(b)(1)(iv), the evaluation of the groundwater monitoring data for statistically significant increases over background levels for the constituents listed in Appendix III 40 CFR Part 257 was completed in January 2018.
- In April 2018, an Alternate Source Demonstration was prepared in accordance with §257.94(e)(2) and demonstrated that the SSIs for pH in two background monitoring wells were caused by a source other than the EAPPS.
- The evaluation of the groundwater monitoring data for SSIs over background levels for the constituents listed in Appendix III of 40 CFR Part 257, as required by §257.94, was completed in October 2018.

4.2 Completion of Required Reports

The following reports were completed during the reporting period:

- Summary of Statistical Analyses of Baseline Groundwater Samples, Economizer Ash and Pyrite Pond System, Big Bend Station, January 2018.
- Annual Groundwater Monitoring and Corrective Action Report, Big Bend Power Station – Economizer Ash and Pyrite Pond System, January 2018.
- Alternate Source Demonstration – Economizer Ash and Pyrite Pond System, Big Bend Station, April 2018.
- Summary of Results – Second Detection Monitoring Event, Economizer Ash and Pyrite Pond System, Big Bend Station, October 2018.

4.3 Problems Encountered and Resolution

No problems were encountered during the reporting period.

5. GROUNDWATER MONITORING DATA - 257.90(E)(3)

5.1 Detection Monitoring

Detection monitoring (Appendix III) parameters (**Table 2**) were evaluated to assess the potential release of CCR from the EAPPS into groundwater. Detection monitoring samples were collected semi-annually from each background and compliance well and analyzed for Appendix III constituents.

The second and third detection monitoring events were conducted in April 2018 and September 2018. The Appendix III and Appendix IV analytical results from the two detection monitoring events are provided in **Table 3** with the baseline monitoring results generated at the EAPPS between June 2016 and October 2017. The analytical laboratory reports for the April 2018 and September 2018 are provided in **Appendix A** and **Appendix B**, respectively.

5.1.1 Alternative Monitoring Frequency – 257.94(d)(3)

Not applicable for this annual reporting period.

5.1.2 Identification of Appendix III Constituents Detected at SSI Over Background – 257.94(e)

Groundwater pH was the only Appendix III constituent found to be above background concentrations in each of the detection monitoring events conducted in 2018. Groundwater pH was documented above the 95% upper prediction limit (UPL) at BBS-CCR-1 in the second (April 2018) and third (September 2018) detection monitoring events and above the UPL at BBS-CCR-2 in second (April 2018) detection monitoring event and therefore represented an SSI.

5.1.3 Alternate Source Demonstration – 257.94(e)(2)

In April 2018, an ASD was successfully completed and certified by a Professional Engineer to address SSIs of groundwater pH at BBS-CCR-1 and BBS-CCR-2 in accordance with 40 CFR.94(e)(2). The groundwater pH SSIs were shown to be a result of alternate sources. A copy of the ASD is provided in **Appendix C**.

5.1.4 Transition from Detection to Assessment Monitoring – 257.90(e)(4)

The detection monitoring program for the groundwater monitoring system was initiated in October 2017 pursuant to §257.90(b). Because of the successful ASD completed in April 2018 in accordance with §257.94(e)(2), the EAPPS remains in the detection monitoring program.

5.2 Assessment Monitoring

None of the provisions of 40 CFR 257.95 are applicable for this annual reporting period.

6. DATA USABILITY EVALUATION

The Appendix III and Appendix IV groundwater results were reviewed based on the following references:

- *CCR Groundwater Monitoring Program Plan*, Big Bend Power Station, September 2016;
- USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, August 2014 (OSWER 9355.0-131, EPA 540-R-013-001);
- the applicability and appropriateness of the analytical methods referenced by the data package; and
- professional and technical judgment by the data validation team.

A Stage 2A data validation report evaluating the quality control (QC) parameters was generated for each detection monitoring event. Additional data qualifiers generated from the data validation were applied where appropriate. The groundwater data generated from each detection monitoring event was deemed usable for meeting the project objectives.

The data validation reports for the second and third detection monitoring events are provided in **Appendix D**.

7. DETECTION MONITORING STATISTICAL ANALYSIS

The statistical analysis of the detection monitoring data (October 2017, April 2018, and September 2018) was performed in accordance with the *CCR Statistical Analysis Plan*. The statistical approach employed is based on the following findings documented in the *Summary of Statistical Analyses of Baseline Groundwater Samples* (15 January 2018).

- The baseline dataset revealed that each of the Appendix III constituents exhibited a non-parametric distribution among the two background monitoring wells.
- The two background monitoring wells exhibited spatial variability for all the Appendix III constituents.
- An intra-well comparison could not be performed due to the absence of groundwater data at the EAPPS representative of pre-operational conditions.
- The data from the two background monitoring wells were aggregated to create a pooled background dataset.
- The 95% UPL achieved 95% confidence and was calculated for each constituent and resulted in the maximum detected concentration of each constituent in each of the background monitoring wells.
- The Appendix III constituents detected in each of the detection monitoring events were compared to the 95% UPL for each constituent to evaluate the presence of SSIs.

During each of the three detection monitoring events conducted to date, groundwater pH was documented as an SSI in two of the three downgradient monitoring wells (BBS-CCR-1 and BBS-CCR-2). As stated in Section 5.1.3, the 2018 ASD documented that elevated groundwater pH is due to sources unrelated to the EAPPS and therefore does not indicate a release of CCR from the EAPPS.

Detection monitoring will continue in 2019.

8. ASSESSMENT MONITORING STATISTICAL ANALYSIS

Not applicable for this annual reporting period.

9. ACTIVITIES PLANNED FOR 2019

The projected key activities for the upcoming year include the following:

- The statistical evaluation of the third detection monitoring event groundwater data for Appendix III SSIs was completed by January 15, 2019 in accordance with 257.93.
- Two semi-annual detection monitoring events (April 2019 and October 2019) and associated statistical analyses will be conducted.

10. CORRECTIVE MEASURES

Not applicable for this annual reporting period.

11. REMEDY SELECTION

Not applicable for this annual reporting period.

12. CORRECTIVE ACTION

Not applicable for this annual reporting period.

13. REFERENCES

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Geosyntec Consultants, Inc. 2017. Groundwater Monitoring Well Design, Installation, Development, and Decommissioning Report, Big Bend Power Station, Economizer Ash and Pyrite Pond System, October 2017.

Geosyntec Consultants, Inc. 2017. Statistical Analysis Plan, Big Bend Power Station, Economizer Ash and Pyrite Pond System, October 2017.

Southwest Florida Water Management District, 2010. 2010 Regional Water Supply Plan, Tampa Bay Planning Region. Brooksville, Florida.

Tihanksy, A.B. and L.A. Knochenmus. 2001. Karst Features and Hydrogeology in West-central Florida-A Field Perspective. US Geological Survey-Water-Resources Investigations Report 01-4011.

USEPA, April 2015. 40 CFR Part 257, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, EPA-HQ-RCRA-2009-0640.

TABLES

Table 1: CCR Monitoring Well Construction Details

TEC Big Bend Station Economizer Ash and Pyrite Pond System
Gibsonton, FL

Well ID	Diameter (in)	Designation	Northing (NAD 1983)	Easting (NAD 1983)	Ground Surface Elevation (ft NAVD)	TOC Elevation* (ft NAVD)	Total Depth (ft bls)	Screen Interval (ft bls)	Top of Screen Elevation (ft NAVD)	Bottom of Screen Elevation (ft NAVD)
BBS-CCR-BW1	2	Background	1256638.34	528461.95	29.10	33.40	40	30-40	-0.90	-10.90
BBS-CCR-BW2	2	Background	1256966.67	527897.28	7.70	12.54	19	9-19	-1.30	-11.30
BBS-CCR-1	2	Detection	1257433.85	528211.74	5.00	9.82	17.5	7.5-17.5	-2.50	-12.50
BBS-CCR-2	2	Detection	1257429.29	528769.31	5.00	9.34	17.5	7.5-17.5	-2.50	-12.50
BBS-CCR-3	2	Detection	1257154.61	529023.26	4.90	9.20	18.5	8.5-18.5	-3.60	-13.60

Notes

1. in = Inches
2. ft bls = Feet Below Land Surface
3. Horizontal datum surveyed to the North American Datum (NAD) of 1983 US State Plane Florida West.
4. Vertical datum surveyed to the North American Vertical Datum (NAVD) of 1988.
5. *Top of casing elevations were revised in September 2016 during final aboveground well completions. The additional PVC stickup was measured in the field and added to the surveyed top of casing elevation.

Table 2: Summary of Detection and Assessment Monitoring Constituents

TEC Big Bend Station Economizer Ash and Pyrite Pond System
Gibsonton, FL

Constituent	Constituent Reference		Analytical Methods(s)	EPA Primary or Secondary MCL (ug/L)
	40 CFR 257 Appendix III	40 CFR 257 Appendix IV		
Arsenic (Total)		X	EPA 200.8 or 6020	10
Antimony (Total)		X	EPA 200.8 or 6020	6
Barium (Total)		X	EPA 6010	2,000
Beryllium (Total)		X	EPA 6010	4
Boron (Total)	X		EPA 6010	NA
Cadmium (Total)		X	EPA 200.8 or 6020	5
Calcium (Total)	X		EPA 6010	NA
Chloride	X		EPA 300.0	250,000
Chromium (Total)		X	EPA 6010	100
Cobalt (Total)		X	EPA 6010	NA
Fluoride	X		EPA 300.0	4,000
Lead (Total)		X	EPA 200.8	15
Lithium (Total)		X	EPA 6010	NA
Mercury (Total)		X	EPA 7470	2
Molybdenum (Total)		X	EPA 6010	NA
pH	X		Field	6.5-8.5 (STD Units)
Radium 226 and 228 (Total)		X	EPA 903	5 (pCi/L)
Selenium (Total)		X	EPA 200.8 or 6020	50
Sulfate	X		EPA 300.0	250,000
TDS	X		SM2540C	500,000
Thallium (Total)		X	EPA 6020	2

Notes.

1. EPA = US Environmental Protection Agency
2. MCL = Maximum Contaminant Level
3. ug/L = Micrograms per liter
4. STD Units = Standard Units
5. pCi/L = picoCuries per liter

Table 3: Summary of Baseline and Detection Monitoring Groundwater Analytical Results
TEC Big Bend Station Economizer Ash and Pyrite Pond System
Gibsonton, FL

Well ID	Sample Date	Field Parameters							
		Top of Casing Elevation (a) ft NAVD 88	Depth to Water ft BTOC	Groundwater Elevation ft NAVD 88	Temperature C	Specific Conductivity umhos/cm	Dissolved Oxygen mg/L	Redox Potential mV	Turbidity NTU
		Result	Result	Result	Result	Result	Result	Result	Result
BBS-CCR-BW1	6/24/2016	30.13	25.37	4.76	27.84	5620	0.18	-8.6	5.14
(BKGD)	7/27/2016	30.13	26.19	3.94	28.25	5420	0.17	-7.3	7.1
	8/26/2016	30.13	25.78	4.35	28.11	5140	0.12	-22.8	6.47
	10/28/2016	33.40	29.42	3.98	27.46	4860	0.13	-76.2	4.08
	11/10/2016	33.40	29.84	3.56	27.50	5000	0.13	-71.1	1.77
	1/26/2017	33.40	30.49	2.91	26.98	4940	0.20	-20.2	2.04
	4/13/2017	33.40	30.71	2.69	27.20	1580	0.14	-114	4.22
	6/28/2017	33.40	29.92	3.48	27.72	5010	0.42	-11.4	0.69
	7/20/2017	33.40	28.89	4.51	27.89	4960	0.60	-23	2.38
	8/16/2017	33.40	28.74	4.66	28.08	5000	0.45	3.6	6.03
	10/13/2017	33.40	29.60	3.80	28.16	4570	0.40	-18.4	2.51
	4/13/2018	33.40	29.37	4.03	27.64	4800	0.27	-10.3	4.26
	9/12/2018	33.40	28.42	4.98	27.71	4410	0.55	-11.1	2.62
BBS-CCR-BW2	6/24/2016	9.81	4.72	5.09	26.42	1640	0.37	-59.4	6.7
(BKGD)	7/27/2016	9.81	5.52	4.29	27.56	1500	0.15	-84.1	4.86
	8/26/2016	9.81	5.22	4.59	27.74	1380	0.10	-59.5	1.73
	10/28/2016	12.54	8.06	4.48	27.22	1340	0.37	-91.5	3.99
	11/10/2016	12.54	8.45	4.09	27.1	1400	0.20	-73.8	5.86
	1/26/2017	12.54	9.13	3.41	25.25	1460	0.30	-74.1	16.4
	4/13/2017	12.54	9.24	3.3	30.71	1480	1.3	-42	19
	6/28/2017	12.54	8.53	4.01	26.69	1538	0.19	-82.4	6.09
	7/20/2017	12.54	7.45	5.09	27.2	1540	0.33	-94	5.27
	8/16/2017	12.54	7.33	5.21	27.69	1580	0.43	-53.3	3.66
	10/13/2017	12.54	7.38	5.16	27.95	1700	0.28	-72.1	3.96
	4/13/2018	12.54	8.02	4.52	24.90	1590	0.61	-36.3	17.3
	9/12/2018	12.54	7.05	5.49	27.46	1960	0.83	-44.2	4.34
BBS-CCR-1	6/24/2016	7.79	3.51	4.28	25.48	3940	0.10	-49.1	8.01
(DOWNGRADIENT)	7/27/2016	7.79	5.00	2.79	26.41	4180	0.22	-74.1	3.88
	8/26/2016	7.79	5.06	2.73	27.05	4000	0.14	-34.8	2.08
	10/28/2016	9.82	6.78	3.04	25.78	4060	0.10	-107	3.22
	11/10/2016	9.82	7.38	2.44	25.70	4290	0.10	-136	0.89
	1/26/2017	9.82	7.46	2.36	24.03	4320	0.10	-110	1.99
	4/13/2017	9.82	7.64	2.18	23.70	4170	0.10	-80.4	4.12
	6/28/2017	9.82	7.41	2.41	25.54	4063	0.27	-80.6	3.63
	7/20/2017	9.82	5.86	3.96	25.81	3960	0.10	-122	1.58
	8/16/2017	9.82	7.03	2.79	25.80	4110	0.28	-109	1.88
	10/13/2017	9.82	7.32	2.50	26.57	4260	0.24	-83.3	0.89
	4/13/2018	9.82	7.40	2.42	24.90	4170	0.11	-61.6	3.76
	9/12/2018	9.82	6.75	3.07	26.10	4120	0.20	-74.9	9.47

Table 3: Summary of Baseline and Detection Monitoring Groundwater Analytical Results
TEC Big Bend Station Economizer Ash and Pyrite Pond System
Gibsonton, FL

Well ID	Sample Date	Field Parameters							
		Top of Casing Elevation (a) ft NAVD 88	Depth to Water ft BTOC	Groundwater Elevation ft NAVD 88	Temperature C	Specific Conductivity umhos/cm	Dissolved Oxygen mg/L	Redox Potential mV	Turbidity NTU
		Result	Result	Result	Result	Result	Result	Result	Result
BBS-CCR-2 (DOWNGRADIENT)	6/24/2016	8.14	3.45	4.69	25.62	1580	0.10	-71	4.9
	7/27/2016	8.14	5.30	2.84	26.42	1700	0.13	-67.4	7.16
	8/26/2016	8.14	5.35	2.79	27.35	1570	0.10	-27.3	3.31
	10/28/2016	9.34	6.78	2.56	25.64	1500	0.10	-183	3.73
	11/10/2016	9.34	6.88	2.46	25.66	1540	0.13	-186	7.1
	1/26/2017	9.34	6.93	2.41	24.27	1560	0.10	-182	4.93
	4/13/2017	9.34	7.15	2.19	23.95	1540	0.10	-138	3.43
	6/28/2017	9.34	6.97	2.37	25.12	1485	0.24	-131	4.71
	7/20/2017	9.34	5.06	4.28	25.74	1630	0.10	-154	4.56
	8/16/2017	9.34	6.53	2.81	26.43	1560	0.25	-233	3.22
	10/13/2017	9.34	6.88	2.46	26.46	1350	0.20	-188	3.03
	4/13/2018	9.34	6.89	2.45	24.60	1360	0.20	-92	2.96
	9/12/2018	9.34	6.23	3.11	26.74	1520	0.24	-38.8	3.43
BBS-CCR-3 (DOWNGRADIENT)	6/24/2016	6.78	1.51	5.27	26.62	1580	0.54	-145	11.5
	7/27/2016	6.78	3.60	3.18	27.28	1740	0.10	-74.4	8.04
	8/26/2016	6.78	3.48	3.30	27.07	1690	0.15	-155	6.35
	10/28/2016	9.20	6.54	2.66	26.20	1640	0.10	-266	3.26
	11/10/2016	9.20	6.77	2.43	26.10	1650	0.10	-239	1.18
	1/26/2017	9.20	6.81	2.39	24.25	1510	0.11	-168	1.79
	4/13/2017	9.20	7.13	2.07	24.27	1580	0.14	-114	4.22
	6/28/2017	9.20	6.64	2.56	26.15	1755	0.28	-125	0.94
	7/20/2017	9.20	4.77	4.43	26.73	1750	0.17	-122	0.51
	8/16/2017	9.20	6.04	3.16	26.86	1790	0.29	-206	0.47
	10/13/2017	9.20	6.52	2.68	27.18	1750	0.37	-249	2.39
	4/13/2018	9.20	6.63	2.57	24.06	1810	0.19	-101	3.79
	9/12/2018	9.20	5.79	3.41	26.88	1690	0.52	-105	3.47

Table 3: Summary of Baseline and Detection Monitoring Groundwater Analytical Results
TEC Big Bend Station Economizer Ash and Pyrite Pond System
Gibsonton, FL

Well ID	Sample Date	Appendix III Parameters												Appendix IV Parameters													
		pH	Boron		Calcium		Chloride		Fluoride		Sulfate		TDS		Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt	
		SU	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
		Result	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
BBS-CCR-BW1	6/24/2016	6.51	59.1		781		1140	J-	0.199		1440	J-	5050	J-	0.600	U	10.2		72.9		0.200	U	0.100	U	1.60	U	1.40	I
(BKGD)	7/27/2016	6.38	56.9		737		1120		0.11		1510		4190	(-)	0.600	U	8.10		68.2		0.200	U	0.100	U	1.60	U	1.33	I
	8/26/2016	6.41	53.7	V	729		1030		0.18		1420		4290		1.77	I	8.89		61.4		0.200	U	0.100	U	1.60	U	1.52	I
	10/28/2016	6.50	51.4		675	V	939	V	0.194		1400		4120	J-	6.00	U	3.20	U	60		0.200	U	1.00	U	1.60	U	0.963	I
	11/10/2016	6.52	49.7		692		993	V	0.261		1440		4170	J-	0.600	U	8.49		61.2		0.200	U	0.100	U	1.60	U	1.45	I
	1/26/2017	6.46	45.9		728		942	V	0.315		1520		4510	J	0.600	U	0.32	U	54.6		0.200	U	0.100	U	1.60	U	1.5	I
	4/13/2017	6.49	49.0		693		934		0.256		1550		4060	J	0.600	U	8.61		53.6		0.200	U	0.108	I	3.23	I	2.00	U
	6/28/2017	6.47	51.7		781		995		0.298		1510		4430		0.600	U	7.68		55.4		0.200	U	0.124	I	2.29	I	1.71	I
	7/20/2017	6.49	47.0		744	V	915	V	0.255	J	1470		4160	J	6.00	U	8.48	I	51.7		0.200	U	1.00	U	2.16	I	1.97	I
	8/16/2017	6.52	48.0		743		793		0.01	U	1320		4340		0.600	U	6.60		55.6		0.200	U	0.100	U	2.48	J	1.66	J
	10/13/2017	6.55	44.2		691		809		0.334		217		3890		0.600	U	9.06		55.8		0.200	U	0.100	U	1.60	U	1.86	J
	4/13/2018	6.51	36.9		694		874		0.346		1380		4000		0.600	U	8.76		52.3		0.200	U	0.145		3.90		1.87	
	9/12/2018	6.51	33.2		664		737		0.818		1290		3740		0.600	U	10.1		51.5		0.500	U	0.203	I	1.60		1.88	I
BBS-CCR-BW2	6/24/2016	6.53	3.89		313		123		0.409		414		1230		0.600	U	2.65		51.3		0.200	U	0.100	U	1.60	U	1.00	U
(BKGD)	7/27/2016	6.48	4.25		271		116		0.432		341		1060		0.600	U	1.75	I	49.8		0.200	U	0.100	U	1.60	U	0.14	I
	8/26/2016	6.48	3.70	V	237		116		0.455		276		980		0.600	U	2.03		43.2		0.200	U	0.100	U	1.60	U	0.153	I
	10/28/2016	6.67	3.90		238	J-,V	125	V	0.44		246		1010		0.600	U	1.62	I	46.3		0.200	U	0.100	U	1.60	U	0.151	I
	11/10/2016	6.68	3.75		243		129	V	0.464		255		966	J-	0.600	U	2.59		45.8		0.200	U	0.100	U	1.60	U	0.157	I
	1/26/2017	6.62	3.27		240		145	V	0.472		255		1140		0.600	U	0.709	I	38.8		0.200	U	0.100	U	1.60	U	0.136	I
	4/13/2017	6.67	4.08		260		140		0.478		323		1120		0.600	U	1.45	I	42.7		0.200	U	0.100	U	1.60	U	2.00	U
	6/28/2017	6.64	4.54	J-	290	J-	135		0.559		402		1170		0.600	U	1.68	I	48.8		0.200	U	0.100	U	1.68	I	0.0959	I
	7/20/2017	6.66	4.57		278	V	123	V	0.319	J	41.7		1200		6.00	U	3.20	U	47.7		0.22	U	1.00	U	2.26	I	0.400	U
	8/16/2017	6.68	4.39		287		117		0.352		462		1180	J	0.600	U	1.80	J	49.9		0.200	U	0.100	U	1.60	U	0.11	J
	10/13/2017	6.70	4.08		321		84.9		0.513		632		1330		0.600	U	2.01		56.2		0.254	J	0.100	U	1.60	U	0.129	J
	4/13/2018	6.69	2.93		297		83.2		0.457		458		1190		0.600	U	4.63		46.9		0.200	U	0.100	U	1.60	U	0.247	
	9/12/2018	6.60	2.64	V	344		148		0.338	I, V	638		1500		0.600	U	5.01		63.6		0.500	U	0.100	U	1.60	U	0.285	I
BBS-CCR-1	6/24/2016	6.80	14.4		541		619		0.211		1240		3060	J	0.600	U	8.74		122		0.200	U	0.100	U	1.60	U	1.00	U
(DOWNGRADIENT)	7/27/2016	6.67	0.306		227		742	J-	0.128		1320	J-	3140		1.03	I	7.38		30.8		0.200	U	0.100	U	1.60	U	0.45	I
	8/26/2016	6.71	11.4		556		695		0.454		1240		2980		0.600	U	7.94		115		0.200	U	0.100	U	1.60	U	0.485	
	10/28/2016	6.83	15.7		556	V	743	J-	0.104		1230	J-	3170	J-	0.600	U	8.30		122		0.200	U	0.100	U	1.60	U	0.507	I
	11/10/2016	6.82	16.2		606		817	V	0.0871		1290		3470	J-	0.600	U	8.93		129		0.200	U	0.100	U	1.60	U	0.519	I
	1/26/2017	6.79	15.5	J-	579	J-	820	V	0.184		1350		3670	J	0.602	I	9.04		115		0.200	U	0.100	U	1.60	U	0.489	I
	4/13/2017	6.84	16.4		555		124		0.17		443		3110	J	0.600	U	10.53		116	I	2.00	U	0.100	U	1.60	U	2.00	U
	6/28/2017	6.78	16.5		569		720		0.208		1120		3140		0.600	U	9.76		113		0.200	U	0.100	U	1.93	I	0.484	I
	7/20/2017	6.81	16.0		576	V	694	J-, V	0.157	J	1390		3400	J	3.00	U	10.3		112		0.200	U	0.500	U	1.62	I	0.495	I
	8/16/2017	6.82	17.0		572		710		0.2		1240		2960	J	0.600	U	9.33		122		0.200	U	0.100	U	1.60	U	0.473	J
	10/13/2017	6.83	19.9		596		716		0.201		1230		3470		0.600	U	9.03		129		0.200	U	0.100	U	1.60	U	0.453	J
	4/13/2018	6.83	19.6		577		714		0.21		1290		3230		0.600	U	8.44		117		0.200	U	0.25		1.60	I	0.522	
	9/12/2018	6.80	19.9		549		674		0.235	I, V	1220		3250		0.600	U	9.80		114		0.500	U	0.100	U	1.60	U	0.556	I

Table 3: Summary of Baseline and Detection Monitoring Groundwater Analytical Results
TEC Big Bend Station Economizer Ash and Pyrite Pond System
Gibsonton, FL

Well ID	Sample Date	Appendix III Parameters												Appendix IV Parameters													
		pH	Boron		Calcium		Chloride		Fluoride		Sulfate		TDS		Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt	
		SU	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
		Result	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
BBS-CCR-2	6/24/2016	6.80	1.55		198		118		0.148		471		1170	J-	0.600	U	1.83	I	65		0.200	U	0.100	U	1.60	U	1.00	U
(DOWNGRADIENT)	7/27/2016	6.68	2.81		193		140		0.183		542		1170		0.83	I	0.99	I	64.8		0.200	U	0.100	U	1.60	U	0.09	I
	8/26/2016	6.74	2.86		192		124		0.15		484		1120		0.600	U	1.25		61.4		0.200	U	0.100	U	1.60	U	0.0776	
	10/28/2016	6.87	2.08		181	V	112	V	0.171		468		1130		0.600	U	1.16	I	60.6		0.200	U	0.100	U	1.60	U	0.107	I
	11/10/2016	6.89	2.28		181		111	V	0.168		468		1110		0.600	U	1.37	I	62.4		0.200	U	0.100	U	1.60	U	0.105	I
	1/26/2017	6.89	3.86		172		115	J+	0.248	J+	490	J-	1140		0.600	U	1.09	I	54.6		0.200	U	0.100	U	1.60	U	0.0902	I
	4/13/2017	6.93	5.01		163		119		0.237		485	J-	1150		0.600	U	2.64		55.8		0.200	U	0.100	U	2.29	I	2.00	U
	6/28/2017	6.87	3.20		173		105		0.214		415	J-	1080		0.600	U	1.01	I	54.6		0.200	U	0.100	U	1.96	I	0.0875	I
	7/20/2017	6.97	4.94		178	V	114	V	0.166	J	481		1140		0.600	U	0.974	I	54.6		0.423	U	0.100	U	3.11	I	0.0857	I
	8/16/2017	6.92	4.32		171		113		0.155		459		1080		1.20	U	1.02	J	56.8		0.200	U	0.200	U	1.60	U	0.15	J
	10/13/2017	6.87	0.888		169		70.9		0.182		432		1030		0.600	U	1.14		53.3		0.200	U	0.100	U	1.60	U	0.115	J
	4/13/2018	6.86	0.966		183		74.8		0.238		436		1000		0.600	U	0.849		49.2		0.200	U	0.100	U	1.60	U	0.108	
	9/12/2018	6.29	0.177	J-, V	218		88.7		0.298	I, V	375		1060		0.600	U	1.34	I	65.2	J-	0.500	J-, U	0.100	U	1.60	J-, U	0.136	U
BBS-CCR-3	6/24/2016	6.42	0.662		187		88.9		0.313		474		1200		0.600	U	1.23	I	65.3		0.200	U	0.100	U	1.60	U	1.00	U
(DOWNGRADIENT)	7/27/2016	6.19	13.2		196		140		0.262		516		1220		0.77	I	0.54	I	67.6		0.200	U	0.100	U	1.60	U	0.09	I
	8/26/2016	6.29	0.54	V	200		136		0.286		517		1210		0.600	U	0.603	I	63.6		0.272	I	0.100	U	1.60	U	0.125	I
	10/28/2016	6.42	0.532		201	V	140	V	0.299		541		1220		0.600	U	0.623	I	66.3		0.200	U	0.100	U	1.60	U	0.124	I
	11/10/2016	6.46	0.502		200		129	V	0.331		492		1220		0.600	U	0.765	I	63		0.200	U	0.100	U	1.60	U	0.117	I
	1/26/2017	6.42	0.381		176		129	V	0.391		454		1200		0.600	U	0.32	U	56.2		0.200	U	0.100	U	1.60	U	0.0989	I
	4/13/2017	6.49	0.385		176		124		0.415		443		1120		0.600	U	0.32	U	58.6		0.200	U	0.100	U	1.60	U	2.00	U
	6/28/2017	6.38	0.184		192		168		0.338		493		1280		0.600	U	0.525	I	61.8		0.200	U	0.100	U	3.12	I	0.119	I
	7/20/2017	6.36	0.211		205	J-, V	158	V	0.23	J	506		1310		3.00	U	1.60	U	63.4		0.356	U	0.500	U	3.43	I	0.200	U
	8/16/2017	6.42	0.266		187		156		0.338		484		1290		0.600	U	0.536	J	59.8		0.200	U	0.100	U	2.02	J	0.123	J
	10/13/2017	6.44	0.373		190		153		0.333		503		1310		0.600	U	0.665	J	59.3		0.200	U	0.100	U	1.60	U	0.115	J
	4/13/2018	6.41	0.180		206		168		0.372		506		1310		0.600	U	0.365		66.1		0.200	U	0.100	U	4.67		0.154	
	9/12/2018	6.41	0.398	V	191		132		0.309	I, V	469		1200		0.600	U	0.613	I	62.8		0.500	U	0.100	U	1.60	U	0.136	

Table 3: Summary of Baseline and Detection Monitoring Groundwater Analytical Results
TEC Big Bend Station Economizer Ash and Pyrite Pond System
Gibsonton, FL

Well ID	Sample Date	Appendix IV Parameters													
		Lead ug/L		Lithium ug/L		Mercury ug/L		Molybdenum ug/L		Radium 226/228 pCi/L		Selenium ug/L		Thallium ug/L	
		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
BBS-CCR-BW1	6/24/2016	0.0800	U	8.9	I	0.0500	U	4.46	I	38		2.09		0.118	I
(BKGD)	7/27/2016	0.200	I	20	I	0.0500	U	2.88	I	35		1.92	I	0.100	U
	8/26/2016	0.111	I	7.4	I	0.0500	U	11.1	I	31		1.73	I	0.100	U
	10/28/2016	0.800	U	11	I	0.0500	U	6	I	32.3		2.00	U	1.00	U
	11/10/2016	0.102	I	10	I	0.0500	U	6.58	I	29.9		2.51		0.100	U
	1/26/2017	0.113	I	18	I	0.0500	U	7.16	I	32.5		0.2	U	0.100	U
	4/13/2017	0.129	I	39.7		0.0500	U	15.6	I	39.7		1.62	I	0.100	U
	6/28/2017	0.0800	U	15	U	0.0500	U	16.3	U	37.8		1.81	I	0.100	U
	7/20/2017	0.800	U	17	I	0.0500	U	13.6	I	37.2		2.00	U	1.00	U
	8/16/2017	0.291	J	0.05	U	0.0500	U	1.43	J	30.1		1.76	J	0.100	U
	10/13/2017	0.103	J	17	V	0.0500	U	4.27	J	22.1		2.14	J	0.100	U
	4/13/2018	0.236		26		0.0500	U	8.65		36.3		2.66		0.101	
	9/12/2018	0.141	I	17	I	0.0500	U	22.5		23.6		1.83	I	0.126	I
BBS-CCR-BW2	6/24/2016	0.0800	U	3.8	I	0.0500	U	2.4	I	4.8		0.722	I	0.100	U
(BKGD)	7/27/2016	0.0800	U	9.1	I	0.0500	U	1	U	5.1	J	0.76	I	0.100	U
	8/26/2016	0.0800	U	2	I	0.0500	U	7.57		4		0.577	I	0.100	U
	10/28/2016	0.0800	U	3.8	I	0.0500	U	1.42	I	4.8		0.489	I	0.100	U
	11/10/2016	0.0800	U	1.7	I	0.0500	U	1	U	8		0.485	I	0.100	U
	1/26/2017	0.0800	U	5.2	I	0.0500	U	2.56	I	4.8	J	0.26	I	0.100	U
	4/13/2017	0.0800	U	3.4		0.0500	U	9.65	I	4.5		0.539	I	0.100	U
	6/28/2017	0.0800	U	5.2	I	0.0500	U	10.2	U	4.8		0.386	I	0.100	U
	7/20/2017	0.800	U	5.9	I	0.0500	U	8.9	I	4.4		2.00	U	1.00	U
	8/16/2017	0.101	J	0.05	U	0.0500	U	4.08	J	4.9		0.42	J	0.100	U
	10/13/2017	0.0800	U	8.2	I,V	0.0500	U	2.51	J	4.9		0.523	J	0.100	U
	4/13/2018	0.112		9.9		0.0500	U	3.28		4.7		0.666		0.100	U
	9/12/2018	0.0800	U	6.2	I	0.0500	U	2.50	U	3.7		0.563	I	0.100	U
BBS-CCR-1	6/24/2016	0.0800	U	8.3	I	0.0500	U	106		39		0.696	I	0.100	U
(DOWNGRADIENT)	7/27/2016	0.110	I	15	I	0.0500	U	105		33		0.96	I	0.100	U
	8/26/2016	0.0800	U	7.4	I	0.0500	U	80.3		15		0.385		0.100	U
	10/28/2016	0.0800	U	12	I	0.0500	U	95.5		42.6		0.69	I	0.100	U
	11/10/2016	0.0800	U	8.4	I	0.0500	U	98.4		37.3		1.04	I	0.100	U
	1/26/2017	0.0800	U	14	I	0.0500	U	92.4		32.5		0.653	I	0.100	U
	4/13/2017	0.0979	I	10	I	0.0500	U	124	I	35.8	I	0.937	I	0.100	U
	6/28/2017	0.0800	U	13	I	0.0500	U	96.5	I	41.4		0.756	I	0.100	U
	7/20/2017	0.400	U	14	I, J3	0.0500	U	99.6		34.7		2.25	I	0.500	U
	8/16/2017	0.0800	U	0.05	U	0.0500	U	86.4		33.4		0.918	J	0.100	U
	10/13/2017	0.0800	U	15	I,V	0.0500	U	82.5		35.6		0.99	J	0.100	U
	4/13/2018	0.328		22		0.0500	U	74.8		34		0.908		0.100	U
	9/12/2018	0.0800	U	16	I	0.0500	U	73.4		34.7		0.721	I	0.100	U

Table 3: Summary of Baseline and Detection Monitoring Groundwater Analytical Results
TEC Big Bend Station Economizer Ash and Pyrite Pond System
Gibsonton, FL

Well ID	Sample Date	Appendix IV Parameters													
		Lead ug/L		Lithium ug/L		Mercury ug/L		Molybdenum ug/L		Radium 226/228 pCi/L		Selenium ug/L		Thallium ug/L	
		Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q	Result	Q
BBS-CCR-2	6/24/2016	0.0800	U	10	I	0.0500	U	1.73	I	15		0.376	I	0.100	U
(DOWNGRADIENT)	7/27/2016	0.110	I	17	I	0.0500	U	1	U	13.2		0.28	I	0.100	U
	8/26/2016	0.0800	U	11	I	0.0500	U	7.78		32		0.200	U	0.100	U
	10/28/2016	0.129	I	14	I	0.0500	U	1	U	14.9		0.333	I	0.100	U
	11/10/2016	0.0955	I	11	I	0.0500	U	1.43	I	14.8		0.259	I	0.100	U
	1/26/2017	0.0800	U	13	I	0.0500	U	2.52	I	13.9		0.200	U	0.100	U
	4/13/2017	0.176	I	13	I	0.0500	U	9.82	I	14.2		0.200	U	0.100	U
	6/28/2017	0.144	I	14	I	0.0500	U	9.59	U	14.7		0.200	U	0.100	U
	7/20/2017	0.127	I	16	I	0.0500	U	9.88	I	14.4		0.474	I	0.100	U
	8/16/2017	0.244	J	0.05	U	0.0500	U	3.02	J	12.1		0.662	J	0.200	U
	10/13/2017	0.150	J	16	I,V	0.0500	U	1.99	J	13.5		0.474	J	0.100	U
	4/13/2018	0.167		17		0.0500	U	2.69		17.4		0.395		0.100	U
	9/12/2018	0.102	I	13	I	0.0500	U	2.50	J-, U	15.3		0.509	U	0.100	U
BBS-CCR-3	6/24/2016	0.125	I	3.7	I	0.058	I	4.09	I	10.3		0.262	I	0.100	U
(DOWNGRADIENT)	7/27/2016	0.0800	I	11	I	0.0500	U	2.23	I	12.3		0.27	I	0.100	U
	8/26/2016	0.0800	U	6.1	I	0.0500	U	8.1		15		0.200	U	0.100	U
	10/28/2016	0.107	I	8.2	I	0.0500	U	3.63	I	18.1		0.200	U	0.100	U
	11/10/2016	0.0800	U	6.1	I	0.0500	U	3.9	I	17.5		0.253	I	0.100	U
	1/26/2017	0.0800	U	7.7	I	0.0500	U	5.42	I	15		0.200	U	0.100	U
	4/13/2017	0.0800	U	6.3	I	0.0500	U	11.7	I	14.4		0.200	U	0.100	U
	6/28/2017	0.0800	U	5.2	I	0.0500	U	11.9	U	17.7		0.200	U	0.100	U
	7/20/2017	0.400	U	10	I	0.0500	U	10.6	I	20.3		1.00	U	0.500	U
	8/16/2017	0.0800	U	0.05	U	0.0500	U	3.14	J	19.6		0.200	U	0.100	U
	10/13/2017	0.0800	U	11	I,V	0.0500	U	3.82	J	20		0.285	J	0.100	U
	4/13/2018	0.0911		15		0.0500	U	3.64		19.9		0.357		0.100	U
	9/12/2018	0.0800	U	11	I	0.0500	U	3.99	I	14.8		0.509	U	0.100	U

Abbreviations:

Q - Data qualifier
C - Celsius
ft BTOC - feet below top of well casing
mg/L - milligrams per liter
SU - Standard units
ft NAVD 88 - feet elevation in North American Vertical Datum 1988
ug/L - micrograms per liter
umhos/cm - micromohs per centimeter
mV - millivolts
pCI/L - picocuries per liter

Notes:

1. U: Laboratory qualifer - Indicates that the compound was not detected above the reporting limit.
2. I: Laboratory qualifier - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit; estimated value
3. J(-): Laboratory qualifier - The reported value is an estimated value.
4. J: Data validation qualifer - The analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
5. UJ: Data validation qualifer - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
6. J- : Data validation qualifer - The analyte was positively identified; however, the associated numerical value is likely to be lower than the concentration of the analyte in the sample due to negative bias of associated QC or calibration data or attributable to matrix interference.
7. V: Analyte detected in the method blank.
8. Q: Laboratory qualifer- Re-analysis of sample beyond the accepted holding time.
9. J3: Laboratory qualifer - Estimated value; value may not be accurate. Spike recovery or RPD outside of

(a) - Top of well casings revised in September 2016 once final aboveground completions were constructed. The additional PVC stickup was measured and added to the original surveyed top of casing elevation.

FIGURES

400 200 0 400 Feet

Legend

Jackson Branch

Economizer Ash and Pyrite Pond System (EAPPS)

Note:
Source of 2014 Aerials: Florida Department of Transportation, Surveying and Mapping Office.

Economizer Ash and Pyrite Pond System Location Map

TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

Tampa, FL | January 2019

Figure 1

Path: (Tlusville-01\Data\TT\GIS\FR2033_TECO_BigBend\MXDs\20160716\EAPPS_mxd 18 Jan 2018 JRB

Legend

- Background Well Location
- CCR Monitoring Well Location

Note:
2014 Aerial Imagery source, Florida Department of Transporation Surveying and Mapping Office APLUS website.

CCR Monitoring Well Locations
Economizer Ash and Pyrite Pond System

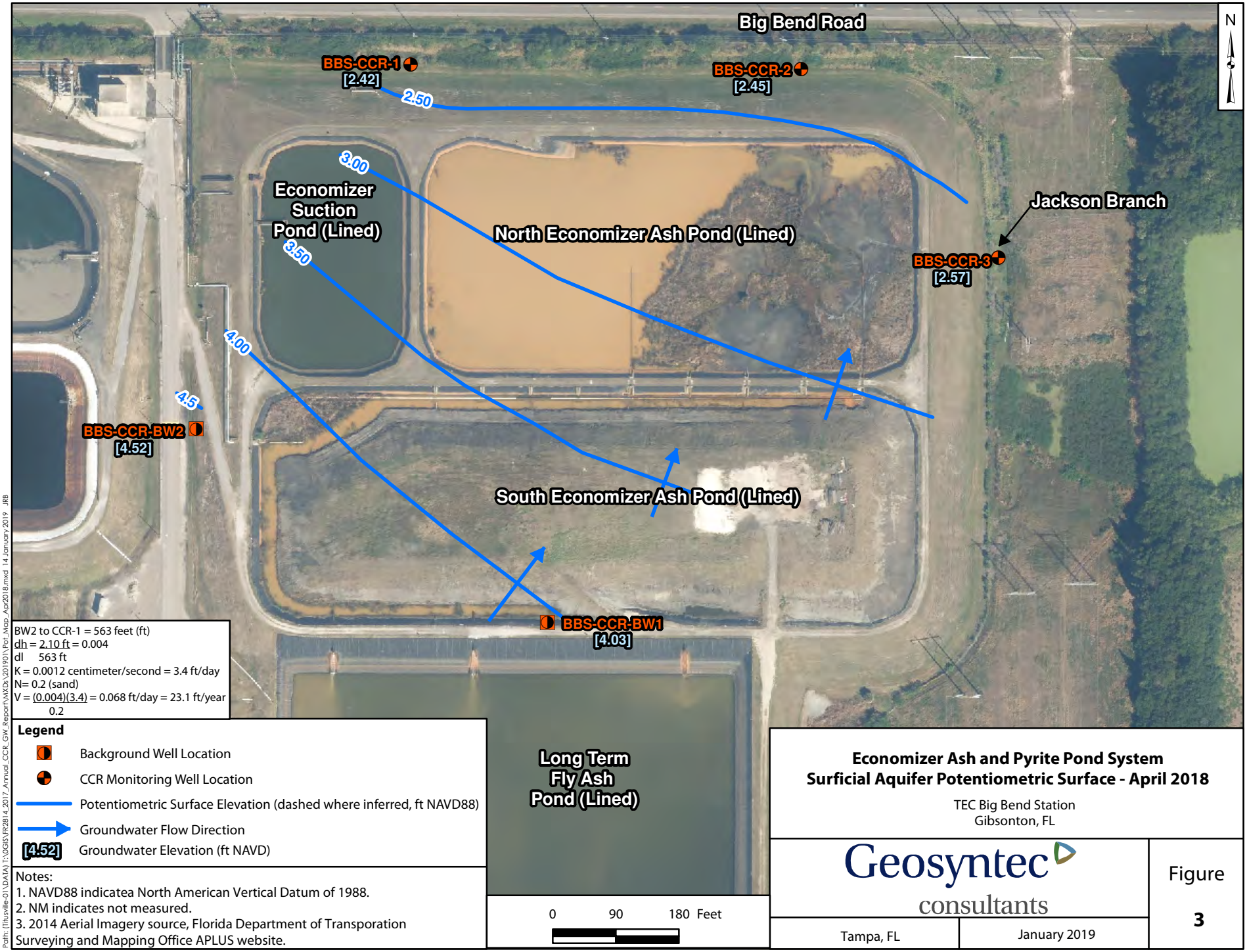
TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

Tampa, FL | January 2019

Figure **2**

Path: (Titusville-01\DATA) T:\GIS\FR2814.2017_Annual_CCR_GW_Report\MXDs\CCR_MW_Locs.mxd 18 January 2018 JRB


Big Bend Road
BBS-CCR-1
[2.42]
BBS-CCR-2
[2.45]
2.50
3.00
Economizer
Suction
Pond (Lined)
North Economizer Ash Pond (Lined)
Jackson Branch
BBS-CCR-3
[2.57]
3.50
4.00
4.5
BBS-CCR-BW2
[4.52]
South Economizer Ash Pond (Lined)
BBS-CCR-BW1
[4.03]
Long Term
Fly Ash
Pond (Lined)
N
BW2 to CCR-1 = 563 feet (ft)
dh = 2.10 ft = 0.004
dl 563 ft
K = 0.0012 centimeter/second = 3.4 ft/day
N= 0.2 (sand)
V = (0.004)(3.4) = 0.068 ft/day = 23.1 ft/year
0.2
Legend
Background Well Location
CCR Monitoring Well Location
Potentiometric Surface Elevation (dashed where inferred, ft NAVD88)
Groundwater Flow Direction
[4.52] Groundwater Elevation (ft NAVD)
Notes:
1. NAVD88 indicatea North American Vertical Datum of 1988.
2. NM indicates not measured.
3. 2014 Aerial Imagery source, Florida Department of Transporation Surveying and Mapping Office APLUS website.
0 90 180 Feet
Economizer Ash and Pyrite Pond System
Surficial Aquifer Potentiometric Surface - April 2018
TEC Big Bend Station
Gibsonton, FL
Geosyntec consultants
Tampa, FL
January 2019
Figure
3
Path: (Tillsville-01\DATA) T:\GIS\FR2814_2017_Annual_CCR_GW_Report\MXDs\20190\1\Pot_Map_Apr2018.mxd 14 January 2019 JRB

BW2 to CCR-1 = 563 feet (ft)
dh = 2.42 ft = 0.004
dl 563 ft
K = 0.0012 centimeter/second = 3.4 ft/day
N= 0.2 (sand)
V = (0.004)(3.4) = 0.073 ft/day = 26.7 ft/year
0.2

Legend

- Background Well Location
- CCR Monitoring Well Location
- Potentiometric Surface Elevation (dashed where inferred, ft NAVD88)
- Groundwater Flow Direction
- [5.49] Groundwater Elevation (ft NAVD)

Notes:
1. NAVD88 indicatea North American Vertical Datum of 1988.
2. NM indicates not measured.
3. 2014 Aerial Imagery source, Florida Department of Transporation Surveying and Mapping Office APLUS website.

0 90 180 Feet

Economizer Ash and Pyrite Pond System
Surficial Aquifer Potentiometric Surface - September 2018

TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

Tampa, FL | January 2019

Figure
4

Path: (Tillsville-01\DATA) T:\GIS\FR2814_2017_Annual_CCR_GW_Report\MXDs\20190\Pot_Map_Sept2018.mxd 14 January 2019 JRB

APPENDIX A

Laboratory Analytical Data Report – Second Detection Monitoring Event (April 2018)

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Big Bend Power Station
Terry Eastley
13031 Wyandott Rd
Apollo Beach, FL 33572
tleastley@tecoenergy.com

Report Date: 05/03/18 11:00

Work Order - L18D079 **Project - CCR Wells Economizer Ash Pond**

Case Narrative

5 sample(s) were received on 04/13/18 14:43.

There were no issues noted with the sample(s) associated with this workorder unless noted below.

Radiological Analysis for sample BBS-CCR2 was lost in the laboratory during analysis. This sample was resampled on 4/25/2018. The report is attached under workorder number L18D118.

EPA 300.0

The recovery of the matrix spike and spike duplicate for Chloride and Sulfate was below the control limits due to matrix interference. The parent sample is flagged with a J qualifier.

SM 2540C

A constant weight could not be acheived after three consectutive weighing and drying cycles for samples BBS-CCR-3. The sample(s) are flagged with a J qualifier.

TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-01**

Sample Description: BBS-CCR-1

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 13:23

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**714**	mg/L	0.400	10.0	J-,V	20	EPA 300.0	TMH	4/13/18 19:02
Specific Conductance	**4170**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	4/13/18 13:23
Dissolved Oxygen	**0.110**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	4/13/18 13:23
Fluoride	**0.210**	mg/L	0.0100	0.0500	V	1	EPA 300.0	TMH	4/13/18 18:52
pH	**6.83**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	4/13/18 13:23
REDOX Potential	**-61.6**	mV	-999	-999		1	SM 2580B	RAB	4/13/18 13:23
Total Dissolved Solids	**3230**	mg/L	24.0	40.0		2	SM 2540C	NLT	4/16/18 14:40
Sulfate	**1290**	mg/L	10.0	40.0	J-	20	EPA 300.0	TMH	4/13/18 19:02
Turbidity	**3.76**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	4/13/18 13:23
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	RLC	4/16/18 14:31
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	RLC	4/16/18 6:44
Arsenic	**8.44**	ug/L	0.320	2.00		1	EPA 200.8	RLC	4/16/18 6:44
Cadmium	**0.250**	ug/L	0.100	0.500	V,I	1	EPA 200.8	RLC	4/16/18 6:44
Cobalt	**0.522**	ug/L	0.0400	2.00	V,I	1	EPA 200.8	RLC	4/16/18 6:44
Lead	**0.000328**	mg/L	8.00E-5	0.00200	V,I	1	EPA 200.8	RLC	4/16/18 6:44
Selenium	**0.908**	ug/L	0.200	2.00	I	1	EPA 200.8	RLC	4/16/18 6:44
Thallium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	RLC	4/16/18 6:44
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.117**	mg/L	0.000500	0.0200		1	EPA 6010B	RLC	4/16/18 7:53
Beryllium	0.200	ug/L	0.200	2.00	U	1	EPA 6010B	RLC	4/16/18 7:53
Boron	**19.6**	mg/L	0.0100	0.0500		1	EPA 6010B	RLC	4/16/18 7:53
Calcium	**577000**	ug/L	30.0	1000	V	1	EPA 6010B	RLC	4/16/18 6:30
Chromium	**1.60**	ug/L	1.60	12.0	I	1	EPA 6010B	RLC	4/16/18 7:53
Molybdenum	**74.8**	ug/L	1.00	20.0		1	EPA 6010B	RLC	4/16/18 7:53
KNL Laboratory									
Radium - 226									
Rad - 226	**29.3**	pCi/L	0.5	0.5		1	EPA 903.0	KL1	4/25/18 12:08
Rad - 226 Counting Error +/-	**1.6**	pCi/L				1	EPA 903.0	KL1	4/25/18 12:08
Radium - 228									
Rad - 228	**4.7**	pCi/L	0.7	0.7		1	EPA Ra-05	KL1	4/27/18 11:46
Rad - 228 Counting Error +/-	**0.8**	pCi/L				1	EPA Ra-05	KL1	4/27/18 11:46

Laboratory Services certifies that the test result in this report meet all requirements of the latest promulgated TNI standards, unless indicated otherwise in the body of the report. Unless otherwise noted, all methods followed are per the most current published version of 40 CFR Part 136, Table B. Results reported on this report pertain to the above referenced sample only.

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-01**

Sample Description: BBS-CCR-1

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 13:23

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**34.0**	pCi/L	0.7	0.7		1	Calc	KL1	4/27/18 11:46
Rad-226/228 Counting Error +/-	**1.6**	pCi/L				1	Calc	KL1	4/27/18 11:46
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.022**	mg/L	0.0010	0.050	I	1	6010B Z01	GESP	4/19/18 14:32

Laboratory Services certifies that the test result in this report meet all requirements of the latest promulgated TNI standards, unless indicated otherwise in the body of the report. Unless otherwise noted, all methods followed are per the most current published version of 40 CFR Part 136, Table B. Results reported on this report pertain to the above referenced sample only.

TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-02**

Sample Description: BBS-CCR-2

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 12:51

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**74.8**	mg/L	0.0200	0.500	V	1	EPA 300.0	TMH	4/13/18 19:59
Specific Conductance	**1360**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	4/13/18 12:51
Dissolved Oxygen	**0.200**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	4/13/18 12:51
Fluoride	**0.238**	mg/L	0.0100	0.0500	V	1	EPA 300.0	TMH	4/13/18 19:59
pH	**6.86**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	4/13/18 12:51
REDOX Potential	**-92.0**	mV	-999	-999		1	SM 2580B	RAB	4/13/18 12:51
Total Dissolved Solids	**1000**	mg/L	24.0	40.0		2	SM 2540C	NLT	4/16/18 14:40
Sulfate	**436**	mg/L	10.0	40.0		20	EPA 300.0	TMH	4/13/18 19:59
Turbidity	**2.96**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	4/13/18 12:51
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	RLC	4/16/18 14:35
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	RLC	4/16/18 6:46
Arsenic	**0.849**	ug/L	0.320	2.00	I	1	EPA 200.8	RLC	4/16/18 6:46
Cadmium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	RLC	4/16/18 6:46
Cobalt	**0.108**	ug/L	0.0400	2.00	V,I	1	EPA 200.8	RLC	4/16/18 6:46
Lead	**0.000167**	mg/L	8.00E-5	0.00200	V,I	1	EPA 200.8	RLC	4/16/18 6:46
Selenium	**0.395**	ug/L	0.200	2.00	I	1	EPA 200.8	RLC	4/16/18 6:46
Thallium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	RLC	4/16/18 6:46
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.0492**	mg/L	0.000500	0.0200		1	EPA 6010B	RLC	4/16/18 7:56
Beryllium	0.200	ug/L	0.200	2.00	U	1	EPA 6010B	RLC	4/16/18 7:56
Boron	**0.966**	mg/L	0.0100	0.0500		1	EPA 6010B	RLC	4/16/18 7:56
Calcium	**183000**	ug/L	30.0	1000	V	1	EPA 6010B	RLC	4/16/18 6:32
Chromium	1.60	ug/L	1.60	12.0	U	1	EPA 6010B	RLC	4/16/18 7:56
Molybdenum	**2.69**	ug/L	1.00	20.0	I	1	EPA 6010B	RLC	4/16/18 7:56
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.017**	mg/L	0.0010	0.050	I	1	6010B Z01	GESP	4/19/18 14:36

Laboratory Services certifies that the test result in this report meet all requirements of the latest promulgated TNI standards, unless indicated otherwise in the body of the report. Unless otherwise noted, all methods followed are per the most current published version of 40 CFR Part 136, Table B. Results reported on this report pertain to the above referenced sample only.

TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-03**

Sample Description: BBS-CCR-3

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 12:22

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**168**	mg/L	0.400	10.0	V	20	EPA 300.0	TMH	4/13/18 20:18
Specific Conductance	**1810**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	4/13/18 12:22
Dissolved Oxygen	**0.190**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	4/13/18 12:22
Fluoride	**0.372**	mg/L	0.0100	0.0500	V	1	EPA 300.0	TMH	4/13/18 20:09
pH	**6.41**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	4/13/18 12:22
REDOX Potential	**-101**	mV	-999	-999		1	SM 2580B	RAB	4/13/18 12:22
Total Dissolved Solids	**1310**	mg/L	24.0	40.0	J-	2	SM 2540C	NLT	4/16/18 14:40
Sulfate	**506**	mg/L	10.0	40.0		20	EPA 300.0	TMH	4/13/18 20:18
Turbidity	**3.79**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	4/13/18 12:22
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	RLC	4/16/18 14:38
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	RLC	4/16/18 6:48
Arsenic	**0.365**	ug/L	0.320	2.00	I	1	EPA 200.8	RLC	4/16/18 6:48
Cadmium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	RLC	4/16/18 6:48
Cobalt	**0.154**	ug/L	0.0400	2.00	V,I	1	EPA 200.8	RLC	4/16/18 6:48
Lead	**9.11E-5**	mg/L	8.00E-5	0.00200	V,I	1	EPA 200.8	RLC	4/16/18 6:48
Selenium	**0.357**	ug/L	0.200	2.00	I	1	EPA 200.8	RLC	4/16/18 6:48
Thallium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	RLC	4/16/18 6:48
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.0661**	mg/L	0.000500	0.0200		1	EPA 6010B	RLC	4/16/18 7:59
Beryllium	0.200	ug/L	0.200	2.00	U	1	EPA 6010B	RLC	4/16/18 7:59
Boron	**0.180**	mg/L	0.0100	0.0500		1	EPA 6010B	RLC	4/16/18 7:59
Calcium	**206000**	ug/L	30.0	1000	V	1	EPA 6010B	RLC	4/16/18 6:34
Chromium	**4.67**	ug/L	1.60	12.0	I	1	EPA 6010B	RLC	4/16/18 7:59
Molybdenum	**3.64**	ug/L	1.00	20.0	I	1	EPA 6010B	RLC	4/16/18 7:59
KNL Laboratory									
Radium - 226									
Rad - 226	**19.3**	pCi/L	0.5	0.5		1	EPA 903.0	KL1	4/26/18 12:20
Rad - 226 Counting Error +/-	**1.4**	pCi/L				1	EPA 903.0	KL1	4/26/18 12:20
Radium - 228									
Rad - 228	0.7	pCi/L	0.7	0.7	U	1	EPA Ra-05	KL1	4/26/18 11:32
Rad - 228 Counting Error +/-	**0.5**	pCi/L				1	EPA Ra-05	KL1	4/26/18 11:32

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Tampa Electric Laboratory Services

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Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-03**

Sample Description: BBS-CCR-3

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 12:22

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**19.9**	pCi/L	0.7	0.7		1	Calc	KL1	4/26/18 12:20
Rad-226/228 Counting Error +/-	**1.4**	pCi/L				1	Calc	KL1	4/26/18 12:20
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.015**	mg/L	0.0010	0.050	I	1	6010B Z01	GESP	4/19/18 14:39

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TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-04**

Sample Description: BBS-CCR-BW1

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 11:51

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**874**	mg/L	0.400	10.0	V	20	EPA 300.0	TMH	4/13/18 20:37
Specific Conductance	**4800**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	4/13/18 11:51
Dissolved Oxygen	**0.270**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	4/13/18 11:51
Fluoride	**0.346**	mg/L	0.0100	0.0500	V	1	EPA 300.0	TMH	4/13/18 20:28
pH	**6.51**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	4/13/18 11:51
REDOX Potential	**-10.3**	mV	-999	-999		1	SM 2580B	RAB	4/13/18 11:51
Total Dissolved Solids	**4000**	mg/L	24.0	40.0		2	SM 2540C	NLT	4/16/18 14:40
Sulfate	**1380**	mg/L	10.0	40.0		20	EPA 300.0	TMH	4/13/18 20:37
Turbidity	**4.26**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	4/13/18 11:51
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	RLC	4/16/18 14:41
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	RLC	4/16/18 6:51
Arsenic	**8.76**	ug/L	0.320	2.00		1	EPA 200.8	RLC	4/16/18 6:51
Cadmium	**0.145**	ug/L	0.100	0.500	V,I	1	EPA 200.8	RLC	4/16/18 6:51
Cobalt	**1.87**	ug/L	0.0400	2.00	V,I	1	EPA 200.8	RLC	4/16/18 6:51
Lead	**0.000236**	mg/L	8.00E-5	0.00200	V,I	1	EPA 200.8	RLC	4/16/18 6:51
Selenium	**2.66**	ug/L	0.200	2.00		1	EPA 200.8	RLC	4/16/18 6:51
Thallium	**0.101**	ug/L	0.100	0.500	V,I	1	EPA 200.8	RLC	4/16/18 6:51
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.0523**	mg/L	0.000500	0.0200		1	EPA 6010B	RLC	4/16/18 8:08
Beryllium	0.200	ug/L	0.200	2.00	U	1	EPA 6010B	RLC	4/16/18 8:08
Boron	**36.9**	mg/L	0.0100	0.0500		1	EPA 6010B	RLC	4/16/18 8:08
Calcium	**694000**	ug/L	30.0	1000	V	1	EPA 6010B	RLC	4/16/18 6:37
Chromium	**3.90**	ug/L	1.60	12.0	I	1	EPA 6010B	RLC	4/16/18 8:08
Molybdenum	**8.65**	ug/L	1.00	20.0	I	1	EPA 6010B	RLC	4/16/18 8:08
KNL Laboratory									
Radium - 226									
Rad - 226	**32.2**	pCi/L	0.5	0.5		1	EPA 903.0	KL1	4/26/18 12:20
Rad - 226 Counting Error +/-	**1.8**	pCi/L				1	EPA 903.0	KL1	4/26/18 12:20
Radium - 228									
Rad - 228	**4.1**	pCi/L	0.7	0.7		1	EPA Ra-05	KL1	4/26/18 11:32
Rad - 228 Counting Error +/-	**0.7**	pCi/L				1	EPA Ra-05	KL1	4/26/18 11:32

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Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-04**

Sample Description: BBS-CCR-BW1

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 11:51

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**36.3**	pCi/L	0.7	0.7		1	Calc	KL1	4/26/18 12:20
Rad-226/228 Counting Error +/-	**1.8**	pCi/L				1	Calc	KL1	4/26/18 12:20
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.026**	mg/L	0.0010	0.050	I	1	6010B Z01	GESP	4/19/18 14:42

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TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

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Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-05**

Sample Description: BBS-CCR-BW2

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 11:02

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**83.2**	mg/L	0.0200	0.500	V	1	EPA 300.0	TMH	4/13/18 20:47
Specific Conductance	**1590**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	4/13/18 11:02
Dissolved Oxygen	**0.610**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	4/13/18 11:02
Fluoride	**0.457**	mg/L	0.0100	0.0500	V	1	EPA 300.0	TMH	4/13/18 20:47
pH	**6.69**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	4/13/18 11:02
REDOX Potential	**-36.3**	mV	-999	-999		1	SM 2580B	RAB	4/13/18 11:02
Total Dissolved Solids	**1190**	mg/L	24.0	40.0		2	SM 2540C	NLT	4/16/18 14:40
Sulfate	**458**	mg/L	10.0	40.0		20	EPA 300.0	TMH	4/13/18 20:56
Turbidity	**17.3**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	4/13/18 11:02
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	RLC	4/16/18 14:45
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	RLC	4/16/18 7:08
Arsenic	**4.63**	ug/L	0.320	2.00		1	EPA 200.8	RLC	4/16/18 7:08
Cadmium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	RLC	4/16/18 7:08
Cobalt	**0.247**	ug/L	0.0400	2.00	V,I	1	EPA 200.8	RLC	4/16/18 7:08
Lead	**0.000112**	mg/L	8.00E-5	0.00200	V,I	1	EPA 200.8	RLC	4/16/18 7:08
Selenium	**0.666**	ug/L	0.200	2.00	I	1	EPA 200.8	RLC	4/16/18 7:08
Thallium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	RLC	4/16/18 7:08
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.0469**	mg/L	0.000500	0.0200		1	EPA 6010B	RLC	4/16/18 8:10
Beryllium	0.200	ug/L	0.200	2.00	U	1	EPA 6010B	RLC	4/16/18 8:10
Boron	**2.93**	mg/L	0.0100	0.0500		1	EPA 6010B	RLC	4/16/18 8:10
Calcium	**297000**	ug/L	30.0	1000	V	1	EPA 6010B	RLC	4/16/18 6:44
Chromium	1.60	ug/L	1.60	12.0	U	1	EPA 6010B	RLC	4/16/18 8:10
Molybdenum	**3.28**	ug/L	1.00	20.0	I	1	EPA 6010B	RLC	4/16/18 8:10
KNL Laboratory									
Radium - 226									
Rad - 226	**4.6**	pCi/L	0.4	0.4		1	EPA 903.0	KL1	4/26/18 12:20
Rad - 226 Counting Error +/-	**0.7**	pCi/L				1	EPA 903.0	KL1	4/26/18 12:20
Radium - 228									
Rad - 228	0.7	pCi/L	0.7	0.7	U	1	EPA Ra-05	KL1	4/26/18 11:32
Rad - 228 Counting Error +/-	**0.4**	pCi/L				1	EPA Ra-05	KL1	4/26/18 11:32

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Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D079-05**

Sample Description: BBS-CCR-BW2

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/13/18 11:02

Date of Sample Receipt: 4/13/18 14:43

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**4.7**	pCi/L	0.7	0.7		1	Calc	KL1	4/26/18 12:20
Rad-226/228 Counting Error +/-	**0.7**	pCi/L				1	Calc	KL1	4/26/18 12:20
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.0099**	mg/L	0.0010	0.050	I	1	6010B Z01	GESP	4/19/18 14:46

Comments

U	Indicates that the compound was analyzed for but not detected.
J-	The reported value is an estimated value, see the case narrative for specifics.
I	Estimated value
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
V	Analyte detected in the method blank

Subcontract Laboratories:

KNL Laboratory	E84025
TestAmerica Pensacola	E81010

Total Recoverable Metals by SW846 Method 6010B - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18D0095 - EPA 6010B											
Blank (18D0095-BLK1)					Prepared: 04/13/18 Analyzed: 04/16/18						
Barium	0.000500	0.000500	0.0200	mg/L							U
Beryllium	0.200	0.200	2.00	ug/L							U
Boron	0.0100	0.0100	0.0500	mg/L							U
Calcium	184	30.0	1000	ug/L							I
Chromium	1.60	1.60	12.0	ug/L							U
Molybdenum	1.00	1.00	20.0	ug/L							U
LCS (18D0095-BS1)					Prepared: 04/13/18 Analyzed: 04/16/18						
Barium	1.01	0.000500	0.0200	mg/L	1.0000		101	80-120			
Beryllium	1020	0.200	2.00	ug/L	1000.0		102	80-120			
Boron	1.07	0.0100	0.0500	mg/L	1.0000		107	80-120			
Chromium	1060	1.60	12.0	ug/L	1000.0		106	80-120			
Molybdenum	1000	1.00	20.0	ug/L	1000.0		100	80-120			
Matrix Spike (18D0095-MS1)			**Source: L18D075-02**		Prepared: 04/13/18 Analyzed: 04/16/18						
Barium	2.08	0.000500	0.0200	mg/L	2.0000	U	104	75-125			
Beryllium	2100	0.200	2.00	ug/L	2000.0	U	105	75-125			
Boron	2.21	0.0100	0.0500	mg/L	2.0000	U	111	75-125			
Chromium	2160	1.60	12.0	ug/L	2000.0	U	108	75-125			
Molybdenum	1020	1.00	20.0	ug/L	1000.0	U	102	75-125			
Matrix Spike Dup (18D0095-MSD1)			**Source: L18D075-02**		Prepared: 04/13/18 Analyzed: 04/16/18						
Barium	1.97	0.000500	0.0200	mg/L	2.0000	U	98.3	75-125	5.59	20	
Beryllium	1970	0.200	2.00	ug/L	2000.0	U	98.5	75-125	6.24	20	
Boron	2.10	0.0100	0.0500	mg/L	2.0000	U	105	75-125	5.09	20	
Chromium	2050	1.60	12.0	ug/L	2000.0	U	103	75-125	5.28	20	
Molybdenum	1000	1.00	20.0	ug/L	1000.0	U	100	75-125	1.33	20	

Total Mercury by SW846 Method 7470/7471 - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18D0103 - EPA 7470A											
Blank (18D0103-BLK1)					Prepared & Analyzed: 04/16/18						
Mercury	0.0500	0.0500	0.200	ug/L							U
LCS (18D0103-BS1)					Prepared & Analyzed: 04/16/18						
Mercury	1.14	0.0500	0.200	ug/L	1.0000		114	80-120			
Matrix Spike (18D0103-MS1)		**Source: L18D079-05**			Prepared & Analyzed: 04/16/18						
Mercury	1.08	0.0500	0.200	ug/L	1.0000	U	108	75-125			
Matrix Spike Dup (18D0103-MSD1)		**Source: L18D079-05**			Prepared & Analyzed: 04/16/18						
Mercury	1.15	0.0500	0.200	ug/L	1.0000	U	115	75-125	6.53	20	

Total Recoverable Metals by 200 Series - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18D0100 - EPA 200.8											
Blank (18D0100-BLK1)					Prepared: 04/13/18 Analyzed: 04/16/18						
Antimony	0.600	0.600	2.00	ug/L							U
Arsenic	0.320	0.320	2.00	ug/L							U
Cadmium	0.392	0.100	0.500	ug/L							I
Cobalt	0.344	0.0400	2.00	ug/L							I
Lead	0.000543	8.00E-5	0.00200	mg/L							I
Selenium	0.200	0.200	2.00	ug/L							U
Thallium	0.330	0.100	0.500	ug/L							I
LCS (18D0100-BS1)					Prepared: 04/13/18 Analyzed: 04/16/18						
Antimony	103	0.600	2.00	ug/L	100.00		103	85-115			
Arsenic	103	0.320	2.00	ug/L	100.00		103	85-115			
Cadmium	103	0.100	0.500	ug/L	100.00		103	85-115			V
Cobalt	102	0.0400	2.00	ug/L	100.00		102	85-115			V
Lead	0.107	8.00E-5	0.00200	mg/L	0.10000		107	85-115			V
Selenium	99.7	0.200	2.00	ug/L	100.00		99.7	85-115			
Thallium	107	0.100	0.500	ug/L	100.00		107	85-115			V
Matrix Spike (18D0100-MS1)		**Source: L18D079-01**			Prepared: 04/13/18 Analyzed: 04/16/18						
Antimony	99.9	0.600	2.00	ug/L	100.00	U	99.9	70-130			
Arsenic	93.1	0.320	2.00	ug/L	100.00	8.44	84.6	70-130			
Cadmium	79.5	0.100	0.500	ug/L	100.00	0.250	79.2	70-130			V
Cobalt	87.6	0.0400	2.00	ug/L	100.00	0.522	87.0	70-130			V
Lead	0.0886	8.00E-5	0.00200	mg/L	0.10000	0.000328	88.3	70-130			V
Selenium	79.8	0.200	2.00	ug/L	100.00	0.908	78.9	70-130			
Thallium	92.8	0.100	0.500	ug/L	100.00	U	92.8	70-130			V
Matrix Spike Dup (18D0100-MSD1)		**Source: L18D079-01**			Prepared: 04/13/18 Analyzed: 04/16/18						
Antimony	99.4	0.600	2.00	ug/L	100.00	U	99.4	70-130	0.437	20	
Arsenic	94.4	0.320	2.00	ug/L	100.00	8.44	86.0	70-130	1.44	20	
Cadmium	82.3	0.100	0.500	ug/L	100.00	0.250	82.0	70-130	3.44	20	V
Cobalt	89.5	0.0400	2.00	ug/L	100.00	0.522	89.0	70-130	2.25	20	V
Lead	0.0895	8.00E-5	0.00200	mg/L	0.10000	0.000328	89.2	70-130	1.03	20	V
Selenium	81.6	0.200	2.00	ug/L	100.00	0.908	80.7	70-130	2.26	20	
Thallium	92.9	0.100	0.500	ug/L	100.00	U	92.9	70-130	0.0464	20	V

General Chemistry Parameters - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18D0099 - EPA 300.0											
Blank (18D0099-BLK1)					Prepared & Analyzed: 04/13/18						
Chloride	0.0647	0.0200	0.500	mg/L							I
Fluoride	0.0171	0.0100	0.0500	mg/L							I
Sulfate	0.500	0.500	2.00	mg/L							U
LCS (18D0099-BS1)					Prepared & Analyzed: 04/13/18						
Chloride	5.14	0.0200	0.500	mg/L	5.0000		103	90-110			V
Fluoride	5.29	0.0100	0.0500	mg/L	5.0000		106	90-110			V
Sulfate	5.10	0.500	2.00	mg/L	5.0000		102	90-110			
Matrix Spike (18D0099-MS1)		**Source: L18D002-01**			Prepared & Analyzed: 04/13/18						
Chloride	312	0.200	5.00	mg/L	50.000	272	80.4	90-110			J-,V
Fluoride	55.4	0.100	0.500	mg/L	50.000	1.80	107	90-110			V
Sulfate	803	5.00	20.0	mg/L	50.000	785	36.7	90-110			
Matrix Spike (18D0099-MS2)		**Source: L18D079-01**			Prepared & Analyzed: 04/13/18						
Chloride	800	0.400	10.0	mg/L	100.00	714	86.2	90-110			J-,V
Fluoride	109	0.200	1.00	mg/L	100.00	0.210	109	90-110			V
Sulfate	1340	10.0	40.0	mg/L	100.00	1290	55.8	90-110			J-
Matrix Spike Dup (18D0099-MSD1)		**Source: L18D002-01**			Prepared & Analyzed: 04/13/18						
Chloride	314	0.200	5.00	mg/L	50.000	272	84.4	90-110	0.644	20	J-,V
Fluoride	55.7	0.100	0.500	mg/L	50.000	1.80	108	90-110	0.689	20	V
Sulfate	805	5.00	20.0	mg/L	50.000	785	39.6	90-110	0.181	20	
Matrix Spike Dup (18D0099-MSD2)		**Source: L18D079-01**			Prepared & Analyzed: 04/13/18						
Chloride	796	0.400	10.0	mg/L	100.00	714	82.3	90-110	0.491	20	J-,V
Fluoride	110	0.200	1.00	mg/L	100.00	0.210	110	90-110	0.838	20	V
Sulfate	1340	10.0	40.0	mg/L	100.00	1290	49.7	90-110	0.448	20	J-

General Chemistry Parameters - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18D0106 - SM 2540C											
Blank (18D0106-BLK1)					Prepared & Analyzed: 04/16/18						
Total Dissolved Solids	12.0	12.0	20.0	mg/L							U
LCS (18D0106-BS1)					Prepared & Analyzed: 04/16/18						
Total Dissolved Solids	996	12.0	20.0	mg/L	1000.0		99.6	80-120			
Duplicate (18D0106-DUP1)			**Source: L18D023-01**		Prepared & Analyzed: 04/16/18						
Total Dissolved Solids	342	12.0	20.0	mg/L		348			1.74	10	
Duplicate (18D0106-DUP2)			**Source: L18D079-01**		Prepared & Analyzed: 04/16/18						
Total Dissolved Solids	3160	24.0	40.0	mg/L		3230			2.44	10	

Tampa Electric Laboratory Services

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Metals (ICP) - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 394328 - 6010B Z01											
Blank (394603-42)					Prepared: 04/18/18 Analyzed: 04/19/18						
Lithium	0.0010	0.0010	0.050	mg/L				-			U
LCS (394603-43)					Prepared: 04/18/18 Analyzed: 04/19/18						
Lithium	1.05	0.0010	0.050	mg/L	1.00		105	80-120			
Matrix Spike (394603-48)			**Source: 400-394603-45**		Prepared: 04/18/18 Analyzed: 04/19/18						
Lithium	1.40	0.0010	0.050	mg/L	1.00		110	75-125			
Matrix Spike Dup (394603-49)			**Source: 400-394603-45**		Prepared: 04/18/18 Analyzed: 04/19/18						
Lithium	1.41	0.0010	0.050	mg/L	1.00		111	75-125	1	20	

Tampa Electric Company, Laboratory Services

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Peggy Penner, Manager, Laboratory Services

Laboratory Services certifies that the test result in this report meet all requirements of the latest promulgated TNI standards, unless indicated otherwise in the body of the report. Unless otherwise noted, all methods followed are per the most current published version of 40 CFR Part 136, Table B. Results reported on this report pertain to the above referenced sample only.

Site: **Big Bend** Date: 04/13/18 File Name: 041318_Wells_RAB Weather: Clear & Hot Sampler(s) / Initials RAB /TECO Initials RAB

LIMS #	Loction Code	Time	FE^2	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L18D079-01 A	BBS-CCR-1	13:23		6.83	24.90	4167	0.11	3.76	-61.60		Lt. Yellow	None		
L18D079-02 A	BBS-CCR-2	12:51		6.86	24.60	1365	0.20	2.96	-92.00		Lt Yellow	Mild		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L18D079-01 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	10
L18D079-02 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)		Samples On Ice	Sample Reciept
ESS 0121301C	ESS 0218201Y	ESS 0321301C	ESS	ESS	ESS		☑ Yes ☐ No	Time 14:43

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID	Temp 1.2 C
1L bottles (rads): 5 ml HNO3 to pH <2	L 020807M ☑	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐	
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐	
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 020807M ☑	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	A checked box indicates that the sample was verified to a pH of <2		

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time	Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID: MPM08	L 021961B	7	7.00	8:07			7.03	14:51	Meter ID:	8:26	21.6	236.2	236.2
FDEP FT 1100	L 020460B	10	10.04	8:07	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)				MPM08	14:56	21.6	235.5	236.2
Units: SU	L 020896E	4	4.00	8:07	A checked box indicates ICV / CCV passed				Zobell Sol ID:				

Conductivity Meter Calib.	Standard ID	Std Value	Cal	Time	ICV	Time	CCV	Time	L 020893A				
Meter ID: MPM08	L 019356D	1000	1000	8:16					DO Meter Cal	Time	Temp °C	Reading mg/l	Theo Value mg/l
FDEP FT 1200, Units: uMHOS	L 020249C	10000			9745	8:22	9730	14:53	Meter ID:	7:59	21.9	8.80	8.761

Turbidity Meter Calibration	Standard ID	Std Value	Acceptability Range		ICV	Time	CCV	Time	MPM08	15:09	22.7	8.54	8.627
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.66	7:58			Barom. Pres				
FDEP FT 1600, Units: NTU	L 019884	52.20	48.81	55.59			52.70	15:02	760				

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID	Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L	MPM08	0.2	5	0.3	10

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026, 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft)	- Depth to Water (ft)	= Water Column (ft)	x Well Capacity (gal)	= 1 Well Volume (gal)	(Tubing Capacity (gal/ft.)	x Tubing Length (ft)	) + Pump Volume (gal)	+ Cell Volume (gal)	= 1 Eqpt Volume (gal)	
BBS-CCR-1	2	10	17.32	22.32	7.40	14.92	0.16	2.39	0.0026	23.3	0	0.06	0.12	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	13:07	320	0.85	0.85	7.48	6.83	24.80	4170	0.16	1.57	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	13:09	320	0.17	1.02	7.48	6.83	24.84	4166	0.12	4.23	Temp°C+/- 0.2	STABLE	Pump:	PP
12:57	13:11	330	0.17	1.19	7.49	6.83	24.90	4167	0.11	3.76	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
13:11											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At	**12:58**	**Gallons to Purge**	**0.12**	Stablility Values =		6.83	24.90	4167	0.11	3.76				

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft)	- Depth to Water (ft)	= Water Column (ft)	x Well Capacity (gal)	= 1 Well Volume (gal)	(Tubing Capacity (gal/ft.)	x Tubing Length (ft)	) + Pump Volume (gal)	+ Cell Volume (gal)	= 1 Eqpt Volume (gal)	
BBS-CCR-2	2	10	16.84	21.84	6.89	14.95	0.16	2.39	0.0026	22.84	0	0.06	0.12	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	12:35	300	0.55	0.55	6.95	6.88	24.50	1366	0.36	4.62	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	12:37	310	0.16	0.71	6.96	6.87	24.54	1360	0.21	3.14	Temp°C+/- 0.2	STABLE	Pump:	PP
12:28	12:39	300	0.16	0.87	6.97	6.86	24.60	1365	0.20	2.96	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
12:39											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At	**12:30**	**Gallons to Purge**	**0.12**	Stablility Values =		6.86	24.60	1365	0.20	2.96				

Comments:

Total Time Total Miles

Site: **Big Bend** Date: 04/13/18 File Name: 041318_Wells_RAB Weather: Clear & Hot Sampler(s) / Initials RAB /TECO Initials RAB

LIMS #	Loction Code	Time	FE^2	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L18D079-03 A	BBS-CCR-3	12:22		6.41	24.06	1811	0.19	3.79	-100.60		Lt Yellow	Mild		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L18D079-03 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	5
	☐				☐	☐	☐	☐	☐	☐	☐	☐	☐	

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)		Samples On Ice	Sample Reciept
ESS 0121301C	ESS 0218201Y	ESS 0321301C	ESS	ESS	ESS		☑ Yes ☐ No	Time 14:43
								Temp 1.2 C

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID
1L bottles (rads): 5 ml HNO3 to pH <2	L 020807M ☑	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 020807M ☑	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	A checked box indicates that the sample was verified to a pH of <2	

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time
Meter ID: MPM08	L 021961B	7	7	8:07			7.03	14:51
FDEP FT 1100	L 020460B	10	10	8:07	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)			
Units: SU	L 020896E	4	4	8:07	A checked box indicates ICV / CCV passed			

Conductivity Meter Calib.	Standard ID	Std Value	Cal	Time	ICV	Time	CCV	Time
Meter ID: MPM08	L 019356D	1000	1000	8:16				
FDEP FT 1200, Units: uMHOS	L 020249C	10000			9745	8:22	9730	14:53

Turbidity Meter Calibration	Standard ID	Std Value	Acceptability Range		ICV	Time	CCV	Time
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.66	7:58		
FDEP FT 1600, Units: NTU	L 019884	52.20	48.81	55.59			52.70	15:02

Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID:	8:26	21.6	236.2	236.2
MPM08	14:56	21.6	235.5	236.2
Zobell Sol ID:				
L 93A				

DO Meter Cal	Time	Temp °C	Reading mg/l	Theo Value mg/l
Meter ID:	7:59	21.9	8.80	8.761
MPM08	15:09	22.7	8.54	8.627
Barom. Pres				
760				

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L

Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
MPM08	0.2	5	0.3	10

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) -	Depth to Water (ft) =	Water Column (ft) x	Well Capacity (gal) =	1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x	Tubing Length (ft)) +	Pump Volume (gal) +	Cell Volume (gal) =	1 Eqpt. Volume (gal)
BBS-CCR-3	2	10	18.23	23.23	6.63	16.60	0.16	2.66	0.0026	24.23	0	0.06	0.12

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	12:09	440	0.70	0.70	7.14	6.42	24.16	1826	0.21	4.19	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	12:11	450	0.24	0.94	7.15	6.42	24.15	1821	0.23	4.36	Temp°C+/- 0.2	STABLE	Pump:	PP
12:03	12:13	450	0.24	1.18	7.15	6.41	24.06	1811	0.19	3.79	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
12:13											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At	**12:04**	**Gallons to Purge**	**0.12**	Stablility Values =		6.41	24.06	1811	0.19	3.79				

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) -	Depth to Water (ft) =	Water Column (ft) x	Well Capacity (gal) =	1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x	Tubing Length (ft)) +	Pump Volume (gal) +	Cell Volume (gal =	1 Eqpt. Volume (gal)
0	2	10	14	18		18.00	0.16	2.88	0.0026	100	0	0.06	0.32

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
											ph:+/- 0.2		Level Meter:	WLM08
Purge Start:											Temp°C+/- 0.2		Pump:	PP
											Cond % +/- 5		Tubing:	PE/S
Purge End:											DO % Sat.< 20		Dedicated ☐	Yes
											Turb. NTU < 20		Tubing? ☐	No
Purge Complete At		**Gallons to Purge**	**0.32**	Stablity Values =										

Comments:

Total Time Total Miles

Site: **Big Bend** Date: 04/13/18 File Name: 041318_Wells_RAB Weather: Clear & Hot Sampler(s) / Initials RAB /TECO Initials RAB

LIMS #	Loction Code	Time	FE²	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L18D079-04 A	BBS-CCR-BW-1	11:51		6.51	27.64	4805	0.27	4.26	-10.30		Clear	None		
L18D079-05 A	BBS-CCR-BW-2	11:02		6.69	24.90	1593	0.61	17.30	-36.30		Lt Yellow	None		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	-36.3	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L18D079-04 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	10
L18D079-05 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)	Samples On Ice	Sample Reciept
ESS 0121301C	ESS 0218201Y	ESS 0321301C	ESS	ESS	ESS	☑ Yes ☐ No	Time 14:43
							Temp 1.2 C

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID
1L bottles (rads): 5 ml HNO3 to pH <2	L 020807M ☐	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 020807M ☐	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	A checked box indicates that the sample was verified to a pH of <2	

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time	Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID: MPM08	L 021961B	7	7	8:07			7.03	14:51	Meter ID:	8:26	21.6	236.2	236.2
FDEP FT 1100	L 020460B	10	10	8:07	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)				MPM08	14:56	21.6	235.5	236.2
Units: SU	L 020896E	4	4	8:07	A checked box indicates ICV / CCV passed				Zobell Sol ID:				
Conductivity Meter Calib.	**Standard ID**	**Std Value**	**Cal**	**Time**	**ICV**	**Time**	**CCV**	**Time**	L 020893A				
Meter ID: MPM08	L 019356D	1000	1000	8:16					**DO Meter Cal**	**Time**	**Temp °C**	**Reading mg/l**	**Theo Value mg/l**
FDEP FT 1200, Units: uMHOS	L 020249C	10000			9745	8:22	9730	14:53	Meter ID:	7:59	21.9	8.80	8.761
Turbidity Meter Calibration	**Standard ID**	**Std Value**	**Acceptability Range**		**ICV**	**Time**	**CCV**	**Time**	MPM08	15:09	22.7	8.54	8.627
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.66	7:58			Barom. Pres				
FDEP FT 1600, Units: NTU	L 019884	52.20	48.81	55.59			52.70	15:02	760				

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID	Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L	MPM08	0.2	5	0.3	10

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) -	Depth to Water (ft) =	Water Column (ft) x	Well Capacity (gal) =	1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x	Tubing Length (ft)) +	Pump Volume (gal) +	Cell Volume (gal) =	1 Eqpt. Volume (gal)	
BBS-CCR-BW-1	2	10	39.3	44.3	29.37	14.93	0.16	2.39	0.0026	100	0	0.06	0.32	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	11:43	930	5.90	5.90	30.40	6.51	27.66	4770	0.28	9.71	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	11:45	950	0.50	6.40	30.41	6.51	27.64	4785	0.27	7.27	Temp°C+/- 0.2	STABLE	Pump:	ESP
11:19	11:47	950	0.50	6.90	30.40	6.51	27.64	4805	0.27	4.26	Cond % +/- 5	STABLE	Tubing:	PE
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☐	Yes
11:47											Turb. NTU < 20	STABLE	Tubing? ☑	No
Purge Complete At	**11:20**	**Gallons to Purge**	**0.32**	Stability Values =		6.51	27.64	4805	0.27	4.26				

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) -	Depth to Water (ft) =	Water Column (ft) x	Well Capacity (gal) =	1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x	Tubing Length (ft)) +	Pump Volume (gal) +	Cell Volume (gal) =	1 Eqpt. Volume (gal)	
BBS-CCR-BW-2	2	10	18.49	23.84	8.02	15.82	0.16	2.53	0.0026	24.64	0	0.06	0.12	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	10:47	330	2.18	2.18	8.19	6.70	24.83	1593	0.71	19.10	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	10:49	320	0.17	2.35	8.18	6.69	24.85	1595	0.65	14.20	Temp°C+/- 0.2	STABLE	Pump:	PP
10:22	10:51	320	0.17	2.52	8.17	6.69	24.90	1593	0.61	17.30	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
10:51											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At	**10:23**	**Gallons to Purge**	**0.12**	Stability Values =		6.69	24.90	1593	0.61	17.30				

Comments:

Total Time Total Miles

GROUNDWATER WELL SAMPLING EQUIPMENT CALIBRATION

Date: 04/13/18 Sampler(s): RAB Initials RAB

pH Meter Calibration		Buffer ID	Buffer Value	Cal	Time
Meter ID: MPM08	L	021961B	7	7.00	8:07
FDEP FT 1100	L	020460B	10	10.04	8:07
Units: SU	L	020896E	4	4.00	8:07
ICV Check	L	020895K	7		

	CCV	Time	Pass/Fail
	7.03	14:51	Pass

QC (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)

ICV	Time	Pass/Fail
7.03	811	Pass

A checked box indicates ICV / CCV passed

Conductivity Meter Calib.		Standard ID	Std Value	Cal	Time
Meter ID: MPM08	L	019356D	1000	1000	8:16
FDEP FT 1200, Units: uMHOS	L	020249C	10000		

ICV	Time	Pass/Fail	CCV	Time	Pass/Fail
9745	8:22	Pass	9730	14:53	Pass

Turbidity Meter Calibration		Standard ID	Std Value	Acceptability Range	
Meter ID: TM07	L	019883	5.56	5.00	6.12
FDEP FT 1600, Units: NTU	L	019884	52.20	48.81	55.59

CCV	Time	Pass/Fail	CCV	Time	Pass/Fail
5.66	7:58	Pass			
			52.70	15:02	Pass

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L

Redox Cal	Time	Temp °C	Reading mv	Theo Value mv	Pass / Fail
Meter ID:	8:26	21.6	236.2	236.2	Pass
MPM08	14:56	21.6	235.5	236.2	Pass
Zobell Sol ID:					
L 020893A					

DO Meter Cal	Time	Temp °C	Reading mg/l	Theo Value mg/l	Pass / Fail
FDEP FT 1500					
Meter ID:	7:59	21.9	8.80	8.761	Pass
MPM08	15:09	22.7	8.54	8.627	Pass
Barom. Pres					
760					

Therm ID	pH	Conduct. %	DO mg/l	Redox mv	CL2
MPM08	0.2	5	0.3	10	0.2

Calibration Criterion

Ferrous Iron Comparator ID: Reagent ID: L-

ClO_2 DPD Check must read +/- 10% of the Calculated Std. Concentration, multiplied by 2.4. Glycene check should read < 0.10 mg/l ClO_2.

Chlorine Dioxide (mg/l)	Std. Conc. (mg/l)	Std. Spike Volume (ml)	Cal Sample Volume (ml)	Calc. Std. Conc. (mg/l)
Meter ID:		1.0	100	
			DPD ID: L	

Initial Calibration Verification ICV				Continuous Calibration Verification CCV			Method 10126*
DPD Check (mg/l)	Glycene Check	Time	Pass/Fail	DPD Check (mg/l)	Time	Pass/Fail	*Equivalent to Standard Methods, 4500 ClO_2 D.
Glycene ID: L		A checked box indicates reagent expiration date has been verified.					

COMMENTS: CL2 Std. ID: L

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

FACILITY NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.
WELL NO:	BBS-CCR-1	SAMPLE ID:	L18D079-01 A
DATE:	4/13/18		

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	1/4	WELL SCREEN INTERVAL (NGVD) DEPTH	12.32	feet to	22.32 (feet)	STATIC DEPTH TO WATER (feet):	7.40	PURGE PUMP TYPE OR BAILER:	PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY

= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME

=(0 gallons + (0.0026 gallons/foot X 23.3 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	17.32	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	17.32	PURGING INITIATED AT:	12:57	PURGING ENDED AT:	13:11	TOTAL VOLUME PURGED (gallons):	1.19

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/l or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
13:07	0.85	0.85	0.09	7.48	6.83	24.80	4170	0.16	1.57	Lt. Yellow	None
13:09	0.17	1.02	0.09	7.48	6.83	24.84	4166	0.12	4.23	Lt. Yellow	None
13:11	0.17	1.19	0.09	7.49	6.83	24.90	4167	0.11	3.76	Lt. Yellow	None

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	RAB TECO	SAMPLER (S) SIGNATURES:		SAMPLING INITIATED AT:	13:11	SAMPLING ENDED AT:	13:23
PUMP OR TUBING DEPTH IN WELL (feet):	17.3	SAMPLE PUMP FLOW RATE (mL per minute):	323	TUBING MATERIAL CODE:	PE/S		
FIELD DECONTAMINATION:	Y ☐ N ☑	FIELD-FILTERED: Filtration Equipment Type	Y ☐ N ☑	FILTER SIZE:	µm	DUPLICATE:	Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.	
WELL NO:	BBS-CCR-2	SAMPLE ID:	L18D079-02 A	DATE: 4/13/18

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	WELL SCREEN INTERVAL DEPTH	STATIC DEPTH TO WATER (feet):	PURGE PUMP TYPE OR BAILER:
	1/4	11.84 feet to 21.84 (feet)	6.89	PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 22.84 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (gallons):
16.84	16.84	12:28	12:39	0.87

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
12:35	0.55	0.55	0.08	6.95	6.88	24.50	1366	0.36	4.62	Lt Yellow	Mild
12:37	0.16	0.71	0.08	6.96	6.87	24.54	1360	0.21	3.14	Lt Yellow	Mild
12:39	0.16	0.87	0.08	6.97	6.86	24.60	1365	0.20	2.96	Lt Yellow	Mild

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER (S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
RAB TECO		12:39	12:51

PUMP OR TUBING DEPTH IN WELL (feet):	SAMPLE PUMP FLOW RATE (mL per minute):	TUBING MATERIAL CODE:
16.8	303	PE/S

FIELD DECONTAMINATION: Y ☐ N ☑
FIELD-FILTERED: Y ☐ N ☑ FILTER SIZE: µm Filtration Equipment Type:
DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.
WELL NO:	BBS-CCR-3	SAMPLE ID:	L18D079-03 A
DATE:	4/13/18		

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	1/4	WELL SCREEN INTERVAL DEPTH	13.23	feet to	23.23 (feet)	STATIC DEPTH TO WATER (feet):	6.63	PURGE PUMP TYPE OR BAILER:	PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 24.23 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	18.23	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	18.23	PURGING INITIATED AT:	12:03	PURGING ENDED AT:	12:13	TOTAL VOLUME PURGED (gallons):	1.18

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
12:09	0.70	0.70	0.12	7.14	6.42	24.16	1826	0.21	4.19	Lt Yellow	Mild
12:11	0.24	0.94	0.12	7.15	6.42	24.15	1821	0.23	4.36	Lt Yellow	Mild
12:13	0.24	1.18	0.12	7.15	6.41	24.06	1811	0.19	3.79	Lt Yellow	Mild

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	RAB TECO	SAMPLER (S) SIGNATURES:		SAMPLING INITIATED AT:	12:13	SAMPLING ENDED AT:	12:22
PUMP OR TUBING DEPTH IN WELL (feet):	18.2	SAMPLE PUMP FLOW RATE (mL per minute):	447	TUBING MATERIAL CODE:	PE/S		
FIELD DECONTAMINATION:	Y ☐ N ☑	FIELD-FILTERED: Filtration Equipment Type:	Y ☐ N ☑	FILTER SIZE:	µm	DUPLICATE:	Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.	
WELL NO:	BBS-CCR-BW-1	SAMPLE ID:	L18D079-04 A	DATE: 4/13/18

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches) 1/4	WELL SCREEN INTERVAL DEPTH 34.30 feet to 44.30 (feet)	STATIC DEPTH TO WATER (feet): 29.37	PURGE PUMP TYPE OR BAILER: ESP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 100 feet) + 0.06 gallons = 0.32 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 39.30	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 39.30	PURGING INITIATED AT: 11:19	PURGING ENDED AT: 11:47	TOTAL VOLUME PURGED (gallons): 6.90

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
11:43	5.90	5.90	0.25	30.40	6.51	27.66	4770	0.28	9.71	Clear	None
11:45	0.50	6.40	0.25	30.41	6.51	27.64	4785	0.27	7.27	Clear	None
11:47	0.50	6.90	0.25	30.40	6.51	27.64	4805	0.27	4.26	Clear	None

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER (S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
RAB TECO		11:47	11:51

PUMP OR TUBING DEPTH IN WELL (feet): 39.3	SAMPLE PUMP FLOW RATE (mL per minute): 943	TUBING MATERIAL CODE: PE	
FIELD DECONTAMINATION: Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type:	FILTER SIZE: µm	DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	ESP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	ESP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	ESP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	**Big Bend**	SITE LOCATION:	**Apollo Beach, FL.**
WELL NO:	**BBS-CCR-BW-2**	SAMPLE ID: **L18D079-05 A**	DATE: **4/13/18**

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches) 1/4	WELL SCREEN INTERVAL DEPTH 13.64 feet to 23.34 (feet)	STATIC DEPTH TO WATER (feet): 8.02	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 24.64 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 18.49	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 18.49	PURGING INITIATED AT: 10:22	**PURGING ENDED AT:** 10:51	TOTAL VOLUME PURGED (gallons): 2.52

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/l or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
10:47	2.18	2.18	0.09	8.19	6.70	24.83	1593	0.71	19.10	Lt Yellow	None
10:49	0.17	2.35	0.09	8.18	6.69	24.85	1595	0.65	14.20	Lt Yellow	None
10:51	0.17	2.52	0.09	8.17	6.69	24.90	1593	0.61	17.30	Lt Yellow	None

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: RAB TECO	SAMPLER (S) SIGNATURES:	SAMPLING INITIATED AT: 10:51	SAMPLING ENDED AT: 11:02
PUMP OR TUBING DEPTH IN WELL (feet): 18.5	SAMPLE PUMP FLOW RATE (mL per minute): 323	TUBING MATERIAL CODE: PE/S	
FIELD DECONTAMINATION: Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type: FILTER SIZE: µm		DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

KNL ENVIRONMENTAL TESTING

DOH Certification #E84025
DEP COMPQAP # 870251

Report Date: May 2, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody:	Client
Client/Field ID:	L18D079-01 BBS-CCR-1
Sample Collection:	04-13-18/1323
Lab ID No:	18.3632
Lab Custody Date:	04-13-18/1520
Sample description:	Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results	Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	34.0 ± 1.6	Calc	Calc	0.7
Radium-226	pCi/l	29.3 ± 1.6	4-25-18/1208	EPA 903.0	0.5
Radium-228	pCi/l	4.7 ± 0.8	4-27-18/1146	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Radium 228 Analysis**

Client Project # : L180079-01

Analysis Completion Date: 4 / 27 / 18

Precision Data:

Sample #: 18.3649

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
3.7	4.1	0.4	10.26

Spike Data:

Sample #: 18.3649

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
0.0	3.94	4.1	104

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
4.0	3.94	102

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.0 +/- 0.2	4 / 27 / 18

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Total Radium Analysis**

Client Project # : 418D079-01

Analysis Completion Date: 4 / 25 / 18

Precision Data:

Sample #: 18.3633

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
17.0	16.1	0.9	5.44

Spike Data:

Sample #: 18.3633

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
11.4	4.5	16.1	104

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
10.2	9.1	112

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.4 +/- 0.2	4 / 25 / 18

KNL ENVIRONMENTAL TESTING

DOH Certification #E84025
DEP COMPQAP # 870251

Report Date: May 2, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody:	Client
Client/Field ID:	L18D079-03 BBS-CCR-3
Sample Collection:	04-13-18/1222
Lab ID No:	18.3634
Lab Custody Date:	04-13-18/1520
Sample description:	Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results	Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	19.9 ± 1.4	Calc	Calc	0.7
Radium-226	pCi/l	19.3 ± 1.4	4-26-18/1220	EPA 903.0	0.5
Radium-228	pCi/l	0.6 ± 0.5	4-26-18/1132	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

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813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Total Radium Analysis**

Client Project # : L18D079-03

Analysis Completion Date: 4 / 26 / 18

Precision Data:

Sample #: 18.3650

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
4.9	6.0	1.1	20.18

Spike Data:

Sample #: 18.3650

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
0.4	4.5	4.9	100

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
10.1	9.1	111

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.1 +/- 0.1	4 / 26 / 18

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Radium 228 Analysis**

Client Project # : L180079-03

Analysis Completion Date: 4 / 25 / 18

Precision Data:

Sample #: 183636

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
4.4	4.6	0.2	4.44

Spike Data:

Sample #: 183636

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
0.0	3.94	4.4	112

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
4.0	3.94	102

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.0 +/- 0.2	4 / 25 / 18

KNL ENVIRONMENTAL TESTING

DOH Certification #E84025
DEP COMPQAP # 870251

Report Date: May 2, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody:	Client
Client/Field ID:	L18D079-04 BBS-CCR-BW1
Sample Collection:	04-13-18/1151
Lab ID No:	18.3635
Lab Custody Date:	04-13-18/1520
Sample description:	Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results			Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	36.3	±	1.8	Calc	Calc	0.7
Radium-226	pCi/l	32.2	±	1.8	4-26-18/1220	EPA 903.0	0.5
Radium-228	pCi/l	4.1	±	0.7	4-26-18/1132	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Total Radium Analysis**

Client Project # : L18D079-04

Analysis Completion Date: 4 / 26 / 18

Precision Data:

Sample #: 18.3650

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
4.9	6.0	1.1	20.18

Spike Data:

Sample #: 18.3650

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
0.4	4.5	4.9	100

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
10.1	9.1	111

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.1 +/- 0.1	4 / 26 / 18

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Radium 228 Analysis**

Client Project # : L18D079-04

Analysis Completion Date: 4 / 26 / 18

Precision Data:

Sample #: 18.3636

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
4.4	4.6	0.2	4.44

Spike Data:

Sample #: 18.3636

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
0.0	3.94	4.4	112

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
4.0	3.94	102

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.0 +/- 0.2	4 / 26 / 18

SUBCONTRACT ORDER

Tampa Electric Company, Laboratory Services

L18D079

SENDING LABORATORY:

Tampa Electric Company, Laboratory Services
5012 Causeway Blvd
Tampa, FL 33619
Phone: (813) 630-7490
Fax: (813) 630-7360
Project Manager: Peggy Penner

RECEIVING LABORATORY:

KNL Laboratory Services
3202 N. Florida Ave.
Tampa, FL 33603
Phone :(813) 229-2879
Fax: -

Due Date: 04/20/18 16:00

Analysis	Expires	Laboratory ID	Comments
Sample ID: L18D079-01 BBS-CCR-1		**Water**	
Sampled: 04/13/18 13:23		18-3632	
Radium 226+228, Total	10/10/18 13:23	Level 2 Data requred	
Radium 226 EPA 903.0	10/10/18 13:23	Level 2 Data requred	
Radium 228 Ra-05	10/10/18 13:23	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		
Sample ID: L18D079-02 BBS-CCR-2		**Water**	
Sampled: 04/13/18 12:51		18-3633	SAMPLE LOST JS
Radium 228 Ra-05	10/10/18 12:51	Level 2 Data requred	
Radium 226+228, Total	10/10/18 12:51	Level 2 Data requred	
Radium 226 EPA 903.0	10/10/18 12:51	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		
Sample ID: L18D079-03 BBS-CCR-3		**Water**	
Sampled: 04/13/18 12:22		18-3634	
Radium 228 Ra-05	10/10/18 12:22	Level 2 Data requred	
Radium 226+228, Total	10/10/18 12:22	Level 2 Data requred	
Radium 226 EPA 903.0	10/10/18 12:22	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		
Sample ID: L18D079-04 BBS-CCR-BW1		**Water**	
Sampled: 04/13/18 11:51		18-3635	
Radium 228 Ra-05	10/10/18 11:51	Level 2 Data requred	
Radium 226+228, Total	10/10/18 11:51	Level 2 Data requred	
Radium 226 EPA 903.0	10/10/18 11:51	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		

Released By	Date & Time	Received By	Date & Time
Eric Wann	4/13/18	KNL DR	04/13/18 1520
Released By	Date & Time	Received By	Date & Time

KNL ENVIRONMENTAL TESTING

DOH Certification #E84025
DEP COMPQAP # 870251

Report Date: May 2, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody:	Client
Client/Field ID:	L18D079-05 BBS-CCR-BW2
Sample Collection:	04-13-18/1102
Lab ID No:	18.3636
Lab Custody Date:	04-13-18/1520
Sample description:	Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results			Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	4.7	±	0.7	Calc	Calc	0.7
Radium-226	pCi/l	4.6	±	0.7	4-26-18/1220	EPA 903.0	0.4
Radium-228	pCi/l	0.0	±	0.4	4-26-18/1132	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Total Radium Analysis**

Client Project # : LB0079-05

Analysis Completion Date: 4 / 26 / 18

Precision Data:

Sample #: 18.3650

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
4.9	6.0	1.1	20.18

Spike Data:

Sample #: 18,3650

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
0.4	4.5	4.9	100

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
10.1	9.1	111

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.1 +/- 0.1	4 / 26 / 18

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Radium 228 Analysis**

Client Project # : L18D079-05

Analysis Completion Date: 4 / 26 / 18

Precision Data:

Sample #: 18.3635

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
4.4	4.6	0.2	4.44

Spike Data:

Sample #: 18.3636

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
0.0	3.94	4.4	112

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
4.0	3.94	102

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.0 +/- 0.2	4 / 25 / 18

SUBCONTRACT ORDER

Tampa Electric Company, Laboratory Services

L18D079

Analysis	Expires	Laboratory ID	Comments
Sample ID: L18D079-05 BBS-CCR-BW2		**Water** 18-3636	
Sampled: 04/13/18 11:02			
Radium 228 Ra-05	10/10/18 11:02	Level 2 Data requred	
Radium 226+228, Total	10/10/18 11:02	Level 2 Data requred	
Radium 226 EPA 903.0	10/10/18 11:02	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		

Released By	Date & Time	Received By	Date & Time
Erin Warren	4-13-18	KNK RS	04-13-18 1520
Released By	Date & Time	Received By	Date & Time

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Tampa
6712 Benjamin Road
Suite 100
Tampa, FL 33634
Tel: (813)885-7427

TestAmerica Job ID: 660-86743-1
Client Project/Site: L18D079

For:
Tampa Electric Company
5012 Causeway Boulevard
Tampa, Florida 33619

Attn: Ms. Peggy Penner

Authorized for release by:
4/20/2018 7:11:19 PM

Keaton Conner, Project Manager I
(813)885-7427
keaton.conner@testamericainc.com

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Sample Summary

Client: Tampa Electric Company
Project/Site: L18D079

TestAmerica Job ID: 660-86743-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
660-86743-1	L18D079-01	Water	04/13/18 13:23	04/16/18 12:00
660-86743-2	L18D079-02	Water	04/13/18 12:51	04/16/18 12:00
660-86743-3	L18D079-03	Water	04/13/18 12:22	04/16/18 12:00
660-86743-4	L18D079-04	Water	04/13/18 11:51	04/16/18 12:00
660-86743-5	L18D079-05	Water	04/13/18 11:02	04/16/18 12:00

Definitions/Glossary

Client: Tampa Electric Company
Project/Site: L18D079

TestAmerica Job ID: 660-86743-1

Qualifiers

Metals

Qualifier	Qualifier Description
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
U	Indicates that the compound was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 660-86743-1

Laboratory: TestAmerica Tampa

Narrative

CASE NARRATIVE

Client: Tampa Electric Company

Project: L18D079

Report Number: 660-86743-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In the event of interference or analytes present at high concentrations, samples may be diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

RECEIPT

The samples were received on 4/16/2018 12:00 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.8º C.

TOTAL METALS (ICP)

Samples L18D079-01 BBS-CCR-1 (660-86743-1), L18D079-02 BBS-CCR-2 (660-86743-2), L18D079-03 BBS-CCR-3 (660-86743-3), L18D079-04 BBS-CCR-BW1 (660-86743-4) and L18D079-05 BBS-CCR-BW2 (660-86743-5) were analyzed for total metals (ICP) in accordance with EPA SW-846 Method 6010B. The samples were prepared on 04/18/2018 and analyzed on 04/19/2018.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Detection Summary

Client: Tampa Electric Company
Project/Site: L18D079

TestAmerica Job ID: 660-86743-1

Client Sample ID: L18D079-01 — Lab Sample ID: 660-86743-1

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.022	I	0.050	0.0010	mg/L	1		6010B	Total/NA

Client Sample ID: L18D079-02 — Lab Sample ID: 660-86743-2

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.017	I	0.050	0.0010	mg/L	1		6010B	Total/NA

Client Sample ID: L18D079-03 — Lab Sample ID: 660-86743-3

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.015	I	0.050	0.0010	mg/L	1		6010B	Total/NA

Client Sample ID: L18D079-04 — Lab Sample ID: 660-86743-4

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.026	I	0.050	0.0010	mg/L	1		6010B	Total/NA

Client Sample ID: L18D079-05 — Lab Sample ID: 660-86743-5

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0099	I	0.050	0.0010	mg/L	1		6010B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Tampa Electric Company
Project/Site: L18D079

TestAmerica Job ID: 660-86743-1

Client Sample ID: L18D079-01
Lab Sample ID: 660-86743-1
Date Collected: 04/13/18 13:23
Matrix: Water
Date Received: 04/16/18 12:00

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.022	I	0.050	0.0010	mg/L		04/18/18 11:28	04/19/18 14:32	1

Client Sample ID: L18D079-02
Lab Sample ID: 660-86743-2
Date Collected: 04/13/18 12:51
Matrix: Water
Date Received: 04/16/18 12:00

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.017	I	0.050	0.0010	mg/L		04/18/18 11:28	04/19/18 14:36	1

Client Sample ID: L18D079-03
Lab Sample ID: 660-86743-3
Date Collected: 04/13/18 12:22
Matrix: Water
Date Received: 04/16/18 12:00

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.015	I	0.050	0.0010	mg/L		04/18/18 11:28	04/19/18 14:39	1

Client Sample ID: L18D079-04
Lab Sample ID: 660-86743-4
Date Collected: 04/13/18 11:51
Matrix: Water
Date Received: 04/16/18 12:00

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.026	I	0.050	0.0010	mg/L		04/18/18 11:28	04/19/18 14:42	1

Client Sample ID: L18D079-05
Lab Sample ID: 660-86743-5
Date Collected: 04/13/18 11:02
Matrix: Water
Date Received: 04/16/18 12:00

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0099	I	0.050	0.0010	mg/L		04/18/18 11:28	04/19/18 14:46	1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 400-394328/1-A
Matrix: Water
Analysis Batch: 394603

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 394328

Analyte	MB Result	MB Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0010	U	0.050	0.0010	mg/L		04/18/18 11:28	04/19/18 13:37	1

Lab Sample ID: LCS 400-394328/2-A
Matrix: Water
Analysis Batch: 394603

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 394328

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	1.00	1.05		mg/L		105	80 - 120

Lab Sample ID: 400-152010-J-2-K MS
Matrix: Water
Analysis Batch: 394603

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 394328

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lithium	0.30		1.00	1.40		mg/L		110	75 - 125

Lab Sample ID: 400-152010-J-2-L MSD
Matrix: Water
Analysis Batch: 394603

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 394328

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	0.30		1.00	1.41		mg/L		111	75 - 125	1	20

QC Association Summary

Client: Tampa Electric Company
Project/Site: L18D079

TestAmerica Job ID: 660-86743-1

Metals

Prep Batch: 394328

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
660-86743-1	L18D079-01	Total/NA	Water	3010A	
660-86743-2	L18D079-02	Total/NA	Water	3010A	
660-86743-3	L18D079-03	Total/NA	Water	3010A	
660-86743-4	L18D079-04	Total/NA	Water	3010A	
660-86743-5	L18D079-05	Total/NA	Water	3010A	
MB 400-394328/1-A	Method Blank	Total/NA	Water	3010A	
LCS 400-394328/2-A	Lab Control Sample	Total/NA	Water	3010A	
400-152010-J-2-K MS	Matrix Spike	Total/NA	Water	3010A	
400-152010-J-2-L MSD	Matrix Spike Duplicate	Total/NA	Water	3010A	

Analysis Batch: 394603

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
660-86743-1	L18D079-01	Total/NA	Water	6010B	394328
660-86743-2	L18D079-02	Total/NA	Water	6010B	394328
660-86743-3	L18D079-03	Total/NA	Water	6010B	394328
660-86743-4	L18D079-04	Total/NA	Water	6010B	394328
660-86743-5	L18D079-05	Total/NA	Water	6010B	394328
MB 400-394328/1-A	Method Blank	Total/NA	Water	6010B	394328
LCS 400-394328/2-A	Lab Control Sample	Total/NA	Water	6010B	394328
400-152010-J-2-K MS	Matrix Spike	Total/NA	Water	6010B	394328
400-152010-J-2-L MSD	Matrix Spike Duplicate	Total/NA	Water	6010B	394328

Lab Chronicle

Client: Tampa Electric Company
Project/Site: L18D079

TestAmerica Job ID: 660-86743-1

Client Sample ID: L18D079-01
Date Collected: 04/13/18 13:23
Date Received: 04/16/18 12:00

Lab Sample ID: 660-86743-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	394328	04/18/18 11:28	KWN	TAL PEN
Total/NA	Analysis	6010B		1			394603	04/19/18 14:32	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Client Sample ID: L18D079-02
Date Collected: 04/13/18 12:51
Date Received: 04/16/18 12:00

Lab Sample ID: 660-86743-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	394328	04/18/18 11:28	KWN	TAL PEN
Total/NA	Analysis	6010B		1			394603	04/19/18 14:36	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Client Sample ID: L18D079-03
Date Collected: 04/13/18 12:22
Date Received: 04/16/18 12:00

Lab Sample ID: 660-86743-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	394328	04/18/18 11:28	KWN	TAL PEN
Total/NA	Analysis	6010B		1			394603	04/19/18 14:39	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Client Sample ID: L18D079-04
Date Collected: 04/13/18 11:51
Date Received: 04/16/18 12:00

Lab Sample ID: 660-86743-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	394328	04/18/18 11:28	KWN	TAL PEN
Total/NA	Analysis	6010B		1			394603	04/19/18 14:42	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Client Sample ID: L18D079-05
Date Collected: 04/13/18 11:02
Date Received: 04/16/18 12:00

Lab Sample ID: 660-86743-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	394328	04/18/18 11:28	KWN	TAL PEN
Total/NA	Analysis	6010B		1			394603	04/19/18 14:46	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Accreditation/Certification Summary

Client: Tampa Electric Company
Project/Site: L18D079

TestAmerica Job ID: 660-86743-1

Laboratory: TestAmerica Tampa

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Florida	NELAP	4	E84282	06-30-18

Laboratory: TestAmerica Pensacola

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Florida	NELAP	4	E81010	06-30-18

Method Summary

Client: Tampa Electric Company
Project/Site: L18D079

TestAmerica Job ID: 660-86743-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL PEN
3010A	Preparation, Total Metals	SW846	TAL PEN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

SUBCONTRACT ORDER

Tampa Electric Company, Laboratory Services

L18D079

SENDING LABORATORY:

Tampa Electric Company, Laboratory Services
5012 Causeway Blvd
Tampa, FL 33619
Phone: (813) 630-7490
Fax: (813) 630-7360
Project Manager: Peggy Penner

RECEIVING LABORATORY:

TestAmerica Laboratories, Inc. - Tampa
6712 Benjamin Rd., Suite 100
Tampa, FL 33634
Phone :(813) 885-7427
Fax: -

Due Date: 04/20/18 16:00

Analysis	Expires		Laboratory ID	Comments
Sample ID: L18D079-01 **BBS-CCR-1**		**Water**		
Sampled: 04/13/18 13:23				
Lithium, Total EPA 6010	10/10/18 13:23			
Containers Supplied:				
Poly HNO3 - 250mL (A)				
Sample ID: L18D079-02 **BBS-CCR-2**		**Water**		
Sampled: 04/13/18 12:51				
Lithium, Total EPA 6010	10/10/18 12:51			
Containers Supplied:				
Poly HNO3 - 250mL (A)				
Sample ID: L18D079-03 **BBS-CCR-3**		**Water**		
Sampled: 04/13/18 12:22				
Lithium, Total EPA 6010	10/10/18 12:22			
Containers Supplied:				
Poly HNO3 - 250mL (A)				
Sample ID: L18D079-04 **BBS-CCR-BW1**		**Water**		
Sampled: 04/13/18 11:51				
Lithium, Total EPA 6010	10/10/18 11:51			
Containers Supplied:				
Poly HNO3 - 250mL (A)				
Sample ID: L18D079-05 **BBS-CCR-BW2**		**Water**		
Sampled: 04/13/18 11:02				
Lithium, Total EPA 6010	10/10/18 11:02			
Containers Supplied:				
Poly HNO3 - 250mL (A)				

660-86743 Chain of Custody

Loc: 660
86743

Released By	Date & Time	Received By	Date & Time
[signature]	4-13-18	[signature]	4-16-18@ 1200
Released By	Date & Time	Received By	Date & Time
			1.2/1.8 cw09

TestAmerica Tampa
6712 Benjamin Road Suite 100
Tampa, FL 33634
Phone (813) 885-7427 Fax (813) 885-7049

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Conner, Keaton	Carrier Tracking No(s):	COC No: 660-104271.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: keaton.conner@testamericainc.com	State of Origin: Florida	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Florida; NELAP - Texas		Job #: 660-86743-1
Address: 3355 McLemore Drive, ,	Due Date Requested: 4/19/2018			
City: Pensacola	TAT Requested (days):			
State, Zip: FL, 32514				
Phone: 850-474-1001(Tel) 850-478-2671(Fax)	PO #:			
Email:	WO #:			
Project Name: L18A	Project #: 66004821			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2O3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - pH 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010B/3010A Lithium	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
L18D079-01 BBS-CCR-1 (660-86743-1)	4/13/18	13:23 Eastern		Water			X	1	
L18D079-02 BBS-CCR-2 (660-86743-2)	4/13/18	12:51 Eastern		Water			X	1	
L18D079-03 BBS-CCR-3 (660-86743-3)	4/13/18	12:22 Eastern		Water			X	1	
L18D079-04 BBS-CCR-BW1 (660-86743-4)	4/13/18	11:51 Eastern		Water			X	1	
L18D079-05 BBS-CCR-BW2 (660-86743-5)	4/13/18	11:02 Eastern		Water			X	1	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	4-16-18 1700	TAT			
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time: 4-17-18 9:13	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 0.5° IR7

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: Tampa Electric Company

Job Number: 660-86743-1

Login Number: 86743
List Number: 1
Creator: Redding, Charles S

List Source: TestAmerica Tampa

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Tampa Electric Company

Job Number: 660-86743-1

Login Number: 86743
List Number: 2
Creator: Johnson, Jeremy N

List Source: TestAmerica Pensacola
List Creation: 04/17/18 04:30 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	0.0°C IR7
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Big Bend Power Station
Terry Eastley
13031 Wyandott Rd
Apollo Beach, FL 33572
tleastley@tecoenergy.com

Report Date: 05/03/18 11:12

Work Order - L18D116 **Project - CCR Wells Economizer Ash Pond**

Case Narrative

1 sample(s) were received on 04/25/18 10:38.

There were no issues noted with the sample(s) associated with this workorder unless noted below.

Resample of well BBS-CCR-2 for Radiological analysis.

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18D116-01**

Sample Description: BBS-CCR-2

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 4/25/18 9:43

Date of Sample Receipt: 4/25/18 10:38

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Specific Conductance	**1390**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	4/25/18 9:43
Dissolved Oxygen	**0.680**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	4/25/18 9:43
pH	**6.93**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	4/25/18 9:43
Turbidity	**5.19**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	4/25/18 9:43
KNL Laboratory									
Radium - 226									
Rad - 226	**14.8**	pCi/L	0.4	0.4		1	EPA 903.0	KL1	4/30/18 12:47
Rad - 226 Counting Error +/-	**1.1**	pCi/L				1	EPA 903.0	KL1	4/30/18 12:47
Radium - 228									
Rad - 228	**2.6**	pCi/L	0.7	0.7		1	EPA Ra-05	KL1	5/1/18 11:09
Rad - 228 Counting Error +/-	**0.6**	pCi/L				1	EPA Ra-05	KL1	5/1/18 11:09
Radium-226/228									
Rad-226/228	**17.4**	pCi/L	0.7	0.7		1	Calc	KL1	5/1/18 11:09
Rad-226/228 Counting Error +/-	**1.1**	pCi/L				1	Calc	KL1	5/1/18 11:09

Comments

Subcontract Laboratories:

KNL Laboratory E84025

Tampa Electric Company, Laboratory Services

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Peggy Penner, Manager, Laboratory Services

Laboratory Services certifies that the test result in this report meet all requirements of the latest promulgated TNI standards, unless indicated otherwise in the body of the report. Unless otherwise noted, all methods followed are per the most current published version of 40 CFR Part 136, Table B. Results reported on this report pertain to the above referenced sample only.

Site: Date: 04/25/18 File Name: 042518_Wells_RAB Weather: Partly Cloudy & Mild Sampler(s) / Initials RAB /TECO Initials RAB

LIMS #	Loction Code	Time	FE²	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L18D116-01	BBS-CCR-2	9:43		6.93	23.65	1389	0.68	5.19			Lt. Yellow	Mild		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
	☐				☐	☐	☐	☐	☐	☐	☐	☐	☐	
L18D116-01	☐				☐	☐	☑ 1	☐	☐	☐	☐	☐	☐	1

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)		Samples On Ice	Sample Reciept
ESS 0121301C	ESS	ESS	ESS	ESS	ESS		☑ Yes ☐ No	Time 10:38

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID	Temp 23.5 C
1L bottles (rads): 5 ml HNO3 to pH <2	L 020807M ☑	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐	
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐	
250 ml bottles (metal): 1 ml HNO3 to pH <2	L ☐	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	A checked box indicates that the sample was verified to a pH of <2		

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time	Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID: MPM08	L 021961D	7	7.01	8:13			7.02	10:40	Meter ID:				
FDEP FT 1100	L 021107A	10	10.04	8:13	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)				0				
Units: SU	L 020896E	4	4.00	8:13	A checked box indicates ICV / CCV passed				Zobell Sol ID:				
Conductivity Meter Calib.	**Standard ID**	**Std Value**	**Cal**	**Time**	**ICV**	**Time**	**CCV**	**Time**	L				
Meter ID: MPM08	L 020700B	1000	1001	8:01					**DO Meter Cal**	**Time**	**Temp °C**	**Reading mg/l**	**Theo Value mg/l**
FDEP FT 1200, Units: uMHOS	L 020249D	10000			9780	8:05	9807	10:42	Meter ID:	7:57	21.8	8.83	8.777
Turbidity Meter Calibration	**Standard ID**	**Std Value**	**Acceptability Range**		**ICV**	**Time**	**CCV**	**Time**	MPM08	10:34	22.7	8.70	8.644
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.64	7:52	5.62	10:36	Barom. Pres				
FDEP FT 1600, Units: NTU	L 0								760				

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID	Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L	MPM08	0.2	5	0.3	10

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026, 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) -	Depth to Water (ft) =	Water Column (ft) x	Well Capacity (gal) =	1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x	Tubing Length (ft)) +	Pump Volume (gal) +	Cell Volume (gal) =	1 Eqpt Volume (gal)	
0	2	10	17.32	22.32		22.32	0.16	3.57	0.0026	23.3	0	0.06	0.12	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
											ph:+/- 0.2		Level Meter:	
Purge Start:											Temp°C+/- 0.2		Pump:	PP
											Cond % +/- 5		Tubing:	PE/S
Purge End:											DO % Sat.< 20		Dedicated ☑	Yes
											Turb. NTU < 20		Tubing? ☐	No
Purge Complete At		Gallons to Purge 0.12		Stablility Values =										

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) -	Depth to Water (ft) =	Water Column (ft) x	Well Capacity (gal) =	1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x	Tubing Length (ft)) +	Pump Volume (gal) +	Cell Volume (gal) =	1 Eqpt Volume (gal)	
BBS-CCR-2	2	10	16.84	21.84	6.92	14.92	0.16	2.39	0.0026	22.84	0	0.06	0.12	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	9:35	600	1.27	1.27	7.08	6.94	23.71	1377	0.87	4.51	ph:+/- 0.2	STABLE	Level Meter:	
Purge Start:	9:37	610	0.32	1.59	7.08	6.92	23.71	1378	0.67	6.53	Temp°C+/- 0.2	STABLE	Pump:	PP
9:27	9:40	600	0.48	2.07	7.09	6.93	23.65	1389	0.68	5.19	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
9:40											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At 9:28		Gallons to Purge 0.12		Stablility Values =		6.93	23.65	1389	0.68	5.19				

Comments:

Total Time Total Miles

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.	
WELL NO:	BBS-CCR-2	SAMPLE ID:	L18D116-01	DATE: 4/25/18

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches) 1/4	WELL SCREEN INTERVAL DEPTH 11.84 feet to 21.84 (feet)	STATIC DEPTH TO WATER (feet): 6.92	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 22.84 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 16.84	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 16.84	PURGING INITIATED AT: 9:27	PURGING ENDED AT: 9:40	TOTAL VOLUME PURGED (gallons): 2.07

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
9:35	1.27	1.27	0.16	7.08	6.94	23.71	1377	0.87	4.51	Lt. Yellow	Mild
9:37	0.32	1.59	0.16	7.08	6.92	23.71	1378	0.67	6.53	Lt. Yellow	Mild
9:40	0.48	2.07	0.16	7.09	6.93	23.65	1389	0.68	5.19	Lt. Yellow	Mild

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER (S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
RAB TECO		9:40	9:43

PUMP OR TUBING DEPTH IN WELL (feet): 16.8	SAMPLE PUMP FLOW RATE (mL per minute): 603	TUBING MATERIAL CODE: PE/S	
FIELD DECONTAMINATION: Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type:	FILTER SIZE: µm	DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Rad-1L	1	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

KNL ENVIRONMENTAL TESTING

DOH Certification #E84025
DEP COMPQAP # 870251

Report Date: May 2, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody:	Client
Client/Field ID:	L18D116-01 BBS-CCR-2
Sample Collection:	04-25-18/0943
Lab ID No:	18.4111
Lab Custody Date:	04-25-18/1140
Sample description:	Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results			Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	17.4	±	1.1	Calc	Calc	0.7
Radium-226	pCi/l	14.8	±	1.1	4-30-18/1247	EPA 903.0	0.4
Radium-228	pCi/l	2.6	±	0.6	5-1-18/1109	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Total Radium Analysis**

Client Project # : LJB0116-01

Analysis Completion Date: 4 / 30 / 18

Precision Data:

Sample #: 183839

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
6.6	6.4	0.2	3.08

Spike Data:

Sample #: 183839

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
2.0	4.5	6.6	102

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
8.7	9.1	96

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.4 +/- 0.2	5 / 1 / 18

KNL ENVIRONMENTAL TESTING

FL DOH Certification # E84025

QC Summary: **Radium 228 Analysis**

Client Project # : L180116-01

Analysis Completion Date: 5 / 1 / 18

Precision Data:

Sample #: 18.3661

Sample Analysis (pCi/l)	Duplicate Analysis (pCi/l)	Range (pCi/l)	RPD (%)
3.4	4.4	1.0	25.64

Spike Data:

Sample #: 18.3661

Sample Analysis (pCi/l)	Spike Added (pCi/l)	Analytical Result (pCi/l)	Spike Rec (%)
0.0	3.9	4.4	113

LCS Data:

Analytical Result (pCi/l)	True Value (pCi/l)	% Recovery
4.1	3.9	105

Lab Blank:

	Analytical Result (pCi/l)	Analysis Date
Lab Blank	0.0 +/- 0.2	5 / 1 / 18

SUBCONTRACT ORDER

Tampa Electric Company, Laboratory Services

L18D116

SENDING LABORATORY:

Tampa Electric Company, Laboratory Services
5012 Causeway Blvd
Tampa, FL 33619
Phone: (813) 630-7490
Fax: (813) 630-7360
Project Manager: Peggy Penner

RECEIVING LABORATORY:

KNL Laboratory Services
3202 N. Florida Ave.
Tampa, FL 33603
Phone :(813) 229-2879
Fax: -

Due Date: 05/02/18 16:00

18.4111

Analysis	Expires	Laboratory ID	Comments
Sample ID: L18D116-01 BBS-CCR-2 **Sampled: 04/25/18 09:43**		**Water** 18.3633 ← resample for	
Radium 228 Ra-05	10/22/18 09:43		Level 2 Data requred
Radium 226+228, Total	10/22/18 09:43		Level 2 Data requred
Radium 226 EPA 903.0	10/22/18 09:43		Level 2 Data requred

Containers Supplied:
Poly HNO3 - 1000mL (A)

Released By	Date & Time	Received By	Date & Time
	4-25-18 1140 RAB		4-25-18 1140
Released By	Date & Time	Received By	Date & Time

APPENDIX B

Laboratory Analytical Data Report – Third Detection Monitoring Event (September 2018)

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Big Bend Power Station
Terry Eastley
13031 Wyandott Rd
Apollo Beach, FL 33572
tleastley@tecoenergy.com

Report Date: 11/15/18 11:34

Work Order - L18I055 **Project - CCR Wells Economizer Ash Pond**

Case Narrative

Report Revised 11/15/2018 to correct a typographical error on BBS-CCR-1 Rad-226/228 resutls and BBS-CCR-3 Rad 226/228 Counting Error.

5 sample(s) were received on 09/12/18 14:28.

There were no issues noted with the sample(s) associated with this workorder unless noted below.

EPA 6010

The recovery of the matrix spike and spike duplicate for several analytes are below the contorl limits due to matrix interference. The parent sample is flagged with a J qualifier.

TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-01**

Sample Description: BBS-CCR-1

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 12:30

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**674**	mg/L	1.00	5.00		10	EPA 300.0	TMH	9/26/18 21:21
Specific Conductance	**4120**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	9/12/18 12:30
Dissolved Oxygen	**0.200**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	9/12/18 12:30
Fluoride	**0.235**	mg/L	0.100	0.500	I,V	10	EPA 300.0	TMH	9/26/18 21:21
pH	**6.80**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	9/12/18 12:30
REDOX Potential	**-74.9**	mV	-999	-999		1	SM 2580B	RAB	9/12/18 12:30
Total Dissolved Solids	**3250**	mg/L	40.0	40.0		4	SM 2540C	NLT	9/17/18 14:42
Sulfate	**1220**	mg/L	50.0	200		100	EPA 300.0	TMH	9/26/18 21:31
Turbidity	**9.47**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	9/12/18 12:30
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	MCR	9/19/18 11:00
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	MCR	9/14/18 11:10
Arsenic	**9.80**	ug/L	0.320	2.00		1	EPA 200.8	MCR	9/14/18 11:10
Cadmium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	MCR	9/14/18 11:10
Cobalt	**0.556**	ug/L	0.136	2.00	I	1	EPA 200.8	MCR	9/14/18 11:10
Lead	0.0800	ug/L	0.0800	2.00	U	1	EPA 200.8	MCR	9/14/18 11:10
Selenium	**0.721**	ug/L	0.509	2.00	I	1	EPA 200.8	MCR	9/14/18 11:10
Thallium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	MCR	9/14/18 11:10
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.114**	mg/L	0.000500	0.0200		1	EPA 6010B	RC	9/17/18 14:10
Beryllium	0.500	ug/L	0.500	2.00	U	1	EPA 6010B	RC	9/17/18 14:10
Boron	**19.9**	mg/L	0.0100	0.0500	V	1	EPA 6010B	RC	9/17/18 14:10
Calcium	**549000**	ug/L	30.0	1000		1	EPA 6010B	RC	9/14/18 13:20
Chromium	1.60	ug/L	1.60	12.0	U	1	EPA 6010B	RC	9/17/18 14:10
Molybdenum	**73.4**	ug/L	2.50	20.0		1	EPA 6010B	RC	9/17/18 14:10
KNL Laboratory									
Radium - 226									
Rad - 226	**33.2**	pCi/L	0.6	0.6		1	EPA 903.0	KL1	9/24/18 13:00
Rad - 226 Counting Error +/-	**1.8**	pCi/L				1	EPA 903.0	KL1	9/24/18 13:00
Radium - 228									
Rad - 228	**1.5**	pCi/L	0.7	0.7		1	EPA Ra-05	KL1	9/24/18 11:24
Rad - 228 Counting Error +/-	**0.5**	pCi/L				1	EPA Ra-05	KL1	9/24/18 11:24

Laboratory Services certifies that the test result in this report meet all requirements of the latest promulgated TNI standards, unless indicated otherwise in the body of the report. Unless otherwise noted, all methods followed are per the most current published version of 40 CFR Part 136, Table B. Results reported on this report pertain to the above referenced sample only.

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-01**

Sample Description: BBS-CCR-1

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 12:30

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**34.7**	pCi/L	0.7	0.7		1	Calc	KL1	9/24/18 13:00
Rad-226/228 Counting Error +/-	**1.8**	pCi/L				1	Calc	KL1	9/24/18 13:00
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.016**	mg/L	0.0010	0.050	I	1	200.7 Rev 4.4 Z01	GESP	9/21/18 21:01

Laboratory Services certifies that the test result in this report meet all requirements of the latest promulgated TNI standards, unless indicated otherwise in the body of the report. Unless otherwise noted, all methods followed are per the most current published version of 40 CFR Part 136, Table B. Results reported on this report pertain to the above referenced sample only.

TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-02**

Sample Description: BBS-CCR-2

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 12:00

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**88.7**	mg/L	1.00	5.00		10	EPA 300.0	TMH	9/26/18 21:41
Specific Conductance	**1520**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	9/12/18 12:00
Dissolved Oxygen	**0.240**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	9/12/18 12:00
Fluoride	**0.298**	mg/L	0.100	0.500	I,V	10	EPA 300.0	TMH	9/26/18 21:41
pH	**6.29**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	9/12/18 12:00
REDOX Potential	**-38.8**	mV	-999	-999		1	SM 2580B	RAB	9/12/18 12:00
Total Dissolved Solids	**1060**	mg/L	20.0	20.0		2	SM 2540C	NLT	9/17/18 14:42
Sulfate	**375**	mg/L	5.00	20.0		10	EPA 300.0	TMH	9/26/18 21:41
Turbidity	**3.43**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	9/12/18 12:00
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	MCR	9/19/18 11:04
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	MCR	9/14/18 11:14
Arsenic	**1.34**	ug/L	0.320	2.00	I	1	EPA 200.8	MCR	9/14/18 11:14
Cadmium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	MCR	9/14/18 11:14
Cobalt	0.136	ug/L	0.136	2.00	U	1	EPA 200.8	MCR	9/14/18 11:14
Lead	**0.102**	ug/L	0.0800	2.00	I	1	EPA 200.8	MCR	9/14/18 11:14
Selenium	0.509	ug/L	0.509	2.00	U	1	EPA 200.8	MCR	9/14/18 11:14
Thallium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	MCR	9/14/18 11:14
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.0652**	mg/L	0.000500	0.0200	J-	1	EPA 6010B	RC	9/17/18 14:15
Beryllium	0.500	ug/L	0.500	2.00	J-, U	1	EPA 6010B	RC	9/17/18 14:15
Boron	**0.177**	mg/L	0.0100	0.0500	J-,V	1	EPA 6010B	RC	9/17/18 14:15
Calcium	**218000**	ug/L	30.0	1000		1	EPA 6010B	RC	9/14/18 13:23
Chromium	1.60	ug/L	1.60	12.0	J-, U	1	EPA 6010B	RC	9/17/18 14:15
Molybdenum	2.50	ug/L	2.50	20.0	J-, U	1	EPA 6010B	RC	9/17/18 14:15
KNL Laboratory									
Radium - 226									
Rad - 226	**15.3**	pCi/L	0.6	0.6		1	EPA 903.0	KL1	9/24/18 13:00
Rad - 226 Counting Error +/-	**1.3**	pCi/L				1	EPA 903.0	KL1	9/24/18 13:00
Radium - 228									
Rad - 228	0.7	pCi/L	0.7	0.7	U	1	EPA Ra-05	KL1	9/24/18 11:24
Rad - 228 Counting Error +/-	**0.4**	pCi/L				1	EPA Ra-05	KL1	9/24/18 11:24

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Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-02**

Sample Description: BBS-CCR-2

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 12:00

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**15.3**	pCi/L	0.7	0.7		1	Calc	KL1	9/24/18 13:00
Rad-226/228 Counting Error +/-	**1.3**	pCi/L				1	Calc	KL1	9/24/18 13:00
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.013**	mg/L	0.0010	0.050	I	1	200.7 Rev 4.4 Z01	GESP	9/21/18 21:04

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TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

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Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-03**

Sample Description: BBS-CCR-3

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 11:08

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**132**	mg/L	1.00	5.00		10	EPA 300.0	TMH	9/26/18 22:02
Specific Conductance	**1690**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	9/12/18 11:08
Dissolved Oxygen	**0.520**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	9/12/18 11:08
Fluoride	**0.309**	mg/L	0.100	0.500	I,V	10	EPA 300.0	TMH	9/26/18 22:02
pH	**6.41**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	9/12/18 11:08
REDOX Potential	**-105**	mV	-999	-999		1	SM 2580B	RAB	9/12/18 11:08
Total Dissolved Solids	**1200**	mg/L	20.0	20.0		2	SM 2540C	NLT	9/17/18 14:42
Sulfate	**469**	mg/L	5.00	20.0		10	EPA 300.0	TMH	9/26/18 22:12
Turbidity	**3.47**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	9/12/18 11:08
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	MCR	9/19/18 11:07
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	MCR	9/14/18 11:18
Arsenic	**0.613**	ug/L	0.320	2.00	I	1	EPA 200.8	MCR	9/14/18 11:18
Cadmium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	MCR	9/14/18 11:18
Cobalt	0.136	ug/L	0.136	2.00	U	1	EPA 200.8	MCR	9/14/18 11:18
Lead	0.0800	ug/L	0.0800	2.00	U	1	EPA 200.8	MCR	9/14/18 11:18
Selenium	0.509	ug/L	0.509	2.00	U	1	EPA 200.8	MCR	9/14/18 11:18
Thallium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	MCR	9/14/18 11:18
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.0628**	mg/L	0.000500	0.0200		1	EPA 6010B	RC	9/17/18 14:19
Beryllium	0.500	ug/L	0.500	2.00	U	1	EPA 6010B	RC	9/17/18 14:19
Boron	**0.398**	mg/L	0.0100	0.0500	V	1	EPA 6010B	RC	9/17/18 14:19
Calcium	**191000**	ug/L	30.0	1000		1	EPA 6010B	RC	9/14/18 13:26
Chromium	1.60	ug/L	1.60	12.0	U	1	EPA 6010B	RC	9/17/18 14:19
Molybdenum	**3.99**	ug/L	2.50	20.0	I	1	EPA 6010B	RC	9/17/18 14:19
KNL Laboratory									
Radium - 226									
Rad - 226	**14.1**	pCi/L	0.6	0.6		1	EPA 903.0	KL1	9/24/18 13:00
Rad - 226 Counting Error +/-	**1.3**	pCi/L				1	EPA 903.0	KL1	9/24/18 13:00
Radium - 228									
Rad - 228	**0.7**	pCi/L	0.7	0.7		1	EPA Ra-05	KL1	9/24/18 11:24
Rad - 228 Counting Error +/-	**0.5**	pCi/L				1	EPA Ra-05	KL1	9/24/18 11:24

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Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-03**

Sample Description: BBS-CCR-3

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 11:08

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**14.8**	pCi/L	0.7	0.7		1	Calc	KL1	9/24/18 13:00
Rad-226/228 Counting Error +/-	**1.3**	pCi/L				1	Calc	KL1	9/24/18 13:00
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.011**	mg/L	0.0010	0.050	I	1	200.7 Rev 4.4 Z01	GESP	9/21/18 21:08

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Tampa Electric Laboratory Services

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Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-04**

Sample Description: BBS-CCR-BW1

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 10:26

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**737**	mg/L	1.00	5.00		10	EPA 300.0	TMH	10/3/18 2:32
Specific Conductance	**4410**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	9/12/18 10:26
Dissolved Oxygen	**0.550**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	9/12/18 10:26
Fluoride	**0.818**	mg/L	0.100	0.500	V	10	EPA 300.0	TMH	10/3/18 2:32
pH	**6.51**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	9/12/18 10:26
REDOX Potential	**-11.1**	mV	-999	-999		1	SM 2580B	RAB	9/12/18 10:26
Total Dissolved Solids	**3740**	mg/L	50.0	50.0		5	SM 2540C	NLT	9/17/18 14:42
Sulfate	**1290**	mg/L	50.0	200		100	EPA 300.0	TMH	10/3/18 9:07
Turbidity	**2.62**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	9/12/18 10:26
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	MCR	9/19/18 11:11
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	MCR	9/14/18 11:21
Arsenic	**10.1**	ug/L	0.320	2.00		1	EPA 200.8	MCR	9/14/18 11:21
Cadmium	**0.203**	ug/L	0.100	0.500	I	1	EPA 200.8	MCR	9/14/18 11:21
Cobalt	**1.88**	ug/L	0.136	2.00	I	1	EPA 200.8	MCR	9/14/18 11:21
Lead	**0.141**	ug/L	0.0800	2.00	I	1	EPA 200.8	MCR	9/14/18 11:21
Selenium	**1.83**	ug/L	0.509	2.00	I	1	EPA 200.8	MCR	9/14/18 11:21
Thallium	**0.126**	ug/L	0.100	0.500	I	1	EPA 200.8	MCR	9/14/18 11:21
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.0515**	mg/L	0.000500	0.0200		1	EPA 6010B	RC	9/17/18 14:24
Beryllium	0.500	ug/L	0.500	2.00	U	1	EPA 6010B	RC	9/17/18 14:24
Boron	**33.2**	mg/L	0.0100	0.0500	V	1	EPA 6010B	RC	9/17/18 14:24
Calcium	**664000**	ug/L	30.0	1000		1	EPA 6010B	RC	9/14/18 13:29
Chromium	1.60	ug/L	1.60	12.0	U	1	EPA 6010B	RC	9/17/18 14:24
Molybdenum	**22.5**	ug/L	2.50	20.0		1	EPA 6010B	RC	9/17/18 14:24
KNL Laboratory									
Radium - 226									
Rad - 226	**20.6**	pCi/L	0.4	0.4		1	EPA 903.0	KL1	9/24/18 13:00
Rad - 226 Counting Error +/-	**1.3**	pCi/L				1	EPA 903.0	KL1	9/24/18 13:00
Radium - 228									
Rad - 228	**3.0**	pCi/L	0.7	0.7		1	EPA Ra-05	KL1	9/25/18 9:59
Rad - 228 Counting Error +/-	**0.6**	pCi/L				1	EPA Ra-05	KL1	9/25/18 9:59

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Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-04**

Sample Description: BBS-CCR-BW1

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 10:26

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**23.6**	pCi/L	0.7	0.7		1	Calc	KL1	9/25/18 9:59
Rad-226/228 Counting Error +/-	**1.3**	pCi/L				1	Calc	KL1	9/25/18 9:59
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.017**	mg/L	0.0010	0.050	I	1	200.7 Rev 4.4 Z01	GESP	9/21/18 21:11

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TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

5012 Causeway Blvd Tampa Fl. 33619 * Ph (813)630-7490 * Fax (813)630-7360 * DOH #E54272

Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-05**

Sample Description: BBS-CCR-BW2

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 9:54

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Tampa Electric Company, Laboratory Services									
General Chemistry Parameters									
Chloride	**148**	mg/L	1.00	5.00		10	EPA 300.0	TMH	9/26/18 22:53
Specific Conductance	**1960**	umhos/cm	100	100		1	FDEP SOP FT 1200	RAB	9/12/18 9:54
Dissolved Oxygen	**0.830**	mg/L	0.100	0.100		1	FDEP SOP FT 1500	RAB	9/12/18 9:54
Fluoride	**0.338**	mg/L	0.100	0.500	I,V	10	EPA 300.0	TMH	9/26/18 22:53
pH	**6.60**	pH Units	1.00	1.00		1	FDEP SOP FT 1100	RAB	9/12/18 9:54
REDOX Potential	**-44.2**	mV	-999	-999		1	SM 2580B	RAB	9/12/18 9:54
Total Dissolved Solids	**1500**	mg/L	20.0	20.0		2	SM 2540C	NLT	9/17/18 14:42
Sulfate	**638**	mg/L	5.00	20.0		10	EPA 300.0	TMH	9/26/18 22:53
Turbidity	**4.34**	NTU	0.100	0.100		1	FDEP SOP FT 1600	RAB	9/12/18 9:54
Total Mercury by SW846 Method 7470/7471									
Mercury	0.0500	ug/L	0.0500	0.200	U	1	EPA 7470A	MCR	9/19/18 11:14
Total Recoverable Metals by 200 Series									
Antimony	0.600	ug/L	0.600	2.00	U	1	EPA 200.8	MCR	9/14/18 11:25
Arsenic	**5.01**	ug/L	0.320	2.00		1	EPA 200.8	MCR	9/14/18 11:25
Cadmium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	MCR	9/14/18 11:25
Cobalt	**0.285**	ug/L	0.136	2.00	I	1	EPA 200.8	MCR	9/14/18 11:25
Lead	0.0800	ug/L	0.0800	2.00	U	1	EPA 200.8	MCR	9/14/18 11:25
Selenium	**0.563**	ug/L	0.509	2.00	I	1	EPA 200.8	MCR	9/14/18 11:25
Thallium	0.100	ug/L	0.100	0.500	U	1	EPA 200.8	MCR	9/14/18 11:25
Total Recoverable Metals by SW846 Method 6010B									
Barium	**0.0636**	mg/L	0.000500	0.0200		1	EPA 6010B	RC	9/17/18 14:29
Beryllium	0.500	ug/L	0.500	2.00	U	1	EPA 6010B	RC	9/17/18 14:29
Boron	**2.64**	mg/L	0.0100	0.0500	V	1	EPA 6010B	RC	9/17/18 14:29
Calcium	**344000**	ug/L	30.0	1000		1	EPA 6010B	RC	9/14/18 13:32
Chromium	1.60	ug/L	1.60	12.0	U	1	EPA 6010B	RC	9/17/18 14:29
Molybdenum	2.50	ug/L	2.50	20.0	U	1	EPA 6010B	RC	9/17/18 14:29
KNL Laboratory									
Radium - 226									
Rad - 226	**3.5**	pCi/L	0.4	0.4		1	EPA 903.0	KL1	9/24/18 13:00
Rad - 226 Counting Error +/-	**0.6**	pCi/L				1	EPA 903.0	KL1	9/24/18 13:00
Radium - 228									
Rad - 228	0.7	pCi/L	0.7	0.7	U	1	EPA Ra-05	KL1	9/25/18 9:59
Rad - 228 Counting Error +/-	**0.4**	pCi/L				1	EPA Ra-05	KL1	9/25/18 9:59

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Tampa Electric Laboratory Services

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Sample Information

Client: Big Bend Power Station

Lab Sample ID: **L18I055-05**

Sample Description: BBS-CCR-BW2

Sample Collection Method: Grab

Sampled By: Robert Barthelette

Date and Time Collected: 9/12/18 9:54

Date of Sample Receipt: 9/12/18 14:28

Laboratory Results

Sample Qualifier:

Parameter	Result	Units	MDL	PQL	Qualifier Code	Dil	Test Method	Analyst	Analysis Date & Time
Radium-226/228									
Rad-226/228	**3.7**	pCi/L	0.7	0.7		1	Calc	KL1	9/25/18 9:59
Rad-226/228 Counting Error +/-	**0.6**	pCi/L				1	Calc	KL1	9/25/18 9:59
TestAmerica Pensacola									
Metals (ICP)									
Lithium	**0.0062**	mg/L	0.0010	0.050	I	1	200.7 Rev 4.4 Z01	GESP	9/21/18 21:14

Comments

U	Indicates that the compound was analyzed for but not detected.
J-	The reported value is an estimated value, see the case narrative for specifics.
I	Estimated value
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
V	Analyte detected in the method blank

Subcontract Laboratories:

KNL Laboratory	E84025
TestAmerica Pensacola	E81010

Total Recoverable Metals by SW846 Method 6010B - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18I0068 - EPA 6010B											
Blank (18I0068-BLK1)					Prepared: 09/11/18 Analyzed: 09/17/18						
Barium	0.000500	0.000500	0.0200	mg/L							U
Beryllium	0.500	0.500	2.00	ug/L							U
Boron	0.0217	0.0100	0.0500	mg/L							I
Calcium	30.0	30.0	1000	ug/L							U
Chromium	1.60	1.60	12.0	ug/L							U
Molybdenum	2.50	2.50	20.0	ug/L							U
LCS (18I0068-BS1)					Prepared: 09/11/18 Analyzed: 09/17/18						
Barium	0.996	0.000500	0.0200	mg/L	1.0000		99.6	80-120			
Beryllium	996	0.500	2.00	ug/L	1000.0		99.6	80-120			
Boron	1.03	0.0100	0.0500	mg/L	1.0000		103	80-120			V
Chromium	996	1.60	12.0	ug/L	1000.0		99.6	80-120			
Molybdenum	2040	2.50	20.0	ug/L	2000.0		102	80-120			
Matrix Spike (18I0068-MS2)		**Source: L18I055-02**			Prepared: 09/13/18 Analyzed: 09/17/18						
Barium	0.364	0.000500	0.0200	mg/L	1.0000	0.0652	29.9	75-125			J-
Beryllium	296	0.500	2.00	ug/L	1000.0	U	29.6	75-125			J-
Boron	0.511	0.0100	0.0500	mg/L	1.0000	0.177	33.3	75-125			J-,V
Chromium	297	1.60	12.0	ug/L	1000.0	U	29.7	75-125			J-
Molybdenum	1780	2.50	20.0	ug/L	1000.0	U	178	75-125			J-
Matrix Spike Dup (18I0068-MSD2)		**Source: L18I055-02**			Prepared: 09/13/18 Analyzed: 09/17/18						
Barium	0.357	0.000500	0.0200	mg/L	1.0000	0.0652	29.2	75-125	2.09	20	J-
Beryllium	292	0.500	2.00	ug/L	1000.0	U	29.2	75-125	1.57	20	J-
Boron	0.492	0.0100	0.0500	mg/L	1.0000	0.177	31.5	75-125	3.63	20	J-,V
Chromium	293	1.60	12.0	ug/L	1000.0	U	29.3	75-125	1.46	20	J-
Molybdenum	1770	2.50	20.0	ug/L	1000.0	U	177	75-125	0.732	20	J-

Tampa Electric Laboratory Services

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Total Mercury by SW846 Method 7470/7471 - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18I0091 - EPA 7470A											
Blank (18I0091-BLK1)					Prepared: 09/18/18 Analyzed: 09/19/18						
Mercury	0.0500	0.0500	0.200	ug/L							U
LCS (18I0091-BS1)					Prepared: 09/18/18 Analyzed: 09/19/18						
Mercury	0.972	0.0500	0.200	ug/L	1.0000		97.2	80-120			
Matrix Spike (18I0091-MS1)		**Source: L18I055-03**			Prepared: 09/18/18 Analyzed: 09/19/18						
Mercury	0.959	0.0500	0.200	ug/L	1.0000	U	95.9	75-125			
Matrix Spike Dup (18I0091-MSD1)		**Source: L18I055-03**			Prepared: 09/18/18 Analyzed: 09/19/18						
Mercury	0.949	0.0500	0.200	ug/L	1.0000	U	94.9	75-125	1.10	20	
Matrix Spike Dup (18I0091-MSD2)		**Source: L18I081-01**			Prepared: 09/18/18 Analyzed: 09/19/18						
Mercury	0.752	0.0500	0.200	ug/L	1.0000	U	75.2	75-125	4.77	20	
Post Spike (18I0091-PS1)		**Source: L18I081-01**			Prepared: 09/18/18 Analyzed: 09/19/18						
Mercury	0.887			ug/L	1.0000	-0.0159	88.7	0-200			
Post Spike (18I0091-PS2)		**Source: L18I081-01**			Prepared: 09/18/18 Analyzed: 09/19/18						
Mercury	0.845			ug/L	1.0000	-0.0159	84.5	0-200			

Total Recoverable Metals by 200 Series - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18I0070 - EPA 200.8											
Blank (18I0070-BLK1)					Prepared: 09/13/18 Analyzed: 09/14/18						
Antimony	0.600	0.600	2.00	ug/L							U
Arsenic	0.320	0.320	2.00	ug/L							U
Cadmium	0.100	0.100	0.500	ug/L							U
Cobalt	0.136	0.136	2.00	ug/L							U
Lead	0.0800	0.0800	2.00	ug/L							U
Selenium	0.509	0.509	2.00	ug/L							U
Thallium	0.100	0.100	0.500	ug/L							U
LCS (18I0070-BS1)					Prepared: 09/13/18 Analyzed: 09/14/18						
Antimony	99.3	0.600	2.00	ug/L	100.00		99.3	85-115			
Arsenic	99.1	0.320	2.00	ug/L	100.00		99.1	85-115			
Cadmium	103	0.100	0.500	ug/L	100.00		103	85-115			
Cobalt	97.0	0.136	2.00	ug/L	100.00		97.0	85-115			
Lead	99.1	0.0800	2.00	ug/L	100.00		99.1	85-115			
Selenium	103	0.509	2.00	ug/L	100.00		103	85-115			
Thallium	99.0	0.100	0.500	ug/L	100.00		99.0	85-115			
Matrix Spike (18I0070-MS1)		**Source: L18I055-01**			Prepared: 09/13/18 Analyzed: 09/14/18						
Antimony	97.7	0.600	2.00	ug/L	100.00	U	97.7	70-130			
Arsenic	97.4	0.320	2.00	ug/L	100.00	9.80	87.5	70-130			
Cadmium	78.4	0.100	0.500	ug/L	100.00	U	78.4	70-130			
Cobalt	81.8	0.136	2.00	ug/L	100.00	0.556	81.2	70-130			
Lead	83.6	0.0800	2.00	ug/L	100.00	U	83.6	70-130			
Selenium	85.7	0.509	2.00	ug/L	100.00	0.721	85.0	70-130			
Thallium	86.2	0.100	0.500	ug/L	100.00	U	86.2	70-130			
Matrix Spike (18I0070-MS2)		**Source: L18I055-05**			Prepared: 09/13/18 Analyzed: 09/14/18						
Antimony	95.9	0.600	2.00	ug/L	100.00	U	95.9	70-130			
Arsenic	98.5	0.320	2.00	ug/L	100.00	5.01	93.5	70-130			
Cadmium	85.3	0.100	0.500	ug/L	100.00	U	85.3	70-130			
Cobalt	87.7	0.136	2.00	ug/L	100.00	0.285	87.4	70-130			
Lead	86.8	0.0800	2.00	ug/L	100.00	U	86.8	70-130			
Selenium	88.0	0.509	2.00	ug/L	100.00	0.563	87.5	70-130			
Thallium	89.5	0.100	0.500	ug/L	100.00	U	89.5	70-130			

Total Recoverable Metals by 200 Series - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18I0070 - EPA 200.8											
Matrix Spike Dup (18I0070-MSD1)		**Source: L18I055-01**			Prepared: 09/13/18 Analyzed: 09/14/18						
Antimony	102	0.600	2.00	ug/L	100.00	U	102	70-130	4.76	20	
Arsenic	98.7	0.320	2.00	ug/L	100.00	9.80	88.9	70-130	1.36	20	
Cadmium	82.0	0.100	0.500	ug/L	100.00	U	82.0	70-130	4.42	20	
Cobalt	87.0	0.136	2.00	ug/L	100.00	0.556	86.5	70-130	6.23	20	
Lead	86.1	0.0800	2.00	ug/L	100.00	U	86.1	70-130	2.91	20	
Selenium	85.9	0.509	2.00	ug/L	100.00	0.721	85.1	70-130	0.158	20	
Thallium	88.5	0.100	0.500	ug/L	100.00	U	88.5	70-130	2.66	20	
Matrix Spike Dup (18I0070-MSD2)		**Source: L18I055-05**			Prepared: 09/13/18 Analyzed: 09/14/18						
Antimony	99.2	0.600	2.00	ug/L	100.00	U	99.2	70-130	3.42	20	
Arsenic	99.1	0.320	2.00	ug/L	100.00	5.01	94.1	70-130	0.643	20	
Cadmium	87.4	0.100	0.500	ug/L	100.00	U	87.4	70-130	2.39	20	
Cobalt	89.3	0.136	2.00	ug/L	100.00	0.285	89.1	70-130	1.87	20	
Lead	87.1	0.0800	2.00	ug/L	100.00	U	87.1	70-130	0.292	20	
Selenium	88.9	0.509	2.00	ug/L	100.00	0.563	88.3	70-130	0.939	20	
Thallium	89.3	0.100	0.500	ug/L	100.00	U	89.3	70-130	0.233	20	

General Chemistry Parameters - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18I0094 - SM 2540C											
Blank (18I0094-BLK1)					Prepared & Analyzed: 09/17/18						
Total Dissolved Solids	10.0	10.0	10.0	mg/L							U
LCS (18I0094-BS1)					Prepared & Analyzed: 09/17/18						
Total Dissolved Solids	990	10.0	10.0	mg/L	1000.0		99.0	80-120			
Duplicate (18I0094-DUP1)			**Source: L18I055-01**		Prepared & Analyzed: 09/17/18						
Total Dissolved Solids	3310	40.0	40.0	mg/L		3250			1.83	10	J-
Batch 18I0170 - EPA 300.0											
Blank (18I0170-BLK1)					Prepared & Analyzed: 09/26/18						
Chloride	0.100	0.100	0.500	mg/L							U
Fluoride	0.0127	0.0100	0.0500	mg/L							I
Sulfate	0.500	0.500	2.00	mg/L							U
LCS (18I0170-BS1)					Prepared & Analyzed: 09/26/18						
Chloride	5.26	0.100	0.500	mg/L	5.0000		105	90-110			
Fluoride	5.09	0.0100	0.0500	mg/L	5.0000		102	90-110			V
Sulfate	4.98	0.500	2.00	mg/L	5.0000		99.6	90-110			
Matrix Spike (18I0170-MS1)			**Source: L18I054-04**		Prepared & Analyzed: 09/26/18						
Chloride	512	1.00	5.00	mg/L	50.000	464	95.8	90-110			
Fluoride	53.0	0.100	0.500	mg/L	50.000	0.874	104	90-110			V
Sulfate	468	5.00	20.0	mg/L	50.000	416	104	90-110			
Matrix Spike (18I0170-MS2)			**Source: L18I092-04**		Prepared & Analyzed: 09/27/18						
Chloride	23.3	0.100	0.500	mg/L	5.0000	18.7	91.3	90-110			
Fluoride	5.20	0.0100	0.0500	mg/L	5.0000	0.0252	104	90-110			V
Sulfate	7.12	0.500	2.00	mg/L	5.0000	2.29	96.6	90-110			

General Chemistry Parameters - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 18I0170 - EPA 300.0											
Matrix Spike Dup (18I0170-MSD1)		**Source: L18I054-04**			Prepared & Analyzed: 09/26/18						
Chloride	508	1.00	5.00	mg/L	50.000	464	89.1	90-110	0.656	20	J-
Fluoride	52.7	0.100	0.500	mg/L	50.000	0.874	104	90-110	0.577	20	V
Sulfate	464	5.00	20.0	mg/L	50.000	416	95.5	90-110	0.942	20	
Matrix Spike Dup (18I0170-MSD2)		**Source: L18I092-04**			Prepared & Analyzed: 09/27/18						
Chloride	23.7	0.100	0.500	mg/L	5.0000	18.7	99.2	90-110	1.69	20	
Fluoride	5.28	0.0100	0.0500	mg/L	5.0000	0.0252	105	90-110	1.57	20	V
Sulfate	7.26	0.500	2.00	mg/L	5.0000	2.29	99.4	90-110	1.96	20	

TECO TAMPA ELECTRIC AN EMERA COMPANY

Tampa Electric Laboratory Services

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Metals (ICP) - Quality Control

Analyte	Result	MDL	PQL	Units	Spike Level	Source Result	%Rec	%Rec Limits	RPD	RPD Limit	Qualifier
Batch 412052 - 200.7 Rev 4.4 Z01											
Blank (412553-83)					Prepared: 09/19/18 Analyzed: 09/21/18						
Lithium	0.0010	0.0010	0.050	mg/L				-			U
LCS (412553-84)					Prepared: 09/19/18 Analyzed: 09/21/18						
Lithium	1.05	0.0010	0.050	mg/L	1.00		105	85-115			

Tampa Electric Company, Laboratory Services

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Peggy Penner, Manager, Laboratory Services

Laboratory Services certifies that the test result in this report meet all requirements of the latest promulgated TNI standards, unless indicated otherwise in the body of the report. Unless otherwise noted, all methods followed are per the most current published version of 40 CFR Part 136, Table B. Results reported on this report pertain to the above referenced sample only.

Site: **Big Bend** Date: 09/12/18 File Name: 091218_Wells_RAB Weather: Partly Cloudy & Hot Sampler(s) / Initials RAB /TECO Initials RAB

LIMS #	Loction Code	Time	FE^2	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L18I055-01 A	BBS-CCR-1	12:30		6.80	26.10	4118	0.20	9.47	-74.9		Lt. Yellow	Mild		
L18I055-02 A	BBS-CCR-2	12:00		6.29	26.74	1516	0.24	3.43	-38.8		Lt. Yellow	Mild		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L18I055-01 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	10
L18I055-02 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)	Samples On Ice	Sample Reciept
ESS 0115801D	ESS 0221301C	ESS 0321301C	ESS	ESS	ESS	☑ Yes ☐ No	Time 14:28

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID	
1L bottles (rads): 5 ml HNO3 to pH <2	L 020807L ☑	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐	Temp 1.8 C
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐	
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 020807L ☑	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	A checked box indicates that the sample was verified to a pH of <2		

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time	Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID: MPM08	L 023378B	7	7.01	8:03			7.03	14:09	Meter ID:	8:11	22.2	234.0	234.9
FDEP FT 1100	L 022447B	10	10.03	8:03	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)				MPM08	14:16	22.6	231.7	234.9
Units: SU	L 022142D	4	4.01	8:03	A checked box indicates ICV / CCV passed				Zobell Sol ID:				
Conductivity Meter Calib.	Standard ID	Std Value	Cal	Time	ICV	Time	CCV	Time	L 022405B				
Meter ID: MPM08	L 022463D	1000	1000	8:15					DO Meter Cal	Time	Temp °C	Reading mg/l	Theo Value mg/l
FDEP FT 1200, Units: uMHOS	L 022464D	10000			9875	8:21	10025	14:13	Meter ID:	7:56	22.5	8.70	8.660
Turbidity Meter Calibration	Standard ID	Std Value	Acceptability Range		ICV	Time	CCV	Time	MPM08	13:58	28.5	7.76	7.759
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.64	7:44			Barom. Pres				
FDEP FT 1600, Units: NTU	L 019884	52.20	48.81	55.59			52.60	14:15	760				

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID	Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L	MPM08	0.2	5	0.3	10

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026, 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft)	- Depth to Water (ft)	= Water Column (ft)	x Well Capacity (gal)	= 1 Well Volume (gal)	(Tubing Capacity (gal/ft.)	x Tubing Length (ft)	) + Pump Volume (gal)	+ Cell Volume (gal)	= 1 Eqpt Volume (gal)	
BBS-CCR-1	2	10	17.32	22.32	6.75	15.57	0.16	2.49	0.0026	23.3	0	0.06	0.12	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	12:18	760	1.20	1.20	6.97	6.82	26.01	4115	0.23	17.10	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	12:20	750	0.40	1.60	6.98	6.80	26.06	4117	0.22	10.60	Temp°C+/- 0.2	STABLE	Pump:	PP
12:12	12:22	750	0.40	2.00	6.98	6.80	26.10	4118	0.20	9.47	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated	☑ Yes
12:22											Turb. NTU < 20	STABLE	Tubing?	☐ No
Purge Complete At	12:13	**Gallons to Purge**	0.12	Stablility Values =		6.80	26.10	4118	0.20	9.47				

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft)	- Depth to Water (ft)	= Water Column (ft)	x Well Capacity (gal)	= 1 Well Volume (gal)	(Tubing Capacity (gal/ft.)	x Tubing Length (ft)	) + Pump Volume (gal)	+ Cell Volume (gal)	= 1 Eqpt Volume (gal)	
BBS-CCR-2	2	10	16.84	21.84	6.23	15.61	0.16	2.50	0.0026	22.84	0	0.06	0.12	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	11:41	480	0.76	0.76	6.29	6.69	26.76	1515	0.31	3.93	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	11:43	500	0.26	1.02	6.30	6.69	26.82	1517	0.27	3.63	Temp°C+/- 0.2	STABLE	Pump:	PP
11:35	11:45	500	0.26	1.28	6.29	6.69	26.74	1516	0.24	3.43	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated	☑ Yes
11:45											Turb. NTU < 20	STABLE	Tubing?	☐ No
Purge Complete At	11:36	**Gallons to Purge**	0.12	Stablility Values =		6.69	26.74	1516	0.24	3.43				

Comments:

Total Time Total Miles

Site: **Big Bend** Date: 09/12/18 File Name: 091218_Wells_RAB Weather: Partly Cloudy & Hot Sampler(s) / Initials RAB /TECO Initials RAB

LIMS #	Loction Code	Time	FE^2	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L18I055-03 A	BBS-CCR-3	11:08		6.41	26.88	1694	0.52	3.47	-105		Yellow	Moderate		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L18I055-03 A	☐		1		☐	☑ 2	☑ 1	☐	☐	☐	☐	☐	☐	4
	☐				☐	☐	☐	☐	☐	☐	☐	☐	☐	

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)	Samples On Ice	Sample Reciept
ESS 0115801D	ESS 0221301C	ESS 0321301C	ESS	ESS	ESS	☑ Yes ☐ No	Time 14:28
							Temp 1.8 C

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID
1L bottles (rads): 5 ml HNO3 to pH <2	L 020807L ☑	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 020807L ☑	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	A checked box indicates that the sample was verified to a pH of <2	

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time	Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID: MPM08	L 023378B	7	7	8:03			7.03	14:09	Meter ID:	8:11	22.2	234.0	234.9
FDEP FT 1100	L 022447B	10	10	8:03	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)				MPM08	14:16	22.6	231.7	234.9
Units: SU	L 022142D	4	4	8:03	A checked box indicates ICV / CCV passed				Zobell Sol ID:				
Conductivity Meter Calib.	**Standard ID**	**Std Value**	**Cal**	**Time**	**ICV**	**Time**	**CCV**	**Time**	L 05B				
Meter ID: MPM08	L 022463D	1000	1000	8:15					**DO Meter Cal**	**Time**	**Temp °C**	**Reading mg/l**	**Theo Value mg/l**
FDEP FT 1200, Units: uMHOS	L 022464D	10000			9875	8:21	10025	14:13	Meter ID:	7:56	22.5	8.70	8.660
Turbidity Meter Calibration	**Standard ID**	**Std Value**	**Acceptability Range**		**ICV**	**Time**	**CCV**	**Time**	MPM08	13:58	28.5	7.76	7.759
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.64	7:44			Barom. Pres				
FDEP FT 1600, Units: NTU	L 019884	52.20	48.81	55.59			52.60	14:15	760				

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID	Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L	MPM08	**0.2**	**5**	**0.3**	**10**

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) - Depth to Water (ft) = Water Column (ft)	x Well Capacity (gal) = 1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x Tubing Length (ft)) + Pump Volume (gal) + Cell Volume (gal) = 1 Eqpt. Volume (gal)	
BBS-CCR-3	2	10	18.23	23.23 - **5.79** = 17.44	x 0.16 = **2.79**	(0.0026 x 24.23) + 0 + 0.06 = **0.12**	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	10:54	480	0.89	0.89	6.40	6.41	26.94	1745	0.27	4.01	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	10:56	500	0.26	1.15	6.41	6.41	26.92	1717	0.46	3.58	Temp°C+/- 0.2	STABLE	Pump:	PP
10:47	10:58	500	0.26	1.41	6.39	6.41	26.88	1694	0.52	3.47	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
10:58											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At 10:48	**Gallons to Purge** 0.12	Stablility Values =		6.41	26.88	1694	0.52	3.47						

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) - Depth to Water (ft) = Water Column (ft)	x Well Capacity (gal) = 1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x Tubing Length (ft)) + Pump Volume (gal) + Cell Volume (gal) = 1 Eqpt. Volume (gal)	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
											ph:+/- 0.2		Level Meter:	WLM08
Purge Start:											Temp°C+/- 0.2		Pump:	PP
											Cond % +/- 5		Tubing:	PE/S
Purge End:											DO % Sat.< 20		Dedicated ☐	Yes
											Turb. NTU < 20		Tubing? ☑	No
Purge Complete At	**Gallons to Purge** 0.00	Stablity Values =												

Comments:

Total Time Total Miles

Site: **Big Bend** Date: 09/12/18 File Name: 091218_Wells_RAB Weather: Partly Cloudy & Hot Sampler(s) / Initials RAB /TECO Initials RAB

LIMS #	Loction Code	Time	FE²	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L18I055-04 A	BBS-CCR-BW-1	10:26		6.51	27.71	4407	0.6	2.62	-11.1		Clear	None		
L18I055-05 A	BBS-CCR-BW-2	9:54		6.60	27.46	1958	0.8	4.34	-44.2		Lt. Yellow	Mild		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L18I055-04 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	10
L18I055-05 A	☐		1		☐	☑ 2	☑ 2	☐	☐	☐	☐	☐	☐	

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)	Samples On Ice	Sample Reciept
ESS 0115801D	ESS 0221301C	ESS 0321301C	ESS	ESS	ESS	☑ Yes ☐ No	Time 14:28
							Temp 1.8 C

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID
1L bottles (rads): 5 ml HNO3 to pH <2	L 020807L ☑	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 020807L ☑	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	A checked box indicates that the sample was verified to a pH of <2	

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time	Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID: MPM08	L 023378B	7	7	8:03			7.03	14:09	Meter ID:	8:11	22.2	234.0	234.9
FDEP FT 1100	L 022447B	10	10	8:03	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)				MPM08	14:16	22.6	231.7	234.9
Units: SU	L 022142D	4	4	8:03	A checked box indicates ICV / CCV passed				Zobell Sol ID:				
Conductivity Meter Calib.	**Standard ID**	**Std Value**	**Cal**	**Time**	**ICV**	**Time**	**CCV**	**Time**	L 022405B				
Meter ID: MPM08	L 022463D	1000	1000	8:15					**DO Meter Cal**	**Time**	**Temp °C**	**Reading mg/l**	**Theo Value mg/l**
FDEP FT 1200, Units: uMHOS	L 022464D	10000			9875	8:21	10025	14:13	Meter ID:	7:56	22.5	8.70	8.660
Turbidity Meter Calibration	**Standard ID**	**Std Value**	**Acceptability Range**		**ICV**	**Time**	**CCV**	**Time**	MPM08	13:58	28.5	7.76	7.759
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.64	7:44			Barom. Pres				
FDEP FT 1600, Units: NTU	L 019884	52.20	48.81	55.59			52.60	14:15	760				

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID	Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L	MPM08	0.2	5	0.3	10

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft)	- Depth to Water (ft)	= Water Column (ft)	x Well Capacity (gal)	= 1 Well Volume (gal)	(Tubing Capacity (gal/ft.)	x Tubing Length (ft)	) + Pump Volume (gal)	+ Cell Volume (gal)	= 1 Eqpt. Volume (gal)	
BBS-CCR-BW-1	2	10	39.3	44.3	28.42	15.88	0.16	2.54	0.0026	100	0	0.06	0.32	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	10:18	3000	6.34	6.34	29.74	6.49	27.71	4215	0.40	8.64	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	10:20	3000	1.59	7.93	29.73	6.50	27.73	4345	0.46	3.03	Temp°C+/- 0.2	STABLE	Pump:	ESP
10:10	10:22	3000	1.59	9.52	29.74	6.51	27.71	4407	0.55	2.62	Cond % +/- 5	STABLE	Tubing:	PE
Purge End:											DO % Sat.< 20	STABLE	Dedicated	☐ Yes
10:22											Turb. NTU < 20	STABLE	Tubing?	☑ No
Purge Complete At	**10:10**	**Gallons to Purge**	**0.32**	Stability Values =		6.51	27.71	4407	0.55	2.62				

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft)	- Depth to Water (ft)	= Water Column (ft)	x Well Capacity (gal)	= 1 Well Volume (gal)	(Tubing Capacity (gal/ft.)	x Tubing Length (ft)	) + Pump Volume (gal)	+ Cell Volume (gal)	= 1 Eqpt. Volume (gal)	
BBS-CCR-BW-2	2	10	18.49	23.84	7.05	16.79	0.16	2.69	0.0026	24.64	0	0.06	0.12	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	9:39	600	1.43	1.43	7.36	6.60	27.44	1958	0.86	5.63	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	9:41	620	0.33	1.76	7.35	6.60	27.47	1960	0.88	4.04	Temp°C+/- 0.2	STABLE	Pump:	PP
9:30	9:43	600	0.32	2.08	7.35	6.60	27.46	1958	0.83	4.34	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated	☑ Yes
9:43											Turb. NTU < 20	STABLE	Tubing?	☐ No
Purge Complete At	**9:31**	**Gallons to Purge**	**0.12**	Stability Values =		6.60	27.46	1958	0.83	4.34				

Comments:

Total Time Total Miles

GROUNDWATER WELL SAMPLING EQUIPMENT CALIBRATION

Date: 09/12/18 Sampler(s): RAB Initials RAB

pH Meter Calibration		Buffer ID	Buffer Value	Cal	Time				CCV	Time	Pass/Fail
Meter ID:	MPM08	L 023378B	7	7.01	8:03				7.03	14:09	Pass
FDEP FT 1100		L 022447B	10	10.03	8:03				QC (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)		
Units: SU		L 022142D	4	4.01	8:03	ICV	Time	Pass/Fail	A checked box indicates ICV / CCV passed		
	ICV Check	L 022603J	7			7.05	8:05	Pass			
Conductivity Meter Calib.		Standard ID	Std Value	Cal	Time	ICV	Time	Pass/Fail	CCV	Time	Pass/Fail
Meter ID:	MPM08	L 022463D	1000	1000	8:15						
FDEP FT 1200, Units: uMHOS		L 022464D	10000			9875	8:21	Pass	10025	14:13	Pass
Turbidity Meter Calibration		Standard ID	Std Value	Acceptability Range		CCV	Time	Pass/Fail	CCV	19884	Pass/Fail
Meter ID:	TM07	L 019883	5.56	5.00	6.12	5.64	7:44	Pass			
FDEP FT 1600, Units: NTU		L 019884	52.20	48.81	55.59				52.60	14:15	Pass
Sulfite Info (QC Check) (EPA 377.1)			QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID		
QC Std: 5ml (NaThio)/500ml DI=10mg/L						L	L	L	L		

Redox Cal	Time	Temp °C	Reading mv	Theo Value mv	Pass / Fail	DO Meter Cal	Time	Temp °C	Reading mg/l	Theo Value mg/l	Pass / Fail
						FDEP FT 1500					
Meter ID:	8:11	22.23	234.0	234.9	Pass	Meter ID:	7:56	22.5	8.70	8.660	Pass
MPM08	14:16	22.60	231.7	234.9	Pass	MPM08	13:58	28.5	7.76	7.759	Pass
Zobell Sol ID:						Barom. Pres					
L 022405B						760					

Therm ID	pH	Conduct. %	DO mg/l	Redox mv	CL2	Calibration Criterion	Ferrous Iron Comparator ID:	Reagent ID: L-
MPM08	0.2	5	0.3	10	0.2			

ClO_2 DPD Check must read +/- 10% of the Calculated Std. Concentration, multiplied by 2.4. Glycene check should read < 0.10 mg/l ClO_2.

Chlorine Dioxide (mg/l)	Std. Conc. (mg/l)	Std. Spike Volume (ml)	Cal Sample Volume (ml)	Calc. Std. Conc. (mg/l)	Initial Calibration Verification ICV: DPD Check (mg/l)	Glycene Check	Time	Pass/Fail	Continuous Calibration Verification CCV: DPD Check (mg/l)	Time	Pass/Fail
Meter ID:		1.0	100								
			DPD ID: L		Glycene ID: L		A checked box indicates reagent expiration date has been verified.				

Method 10126*

*Equivalent to Standard Methods, 4500 ClO_2 D.

COMMENTS: CL2 Std. ID: L

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

FACILITY NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.
WELL NO:	BBS-CCR-1	SAMPLE ID:	L18I055-01 A
DATE:	9/12/18		

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	WELL SCREEN INTERVAL (NGVD)	STATIC DEPTH TO WATER (feet)	PURGE PUMP TYPE OR BAILER:
	1/4	DEPTH 12.32 feet to 22.32 (feet)	6.75	PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 23.3 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	PURGING INITIATED AT:	PURGING ENDED AT:	TOTAL VOLUME PURGED (gallons):
17.32	17.32	12:12	12:22	2.00

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (°C)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/l or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
12:18	1.20	1.20	0.20	6.97	6.82	26.01	4115	0.23	17.10	Lt. Yellow	Mild
12:20	0.40	1.60	0.20	6.98	6.80	26.06	4117	0.22	10.60	Lt. Yellow	Mild
12:22	0.40	2.00	0.20	6.98	6.80	26.10	4118	0.20	9.47	Lt. Yellow	Mild

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.00006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
RAB TECO		12:22	12:30

PUMP OR TUBING DEPTH IN WELL (feet):	SAMPLE PUMP FLOW RATE (mL per minute):	TUBING MATERIAL CODE:
17.3	753	PE/S

FIELD DECONTAMINATION: Y ☐ N ☑
FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type: FILTER SIZE: µm
DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submirsable Pump; PP = Peristaltic Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)

NOTES:
1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.
WELL NO:	BBS-CCR-2	SAMPLE ID:	L18I055-02 A
		DATE:	9/12/18

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	1/4	WELL SCREEN INTERVAL DEPTH	11.84	feet to	21.84 (feet)	STATIC DEPTH TO WATER (feet):	6.23	PURGE PUMP TYPE OR BAILER:	PP

WELL VOLUME PURGE: (only fillout if applicable) **1 WELL VOLUME** = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY

= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable) **1 EQUIPMENT VOL.** = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME

=(0 gallons + (0.0026 gallons/foot X 22.84 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	16.84	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	16.84	PURGING INITIATED AT:	11:35	PURGING ENDED AT:	11:45	TOTAL VOLUME PURGED (gallons):	1.28

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (°C)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
11:41	0.76	0.76	0.13	6.29	6.69	26.76	1515	0.31	3.93	Lt. Yellow	Mild
11:43	0.26	1.02	0.13	6.30	6.69	26.82	1517	0.27	3.63	Lt. Yellow	Mild
11:45	0.26	1.28	0.13	6.29	6.69	26.74	1516	0.24	3.43	Lt. Yellow	Mild

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.00006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	RAB TECO	SAMPLER (S) SIGNATURES:		SAMPLING INITIATED AT:	11:45	SAMPLING ENDED AT:	12:00
PUMP OR TUBING DEPTH IN WELL (feet):	16.8	SAMPLE PUMP FLOW RATE (mL per minute):	493	TUBING MATERIAL CODE:	PE/S		
FIELD DECONTAMINATION:	Y ☐ N ☑	FIELD-FILTERED: Filtration Equipment Type:	Y ☐ N ☑	FILTER SIZE:	µm	DUPLICATE:	Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:

(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submirsable Pump; PP = Peristaltic Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)

NOTES:

1. **The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.	
WELL NO:	BBS-CCR-3	SAMPLE ID:	L18I055-03 A	DATE: 9/12/18

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches) 1/4	WELL SCREEN INTERVAL DEPTH 13.23 feet to 23.23 (feet)	STATIC DEPTH TO WATER (feet): 5.79	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: (only fillout if applicable) **1 WELL VOLUME** = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY

= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable) **1 EQUIPMENT VOL.** = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME

=(0 gallons + (0.0026 gallons/foot X 24.23 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 18.23	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 18.23	PURGING INITIATED AT: 10:47	PURGING ENDED AT: 10:58	TOTAL VOLUME PURGED (gallons): 1.41

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (°C)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/l or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
10:54	0.89	0.89	0.13	6.40	6.41	26.94	1745	0.27	4.01	Yellow	Moderate
10:56	0.26	1.15	0.13	6.41	6.41	26.92	1717	0.46	3.58	Yellow	Moderate
10:58	0.26	1.41	0.13	6.39	6.41	26.88	1694	0.52	3.47	Yellow	Moderate

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.00006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER(S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
RAB TECO		10:58	11:08
PUMP OR TUBING DEPTH IN WELL (feet): 18.2	SAMPLE PUMP FLOW RATE (mL per minute): 493	TUBING MATERIAL CODE: PE/S	
FIELD DECONTAMINATION: Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type:	FILTER SIZE: µm	DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION				
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:

(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submrsable Pump; PP = Peristaltic Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)

NOTES:

1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.
WELL NO:	BBS-CCR-BW-1	SAMPLE ID:	L18I055-04 A
DATE:	9/12/18		

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	1/4	WELL SCREEN INTERVAL DEPTH	34.30	feet to	44.30	(feet)	STATIC DEPTH TO WATER (feet):	28.42	PURGE PUMP TYPE OR BAILER:	ESP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 100 feet) + 0.06 gallons = 0.32 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	39.30	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	39.30	PURGING INITIATED AT:	10:10	PURGING ENDED AT:	10:22	TOTAL VOLUME PURGED (gallons):	9.52

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (°C)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/l or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
10:18	6.34	6.34	0.79	29.74	6.49	27.71	4215	0.40	8.64	Clear	None
10:20	1.59	7.93	0.80	29.73	6.50	27.73	4345	0.46	3.03	Clear	None
10:22	1.59	9.52	0.80	29.74	6.51	27.71	4407	0.55	2.62	Clear	None

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.00006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	RAB TECO	SAMPLER (S) SIGNATURES:		SAMPLING INITIATED AT:	10:22	SAMPLING ENDED AT:	10:26
PUMP OR TUBING DEPTH IN WELL (feet):	39.3	SAMPLE PUMP FLOW RATE (mL per minute):	3000	TUBING MATERIAL CODE:	PE		
FIELD DECONTAMINATION:	Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type:		FILTER SIZE:	µm	DUPLICATE:	Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	ESP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	ESP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	ESP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submirsable Pump; PP = Peristaltic Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)

NOTES:
1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.
WELL NO:	BBS-CCR-BW-2	SAMPLE ID:	L18I055-05 A
DATE:	9/12/18		

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	1/4	WELL SCREEN INTERVAL DEPTH	13.64	feet to	23.34 (feet)	STATIC DEPTH TO WATER (feet):	7.05	PURGE PUMP TYPE OR BAILER:	PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 24.64 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	18.49	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	18.49	PURGING INITIATED AT:	9:30	PURGING ENDED AT:	9:43	TOTAL VOLUME PURGED (gallons):	2.08

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (°C)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/l or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
9:39	1.43	1.43	0.16	7.36	6.60	27.44	1958	0.86	5.63	Lt. Yellow	Mild
9:41	0.33	1.76	0.17	7.35	6.60	27.47	1960	0.88	4.04	Lt. Yellow	Mild
9:43	0.32	2.08	0.16	7.35	6.60	27.46	1958	0.83	4.34	Lt. Yellow	Mild

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.00006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	RAB TECO	SAMPLER (S) SIGNATURES:		SAMPLING INITIATED AT:	9:43	SAMPLING ENDED AT:	9:54
PUMP OR TUBING DEPTH IN WELL (feet):	18.5	SAMPLE PUMP FLOW RATE (mL per minute):	607	TUBING MATERIAL CODE:	PE/S		
FIELD DECONTAMINATION:	Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type:		FILTER SIZE:	µm	DUPLICATE:	Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submirsable Pump; PP = Peristaltic Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (tubing Gravity Drain); VT = Vacuum Trap; O = Other (Specify)

NOTES:
1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Tampa
6712 Benjamin Road
Suite 100
Tampa, FL 33634
Tel: (813)885-7427

TestAmerica Job ID: 660-89608-1
Client Project/Site: L18I055

For:
Tampa Electric Company
5012 Causeway Boulevard
Tampa, Florida 33619

Attn: Ms. Peggy Penner

Authorized for release by:
9/24/2018 11:15:09 AM

Keaton Conner, Project Manager I
(813)885-7427
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Sample Summary

Client: Tampa Electric Company
Project/Site: L18I055

TestAmerica Job ID: 660-89608-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
660-89608-1	L18I055-01	Water	09/12/18 12:30	09/13/18 12:35
660-89608-2	L18I055-02	Water	09/12/18 12:00	09/13/18 12:35
660-89608-3	L18I055-03	Water	09/12/18 11:08	09/13/18 12:35
660-89608-4	L18I055-04	Water	09/12/18 10:26	09/13/18 12:35
660-89608-5	L18I055-05	Water	09/12/18 09:54	09/13/18 12:35

Definitions/Glossary

Client: Tampa Electric Company
Project/Site: L18I055

TestAmerica Job ID: 660-89608-1

Qualifiers

Metals

Qualifier	Qualifier Description
I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
U	Indicates that the compound was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 660-89608-1

Laboratory: TestAmerica Tampa

Narrative

CASE NARRATIVE
Client: Tampa Electric Company
Project: L18I055

Report Number: 660-89608-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In the event of interference or analytes present at high concentrations, samples may be diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

RECEIPT

The samples were received on 9/13/2018 12:35 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.8º C.

TOTAL METALS (ICP)

Samples L18I055-01 (660-89608-1), L18I055-02 (660-89608-2), L18I055-03 (660-89608-3), L18I055-04 (660-89608-4) and L18I055-05 (660-89608-5) were analyzed for total metals (ICP) in accordance with EPA Method 200.7. The samples were prepared on 09/19/2018 and analyzed on 09/21/2018.

The serial dilution performed for the following sample associated with batch 400-412553 was outside control limits: (660-89607-A-1-A SD)

The post digestion spike % recovery associated with batch 400-412553 was outside of control limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Detection Summary

Client: Tampa Electric Company
Project/Site: L18I055

TestAmerica Job ID: 660-89608-1

Client Sample ID: L18I055-01 — Lab Sample ID: 660-89608-1

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.016	I	0.050	0.0010	mg/L	1		200.7 Rev 4.4	Total/NA

Client Sample ID: L18I055-02 — Lab Sample ID: 660-89608-2

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.013	I	0.050	0.0010	mg/L	1		200.7 Rev 4.4	Total/NA

Client Sample ID: L18I055-03 — Lab Sample ID: 660-89608-3

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.011	I	0.050	0.0010	mg/L	1		200.7 Rev 4.4	Total/NA

Client Sample ID: L18I055-04 — Lab Sample ID: 660-89608-4

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.017	I	0.050	0.0010	mg/L	1		200.7 Rev 4.4	Total/NA

Client Sample ID: L18I055-05 — Lab Sample ID: 660-89608-5

Analyte	Result	Qualifier	PQL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lithium	0.0062	I	0.050	0.0010	mg/L	1		200.7 Rev 4.4	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: L18I055-01
Lab Sample ID: 660-89608-1
Date Collected: 09/12/18 12:30
Matrix: Water
Date Received: 09/13/18 12:35

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.016	I	0.050	0.0010	mg/L		09/19/18 10:22	09/21/18 21:01	1

Client Sample ID: L18I055-02
Lab Sample ID: 660-89608-2
Date Collected: 09/12/18 12:00
Matrix: Water
Date Received: 09/13/18 12:35

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.013	I	0.050	0.0010	mg/L		09/19/18 10:22	09/21/18 21:04	1

Client Sample ID: L18I055-03
Lab Sample ID: 660-89608-3
Date Collected: 09/12/18 11:08
Matrix: Water
Date Received: 09/13/18 12:35

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.011	I	0.050	0.0010	mg/L		09/19/18 10:22	09/21/18 21:08	1

Client Sample ID: L18I055-04
Lab Sample ID: 660-89608-4
Date Collected: 09/12/18 10:26
Matrix: Water
Date Received: 09/13/18 12:35

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.017	I	0.050	0.0010	mg/L		09/19/18 10:22	09/21/18 21:11	1

Client Sample ID: L18I055-05
Lab Sample ID: 660-89608-5
Date Collected: 09/12/18 09:54
Matrix: Water
Date Received: 09/13/18 12:35

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0062	I	0.050	0.0010	mg/L		09/19/18 10:22	09/21/18 21:14	1

Method: 200.7 Rev 4.4 - Metals (ICP)

Lab Sample ID: MB 400-412052/1-A
Matrix: Water
Analysis Batch: 412553

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 412052

Analyte	MB Result	MB Qualifier	PQL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	0.0010	U	0.050	0.0010	mg/L		09/19/18 10:22	09/21/18 20:11	1

Lab Sample ID: LCS 400-412052/2-A
Matrix: Water
Analysis Batch: 412553

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 412052

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lithium			1.00	1.05		mg/L		105	85 - 115		

Lab Sample ID: 660-89607-A-1-B MS
Matrix: Water
Analysis Batch: 412553

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 412052

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lithium	0.079		1.00	1.18		mg/L		110	70 - 130		

Lab Sample ID: 660-89607-A-1-C MSD
Matrix: Water
Analysis Batch: 412553

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 412052

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lithium	0.079		1.00	1.24		mg/L		116	70 - 130	5	20

QC Association Summary

Client: Tampa Electric Company
Project/Site: L18I055

TestAmerica Job ID: 660-89608-1

Metals

Prep Batch: 412052

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
660-89608-1	L18I055-01	Total/NA	Water	200.7	
660-89608-2	L18I055-02	Total/NA	Water	200.7	
660-89608-3	L18I055-03	Total/NA	Water	200.7	
660-89608-4	L18I055-04	Total/NA	Water	200.7	
660-89608-5	L18I055-05	Total/NA	Water	200.7	
MB 400-412052/1-A	Method Blank	Total/NA	Water	200.7	
LCS 400-412052/2-A	Lab Control Sample	Total/NA	Water	200.7	
660-89607-A-1-B MS	Matrix Spike	Total/NA	Water	200.7	
660-89607-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	200.7	

Analysis Batch: 412553

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
660-89608-1	L18I055-01	Total/NA	Water	200.7 Rev 4.4	412052
660-89608-2	L18I055-02	Total/NA	Water	200.7 Rev 4.4	412052
660-89608-3	L18I055-03	Total/NA	Water	200.7 Rev 4.4	412052
660-89608-4	L18I055-04	Total/NA	Water	200.7 Rev 4.4	412052
660-89608-5	L18I055-05	Total/NA	Water	200.7 Rev 4.4	412052
MB 400-412052/1-A	Method Blank	Total/NA	Water	200.7 Rev 4.4	412052
LCS 400-412052/2-A	Lab Control Sample	Total/NA	Water	200.7 Rev 4.4	412052
660-89607-A-1-B MS	Matrix Spike	Total/NA	Water	200.7 Rev 4.4	412052
660-89607-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	200.7 Rev 4.4	412052

Lab Chronicle

Client: Tampa Electric Company
Project/Site: L18I055

TestAmerica Job ID: 660-89608-1

Client Sample ID: L18I055-01
Date Collected: 09/12/18 12:30
Date Received: 09/13/18 12:35

Lab Sample ID: 660-89608-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	200.7			50 mL	50 mL	412052	09/19/18 10:22	KWN	TAL PEN
Total/NA	Analysis	200.7 Rev 4.4		1			412553	09/21/18 21:01	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Client Sample ID: L18I055-02
Date Collected: 09/12/18 12:00
Date Received: 09/13/18 12:35

Lab Sample ID: 660-89608-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	200.7			50 mL	50 mL	412052	09/19/18 10:22	KWN	TAL PEN
Total/NA	Analysis	200.7 Rev 4.4		1			412553	09/21/18 21:04	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Client Sample ID: L18I055-03
Date Collected: 09/12/18 11:08
Date Received: 09/13/18 12:35

Lab Sample ID: 660-89608-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	200.7			50 mL	50 mL	412052	09/19/18 10:22	KWN	TAL PEN
Total/NA	Analysis	200.7 Rev 4.4		1			412553	09/21/18 21:08	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Client Sample ID: L18I055-04
Date Collected: 09/12/18 10:26
Date Received: 09/13/18 12:35

Lab Sample ID: 660-89608-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	200.7			50 mL	50 mL	412052	09/19/18 10:22	KWN	TAL PEN
Total/NA	Analysis	200.7 Rev 4.4		1			412553	09/21/18 21:11	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Client Sample ID: L18I055-05
Date Collected: 09/12/18 09:54
Date Received: 09/13/18 12:35

Lab Sample ID: 660-89608-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	200.7			50 mL	50 mL	412052	09/19/18 10:22	KWN	TAL PEN
Total/NA	Analysis	200.7 Rev 4.4		1			412553	09/21/18 21:14	GESP	TAL PEN
	Instrument ID: 6500 ICP Duo									

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Accreditation/Certification Summary

Client: Tampa Electric Company
Project/Site: L18I055

TestAmerica Job ID: 660-89608-1

Laboratory: TestAmerica Tampa

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Florida	NELAP	4	E84282	06-30-19

Laboratory: TestAmerica Pensacola

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Florida	NELAP	4	E81010	06-30-19

Method Summary

Client: Tampa Electric Company
Project/Site: L18I055

TestAmerica Job ID: 660-89608-1

Method	Method Description	Protocol	Laboratory
200.7 Rev 4.4	Metals (ICP)	EPA	TAL PEN
200.7	Preparation, Total Metals	EPA	TAL PEN

Protocol References:

EPA = US Environmental Protection Agency

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

SUBCONTRACT ORDER

Tampa Electric Company, Laboratory Services

L18I055

SENDING LABORATORY:

Tampa Electric Company, Laboratory Services
5012 Causeway Blvd
Tampa, FL 33619
Phone: (813) 630-7490
Fax: (813) 630-7360
Project Manager: Peggy Penner

RECEIVING LABORATORY:

TestAmerica Laboratories, Inc. - Tampa
6712 Benjamin Rd., Suite 100
Tampa, FL 33634
Phone :(813) 885-7427
Fax: -

Due Date: 09/26/18 16:00

Analysis	Expires	Laboratory ID	Comments
Sample ID: L18I055-01 **BBS-CCR-1**		**Water**	
Sampled: 09/12/18 12:30			
Lithium, Total EPA 6010	03/11/19 12:30		
Containers Supplied:			
Poly HNO3 - 250mL (A)			
Sample ID: L18I055-02 **BBS-CCR-2**		**Water**	
Sampled: 09/12/18 12:00			
Lithium, Total EPA 6010	03/11/19 12:00		
Containers Supplied:			
Poly HNO3 - 250mL (A)			
Sample ID: L18I055-03 **BBS-CCR-3**		**Water**	
Sampled: 09/12/18 11:08			
Lithium, Total EPA 6010	03/11/19 11:08		
Containers Supplied:			
Poly HNO3 - 250mL (A)			
Sample ID: L18I055-04 **BBS-CCR-BW1**		**Water**	
Sampled: 09/12/18 10:26			
Lithium, Total EPA 6010	03/11/19 10:26		
Containers Supplied:			
Poly HNO3 - 250mL (A)			
Sample ID: L18I055-05 **BBS-CCR-BW2**		**Water**	
Sampled: 09/12/18 09:54			
Lithium, Total EPA 6010	03/11/19 09:54		
Containers Supplied:			
Poly HNO3 - 250mL (A)			

660-89608 Chain of Custody

Loc: 660
89608

Released By	Date & Time	Received By	Date & Time
[signature]	9-13-18 0905	[signature]	9-13-18 @ 1235
Released By	Date & Time	Received By	Date & Time
		2.8/2.8 CW-09	

TestAmerica Tampa
6712 Benjamin Road Suite 100
Tampa, FL 33634
Phone (813) 885-7427 Fax (813) 885-7049

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Conner, Keaton	Carrier Tracking No(s):	COC No: 660-107805.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: keaton.conner@testamericainc.com	State of Origin: Florida	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note): NELAP - Florida; NELAP - Texas		Job #: 660-89608-1
Address: 3355 McLemore Drive,	Due Date Requested: 9/20/2018			
City: Pensacola	TAT Requested (days):			
State, Zip: FL, 32514				
Phone: 850-474-1001(Tel) 850-478-2671(Fax)	PO #:			
Email:	WO #:			
Project Name: L18I055	Project #: 66004821			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	200.7/200.7_P_TOT Lithium	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
L18I055-01 (660-89608-1)	9/12/18	12:30 Eastern		Water			X	1	
L18I055-02 (660-89608-2)	9/12/18	12:00 Eastern		Water			X	1	
L18I055-03 (660-89608-3)	9/12/18	11:08 Eastern		Water			X	1	
L18I055-04 (660-89608-4)	9/12/18	10:26 Eastern		Water			X	1	
L18I055-05 (660-89608-5)	9/12/18	09:54 Eastern		Water			X	1	

Note: Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc. places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc. attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc.

Possible Hazard Identification	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
Unconfirmed	☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1	[signature]	9-13-18@ 1700	TA TAM	Emily Edney	9/14/18 915	Pace TA
2	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company 9/14/18 EA
3	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 0.2°C IR-8

Ver: 09/20/2016

Login Sample Receipt Checklist

Client: Tampa Electric Company

Job Number: 660-89608-1

Login Number: 89608
List Number: 1
Creator: Redding, Charles S

List Source: TestAmerica Tampa

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Tampa Electric Company

Job Number: 660-89608-1

Login Number: 89608
List Number: 2
Creator: Johnson, Jeremy N

List Source: TestAmerica Pensacola
List Creation: 09/14/18 11:51 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

KNL ENVIRONMENTAL TESTING

FL DOH Certification #E84025

Report Date: September 26, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody: Client
Client/Field ID: L18I055-01
BBS-CCR-1
Sample Collection: 09-12-18/1230
Lab ID No: 18.10577
Lab Custody Date: 09-13-18/0929
Sample description: Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results			Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	34.7	±	1.8	Calc	Calc	0.7
Radium-226	pCi/l	33.2	±	1.8	9-24-18/1300	EPA 903.0	0.6
Radium-228	pCi/l	1.5	±	0.5	9-24-18/1124	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification #E84025

Report Date: September 26, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody: Client
Client/Field ID: L18I055-02
BBS-CCR-2
Sample Collection: 09-12-18/1200
Lab ID No: 18.10578
Lab Custody Date: 09-13-18/0929
Sample description: Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results			Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	15.3	±	1.3	Calc	Calc	0.7
Radium-226	pCi/l	15.3	±	1.3	9-24-18/1300	EPA 903.0	0.6
Radium-228	pCi/l	0.0	±	0.4	9-24-18/1124	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification #E84025

Report Date: September 26, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody: Client
Client/Field ID: L18I055-03
BBS-CCR-3
Sample Collection: 09-12-18/1108
Lab ID No: 18.10579
Lab Custody Date: 09-13-18/0929
Sample description: Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results			Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	14.8	±	1.3	Calc	Calc	0.7
Radium-226	pCi/l	14.1	±	1.3	9-24-18/1300	EPA 903.0	0.6
Radium-228	pCi/l	0.7	±	0.5	9-24-18/1124	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification #E84025

Report Date: September 26, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody:	Client
Client/Field ID:	L18I055-04 BBS-CCR-BW1
Sample Collection:	09-12-18/1026
Lab ID No:	18.10580
Lab Custody Date:	09-13-18/0929
Sample description:	Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results			Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	23.6	±	1.3	Calc	Calc	0.7
Radium-226	pCi/l	20.6	±	1.3	9-24-18/1300	EPA 903.0	0.4
Radium-228	pCi/l	3.0	±	0.6	9-25-18/0959	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

KNL ENVIRONMENTAL TESTING

FL DOH Certification #E84025

Report Date: September 26, 2018

TECO
5012 Causeway Blvd.
Tampa, FL 33619

Attn: Peggy Penner

Field Custody:	Client
Client/Field ID:	L18I055-05 BBS-CCR-BW2
Sample Collection:	09-12-18/0954
Lab ID No:	18.10581
Lab Custody Date:	09-13-18/0929
Sample description:	Water

CERTIFICATE OF ANALYSIS

Parameter	Units	Results			Analysis Date	Method	Detection Limit
Combined Radium (Radium-226 + Radium 228)	pCi/l	3.7	±	0.6	Calc	Calc	0.7
Radium-226	pCi/l	3.5	±	0.6	9-24-18/1300	EPA 903.0	0.4
Radium-228	pCi/l	0.2	±	0.4	9-25-18/0959	EPA Ra-05	0.7

Alpha Standard: Th-230

James W. Hayes
Laboratory Manager

Test results meet all requirements of the NELAC standards. Statement of estimated uncertainty available upon request. Test results refer only to sample(s) listed.
Contact person: Jim Hayes (813) 229-2879.

KNL ENVIROMENTAL TESTING, INC. | 3202 NORTH FLORIDA AVENUE | TAMPA, FLORIDA 33603
813.229.2879 | KNLENVIRONMENTAL.COM

SUBCONTRACT ORDER

Tampa Electric Company, Laboratory Services

L18I055

SENDING LABORATORY:

Tampa Electric Company, Laboratory Services
5012 Causeway Blvd
Tampa, FL 33619
Phone: (813) 630-7490
Fax: (813) 630-7360
Project Manager: Peggy Penner

RECEIVING LABORATORY:

KNL Laboratory Services
3202 N. Florida Ave.
Tampa, FL 33603
Phone :(813) 229-2879
Fax: -

Due Date: 09/26/18 16:00

Analysis	Expires	Laboratory ID	Comments
Sample ID: L18I055-01 BBS-CCR-1		**Water** 18.1057T	
Sampled: 09/12/18 12:30			
Radium 226 EPA 903.0	03/11/19 12:30	Level 2 Data requred	
Radium 226+228, Total	03/11/19 12:30	Level 2 Data requred	
Radium 228 Ra-05	03/11/19 12:30	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		
Sample ID: L18I055-02 BBS-CCR-2		**Water** 18.1057E	
Sampled: 09/12/18 12:00			
Radium 226 EPA 903.0	03/11/19 12:00	Level 2 Data requred	
Radium 226+228, Total	03/11/19 12:00	Level 2 Data requred	
Radium 228 Ra-05	03/11/19 12:00	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		
Sample ID: L18I055-03 BBS-CCR-3		**Water** 18.1057Y	
Sampled: 09/12/18 11:08			
Radium 226+228, Total	03/11/19 11:08	Level 2 Data requred	
Radium 226 EPA 903.0	03/11/19 11:08	Level 2 Data requred	
Radium 228 Ra-05	03/11/19 11:08	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		
Sample ID: L18I055-04 BBS-CCR-BW1		**Water** 18.105E0	
Sampled: 09/12/18 10:26			
Radium 226+228, Total	03/11/19 10:26	Level 2 Data requred	
Radium 226 EPA 903.0	03/11/19 10:26	Level 2 Data requred	
Radium 228 Ra-05	03/11/19 10:26	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		

Released By	Date & Time	Received By	Date & Time
[signature]	9-13-18 0929	KNL [signature]	9-13-18 929
Released By	Date & Time	Received By	Date & Time

SUBCONTRACT ORDER

Tampa Electric Company, Laboratory Services

L18I055

Analysis	Expires	Laboratory ID	Comments
Sample ID: L18I055-05 BBS-CCR-BW2	**Water**	18-1058 1	
Sampled: 09/12/18 09:54			
Radium 228 Ra-05	03/11/19 09:54	Level 2 Data requred	
Radium 226 EPA 903.0	03/11/19 09:54	Level 2 Data requred	
Radium 226+228, Total	03/11/19 09:54	Level 2 Data requred	
Containers Supplied:			
RAD Poly HNO3 - 1000mL (C)	RAD Poly HNO3 - 1000mL (D)		

Released By	Date & Time	Received By	Date & Time
[signature]	9-13-18 0929	[signature]	9-13-18 929
Released By	Date & Time	Received By	Date & Time

APPENDIX C
Alternate Source Demonstration

Certification of Accuracy of Demonstration – Statistically Significant Increase Over Background Levels Not Caused by CCR Unit

As required by 40 C.F.R. § 257.94(e)(2), the undersigned, being a qualified professional engineer, as that term is defined under 40 C.F.R. § 257.53, hereby certifies the accuracy of the information in the report to demonstrate whether, with respect to the CCR unit and Appendix III constituents listed in the table below, the statistically significant increase over background levels determined pursuant to 40 C.F.R. § 257.93(h) (i) was caused by a source other than the CCR unit, or (ii) resulted from error in sampling analysis, statistical evaluation, or natural variation in groundwater quality.

Tampa Electric Company
Economizer Ash and Pyrite Pond System
Big Bend Power Station
Gibsonton, Florida
pH

[P.E. Signature]

Digitally signed by Todd D. Anderson, PE
Date: 2018.04.13 12:22:46 -04'00'

[Date]

Geosyntec consultants

engineers | scientists | innovators

TECO TAMPA ELECTRIC AN EMERA COMPANY

ALTERNATE SOURCE DEMONSTRATION – ECONOMIZER ASH AND PYRITE POND SYSTEM

Big Bend Power Station

13031 Wyandotte Road

Gibsonton, FL 33572

Prepared for

Tampa Electric Company
Tampa, Florida

Prepared by

Geosyntec Consultants, Inc.
12802 Tampa Oaks Boulevard, STE 151
Tampa, FL 33637

Project FR2814.01

13 April 2018

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Figure 4 Surficial Aquifer Potentiometric Surface – August 2016

Figure 5 Surficial Aquifer Potentiometric Surface – November 2016

Figure 6 Surficial Aquifer Potentiometric Surface – April 2017

Figure 7 Surficial Aquifer Potentiometric Surface – October 2017

Figure 8 Regional Surficial Aquifer Monitoring Well Locations

Figure 9 Surficial Aquifer Groundwater Potentiometric Surface Map – August 2014

LIST OF APPENDICIES

Appendix A Summary of Statistical Analyses of Baseline Groundwater Samples

Appendix B EPA 530-R-93-017 Subpart E Section 5.10

Appendix C Groundwater Sampling and Calibration Forms - October 13, 2017

1. PURPOSE OF ALTERNATE SOURCE DEMONSTRATION REPORT

On behalf of the Tampa Electric Company (TEC), Geosyntec Consultants. Inc. (Geosyntec) has prepared this alternate source demonstration (ASD) for the economizer ash and pyrite pond system (EAPPS) at the TEC's Big Bend Power Station (BBS) in Gibsonton, Florida. This ASD has been prepared to meet the requirements of the U. S. Environmental Protection Agency's (USEPA) coal combustion residual (CCR) Rule 40 CFR Part 257.94(e)(2) which states:

> *The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report.*

1.1 Regulatory Background

In June 2016, TEC implemented baseline groundwater sampling as part of closure requirements for the EAPPS. The monitoring well network consists of two background locations (BBS-CCR-BW1 and BBS-CCR-BW2) and three downgradient locations (BBS-CCR-1, BBS-CCR-2, and BBS-CCR-3) installed within the surficial aquifer at the EAPPs (**Figure 1**). Data from the 10 baseline monitoring events and the first detection monitoring events presented in **Table 1**.

In accordance with the provisions established in 40 CFR 257.93, background concentrations were established for each of the constituents listed in 40 CFR 257 Appendix III by analyzing the data from the two background wells present at EAPPS. A 95% upper prediction limit (UPL) was established for each constituent from the results of 10 baseline sampling events occurring between June 2016 and August 2017. For pH a lower prediction limit (LPL) was also determined since acidic water could potentially be an indicator of a release. The first detection monitoring event occurred in October 2017 and resulted in a statistically significant increase (SSI) in pH above the established UPL of 6.70 standard units (SU) in two of the three downgradient monitoring wells, namely 6.83 and 6.87 SU in BBS-CCR-1, and BBS-CCR-2, respectively. The pH SSIs were documented in a summary memorandum entitled *"Summary of Statistical Analyses of Baseline Groundwater Samples"* dated 15 January 2018 (**Appendix A**).

1.2 Objective of ASD

The purpose of this ASD is to document that the SSIs for pH are not associated with a release from the EAPPS. Although 40 CFR 257 does not contain requirements for an ASD beyond the requirements in 257.94(e)(2), the EPA document *Solid Waste Disposal Facility Criteria Technical Manual EPA 530-R-93-017*, November 1993, Subpart E provides guidance on what would be included in an ASD for a municipal solid waste landfill. Geosyntec's approach has been modeled after Section 5.10 of Subpart E (excerpt provided in **Appendix B**) and the analytical techniques and methods presented in *Guidelines for Development of Alternative Source Demonstrations at*

Coal Combustion Residual Sites (EPRI, 2017). This ASD is based on the following three lines of evidence:

- There is inherent error present in the equipment used to measure pH in the field;
- There is natural variation within pH ranges from both BBS background wells and regional monitoring wells;
- A change in local groundwater flow direction will result in the influence from higher pH waters within the immediate vicinity of the EAPPS.

The approaches developed to evaluate the evidence is provided in Section 2 of this report. The justification and support for each approach is provided in Section 3 of this report.

2. ALTERNATE SOURCE DEMONSTRATION APPROACH

2.1 Evaluation of Inherent Error

Given that pH is a parameter that is collected in the field during groundwater sampling, a possible source of error exists in both the calibration of the measurement instrument and the inherent error present due to the accuracy limits of the instrument. Due to this possibility, a thorough investigation of the instrument calibration forms and groundwater sampling forms was conducted to verify that calibration and sampling were accomplished in accordance with standard operating procedures established by the Florida Department of Environmental Protection (FDEP) in FS 2200. A review of pertinent field logs was performed to identify if the pH probe used to collect the detection monitoring samples from wells BBS-CCR-1 and BBS-CCR-2 was properly calibrated, if the calibration drifted throughout the course of the sampling event, if an adequate amount of groundwater was withdrawn to obtain a representative sample from each monitoring well, and if pH readings were allowed to stabilize prior to sample collection. Additionally, the accuracy limitations of the instrument used to measure pH was assessed and compared to the baseline UPL to ascertain if the margin of error for the two pH measurements in question is below the UPL.

2.2 Evaluation of Natural Variation

Because no other Appendix III constituent exhibited a SSI in the October 2017 detection monitoring event, pH results in BBS-CCR-1 and BBS-CCR-2 are not believed to be the result of a release from the EAPPS, but are rather indicative of background levels in the surficial aquifer. To evaluate background pH, data collected from the TEC industrial wastewater (IWW) and remedial action plan (RAP) monitoring well network (**Figure 2**) were obtained for the period of August 2008 to November 2017 (**Table 2**). Three RAP wells within approximately 100 feet from the northwest, southwest, and southeast corners of the EAPPS (B-36, B-35, and B-17R, respectively) were selected for evaluation based on their upgradient proximity to the EAPPS monitoring well network as determined from groundwater elevations measured at the EAPPS (**Figure 3 to Figure 7**).

For comparison, monitoring wells B-4R, B-39, B-40, and B-41 have historically been designated as surficial aquifer background wells by TEC due to their locations upgradient of any TEC development along the perimeter of the property (**Figure 2**). Additionally, four surficial monitoring wells within the Southwest Florida Water Management District (SWFWMD) Regional Observation and Monitoring Program (ROMP) in the Tampa Bay, FL vicinity were identified for a regional background analysis based on available pH data (**Figure 8**). Historical ROMP data obtained by Geosyntec ranged from September 1985 to March 2003.

ProUCL version 5.1 (EPA, 2016) was utilized to generate a 95% upper confidence limit (UCL) of the arithmetic mean for pH values within each individual monitoring well and each dataset in general accordance with guidelines of Chapter 62-780.680 of the Florida Administrative Code (FAC). The most applicable data distribution provided by ProUCL was utilized. The 95% UCLs provide conservative estimates for the true arithmetic mean of each data set. These values were

compared to the October 2017 pH SSIs in BBS-CCR-1 and BBS-CCR-2 to determine if surficial groundwater pH in the vicinity of the EAPPS is exhibiting typical ranges of background variability.

2.3 Evaluation of Groundwater Flow Direction

Should the observed SSIs be the result of influence from background groundwater, a change in the flow direction of groundwater within the EAPPS would likely be observed. Potentiometric surface maps were generated from the baseline and detection monitoring events to compare the observed flow directions and determine if the SSIs could be the result of a change in flow direction.

3. DEMONSTRATION OF OTHER REASONS FOR STATISTICAL INCREASE

This section presents the results of the approaches discussed in Section 2 and provides support that the lines of evidence identified are plausible sources of the pH SSI.

3.1 Findings from Evaluation of Inherent Error

The sampling team used a YSI® multimeter for pH data collection (as well as temperature, specific conductivity, and dissolved oxygen) during monitoring well purging and sampling. Field forms from the October 2017 detection monitoring sampling event are provided in **Appendix C**. A review of the instrument calibration log recorded at 7:02 AM on 13 October 2017 reveals that a 3-point calibration for the pH probe was conducted in accordance with FDEP FS2200. Initial calibration verification (ICV) was conducted for a pH 7.0 SU buffer solution resulting in an acceptable reading of 7.03 SU at 7:06 AM. The continued calibration verification (CCV) performed at 2:29 PM upon the completion of the sampling activities resulted in an acceptable reading of 7.11 SU. Groundwater sampling forms documenting field parameter stabilization for BBS-CCR-1 and BBS-CCR-2 indicate that an adequate amount of water was withdrawn from each well prior to sampling to obtain a representative sample. Additionally, three consecutive pH readings were collected within ± 0.2 SU of each other signifying pH stabilization in each well.

A 0.08 SU drift in pH was observed in the post calibration verification but is not enough to explain why the pH concentrations of BBS-CCR-1 and BBS-CCR-2 (6.83 and 6.87 SU respectively) are outside of the background level of 6.70 SU. However, the error inherent to the instrument itself is accurate within ± 0.2 SU (YSI, 2009). As a result, the October 2017 pH values at BBS-CCR-1 and BBS-CCR-2 are more correctly stated as 6.83 ± 0.2 SU and 6.87 ± 0.2 SU, indicating that the 6.70 SU background level is within the accuracy limits of the instrument.

3.2 Findings from Evaluation of Natural Variation

Statistics for pH data from TEC surficial monitoring wells immediately upgradient of the EAPPS, BBS surficial background monitoring wells, and regional SWFWMD ROMP surficial monitoring wells are included in **Table 2**. Results from 95% UCL calculations are summarized below.

3.2.1 Anthropogenic Background Data – Surficial Aquifer

The pH data from the Economizer Ash and Long-Term Fly Ash Pond monitoring wells (B-17R, B-35, and B-36) indicates the following:

- pH values ranged between 6.60 and 6.96 SU between May 2011 and May 2017;
- 95% UCL values for individual monitoring wells ranged between 6.78 and 6.89 SU and
- The 95% UCL for pH within all three monitoring wells was calculated as 6.82 SU based on 35 total observations.

3.2.2 Natural Background Data – Surficial Aquifer

The pH data from TEC Big Bend IWW/RAP Background Monitoring Wells (B-4R, B-39, B-40, and B-41) indicates the following:

- pH values within the surficial TEC property background wells ranged from 5.81 to 7.31 SU between May 2011 to May 2017;
- 95% UCL values for individual monitoring wells ranged between 6.21 and 7.21 SU; and
- The 95% UCL for pH within all four monitoring wells calculated using 51 total observations is 6.85 SU.

The pH data from the SWFWMD ROMP Monitoring Wells indicates the following:

- pH values ranged between 5.59 and 7.42 SU between September 1985 and March 2003;
- Three of the four monitoring wells had an insufficient number of data points (< 8) to calculate a 95% UCL. Arithmetic mean values are reported for these wells instead. Arithmetic mean and 95% UCL values ranged between 5.77 and 7.25 SU within the individual ROMP wells; and
- The 95% UCL for pH within all four ROMP wells calculated using 34 total observations is 7.13 SU

A 95% UCL of 6.93 SU was also calculated using the combined TEC background and ROMP background well data (85 total observations) over an average range from 5.59 to 7.42 SU.

3.3 Findings from Evaluation of Groundwater Flow Direction

Seasonal variations (e.g., wet and dry seasons) in groundwater flow direction from June 2016 to October 2017 (wet to dry seasons) are presented in **Figure 3** (June 2016), **Figure 4** (August 2015), **Figure 5** (November 2016), **Figure 6** (April 2017), and **Figure 7** (October 2017). Since the installation of the EAPPS monitoring well network in May 2016, little variability in groundwater flow direction was observed during the baseline monitoring events with a predominately north-northeast flow direction observed from background wells BBS-CCR-BW1 and BBS-CCR-BW2 towards the three upgradient monitoring wells located along the northern and eastern borders of the EAPPS. **Figures 3-6** illustrate that surficial groundwater was flowing towards the EAPPS monitoring wells from RAP monitoring well B-35 consistently and that B-36 has been cross to upgradient of BBS-CCR-1 periodically. Similarly, the location of B-17R is typically upgradient of the EAPPS and BBS-CCR-3 based on the northward flow direction observed at BBS-CCR-BW-1 throughout baseline sampling events.

However, noticeable change in groundwater elevations was observed during the October 2017 detection monitoring event, resulting in a more pronounced east-west component across the EAPPS (**Figure 7).** Additionally, a south-southwesterly component appears to be present based on the reversal of gradients observed between monitoring wells BBS-CCR-3 and BBS-CCR-BW-1. These westerly flow components are more aligned with the regional flow across BBS which follows a general east to west flow pattern towards Tampa Bay (**Figure 9**).

4. CONCLUSIONS AND RECOMMENDATIONS

Based on the data review and analysis presented in this ASD, Geosyntec concludes the following regarding the pH SSIs observed in October 2017:

- The margin of error in the pH instrument of ± 0.2 SU means that the background pH level of 6.70 SU is also between 6.50 and 6.90 SU. As a result, the pH values at BBS-CCR-1 and BBS-CCR-2 of 6.83 and 6.87 SU, respectively, are within the margin of error of the instrument and should not be considered SSIs.
- The range of pHs in background adjacent to the EAPPS (6.78 SU to 6.89 SU with a total 95% UCL of 6.82 SU) and BBS to regional background (5.59 to 7.42 SU with a total 95% UCL of 6.93 SU) encompasses the range of pH values (6.30 and 6.70 SU) observed at the EAPPS.
- Subtle changes in groundwater flow direction at the EAPPS (observed in October 2017 during the detection monitoring event) indicates that groundwater originating from the southeast and northwest migrates towards the EAPPS, thus providing for mixing of background groundwater (both anthropogenic and natural) with local groundwater.

This ASD documents that the statistically significant increase in pH at two downgradient monitoring wells is from a source other than the EAPPS. Therefore, the EAPPS will remain in the detection monitoring program.

5. REFERENCES

Electric Power Research Institute (EPRI). 2017. Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites.

Geosyntec Consultants, Inc. 2018. Technical Memorandum: *Summary of Statistical Analyses of Baseline Groundwater Samples Economizer Ash and Pyrite Pond System*.

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United States Environmental Protection Agency (EPA). 1993. Solid Waste Disposal Facility Criteria. *Technical Manual 530R-93-017 Subpart E.*

United States Environmental Protection Agency (EPA). 2016. ProUCL Version 5.1. Statistical Support Software for Site Investigation and Evaluation.

YSI Environmental. 2009. YSI 556 MPS Operations Manual.

TABLES

Table 1: TECO Big Bend EAPPS Analytical Groundwater Results

TECO, Big Bend Facility
Apollo Beach, Florida

				Well ID	BBS-CCR-BW1										
				Sample Date	6/24/2016	7/27/2016	8/26/2016	10/28/2016	11/10/2016	1/26/2017	4/13/2017	6/28/2017	7/20/2017	8/16/2017	10/13/2017
Parameter	**Units**	**MCL**	**Bkgd***		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
Top of Casing Elevation	ft NAVD 88	--	--		30.13	30.13	30.13	30.13	30.13	30.13	30.13	30.13	30.13	30.13	30.13
Depth to Water	ft BTOC	--	--		25.37	26.19	25.78	29.42	29.84	30.49	30.71	29.92	28.89	28.74	29.60
Groundwater Elevation	ft NAVD 88	--	--		4.76	3.94	4.35	0.71	0.29	-0.36	-0.58	0.21	1.24	1.39	0.53
Temperature	C	NA	--		27.84	28.25	28.11	27.46	27.50	26.98	27.20	27.72	27.89	28.08	28.16
Specific Conductivity (field)	umhos/cm	NA	--		5620	5420	5140	4860	5000	4940	1580	5010	4960	5000	4570
pH (field)	SU	6.5 - 8.5	--		6.51	6.38	6.41	6.50	6.52	6.46	6.49	6.47	6.49	6.52	6.55
Dissolved Oxygen	mg/L	NA	--		0.180	0.170	0.120	0.130	0.130	0.200	0.140	0.420	0.600	0.450	0.400
Redox Potential	mV	NA	--		-8.60	-7.30	-22.80	-76.20	-71.1	-20.2	-114.00	-11.4	-23.00	3.60	-18.40
Turbidity (field)	NTU	NA	--		5.14	7.10	6.47	4.08	1.77	2.04	4.22	0.69	2.38	6.03	2.51
Appendix III Parameters															
Boron	mg/L	1.4**	54.6		**59.1**	**56.9**	**53.7 V**	**51.4**	**49.7**	**45.9**	**49.0**	**51.7**	**47.00**	**48.00**	**44.20**
Calcium	mg/L	NA	997.5		**781**	**737**	**729**	**675 V**	**692**	**728**	**693**	**781**	**744 V**	**743**	**691**
Chloride	mg/L	*250*	1088		**1140 J-**	**1120**	**1030**	**939 V**	**993 V**	**942 V**	**934**	**995**	**915 V**	**793**	**809**
Fluoride	mg/L	4***	0.664		**0.199**	**0.110**	**0.180**	**0.194**	**0.261**	**0.315**	**0.256**	**0.298**	**0.255 J**	0.0100 U	**0.334**
Sulfate	mg/L	*250*	1677		**1440 J-**	**1510**	**1420**	**1400**	**1440**	**1520**	**1550**	**1510**	**1470**	**1320**	**217**
Total Dissolved Solids	mg/L	*500*	5418		**5050 J-**	**4190 I(-)**	**4290**	**4120 J-**	**4170 J-**	**4510 J**	**4060 J**	**4430**	**4160 J**	**4340**	**3890**
Appendix IV Parameters															
Antimony	ug/L	6	1.47		0.600 U	0.600 U	**1.77 I**	6.00 U	0.600 U	0.600 U	0.600 U	0.600 U	6.00 U	0.600 U	0.600 U
Arsenic	ug/L	10	8.89		**10.2**	**8.10**	**8.89**	3.20 U	**8.49**	0.320 U	**8.61**	**7.68**	**8.48 I**	**6.60**	**9.06**
Barium	ug/L	2000	106		**72.9**	**68.2**	**61.4**	**60.0**	**61.2**	**54.6**	**53.6**	**55.4**	**51.7**	**55.6**	**55.8**
Beryllium	ug/L	4	0.215		0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
Cadmium	ug/L	5	0.235		0.100 U	0.100 U	0.100 U	1.00 U	0.100 U	0.100 U	**0.108 I**	**0.124 I**	1.00 U	0.100 U	0.100 U
Chromium	ug/L	100	2.45		1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	**3.23 I**	**2.29 I**	**2.16 I**	**2.48 J**	1.6 U
Cobalt	ug/L	140**	1.61		**1.40 I**	**1.33 I**	**1.52 I**	**0.963 I**	**1.45 I**	**1.50 I**	2.0 U	**1.71 I**	**1.97 I**	**1.66 J**	**1.86** J
Lead	ug/L	15	0.265		0.0800 U	**0.200 I**	**0.111 I**	0.800 U	**0.102 I**	**0.113 I**	**0.129 I**	0.0800 U	0.800 U	**0.291 J**	**0.103** J
Lithium	ug/L	140**	19		**8.9 I**	**20 I**	**7.4 I**	**11 I**	**10 I**	**18 I**	**39.7**	**15 U**	**17 I**	0.050 U	17 I,V
Mercury	ug/L	2	0.0500		0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Molybdenum	ug/L	35**	12.8		**4.46 I**	**2.88 I**	**11.1 I**	**6.00 I**	**6.58 I**	**7.16 I**	**15.6 I**	16.3 U	**13.6 I**	**1.43 J**	**4.27** J
Radium 226/228	pCi/L	1	38.2		**38**	**35**	**31**	**32.3**	**29.9**	**32.5**	**39.7**	**37.8**	**37.2**	**30.1**	**22.1**
Selenium	ug/L	50	2.08		**2.09**	**1.92 I**	**1.73 I**	2.00 U	**2.51**	0.200 U	**1.62 I**	**1.81 I**	2.00 U	**1.76 J**	**2.14 J**
Thallium	ug/L	2	0.229		**0.118 I**	0.100 U	0.100 U	1.00 U	0.100 U	0.100 U	0.100 U	0.100 U	1.00 U	0.100 U	0.100 U

Notes and Abbreviations provided on Page 6.

Table 1: TECO Big Bend EAPPS Analytical Groundwater Results

TECO, Big Bend Facility
Apollo Beach, Florida

				Well ID	BBS-CCR-BW2										
				Sample Date	6/24/2016	7/27/2016	8/26/2016	10/28/2016	11/10/2016	1/26/2017	4/13/2017	6/28/2017	7/20/2017	8/16/2017	10/13/2017
Parameter	**Units**	**MCL**	**Bkgd***		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Results Q	Results Q	Result Q
Top of Casing Elevation	ft NAVD 88	--	--		9.81	9.81	9.81	9.81	9.81	9.81	9.81	9.81	9.81	9.81	30.13
Depth to Water	ft BTOC	--	--		4.72	5.52	5.22	8.06	8.45	9.13	9.24	8.53	7.45	7.33	7.38
Groundwater Elevation	ft NAVD 88	--	--		5.09	4.29	4.59	1.75	1.36	0.68	0.57	1.28	2.36	2.48	22.75
Temperature	C	NA	--		26.42	27.56	27.74	27.22	27.10	25.25	30.71	26.69	27.20	27.69	27.95
Specific Conductivity (field)	umhos/cm	NA	--		1640	1500	1380	1340	1400	1460	1480	1538	1540	1580	1700
pH (field)	SU	6.5 - 8.5	--		6.53	6.48	6.48	6.67	6.68	6.62	6.67	6.64	6.66	6.68	6.70
Dissolved Oxygen	mg/L	NA	--		0.370	0.150	0.100 U	0.370	0.200	0.300	1.32	0.190	0.330	0.430	0.280
Redox Potential	mV	NA	--		-59.4	-84.1	-59.5	-91.5	-73.8	-74.1	-42.0	-82.4	-94.0	-53.3	-72.10
Turbidity (field)	NTU	NA	--		6.70	4.86	1.73	3.99	5.86	16.4	19.0	6.1	5.3	3.66	3.96
Appendix III Parameters															
Boron	mg/L	1.4**	54.6		**3.89**	**4.25**	**3.70 V**	**3.90**	**3.75**	**3.27**	**4.08**	**4.54 J-**	**4.57**	**4.39**	**4.08**
Calcium	mg/L	NA	997.5		**313**	**271**	**237**	**238 J-,V**	**243**	**240**	**260**	**290 J-**	**278 V**	**287**	**321**
Chloride	mg/L	*250*	1088		**123**	**116**	**116**	**125 V**	**129 V**	**145 V**	**140**	**135**	**123 V**	**117**	**84.9**
Fluoride	mg/L	4***	0.664		**0.409**	**0.432**	**0.455**	**0.440**	**0.464**	**0.472**	**0.478**	**0.559**	**0.319 J**	**0.352**	**0.513**
Sulfate	mg/L	*250*	1677		**414**	**341**	**276**	**246**	**255**	**255**	**323**	**402**	**41.7**	**462**	**632**
Total Dissolved Solids	mg/L	*500*	5418		**1230**	**1060**	**980**	**1010**	**966 J-**	**1140**	**1120**	**1170**	**1200**	**1180 J**	**1330**
Appendix IV Parameters															
Antimony	ug/L	6	1.47		0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	6.000 U	0.600 U	0.600 U
Arsenic	ug/L	10	8.89		**2.65**	**1.75 I**	**2.03**	**1.62 I**	**2.59**	**0.709 I**	**1.45 I**	**1.68 I**	3.20 U	**1.80 J**	**2.01**
Barium	ug/L	2000	106		**51.3**	**49.8**	**43.2**	**46.3**	**45.8**	**38.8**	**42.7**	**48.8**	**47.7**	**49.9**	**56.2**
Beryllium	ug/L	4	0.215		0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.220 U	0.200 U	**0.254** J
Cadmium	ug/L	5	0.235		0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	1.00 U	0.100 U	0.100 U
Chromium	ug/L	100	2.45		1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	**1.68 I**	**2.26 I**	1.60 U	1.60 U
Cobalt	ug/L	140**	1.61		1.00 U	**0.14 I**	**0.153 I**	**0.151 I**	**0.157 I**	**0.136 I**	2.0 U	**0.0959 I**	0.400 U	**0.110 J**	**0.129** J
Lead	ug/L	15	0.265		0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.800 U	**0.101 J**	0.800 U
Lithium	ug/L	140**	19		**3.8 I**	**9.1 I**	**2.0 I**	**3.8 I**	**1.7 I**	**5.2 I**	**3.4**	**5.2 I**	**5.9 I**	0.050 U	8.2 I,V
Mercury	ug/L	2	0.0500		0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Molybdenum	ug/L	35**	12.8		**2.40 I**	1.00 U	**7.57**	**1.42 I**	1.00 U	**2.56 I**	**9.65 I**	10.2 U	**8.9 I**	**4.08 J**	**2.51** J
Radium 226/228	pCi/L	1	38.2		**4.8**	**5.1 J**	**4.0**	**4.8**	**8.0**	**4.8** J	**4.5**	**4.8**	**4.4**	**4.9**	**4.9**
Selenium	ug/L	50	2.08		**0.722 I**	**0.760 I**	**0.577 I**	**0.489 I**	**0.485 I**	**0.260 I**	**0.539 I**	**0.386 I**	2.00 U	**0.420 J**	**0.523 J**
Thallium	ug/L	2	0.229		0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	1.00 U	0.100 U	0.100 U

Notes and Abbreviations provided on Page 6.

Table 1: TECO Big Bend EAPPS Analytical Groundwater Results

TECO, Big Bend Facility
Apollo Beach, Florida

				Well ID	BBS-CCR-1										
				Sample Date	6/24/2016	7/27/2016	8/26/2016	10/28/2016	11/10/2016	1/26/2017	4/13/2017	6/28/2017	7/20/2017	8/16/2017	10/13/2017
Parameter	**Units**	**MCL**	**Bkgd***		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Results Q	Results Q	Result Q
Top of Casing Elevation	ft NAVD 88	--	--		7.79	7.79	7.79	7.79	7.79	7.79	7.79	7.79	7.79	7.79	7.79
Depth to Water	ft BTOC	--	--		3.51	5.00	5.06	6.78	7.38	7.46	7.64	7.41	5.86	7.03	7.32
Groundwater Elevation	ft NAVD 88	--	--		4.28	2.79	2.73	1.01	0.41	0.33	0.15	0.38	1.93	0.76	0.47
Temperature	C	NA	--		25.48	26.41	27.05	25.78	25.70	24.03	23.70	25.54	25.81	25.80	26.57
Specific Conductivity (field)	umhos/cm	NA	--		3940	4180	4000	4060	4290	4320	4170	4063	3960	4110	4260
pH (field)	SU	6.5 - 8.5	--		6.80	6.67	6.71	6.83	6.82	6.79	6.84	6.78	6.81	6.82	6.83
Dissolved Oxygen	mg/L	NA	--		0.100	0.220	0.140	0.10 U	0.100 U	0.100 U	0.100 U	0.270	0.100	0.280	0.240
Redox Potential	mV	NA	--		-49.1	-74.1	-34.8	-107.0	-136	-110	-80.40	-80.60	-122.00	-109.00	-83.30
Turbidity (field)	NTU	NA	--		8.01	3.88	2.08	3.22	0.890	1.99	4.12	3.63	1.58	1.88	0.89
Appendix III Parameters															
Boron	mg/L	1.4**	54.6		**14.4**	**0.306**	**11.4**	**15.7**	**16.2**	**15.5 J-**	**16.4**	**16.5**	**16**	**17**	**19.90**
Calcium	mg/L	NA	997.5		**541**	**227**	**556**	**556 V**	**606**	**579 J-**	**555**	**569**	**576 V**	**572**	**596.00**
Chloride	mg/L	*250*	1088		**619**	**742 J-**	**695**	**743 J-**	**817 V**	**820 V**	**124**	**720**	**694 J-, V**	**710**	**716**
Fluoride	mg/L	4***	0.664		**0.211**	**0.128**	**0.454**	**0.104**	**0.0871**	**0.184**	**0.170**	**0.208**	**0.157 J**	**0.200**	**0.201**
Sulfate	mg/L	*250*	1677		**1240**	**1320 J-**	**1240**	**1230 J-**	**1290**	**1350**	**443**	**1120**	**1390**	**1240**	**1230**
Total Dissolved Solids	mg/L	*500*	5418		**3060 J**	**3140**	**2980**	**3170 J-**	**3470 J-**	**3670 J**	**3110 J**	**3140**	**3400 J**	**2960 J**	**3470**
Appendix IV Parameters															
Antimony	ug/L	6	1.47		0.600 U	**1.03 I**	0.600 U	0.600 U	0.600 U	0.602 I	0.600 U	0.600 U	3.00 U	0.600 U	0.600 U
Arsenic	ug/L	10	8.89		**8.74**	**7.38**	**7.94**	**8.30**	**8.93**	**9.04**	**10.5**	**9.76**	**10.3**	**9.33**	**9.03**
Barium	ug/L	2000	106		**122**	**30.8**	**115**	**122**	**129**	**115**	**116 I**	**113**	**112**	**122**	**129**
Beryllium	ug/L	4	0.215		0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	2.00 U	0.200 U	0.200 U	0.200 U	0.200 U
Cadmium	ug/L	5	0.235		0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.500 U	0.100 U	0.100 U
Chromium	ug/L	100	2.45		1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	**1.93 I**	**1.62 I**	1.60 U	1.60 U
Cobalt	ug/L	140**	1.61		1.00 U	**0.450 I**	**0.485**	**0.507 I**	**0.519 I**	**0.489 I**	2.0 U	**0.484 I**	**0.495 I**	**0.473 J**	**0.453 J**
Lead	ug/L	15	0.265		0.0800 U	**0.110 I**	0.0800 U	0.0800 U	0.0800 U	0.0800 U	**0.0979 I**	0.0800 U	0.400 U	0.080 U	0.080 U
Lithium	ug/L	140**	19		**8.3 I**	**15 I**	**7.4 I**	**12 I**	**8.4 I**	**14 I**	**10 I**	**13 I**	**14 I, J3**	0.050 U	**15 I,V**
Mercury	ug/L	2	0.0500		0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Molybdenum	ug/L	35**	12.8		**106**	**105**	**80.3**	**95.5**	**98.4**	**92.4**	**124 I**	**96.5 I**	**99.6**	**86.4**	**82.5**
Radium 226/228	pCi/L	1	38.2		**39**	**33**	**15**	**42.6**	**37.3**	**32.5**	**35.8 I**	**41.4**	**34.7**	**33.4**	**35.6**
Selenium	ug/L	50	2.08		**0.696 I**	**0.960 I**	**0.385**	**0.690 I**	**1.04 I**	**0.653 I**	**0.937 I**	**0.756 I**	**2.25 I**	**0.918 J**	**0.99 J**
Thallium	ug/L	2	0.229		0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.500 U	0.100 U	0.100 U

Notes and Abbreviations provided on Page 6.

Table 1: TECO Big Bend EAPPS Analytical Groundwater Results

TECO, Big Bend Facility
Apollo Beach, Florida

				Well ID	BBS-CCR-2										
				Sample Date	6/24/2016	7/27/2016	8/26/2016	10/28/2016	11/10/2016	1/26/2017	4/13/2017	6/28/2017	7/20/2017	8/16/2017	10/13/2017
Parameter	**Units**	**MCL**	**Bkgd***		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Results Q	Results Q	Result Q
Top of Casing Elevation	ft NAVD 88	--	--		8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
Depth to Water	ft BTOC	--	--		3.45	5.30	5.35	6.78	6.88	6.93	7.15	6.97	5.06	6.53	6.88
Groundwater Elevation	ft NAVD 88	--	--		4.69	2.84	2.79	1.36	1.26	1.21	0.99	1.17	3.08	1.61	1.26
Temperature	C	NA	--		25.62	26.42	27.35	25.64	25.66	24.27	23.95	25.12	25.74	26.43	26.46
Specific Conductivity (field)	umhos/cm	NA	--		1580	1700	1570	1500	1540	1560	1540	1485	1630	1560	1350
pH (field)	SU	6.5 - 8.5	--		6.80	6.68	6.74	6.87	6.89	6.89	6.93	6.87	6.97	6.92	6.87
Dissolved Oxygen	mg/L	NA	--		0.100	0.130	0.100 U	0.100	0.130	0.100 U	0.100 U	0.240	0.100 U	0.250	0.200
Redox Potential	mV	NA	--		-71.0	-67.4	-27.3	-183	-186	-182	-138	-131	-154.0	-233.0	-188
Turbidity (field)	NTU	NA	--		4.90	7.16	3.31	3.73	7.10	4.93	3.43	4.71	4.56	3.22	3.03
Appendix III Parameters															
Boron	mg/L	1.4**	54.6		**1.55**	**2.81**	**2.86**	**2.08**	**2.28**	**3.86**	**5.01**	**3.20**	**4.94**	**4.32**	**0.888**
Calcium	mg/L	NA	997.5		**198**	**193**	**192**	**181 V**	**181**	**172**	**163**	**173**	**178 V**	**171**	**169**
Chloride	mg/L	*250*	1088		**118**	**140**	**124**	**112 V**	**111 V**	**115 J+**	**119**	**105**	**114 V**	**113**	**70.9**
Fluoride	mg/L	4***	0.664		**0.148**	**0.183**	**0.150**	**0.171**	**0.168**	**0.248 J+**	**0.237**	**0.214**	**0.166 J**	**0.155**	**0.182**
Sulfate	mg/L	*250*	1677		**471**	**542**	**484**	**468**	**468**	**490 J-**	**485 J-**	**415 J-**	**481**	**459**	**432**
Total Dissolved Solids	mg/L	*500*	5418		**1170 J-**	**1170**	**1120**	**1130**	**1110**	**1140**	**1150**	**1080**	**1140**	**1080**	**1030**
Appendix IV Parameters															
Antimony	ug/L	6	1.47		0.600 U	**0.830 I**	0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	1.20 U	0.600 U
Arsenic	ug/L	10	8.89		**1.83 I**	**0.990 I**	**1.25**	**1.16 I**	**1.37 I**	**1.09 I**	**2.64**	**1.01 I**	**0.974 I**	**1.02 J**	**1.14**
Barium	ug/L	2000	106		**65.0**	**64.8**	**61.4**	**60.6**	**62.4**	**54.6**	**55.8**	**54.6**	**54.6**	**56.8**	**53.3**
Beryllium	ug/L	4	0.215		0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.423 U	0.200 U	0.200 U
Cadmium	ug/L	5	0.235		0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.200 U	0.200 U
Chromium	ug/L	100	2.45		1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	**2.29 I**	**1.96 I**	**3.11 I**	1.60 U	1.60 U
Cobalt	ug/L	140**	1.61		1.00 U	**0.0900 I**	**0.0776**	**0.107 I**	**0.105 I**	**0.0902 I**	2.0 U	**0.0875 I**	**0.0857 I**	**0.150 J**	**0.115** J
Lead	ug/L	15	0.265		0.0800 U	**0.110 I**	0.0800 U	0.129 I	**0.0955** I	0.0800 U	**0.176 I**	**0.144 I**	**0.127 I**	**0.244 J**	0.15 J
Lithium	ug/L	140**	19		**10 I**	**17 I**	**11 I**	**14 I**	**11 I**	**13 I**	**13 I**	**14 I**	**16 I**	0.050 U	16 I,V
Mercury	ug/L	2	0.0500		0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Molybdenum	ug/L	35**	12.8		**1.73 I**	1.00 U	**7.78**	**1.00 U**	**1.43 I**	**2.52 I**	**9.82 I**	9.59 U	**9.88 I**	**3.02 J**	**1.99** J
Radium 226/228	pCi/L	1	38.2		**15.0**	**13.2**	**32**	**14.9**	**14.8**	**13.9**	**14.2**	**14.7**	**14.4**	**12.1**	**13.5**
Selenium	ug/L	50	2.08		**0.376 I**	**0.280 I**	0.200 U	**0.333 I**	**0.259 I**	0.200 U	0.200 U	0.200 U	**0.474 I**	**0.662 J**	**0.474** J
Thallium	ug/L	2	0.229		0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.200 U	0.200 U

Notes and Abbreviations provided on Page 6.

Table 1: TECO Big Bend EAPPS Analytical Groundwater Results

TECO, Big Bend Facility
Apollo Beach, Florida

				Well ID	BBS-CCR-3										
				Sample Date	6/24/2016	7/27/2016	8/26/2016	10/28/2016	11/10/2016	1/26/2017	4/13/2017	6/28/2017	7/20/2017	8/16/2017	10/13/2017
Parameter	**Units**	**MCL**	**Bkgd***		Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q	Result Q
Top of Casing Elevation	ft NAVD 88	--	--		6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78
Depth to Water	ft BTOC	--	--		1.51	3.60	3.48	6.54	6.77	6.81	7.13	6.64	4.77	6.04	6.52
Groundwater Elevation	ft NAVD 88	--	--		5.27	3.18	3.30	0.24	0.01	-0.03	-0.35	0.14	2.01	0.74	0.26
Temperature	C	NA	--		26.62	27.28	27.07	26.20	26.10	24.25	24.27	26.15	26.73	26.86	27.18
Specific Conductivity (field)	umhos/cm	NA	--		1580	1740	1690	1640	1650	1510	1580	1755	1750	1790	1750
pH (field)	SU	6.5 - 8.5	--		6.42	6.19	6.29	6.42	6.46	6.42	6.49	6.38	6.36	6.42	6.44
Dissolved Oxygen	mg/L	NA	--		0.540	0.100 U	0.150	0.100 U	0.100 U	0.110	0.140	0.280	0.170	0.290	0.370
Redox Potential	mV	NA	--		-145	-74.4	-155.0	-266	-239	-168	-114	-125	-122	-206	-249
Turbidity (field)	NTU	NA	--		11.5	8.04	6.35	3.26	1.18	1.79	4.22	0.94	0.51	0.47	2.39
Appendix III Parameters															
Boron	mg/L	1.4**	54.6		**0.662**	**13.2**	**0.540** V	**0.532**	**0.502**	**0.381**	**0.385**	**0.184**	**0.211**	**0.266**	**0.373**
Calcium	mg/L	NA	997.5		**187**	**196**	**200**	**201 V**	**200**	**176**	**176**	**192**	**205 J-, V**	**187**	**190**
Chloride	mg/L	*250*	1088		**88.9**	**140**	**136**	**140 V**	**129 V**	**129 V**	**124**	**168**	**158 V**	**156**	**153**
Fluoride	mg/L	4***	0.664		**0.313**	**0.262**	**0.286**	**0.299**	**0.331**	**0.391**	**0.415**	**0.338**	**0.230 J**	**0.338**	**0.333**
Sulfate	mg/L	*250*	1677		**474**	**516**	**517**	**541**	**492**	**454**	**443**	**493**	**506**	**484**	**503**
Total Dissolved Solids	mg/L	*500*	5418		**1200**	**1220**	**1210**	**1220**	**1220**	**1200**	**1120**	**1280**	**1310**	**1290**	**1310**
Appendix IV Parameters															
Antimony	ug/L	6	1.47		0.600 U	**0.770 I**	0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	0.600 U	3.00 U	0.600 U	0.600 U
Arsenic	ug/L	10	8.89		**1.23 I**	**0.540 I**	**0.603 I**	**0.623 I**	**0.765 I**	0.320 U	0.320 U	**0.525 I**	1.60 U	0.536 J	**0.665** J
Barium	ug/L	2000	106		**65.3**	**67.6**	**63.6**	**66.3**	**63.0**	**56.2**	**58.6**	**61.8**	**63.4**	**59.8**	**59.3**
Beryllium	ug/L	4	0.215		0.200 U	0.200 U	**0.272** I	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.356 U	0.200 U	0.200 U
Cadmium	ug/L	5	0.235		0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.500 U	0.100 U	0.100 U
Chromium	ug/L	100	2.45		1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	1.60 U	**3.12 I**	**3.43 I**	**2.02 J**	1.60 U
Cobalt	ug/L	140**	1.61		1.00 U	**0.0900 I**	**0.125 I**	**0.124 I**	**0.117 I**	**0.0989 I**	2.0 U	**0.119 I**	0.200 U	0.123 J	**0.115** J
Lead	ug/L	15	0.265		**0.125 I**	**0.0800 I**	0.0800 U	**0.107 I**	0.0800 U	0.0800 U	0.0800 U	0.0800 U	0.400 U	0.0800 U	0.0800 U
Lithium	ug/L	140**	19		**3.7 I**	**11 I**	**6.1 I**	**8.2 I**	**6.1 I**	**7.7 I**	**6.3 I**	**5.2 I**	**10 I**	0.050 U	11 I,V
Mercury	ug/L	2	0.0500		**0.0580** I	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Molybdenum	ug/L	35**	12.8		**4.09 I**	**2.23 I**	**8.10**	**3.63 I**	**3.90 I**	**5.42 I**	**11.7 I**	11.9 U	**10.6 I**	**3.14 J**	**3.82** J
Radium 226/228	pCi/L	1	38.2		**10.3**	**12.3**	**15**	**18.1**	**17.5**	**15**	**14.4**	**17.7**	**20.3**	**19.6**	**20.0**
Selenium	ug/L	50	2.08		**0.262 I**	**0.270 I**	0.200 U	0.200 U	**0.253** I	0.200 U	0.200 U	0.200 U	1.00 U	0.200 U	**0.285** J
Thallium	ug/L	2	0.229		0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.500 U	0.100 U	0.100 U

Notes and Abbreviations provided on Page 6.

Table 1: TECO Big Bend EAPPS Analytical Groundwater Results

TECO, Big Bend Facility
Apollo Beach, Florida

Notes:
1. U: Laboratory qualifer - Indicates that the compound was not detected above the reporting limit.
2. I: Laboratory qualifier - The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit; estimated value
3. J(-): Laboratory qualifier - The reported value is an estimated value.
4. J: Data validation qualifer - The analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
5. UJ: Data validation qualifer - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accuratelyand precisely measure the analyte in the sample.
6. J- : Data validation qualifer - The analyte was positively identified; however, the associated numerical value is likely to be lower than the concentration of the analyte in the sample due to negative bias of associated QC or calibration data or attributable to matrix interference.
7. V: Analyte detected in the method blank.
8. Q: Laboratory qualifer- Re-analysis of sample beyond the accepted holding time.
9. J3: Laboratory qualifer - Estimated value; value may not be accurate. Spike recovery or RPD outside of criteria.
9. MCLs - EPA Maximum Contaminant Levels; primary enforceable standards shown unless otherwise noted. Secondary (non-enforceable) standards shown in italics.
10. Detections shown in bold text and higlighted yellow when above background levels or enforceable federal MCLs or Florida Groundwater Cleanup Target Levels (GCTL) if background is less.
11. * Background concentration determined as two times the mean from BBS-CCR-BW1 and BBS-CCR-BW2 in accordance with FDEP Guidance Document "Guidance for Comparing Background and Site Chemical Concentrations in Groundwater" (July 2013). Non - detects taken as 1/2 the reporting limit. Yellow shading indicates above background.
12. ** Florida GCTLs per FDEP Chapter 62-777 of the Florida Administrative Code.
13. *** Secondary MCL for fluoride is 2 mg/L but not enforceable.
14. Background / Upgradient Well shaded green.
15. Concentrations in red considered anomalous (July 2016).

Abbreviations:
Q - Data qualifier
C - Celsius
ft BTOC - feet below top of well casing
mg/L - milligrams per liter
SU - Standard units
ft NAVD 88 - feet elevation in North American Vertical Datum 1988
ug/L - micrograms per liter
umhos/cm - micromohs per centimeter

Table 2: Statistical Comparison of Background Groundwater pH in the Surficial Aquifer

TECO Big Bend Station

13031 Wyandotte Road, Gibsonton, FL 33572

Monitoring Well Units Adjacent to EAPPS

TECO Big Bend Unit Name	Monitoring Wells	Period of Record	Number of Observations	pH[1] Minimum	pH[1] Maximum	95% UCL[2]	Statistic[3]
Unit 20 (Economizer and Long Term Fly Ash Pond)	**B-17R**	5/11 - 11/13	11	6.70	6.89	**6.89**	95% Student's-t UCL
	B-35	5/11 - 5/17	12	6.60	6.92	**6.78**	95% Student's-t UCL
	B-36	5/11 - 5/17	12	6.70	6.96	**6.85**	95% Student's-t UCL
	TOTAL	5/11 - 5/17	35	6.60	6.96	**6.82**	95% Adjusted Gamma UCL

TECO Big Bend and Regional Surficial Aquifer Background Monitoring Wells

Background Source	Monitoring Wells	Period of Record	Number of Observations	pH[1] Minimum	pH[1] Maximum	95% UCL[2]	Statistic[3]
TECO Big Bend IWW/RAP[4] Background Wells	**B-4R**	5/11- 5/17	15	5.81	6.5	**6.21**	95% Student's-t UCL
	B-39	5/11 - 5/17	12	6.87	7.31	**7.21**	95% Student's-t UCL
	B-40	5/11 - 5/17	12	6.70	7.10	**7.00**	95% Student's-t UCL
	B-41	5/11 - 5/17	12	6.60	7.10	**6.97**	95% Student's-t UCL
	TOTAL	5/11 - 5/17	51	5.81	7.31	**6.85**	95% Student's-t UCL
SWFWMD[5] Regional Observation and Monitoring Program	**TR 9-2**	9/93 - 3/03	4	5.59	5.96	**5.77***	Arithmetic Mean
	TR 9-3	9/85 - 3/03	19	6.75	7.42	**7.25**	95% Student's-t UCL
	TR 10-2	9/85 - 3/03	7	6.71	7.16	**7.00***	Arithmetic Mean
	TR12-1	8/93 - 3/03	4	7.15	7.33	**7.24***	Arithmetic Mean
	TOTAL	9/85 - 3/03	34	5.59	7.42	**7.13**	95% Student's-t UCL
	COMBINED[6]	9/85 - 5/17	85	5.59	7.42	**6.93**	95% Student's-t UCL

Notes:

1. All results are reported for pH in standard units (SU).
2. 95% UCL = 95% of the Upper Confidence Limit of the arithmetic mean of the data set.
3. Statistics reported are the most appropriate based on the underlying distribution of each data set.
4. IWW and RAP refer to TECO's Industrial Wastewater and Remedial Action Plan monitoring well networks respectively.
5. SWFWMD = Southwest Florida Water Management District
6. Combined statistic represents the combination of both SWFWMD Regional Observation and Monitoring (ROMP) monitoring wells and TECO Big Bend background monitoring wells.

* Insufficient number of observations to calculate a 95% UCL; arithmetic mean reported instead.

FIGURES

Legend

- Background Well Location
- CCR Monitoring Well Location

Note:
2014 Aerial Imagery source, Florida Department of Transporation Surveying and Mapping Office APLUS website.

CCR Monitoring Well Locations
Economizer Ash and Pyrite Pond System

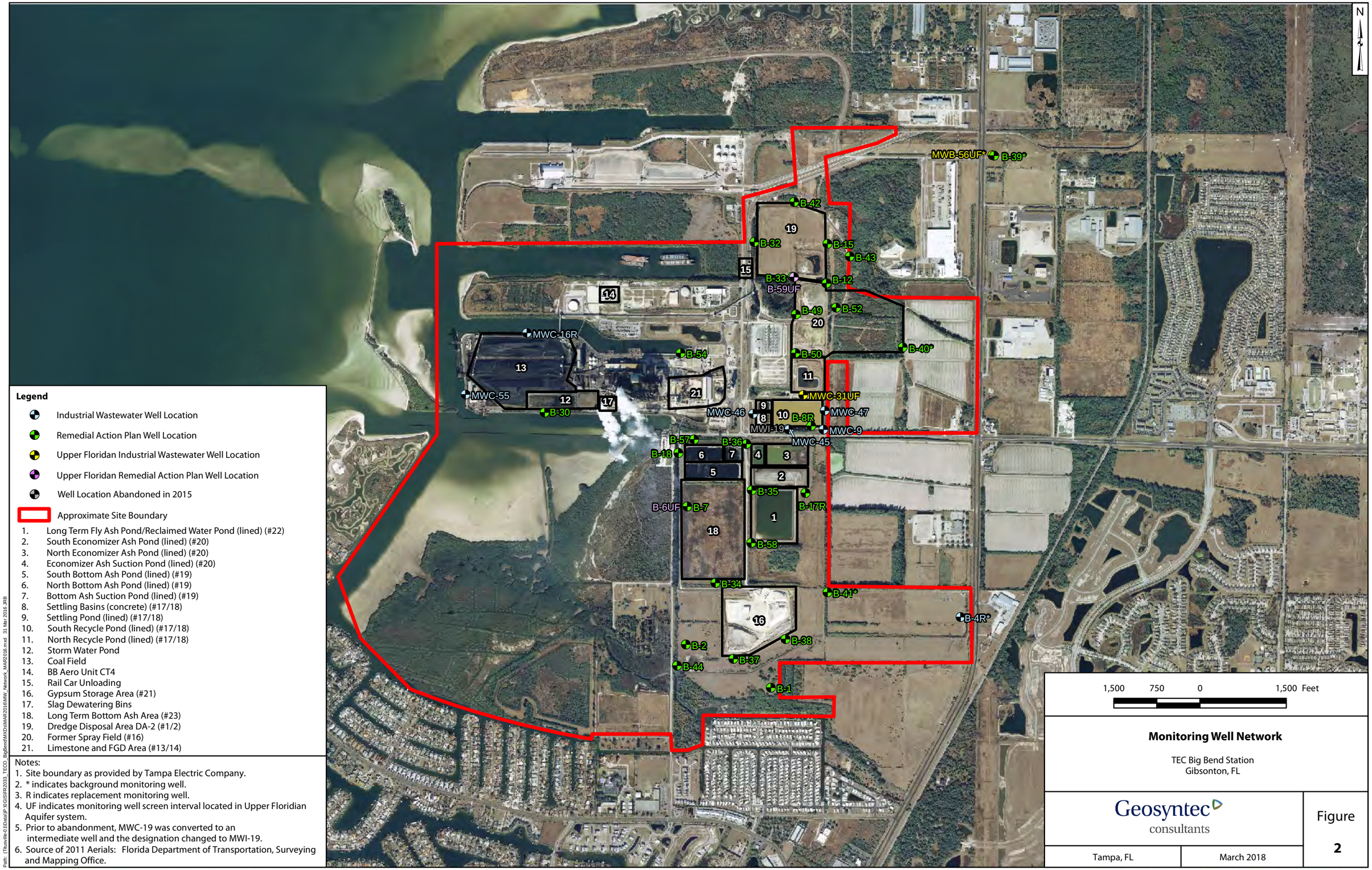
TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

Tampa, FL | March2018

Figure 1

Path: (Titusville-01\DATA) T:\GIS\FR2814.2017_Annual_CCR_GW_Report\MXDs\CCR_MW_Locs.mxd 18 January 2018 JRB



Legend

- Industrial Wastewater Well Location
- Remedial Action Plan Well Location
- Upper Floridan Industrial Wastewater Well Location
- Upper Floridan Remedial Action Plan Well Location
- Well Location Abandoned in 2015
- Approximate Site Boundary

1. Long Term Fly Ash Pond/Reclaimed Water Pond (lined) (#22)
2. South Economizer Ash Pond (lined) (#20)
3. North Economizer Ash Pond (lined) (#20)
4. Economizer Ash Suction Pond (lined) (#20)
5. South Bottom Ash Pond (lined) (#19)
6. North Bottom Ash Pond (lined) (#19)
7. Bottom Ash Suction Pond (lined) (#19)
8. Settling Basins (concrete) (#17/18)
9. Settling Pond (lined) (#17/18)
10. South Recycle Pond (lined) (#17/18)
11. North Recycle Pond (lined) (#17/18)
12. Storm Water Pond
13. Coal Field
14. BB Aero Unit CT4
15. Rail Car Unloading
16. Gypsum Storage Area (#21)
17. Slag Dewatering Bins
18. Long Term Bottom Ash Area (#23)
19. Dredge Disposal Area DA-2 (#1/2)
20. Former Spray Field (#16)
21. Limestone and FGD Area (#13/14)

Notes:
1. Site boundary as provided by Tampa Electric Company.
2. * indicates background monitoring well.
3. R indicates replacement monitoring well.
4. UF indicates monitoring well screen interval located in Upper Floridian Aquifer system.
5. Prior to abandonment, MWC-19 was converted to an intermediate well and the designation changed to MWI-19.
6. Source of 2011 Aerials: Florida Department of Transportation, Surveying and Mapping Office.

Path: (Tfbsvlfle-0:\IData\P-\DGIS\FR2033_TECO_BigBend\MXDs\MAR2016\MW_Network_MAR2016.mxd 31 Mar 2016 JRB

Monitoring Well Network

TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

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Figure 2


Big Bend Road
CCR-PZ1
[2.61]
CCR-SG1
[2.30]
CCR-PZ2
[2.73]
MWB-36
[4.30]
3.5
2.5
3.0
CCR-SG2
[3.26]
Jackson Branch
North Economizer Ash Pond (Lined)
CCR-PZ3
[3.28]
Economizer
Suction
Pond (Lined)
4.0
CCR-PZ6
[4.57]
CCR-PZ4
[3.68]
South Economizer Ash Pond (Lined)
4.5
CCR-PZ5
[4.22]
MWB-35
[5.25]
Long Term
Fly Ash
Pond (Lined)
B-17R
[NM]
N
Legend
Existing Monitoring Well Locations
CCR Compliance Piezometer Locations
Surface Water Staff Gauge Locations
Potentiometric Surface Elevation (ft NAVD)
Groundwater Flow Direction
[5.30] Groundwater Elevation (ft NAVD)
Notes:
1. NAVD88 indicatea North American Vertical Datum of 1988.
2. NM indicates not measured.
3. 2014 Aerial Imagery source, Florida Department of Transporation Surveying and Mapping Office APLUS website.
180 90 0 180 Feet
Economizer Ash and Pyrite Pond System
Surficial Aquifer Potentiometric Surface - June 2016
TEC Big Bend Station
Gibsonton, FL
Geosyntec consultants
Tampa, FL
March 2018
Figure
3
Path: (Tillsville-01\DATA) T:\GIS\FR2814_2017_Annual_CCR_GW_Report\MXDs\201803\Pot_Map_JUN2016.mxd 22 March 2018 MAH

Legend

- Existing Monitoring Well Locations
- Background Well Location
- CCR Monitoring Well Location
- Potentiometric Surface Elevation (ft NAVD88)
- Groundwater Flow Direction
- [3.30] Groundwater Elevation (ft NAVD)

Notes:
1. NAVD88 indicatea North American Vertical Datum of 1988.
2. NM indicates not measured.
3. 2014 Aerial Imagery source, Florida Department of Transporation Surveying and Mapping Office APLUS website.

180 90 0 180 Feet

Economizer Ash and Pyrite Pond System
Surficial Aquifer Potentiometric Surface - August 2016

TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

Tampa, FL | March 2018

Figure 4

Path: (Tillsville-01\DATA) T:\GIS\FR2814_2017_Annual_CCR_GW_Report\MXDs\201803\Pot_Map_AUG2016.mxd 22 March 2018 JRB


Big Bend Road
BBS-CCR-1
[2.44]
BBS-CCR-2
[2.46]
MWB-36
[NM]
2.5
3.0
Economizer
Suction
Pond (Lined)
North Economizer Ash Pond (Lined)
Jackson Branch
BBS-CCR-3
[2.86]
3.5
4.0
BBS-CCR-BW2
[4.09]
South Economizer Ash Pond (Lined)
BBS-CCR-BW1
[3.56]
MWB-35
[NM]
B-17R
[NM]
Long Term
Fly Ash
Pond (Lined)
N
Legend
Existing Monitoring Well Locations
Background Well Location
CCR Monitoring Well Location
Potentiometric Surface Elevation (ft NAVD88)
Groundwater Flow Direction
[2.86] Groundwater Elevation (ft NAVD)
Notes:
1. NAVD88 indicatea North American Vertical Datum of 1988.
2. NM indicates not measured.
3. 2014 Aerial Imagery source, Florida Department of Transporation Surveying and Mapping Office APLUS website.
180 90 0 180 Feet
Economizer Ash and Pyrite Pond System
Surficial Aquifer Potentiometric Surface - November 2016
TEC Big Bend Station
Gibsonton, FL
Geosyntec consultants
Tampa, FL
March 2018
Figure
5
Path: (Tillsville-01\DATA) T:\GIS\FR2814_2017_Annual_CCR_GW_Report\MXDs\201803\Pot_Map_NOV2016.mxd 22 March 2018 JRB

Economizer Ash and Pyrite Pond System
Surficial Aquifer Potentiometric Surface - April 2017

TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

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Figure 6

Economizer Ash and Pyrite Pond System
Surficial Aquifer Potentiometric Surface - October 2017

TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

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Figure **7**

1.5 0.75 0 1.5 Miles

Legend

ROMP Well Location

Approximate Site Boundary

Notes:
1. ROMP locations were obtained from the Southwest Florida Water Management District (SWFWMD) Regional Observation and Monitoring Program (ROMP): https://www.swfwmd.state.fl.us/data/hydrologic/.
2. 2017 World Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

Regional Surficial Aquifer Monitoring Well Locations

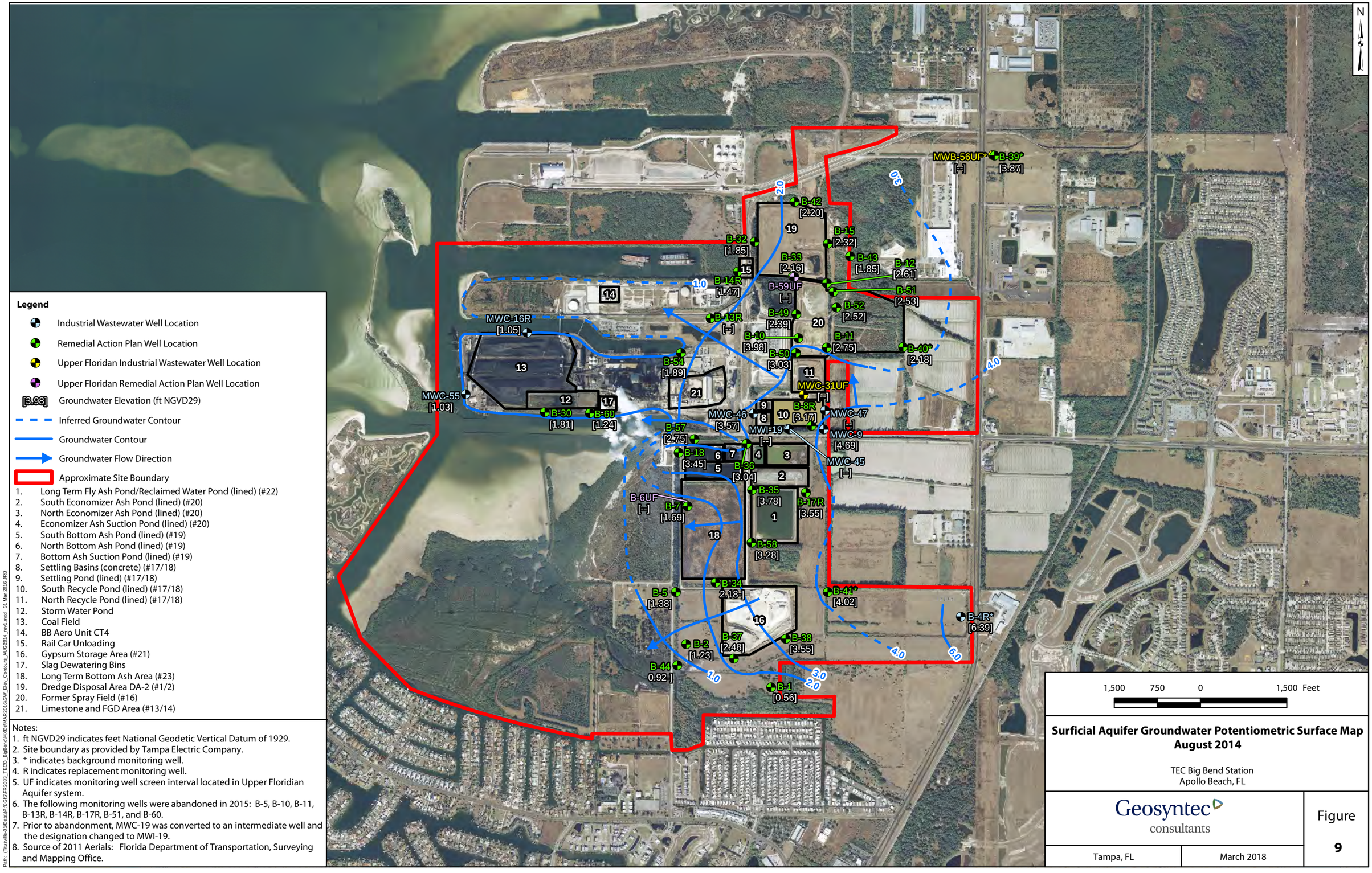
TEC Big Bend Station
Gibsonton, FL

Geosyntec consultants

Tampa, FL | March 2018

Figure 8

Path: \\Tusville-01\Data\7\GIS\FR2814 2017 Annual CCR GW Report\MXDs\2018\03\ROMP Well Map.mxd 22 Mar 2018 JRB



Legend

- Industrial Wastewater Well Location
- Remedial Action Plan Well Location
- Upper Floridan Industrial Wastewater Well Location
- Upper Floridan Remedial Action Plan Well Location
- [3.98] Groundwater Elevation (ft NGVD29)
- Inferred Groundwater Contour
- Groundwater Contour
- Groundwater Flow Direction
- Approximate Site Boundary

1. Long Term Fly Ash Pond/Reclaimed Water Pond (lined) (#22)
2. South Economizer Ash Pond (lined) (#20)
3. North Economizer Ash Pond (lined) (#20)
4. Economizer Ash Suction Pond (lined) (#20)
5. South Bottom Ash Pond (lined) (#19)
6. North Bottom Ash Pond (lined) (#19)
7. Bottom Ash Suction Pond (lined) (#19)
8. Settling Basins (concrete) (#17/18)
9. Settling Pond (lined) (#17/18)
10. South Recycle Pond (lined) (#17/18)
11. North Recycle Pond (lined) (#17/18)
12. Storm Water Pond
13. Coal Field
14. BB Aero Unit CT4
15. Rail Car Unloading
16. Gypsum Storage Area (#21)
17. Slag Dewatering Bins
18. Long Term Bottom Ash Area (#23)
19. Dredge Disposal Area DA-2 (#1/2)
20. Former Spray Field (#16)
21. Limestone and FGD Area (#13/14)

Notes:
1. ft NGVD29 indicates feet National Geodetic Vertical Datum of 1929.
2. Site boundary as provided by Tampa Electric Company.
3. * indicates background monitoring well.
4. R indicates replacement monitoring well.
5. UF indicates monitoring well screen interval located in Upper Floridian Aquifer system.
6. The following monitoring wells were abandoned in 2015: B-5, B-10, B-11, B-13R, B-14R, B-17R, B-51, and B-60.
7. Prior to abandonment, MWC-19 was converted to an intermediate well and the designation changed to MWI-19.
8. Source of 2011 Aerials: Florida Department of Transportation, Surveying and Mapping Office.

Surficial Aquifer Groundwater Potentiometric Surface Map
August 2014

TEC Big Bend Station
Apollo Beach, FL

Geosyntec consultants

Tampa, FL | March 2018

Figure 9

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APPENDIX A

SUMMARY OF STATISTICAL ANALYSES OF BASELINE GROUNDWATER SAMPLES

Geosyntec consultants

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www.geosyntec.com

Memorandum

Date:	15 January 2018
To:	Randy Melton
Copies to:	Terry Eastley Zel Jones
From:	Cathy Crea, M.Sc. Todd Kafka, PG
Subject:	Summary of Statistical Analyses of Baseline Groundwater Samples Economizer Ash and Pyrite Pond System Tampa Electric Company - Big Bend Station 13031 Wyandotte Road Gibsonton, FL 33572

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published 40 Code of Federal Regulations (CFR) Parts 257 and 261: Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule (USEPA, 2015). This regulation addresses the safe disposal of coal combustion residuals (CCR) as solid waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA) and is referred to herein as the CCR Rule. The CCR Rule became effective on October 14, 2015. The rule provides national minimum criteria for "the safe disposal of CCR in new and existing CCR landfills, surface impoundments, and lateral expansions, design and operating criteria, groundwater monitoring and corrective action, closure requirements and post closure care, and recordkeeping, notification, and internet posting requirements." The groundwater monitoring requirements of the CCR Rule apply to the economizer ash and pyrite pond system (EAPPS) at Tampa Electric Company's (TEC) Big Bend Power Station (BBS) in southeast Hillsborough County in Gibsonton, Florida.

Geosyntec Consultants (Geosyntec) has prepared this technical memorandum to summarize the statistical analyses performed on the baseline groundwater samples collected from the groundwater monitoring system (GMS) established at the EAPPS. These activities have been undertaken by TEC to comply with the requirements set forth in 40 CFR 257.50 "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments" pertaining to the EAPPS. TEC installed

a groundwater monitoring system at the EAPPs that complies with 40 CFR 257.91 and performed baseline groundwater sampling events in accordance with 40 CFR 257.93. Geosyntec's statistical analyses were performed in accordance with the *Statistical Analysis Plan* dated 15 October 2017.

BACKGROUND

The groundwater monitoring system (GMS) was installed at the EAPPs in May 2016 and consists to two background monitoring wells, BBS-CCR-BW1 and BBS-CCR-BW2, and three downgradient monitoring wells, BBS-CCR-1, BBS-CCR-2, and BBS-CCR-3. TEC conducted eleven baseline groundwater sampling events from the GMS between June 2016 and October 2017 and analyzed the samples for Appendix III and Appendix IV constituents as required in 40 CFR 257.93. The inorganic data were reviewed based on the following: *CCR Groundwater Monitoring Program Plan*, Big Bend Power Station, Apollo Beach, Florida, September 2016, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, August 2014 (OSWER 9355.0-131, EPA 540-R-013-001), as well as by the pertinent methods referenced by the data package and professional and technical judgment.

Geosyntec prepared a *Statistical Analysis Plan* to provide details on the selection of statistical methods in accordance with the provisions set forth in 40 CFR 257.93 "Groundwater sampling and analysis requirements." These statistical methods were used to establish background conditions and to evaluate groundwater monitoring data collected during detection monitoring (40 CFR 257.94) to evaluate if the CCR units at the BBS are adversely impacting groundwater quality.

METHODOLOGY AND APPROACH

The statistical approach used to evaluate groundwater monitoring data was selected from a suite of methods provided in 40 CFR 257.93(f) (1 through 5) and performed in accordance with a set of performance standards provided in 40 CFR 257.93(g), when applicable.

The approach included the following steps for each Appendix III constituent:

1. Graphical display of data and assessment of equal variance;
2. Evaluate trends and seasonality in the background dataset for each constituent.
3. Identify potential outliers;
4. Evaluate the population distribution of the background dataset for each constituent;
5. Calculate the frequency of non-detects (NDs), and summary statistics (e.g., minimum, maximum, and mean) of the background dataset for each constituent;

6. Calculate appropriate upper limits (95%-95% upper tolerance limit [UTL] and a 95% upper prediction limit [UPL]); and
7. Compare upper limits to the most recent concentrations in the compliance (or downgradient) wells to determine if a statistically significant increase (SSI) above background has occurred.

Assumptions:

- The laboratory reporting limit was substituted for non-detects in all datasets.
- The laboratory reported value for estimated (J-flagged) concentrations were retained in all datasets.
- When a duplicate sample was collected at a background monitoring well, only the higher of the primary and duplicate sample concentrations were included in the aggregated dataset.

BACKGROUND GROUNDWATER QUALITY STATISTICS

The results of the Appendix III constituents (e.g., boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids) detected in groundwater samples from the two background monitoring wells were used to establish background concentrations for these constituents (**Table 1**). Based on professional judgment, the sulfate concentration of 41.7 milligrams per liter (mg/L) detected in BBS-CCR-BW2 on 7/20/17 was deemed an analytical error and was removed from the dataset.

Potential outliers:

- A sulfate concentration of 217 mg/L at BBS-CCR-BW1 was identified as a potential low concentration outlier but was retained in the dataset.
- The TDS concentration of 5,050 mg/L at BBS-CCR-BW1 was identified as a potential high concentration outlier but was retained in the dataset.

Increasing trends:

- An increasing pH trend is statistically present at BBS-CCR-BW2 based on the non-parametric Mann Kendall analysis.

Each of the Appendix III constituents exhibited a non-parametric distribution among the two background wells. The two background wells did show spatial variability for all the Appendix III constituents. An intra-well comparison is often used in these circumstances; however, this approach is not appropriate for the EAPPS since there is no groundwater data representative of pre-operational conditions (e.g., prior to

EAPPS) and therefore no information if the background wells may have already been impacted prior to their construction. Consequently, the data from the two background monitoring wells were aggregated for each constituent to create a single pooled background dataset, consisting of 22 observations (11 events x 2 monitoring wells). Two non-parametric upper limits were calculated for each constituent: a 95%-95% upper tolerance limit (UTL) and a 95% upper prediction limit (UPL), both of which result in the maximum detected concentration among both background wells. However, the 95%-95% UTL could not achieve a confidence level above 67%, but the UPL did achieve 95% confidence. As such, the 95% UPL was used to evaluate SSI for each constituent.

DETECTION MONITORING

Groundwater samples were collected from the GMS in October 2017 to serve as the first detection monitoring event. The comparison of the detection monitoring results to the background values for the Appendix III constituents is shown in **Table 2**. A statistically significant increase (SSI) over background was observed for pH in two compliance monitoring wells (BBS-CCR-1 and BBS-CCR-2).

CONCLUSIONS

As specified in 40 CFR 257.94(3) (e), TEC will either provide (i) a demonstration that the SSI is due to sampling or analysis error, another source, or natural variability or (ii) commence with assessment monitoring within 90 days of this SSI (e.g., by 15 April 2018). The pH values of 6.83 and 6.87 identified as SSIs are within the natural range of groundwater at BBS based on historical values which have been measured across BBS. In the absence of SSIs for other Appendix III constituents, the SSIs for pH do not appear to be attributable to a release from the EAPPS, but are instead attributable to natural variability. Therefore, TEC will continue with detection monitoring as applicable for the EAPPS.

* * * * *

TABLE 1 - BACKGROUND STATISTICS, TEC BIG BEND STATION ECONOMIZER ASH AND PYRITE POND SYSTEM, APOLLO BEACH, FL

Parameter	Units	Number of Samples	Number of NDs	Percent NDs	Minimum Result	Average Result	Maximum Result	Potential Outlier?	Trend?	Background Concentration		
										Distribution	95% UPL[2]	Comment
Boron	mg/L	22	0	0	3.27	27.32	59.1	None	No	NP	59.1	Confidence for UTL = 67.6%
Calcium	mg/L	22	0	0	237	499	781	None	No	NP	781	Confidence for UTL = 67.6%
Chloride	mg/L	22	0	0	84.9	543.8	1140	None	No	NP	1140	Confidence for UTL = 67.6%
Fluoride	mg/L	22	1	5	<0.01	0.332	0.559	None	No	NP	0.559	Confidence for UTL = 67.6%
pH (field)	STD	22	0	0	6.38	6.55	6.70	None	Yes (BBS-CCR-BW2)	NP	(6.38, 6.70)	Confidence for UTL = 30.18%
Sulfate	mg/L	21 [1]	0	0	217	876	1550	217 (BBS-CCR-BW1)	No	NP	1547	Confidence for UTL = 65.9%
Total Dissolved Solids	mg/L	22	0	0	966	2709	5050	5050 (BBS-CCR-BW1)	No	NP	5050	Confidence for UTL = 67.6%

Notes:

< - concentration not detected at or above the adjusted reporting limit

mg/L - milligrams per litre

ND - non-detect

NP - non-parametric

STD - standard units

UTL - upper tolerance limit

UPL - upper prediction limit

1 - A concentration of 41.7 mg/L detected at BBS-CCR-BW2 on 7/20/17 was removed from the data set as a laboratory error based on professional judgment.

2 - The 95% UPL was calculated based on either a normal, lognormal, or Gamma distribution. If data did not follow a discernible distribution, then a non-parametric 95% UPL was calculated. A two-sided prediction interval was calculated for pH.

TABLE 2 - DETECTION MONITORING RESULTS,TEC BIG BEND STATION ECONOMIZER ASH AND PYRITE POND SYSTEM, APOLLO BEACH, FL

Analytical Parameter		Boron, total	Calcium, total	Chloride, total	Fluoride, total	pH (field)	Sulfate, total	Total Dissolved Solids
Units		mg/L	mg/L	mg/L	mg/L	STD	mg/L	mg/L
Background Concentration Value		59.1	781	1140	0.559	(6.38, 6.70)	1550	5050
Well ID	Sample Collection Date	October 2017 Detection Monitoring Results						
BBS-CCR-1	10/13/2017	19.9	596	716	0.201	**6.83**	1230	3470
BBS-CCR-2	10/13/2017	0.888	169	70.9	0.182	**6.87**	432	1030
BBS-CCR-3	10/13/2017	0.373	190	153	0.333	6.44	503	1310

Notes:

- Bold, highlighted text indicates statistically significant increase above background concentration values.

< - concentration not detected at or above the adjusted reporting limit.

mg/L - milligrams per liter

STD - standard units

APPENDIX B

EPA530-R-93-017 SUBPART E SECTION 5.10

Individual Well Comparisons

When only two wells (e.g., a single background and a single compliance point well) are being compared, owners or operators should not perform the parametric or nonparametric ANOVA. Instead, a parametric t-test, such as Cochran's Approximation to the Behrens-Fisher Students' t-test, or a nonparametric test should be performed. When a single compliance well group is being compared to background data and a nonparametric test is needed, the Wilcoxin Rank-Sum test should be performed. These tests are discussed in more detail in standard statistical references and in USEPA (1992b).

Intra-Well Comparisons

Intra-well comparisons, where data of one well are evaluated over time, are useful in evaluating trends in individual wells and for identifying seasonal effects in the data. The intra-well comparison methods do not compare background data to compliance data. Where some existing facilities may not have valid background data, however, intra-well comparisons may represent the only valid comparison available. In the absence of a true background well, several monitoring events may be required to determine trends and seasonal fluctuations in ground-water quality.

Control charts may be used for intra-well comparisons but are only appropriate for uncontaminated wells. If a well is intercepting a release, then it is already in an "out-of-control" state, which violates the principal assumption underlying control chart procedures. Time series analysis (i.e., plotting concentrations over time) is extremely useful for identifying trends in monitoring data. Such data may be adjusted for seasonal effects to aid in assessing the degree of change over time. Guidance for and limitations of intra-well comparison techniques are provided in USEPA (1989) and USEPA (1992b).

Treatment of Non-Detects

The treatment of data below the detection limit of the analytical method (non-detects) used depends on the number or percentage of non-detects and the statistical method employed. Guidance on how to treat non-detects is provided in USEPA (1992b).

5.10 DETECTION MONITORING PROGRAM 40 CFR §258.54

5.10.1 Statement of Regulation

(a) Detection monitoring is required at MSWLF units at all ground-water monitoring wells defined under §§258.51(a)(1) and (a)(2) of this part. At a minimum, a detection monitoring program must include the monitoring for the constituents listed in Appendix I of this part.

1) The Director of an approved State may delete any of the Appendix I monitoring parameters for a MSWLF unit if it can be shown that the removed constituents are not reasonably expected to be in or derived from the waste contained in the unit.

2) The Director of an approved State may establish an alternative list of inorganic indicator parameters for a MSWLF unit, in lieu of some or all of

the heavy metals (constituents 1-15 in Appendix I), if the alternative parameters provide a reliable indication of inorganic releases from the MSWLF unit to the ground water. In determining alternative parameters, the Director shall consider the following factors:

(i) The types, quantities, and concentrations of constituents in wastes managed at the MSWLF unit;

(ii) The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the MSWLF unit;

(iii) The detectability of indicator parameters, waste constituents, and reaction products in the ground water; and

(iv) The concentration or values and coefficients of variation of monitoring parameters or constituents in the background ground-water.

(b) The monitoring frequency for all constituents listed in Appendix I, or the alternative list approved in accordance with paragraph (a)(2), shall be at least semiannual during the active life of the facility (including closure) and the post-closure period. A minimum of four independent samples from each well (background and downgradient) must be collected and analyzed for the Appendix I constituents, or the alternative list approved in accordance with paragraph (a)(2), during the first semiannual sampling event. At least one sample from each well(background and downgradient) must be collected and analyzed during subsequent semiannual sampling events. The Director of an approved State may specify an appropriate alternative frequency for repeated sampling and analysis for Appendix I constituents, or the alternative list approved in accordance with paragraph (a)(2), during the active life (including closure) and the post-closure care period. The alternative frequency during the active life (including closure) shall be no less than annual. The alternative frequency shall be based on consideration of the following factors:

1) Lithology of the aquifer and unsaturated zone;

2) Hydraulic conductivity of the aquifer and unsaturated zone;

3) Ground-water flow rates;

4) Minimum distance between upgradient edge of the MSWLF unit and downgradient monitoring well screen (minimum distance of travel); and

5) Resource value of the aquifer.

(c) If the owner or operator determines, pursuant to §258.53(g) of this part, that there is a statistically significant increase over background for one or more of the constituents listed in Appendix I or the alternative list approved in accordance with paragraph (a)(2), at any monitoring well at the boundary specified under §258.51(a)(2), the owner or operator:

(1) Must, within 14 days of this finding, place a notice in the operating record indicating which constituents have shown statistically significant changes from

background levels, and notify the State Director that this notice was placed in the operating record; and

(2) Must establish an assessment monitoring program meeting the requirements of §258.55 of this part within 90 days, except as provided for in paragraph (3) below.

(3) The owner/operator may demonstrate that a source other than a MSWLF unit caused the contamination or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in ground-water quality. A report documenting this demonstration must be certified by a qualified ground-water scientist or approved by the Director of an approved State and be placed in the operating record. If a successful demonstration is made and documented, the owner or operator may continue detection monitoring as specified in this section. If after 90 days, a successful demonstration is not made, the owner or operator must initiate an assessment monitoring program as required in §258.55.

5.10.2 Applicability

Except for the small landfill exemption and the no migration demonstration, detection monitoring is required at existing MSWLF units, lateral expansions of units, and new MSWLF units. Monitoring must occur at least semiannually at both background wells and downgradient well locations. The Director of an approved State may specify an alternative sampling frequency. Monitoring parameters must include all Appendix I constituents unless an alternative list has been established by the Director of an approved State.

During the first semiannual monitoring event, the owner or operator must collect at least four independent ground-water samples from each well and analyze the samples for all constituents in the Appendix I or alternative list. Each subsequent semiannual event must include, at a minimum, the collection and analysis of one sample from all wells. The monitoring requirement continues throughout the active life of the landfill and the post-closure care period.

If an owner or operator determines that a statistically significant increase over background has occurred for one or more Appendix I constituents (or constituents on an alternative list), a notice must be placed in the facility operating record (see Table 5-2). The owner or operator must notify the State Director within 14 days of the finding. Within 90 days, the owner or operator must establish an assessment monitoring program conforming to the requirements of §258.55.

If evidence exists that a statistically significant increase is due to factors unrelated to the unit, the owner or operator may make a demonstration to this effect to the Director of an approved State or place a certified demonstration in the operating record. The potential reasons for an apparent statistical increase may include:

- A contaminant source other than the landfill unit
- A natural variation in ground-water quality
- An analytical error

- A statistical error
- A sampling error.

The demonstration that one of these reasons is responsible for the statistically significant increase over background must be certified by a qualified ground-water scientist or approved by the Director of an approved State. If a successful demonstration is made and documented, the owner or operator may continue detection monitoring.

If a successful demonstration is not made within 90 days, the owner or operator must initiate an assessment monitoring program. A flow chart for a detection monitoring program in a State whose program has not been approved by EPA is provided in Figure 5-5.

5.10.3 Technical Considerations

If there is a statistically significant increase over background during detection monitoring for one or more constituents listed in Appendix I of Part 258 (or an alternative list of parameters in an approved State), the owner or operator is required to begin assessment monitoring. The requirement to conduct assessment monitoring will not change, even if the Director of an approved State allows the monitoring of geochemical parameters in lieu of some or all of the metals listed in Appendix I. If an owner or operator suspects that a statistically significant increase in a geochemical parameter is caused by natural variation in ground-water quality or a source other than a MSWLF unit, a demonstration to this effect must be documented in a report to avoid proceeding to assessment monitoring.

Independent Sampling for Background

The ground-water monitoring requirements specify that four independent samples be collected from each well to establish background during the first semiannual monitoring event. This is because almost all statistical procedures are based on the assumption that samples are independent of each other. In other words, independent samples more accurately reflect the true range of natural variability in the ground water, and statistical analyses based on independent samples are more accurate. Replicate samples, whether field replicates or lab splits, are not statistically independent measurements.

It may be necessary to gather the independent samples over a range of time sufficient to account for seasonal differences. If seasonal differences are not taken into account, the chance for false positives increases (monitoring results indicate a release, when a release has not occurred). The sampling interval chosen must ensure that sampling is being done on different volumes of ground water. To determine the appropriate interval between sample collection events that will ensure independence, the owner or operator can determine the site's effective porosity, hydraulic conductivity, and hydraulic gradient and use this information to calculate ground-water velocity (USEPA, 1989). Knowing the velocity of the ground water should enable an owner/operator to establish an interval that ensures the four samples are being collected from four different volumes of water. For additional information on establishing sampling interval, see *Statistical Analysis of Groundwater Monitoring Data at RCRA*

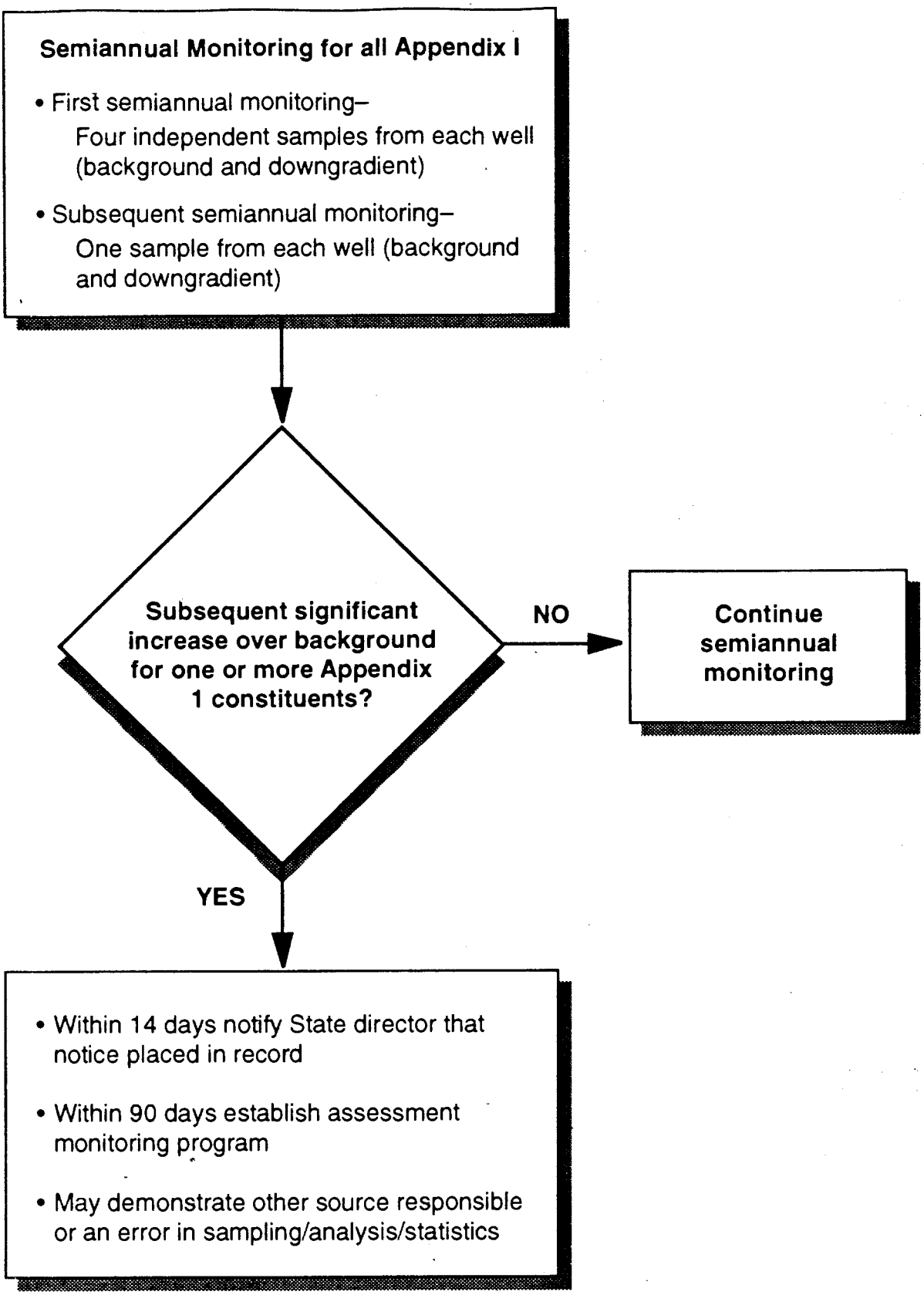

Figure 5-5. Detection Monitoring Program

Facilities - Interim Final Guidance, (USEPA, 1989).

Alternative List/Removal of Parameters

An alternative list of Appendix I constituents may be allowed by the Director of an approved State. The alternative list may use geochemical parameters, such as pH and specific conductance, in place of some or all of the metals (Parameters 1 through 15) in Appendix I. These alternative parameters must provide a reliable indication of inorganic releases from the MSWLF unit to ground water. The option of establishing an alternative list applies only to Parameters 1 through 15 of Appendix I. The list of ground-water monitoring parameters must include all of the volatile organic compounds (Appendix I, Parameters 16 through 62).

A potential problem in substituting geochemical parameters for metals on the alternative list is that many of the geochemical parameters are naturally occurring. However, these parameters have been used to indicate releases from MSWLF units. Using alternative geochemical parameters is reasonable in cases where natural background levels are not high enough to mask the detection of a release from a MSWLF unit. The decision to use alternative parameters also should consider natural spatial and temporal variability in the geochemical parameters.

The types, quantities, and concentrations of wastes managed at the MSWLF unit play an important role in determining whether removal of parameters from Appendix I is appropriate. If an owner or operator has definite knowledge of the nature of wastes accepted at the facility, then removal of constituents from Appendix I may be acceptable. Usually, a waste would have to be homogeneous to allow for this kind of determination. The owner or operator may submit a demonstration that documents the presence or absence of certain constituents in the waste. The owner or operator also would have to demonstrate that constituents proposed for deletion from Appendix I are not degradation or reaction products of constituents potentially present in the waste.

Alternative Frequency

In approved States, 40 CFR §258.54(b) allows the Director to specify an alternative frequency for ground-water monitoring. The alternative frequency is applicable during the active life, including the closure and the post-closure periods. The alternative frequency can be no less than annual.

The need to vary monitoring frequency must be evaluated on a site-specific basis. For example, for MSWLF units located in areas with low ground-water flow rates, it may be acceptable to monitor ground water less frequently. The sampling frequency chosen must be sufficient to protect human health and the environment. Depending on the ground-water flow rate and the resource value of the aquifer, less frequent monitoring may be allowable or more frequent monitoring may be necessary. An approved State may specify an alternative frequency for repeated sampling and analysis of Appendix I constituents based on the following factors:

1) Lithology of the aquifer and the unsaturated zone

2) Hydraulic conductivity of the aquifer and the unsaturated zone

3) Ground-water flow rates

4) Minimum distance between the upgradient edge of the MSWLF unit and the downgradient well screen

5) The resource value of the aquifer.

Approved States also can set alternative frequencies for monitoring during the post-closure care period based on the same factors.

Notification

The notification requirement under 40 CFR §258.54(c) requires an owner or operator to 1) place a notice in the operating record that indicates which constituents have shown statistically significant increases and 2) notify the State Director that the notice was placed in the operating record. The constituents can be from either Appendix I or from an alternative list.

Demonstrations of Other Reasons For Statistical Increase

An owner or operator is allowed 90 days to demonstrate that the statistically significant increase of a contaminant/constituent was caused by statistical, sampling, or analytical errors or by a source other than the landfill unit. The demonstration allowed in §258.54(c)(3) may include:

1) A demonstration that the increase resulted from another contaminant source

2) A comprehensive audit of sampling, laboratory, and data evaluation procedures

3) Resampling and analysis to verify the presence and concentration of the constituents for which the increase was reported.

A demonstration that the increase in constituent concentration is the result of a source other than the MSWLF unit should document that:

- An alternative source exists.
- Hydraulic connection exists between the alternative source and the well with the significant increase.
- Constituent(s) (or precursor constituents) are present at the alternative source or along the flow path from the alternative source prior to possible release from the MSWLF unit.
- The relative concentration and distribution of constituents in the zone of contamination are more strongly linked to the alternative source than to the MSWLF unit when the fate and transport characteristics of the constituents are considered.
- The concentration observed in ground water could not have resulted from the MSWLF unit given the waste constituents and concentrations in the MSWLF unit leachate and wastes, and site hydrogeologic conditions.
- The data supporting conclusions regarding the alternative source are historically consistent with hydrogeologic

conditions and findings of the monitoring program.

The demonstration must be documented, certified by a qualified ground-water scientist, and placed in the operating record of the facility.

Demonstrations of Other Sources of Error

A successful demonstration that the statistically significant change is the result of an error in sampling, analysis, or data evaluation may include the following:

- Clear indication of a transcription or calculation error
- Clear indication of a systematic error in analysis or data reduction
- Resampling, analysis, and evaluation of results
- Corrective measures to prevent the recurrence of the error and incorporation of these measures into the ground-water monitoring program.

If resampling is necessary, the sample(s) taken must be independent of the previous sample. More than one sample may be required to substantiate the contention that the original sample was not representative of the ground-water quality in the affected well(s).

5.11 ASSESSMENT MONITORING PROGRAM 40 CFR §258.55(a)-(f)

5.11.1 Statement of Regulation

(a) Assessment monitoring is required whenever a statistically significant increase over background has been detected for one or more of the constituents listed in Appendix I or in the alternate list approved in accordance with § 258.54(a)(2).

(b) Within 90 days of triggering an assessment monitoring program, and annually thereafter, the owner or operator must sample and analyze the ground water for all constituents identified in Appendix II of this part. A minimum of one sample from each downgradient well must be collected and analyzed during each sampling event. For any new constituent detected in the downgradient wells as a result of the complete Appendix II analysis, a minimum of four independent samples from each well (background and downgradient) must be collected and analyzed to establish background for the new constituents. The Director of an approved State may specify an appropriate subset of wells to be sampled and analyzed for Appendix II constituents during assessment monitoring. The Director of an approved State may delete any of the Appendix II monitoring parameters for a MSWLF unit if it can be shown that the removed constituents are not reasonably expected to be contained in or derived from the waste contained in the unit.

APPENDIX C

GROUNDWATER SAMPLING AND CALIBRATION FORMS - OCTOBER 13, 2017

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

FACILITY NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.
WELL NO:	BBS-CCR-1	SAMPLE ID:	L17J115-01 A
DATE:	10/13/17		

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	1/4	WELL SCREEN INTERVAL (NGVD) DEPTH	12.32	feet to	22.32 (feet)	STATIC DEPTH TO WATER (feet):	7.32	PURGE PUMP TYPE OR BAILER:	PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY

= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME

=(0 gallons + (0.0026 gallons/foot X 23.3 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	17.32	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	17.32	PURGING INITIATED AT:	11:17	PURGING ENDED AT:	11:32	TOTAL VOLUME PURGED (gallons):	1.51

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/l or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
11:28	1.10	1.10	0.10	7.41	6.83	26.47	4268	0.20	1.86	Clear	None
11:30	0.21	1.31	0.11	7.40	6.83	26.53	4261	0.24	0.97	Clear	None
11:32	0.20	1.51	0.10	7.41	6.83	26.57	4258	0.24	0.89	Clear	None

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	RAB TECO	SAMPLER (S) SIGNATURES:		SAMPLING INITIATED AT:	11:32	SAMPLING ENDED AT:	11:50
PUMP OR TUBING DEPTH IN WELL (feet):	17.3	SAMPLE PUMP FLOW RATE (mL per minute):	383	TUBING MATERIAL CODE:	PE/S		
FIELD DECONTAMINATION:	Y ☐ N ☑	FIELD-FILTERED: Filtration Equipment Type	Y ☐ N ☑	FILTER SIZE:	µm	DUPLICATE:	Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.	
WELL NO:	BBS-CCR-2	SAMPLE ID:	L17J115-02 A	DATE: 10/13/17

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches) 1/4	WELL SCREEN INTERVAL DEPTH 11.84 feet to 21.84 (feet)	STATIC DEPTH TO WATER (feet): 6.88	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 22.84 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 16.84	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 16.84	PURGING INITIATED AT: 10:48	PURGING ENDED AT: 11:00	TOTAL VOLUME PURGED (gallons): 1.20

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
10:56	0.80	0.80	0.10	6.94	6.87	26.44	1348	0.19	3.18	Lt. Yellow	None
10:58	0.20	1.00	0.10	6.94	6.86	26.45	1350	0.16	2.80	Lt. Yellow	None
11:00	0.20	1.20	0.10	6.95	6.87	26.46	1350	0.20	3.03	Lt. Yellow	None

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER (S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
RAB TECO		11:00	11:10

PUMP OR TUBING DEPTH IN WELL (feet): 16.8	SAMPLE PUMP FLOW RATE (mL per minute): 380	TUBING MATERIAL CODE: PE/S	
FIELD DECONTAMINATION: Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type:	FILTER SIZE: µm	DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O** = Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.
WELL NO:	BBS-CCR-3	SAMPLE ID:	L17J115-03 A
DATE:	10/13/17		

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches)	1/4	WELL SCREEN INTERVAL DEPTH	13.23	feet to	23.23 (feet)	STATIC DEPTH TO WATER (feet):	6.52	PURGE PUMP TYPE OR BAILER:	PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 24.23 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet):	18.23	FINAL PUMP OR TUBING DEPTH IN WELL (feet):	18.23	PURGING INITIATED AT:	10:13	PURGING ENDED AT:	10:26	TOTAL VOLUME PURGED (gallons):	0.63

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
10:22	0.43	0.43	0.05	6.72	6.47	27.31	1785	0.36	1.59	Yellow	Mild
10:24	0.10	0.53	0.05	6.72	6.45	27.20	1763	0.50	1.13	Yellow	Mild
10:26	0.10	0.63	0.05	6.71	6.44	27.18	1747	0.37	2.39	Yellow	Mild

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	RAB TECO	SAMPLER (S) SIGNATURES:		SAMPLING INITIATED AT:	10:26	SAMPLING ENDED AT:	10:42
PUMP OR TUBING DEPTH IN WELL (feet):	18.2	SAMPLE PUMP FLOW RATE (mL per minute):	187	TUBING MATERIAL CODE:	PE/S		
FIELD DECONTAMINATION:	Y ☐ N ☑	FIELD-FILTERED: Filtration Equipment Type:	Y ☐ N ☑	FILTER SIZE:	µm	DUPLICATE:	Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.	
WELL NO:	BBS-CCR-BW-1	SAMPLE ID:	L17J115-04 A	DATE: 10/13/17

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches) 1/4	WELL SCREEN INTERVAL DEPTH 34.30 feet to 44.30 (feet)	STATIC DEPTH TO WATER (feet): 29.60	PURGE PUMP TYPE OR BAILER: ESP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 100 feet) + 0.06 gallons = 0.32 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 39.30	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 39.30	PURGING INITIATED AT: 9:49	PURGING ENDED AT: 10:01	TOTAL VOLUME PURGED (gallons): 8.23

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/l or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
9:57	5.49	5.49	0.69	30.43	6.55	27.81	4384	0.87	7.30	Clear	None
9:59	1.37	6.86	0.69	30.42	6.55	27.81	4499	0.57	4.40	Clear	None
10:01	1.37	8.23	0.69	30.41	6.55	27.86	4570	0.40	2.51	Clear	None

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER (S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
RAB TECO		10:01	10:04

PUMP OR TUBING DEPTH IN WELL (feet): 39.3	SAMPLE PUMP FLOW RATE (mL per minute): 2600	TUBING MATERIAL CODE: PE	
FIELD DECONTAMINATION: Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type:	FILTER SIZE: µm	DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	ESP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	ESP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	ESP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

DEP-SOP-001/01

FS 2200 Groundwater Sampling

Form FD 9000-24

GROUNDWATER SAMPLING LOG

SITE NAME:	Big Bend	SITE LOCATION:	Apollo Beach, FL.	
WELL NO:	BBS-CCR-BW-2	SAMPLE ID:	L17J115-05 A	DATE: 10/13/17

PURGING DATA

WELL DIAMETER (inches)	TUBING DIAMETER (inches) 1/4	WELL SCREEN INTERVAL DEPTH 13.64 feet to 23.34 (feet)	STATIC DEPTH TO WATER (feet): 7.38	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: (only fillout if applicable)
1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
= (feet - feet) x gallons/foot = gallons

EQUIPMENT VOLUME PURGE: (only fillout if applicable)
1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
=(0 gallons + (0.0026 gallons/foot X 24.64 feet) + 0.06 gallons = 0.12 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 18.49	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 18.49	PURGING INITIATED AT: 9:15	PURGING ENDED AT: 9:32	TOTAL VOLUME PURGED (gallons): 2.27

TIME	VOLUME PURGED (GALLONS)	CUMUL. VOLUME PURGED (GALLONS)	PURGE RATE (GPM)	DEPTH TO WATER (FEET)	pH (standard units)	TEMP. (ºC)	COND. (µmhos/cm OR µS/cm)	DISSOLVED OXYGEN (circle mg/L or % saturation)	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
9:28	1.75	1.75	0.13	7.61	6.68	27.92	1706	0.39	4.98	Lt. Yellow	None
9:30	0.26	2.01	0.13	7.62	6.69	27.95	1702	0.31	6.12	Lt. Yellow	None
9:32	0.26	2.27	0.13	7.62	6.70	27.98	1699	0.28	3.96	Lt. Yellow	None

WELL CAPACITY (Gallons Per Foot): **0.75"** = 0.02; **1"** = 0.04; **1.25"** = 0.06; **2"** = 0.16; **3"** = 0.37; **4"** = 0.65; **5"** = 1.02; **6"** = 1.47; **12"** = 5.88

TUBING INSIDE DIA. CAPACITY (Gal./Ft.): **1/8"** = 0.00006; **3/16"** = 0.0014; **1/4"** = 0.0026; **5/16"** = 0.004; **3/8"** = 0.006; **1/2"** = 0.010; **5/8"** = 0.016

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION:	SAMPLER (S) SIGNATURES:	SAMPLING INITIATED AT:	SAMPLING ENDED AT:
RAB TECO		9:32	9:40

PUMP OR TUBING DEPTH IN WELL (feet): 18.5	SAMPLE PUMP FLOW RATE (mL per minute): 503	TUBING MATERIAL CODE: PE/S	
FIELD DECONTAMINATION: Y ☐ N ☑	FIELD-FILTERED: Y ☐ N ☑ Filtration Equipment Type:	FILTER SIZE: µm	DUPLICATE: Y ☐ N ☑

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL. ADDED IN FIELD (ml) (1)	FINAL pH		
@Ino-500	1	PE	500ml	NONE	NONE	N/A	Inorganics	PP
@Met-250	2	PE	250ml	HNO3	1ml	<2	Metals	PP
@Rad-1L	2	PE	1L	HNO3	5ml	<2	Radiologicals	PP

REMARKS:
(1) Sample bottles pre-preserved at laboratory prior to sample collection.

MATERIAL CODES: **AG** = Amber Glass; **CG** = Clear Glass; **PE** = Polyethylene; **PP** = Polypropylene; **S** = Silicone; **T** = Teflon; **O**= Other (Specify)

SAMPLING/PURGING EQUIPMENT CODES: **APP** = After Peristaltic Pump; **B** = Bailer; **BP** = Bladder Pump; **ESP =** Electric Submirsable Pump; **PP** = Peristaltic Pump **RFPP** = Reverse Flow Peristaltic Pump; **SM** = Straw Method (tubing Gravity Drain); **VT** = Vacuum Trap; **O =** Other (Specify)

NOTES: **1. The above do not constitute all of the information requierd by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212. SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 ºC **Specific Conductance**: ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or 10% (whichever is greater)

Site: **Big Bend** Date: 10/13/17 File Name: 101317_Wells_RAB Weather: Partly Cloudy & Warm Sampler(s) / Initials RAB /TECO Initials RNB

LIMS #	Loction Code	Time	FE²	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L17J115-01 A	BBS-CCR-1	11:50		6.83	26.57	4258	0.24	0.89	-83.3		Clear	None		
L17J115-02 A	BBS-CCR-2	11:10		6.87	26.46	1350	0.20	3.03	-188.5		Lt. Yellow	None		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L17J115-01 A	☐		1		☐	☑ 2	☑ 2							10
L17J115-02 A	☐		1		☐	☑ 2	☑ 2	☐		☐	☐	☐	☐	

(1) 1L plastic (PP) (2) 500ml plastic (PP) (3) 250ml plastic (PP) (4) 100ml coliform bottle (5) 1L amber glass (AG) (6) 40ml VOA vial (CG)

ESS 0107301Y ESS 0218201Y ESS 0307301Y ESS ESS ESS

Samples On Ice ☑ Yes ☐ No

Sample Reciept Time 14:18 Temp 1.4 C

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID
1L bottles (rads): 5 ml HNO3 to pH <2	L 012558	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐
500 ml bottles (metals): 2 ml HNO3 to pH <2	L	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 012558	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	**A checked box indicates that the sample was verified to a pH of <2**	

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time
Meter ID: MPM08	L 019949D	7	7.01	7:02	7.03	7:06	7.11	14:29
FDEP FT 1100	L 019074C	10	10.05	7:02				
Units: SU	L 019303D	4	4.00	7:02				

Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID:	7:10	21.5	236.0	236.2
MPM08	14:33	21.1	233.5	236.2
Zobell Sol ID:				
L 019150B				

Conductivity Meter Calib.	Standard ID	Std Value	Cal	Time	ICV	Time	CCV	Time
Meter ID: MPM08	L 018805E	1000	1000	7:14				
FDEP FT 1200, Units: uMHOS	L 019100B	10000			9830	7:18	9791	14:01

DO Meter Cal	Time	Temp °C	Reading mg/l	Theo Value mg/l
Meter ID:	6:54	21.4	8.90	8.863
MPM08	14:42	20.8	8.97	8.950
Barom. Pres				
760				

Turbidity Meter Calibration	Standard ID	Std Value	Acceptability Range		ICV	Time	CCV	Time
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.60	6:43	5.61	13:59
FDEP FT 1600, Units: NTU	L 0							

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L

Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
MPM08	**0.2**	**5**	**0.3**	**10**

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026, 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) - Depth to Water (ft) = Water Column (ft)	x Well Capacity (gal) = 1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x Tubing Length (ft)) + Pump Volume (gal) + Cell Volume (gal) = 1 Eqpt. Volume (gal)
BBS-CCR-1	2	10	17.32	22.32 - 7.32 = 15.00	x 0.16 = **2.40**	(0.0026 x 23.3) + 0 + 0.06 = **0.12**

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	11:28	380	1.10	1.10	7.41	6.83	26.47	4268	0.20	1.86	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	11:30	390	0.21	1.31	7.40	6.83	26.53	4261	0.24	0.97	Temp°C+/- 0.2	STABLE	Pump:	PP
11:17	11:32	380	0.20	1.51	7.41	6.83	26.57	4258	0.24	0.89	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
11:32											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At	**11:18**	**Gallons to Purge**	**0.12**	Stablility Values =		6.83	26.57	4258	0.24	0.89				

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) - Depth to Water (ft) = Water Column (ft)	x Well Capacity (gal) = 1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x Tubing Length (ft)) + Pump Volume (gal) + Cell Volume (gal) = 1 Eqpt. Volume (gal)
BBS-CCR-2	2	10	16.84	21.84 - 6.88 = 14.96	x 0.16 = **2.39**	(0.0026 x 22.84) + 0 + 0.06 = **0.12**

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	10:56	380	0.80	0.80	6.94	6.87	26.44	1348	0.19	3.18	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	10:58	380	0.20	1.00	6.94	6.86	26.45	1350	0.16	2.80	Temp°C+/- 0.2	STABLE	Pump:	PP
10:48	11:00	380	0.20	1.20	6.95	6.87	26.46	1350	0.20	3.03	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
11:00											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At	**10:49**	**Gallons to Purge**	**0.12**	Stablility Values =		6.87	26.46	1350	0.20	3.03				

Comments:

Total Time Total Miles

Site: **Big Bend** Date: 10/13/17 File Name: 101317_Wells_RAB Weather: Partly Cloudy & Warm Sampler(s) / Initials RAB /TECO Initials

LIMS #	Loction Code	Time	FE²	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L17J115-03 A	BBS-CCR-3	10:42		6.44	27.18	1747	0.37	2.39	-249.3		Yellow	Mild		
	CCR-PZ-4													

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L17J115-03 A	☐		1		☐	☑ 2	☑ 2							5
	☐				☐	☑	☑	☐		☐	☐	☐	☐	

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)		Samples On Ice	Sample Reciept
ESS 0107301Y	ESS 0218201Y	ESS 0307301Y	ESS	ESS	ESS		☑ Yes ☐ No	Time 14:18
								Temp 1.4 C

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID
1L bottles (rads): 5 ml HNO3 to pH <2	L 012558	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 012558	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	**A checked box indicates that the sample was verified to a pH of <2**	

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time	Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID: MPM08	L 019949D	7	7	7:02	7.03	7:06	7.11	14:29	Meter ID:	7:10	21.5	236.0	236.2
FDEP FT 1100	L 019074C	10	10	7:02	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)				MPM08	14:33	21.1	233.5	236.2
Units: SU	L 019303D	4	4	7:02	A checked box indicates ICV / CCV passed				Zobell Sol ID:				
Conductivity Meter Calib.	Standard ID	Std Value	Cal	Time	ICV	Time	CCV	Time	L 50B				
Meter ID: MPM08	L 018805E	1000	1000	7:14					**DO Meter Cal**	Time	Temp °C	Reading mg/l	Theo Value mg/l
FDEP FT 1200, Units: uMHOS	L 019100B	10000			9830	7:18	9791	14:01	Meter ID:	6:54	21.4	8.90	8.863
Turbidity Meter Calibration	Standard ID	Std Value	Acceptability Range		ICV	Time	CCV	Time	MPM08	14:42	20.8	8.97	8.950
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.60	6:43	5.61	13:59	Barom. Pres				
FDEP FT 1600, Units: NTU	L 0								760				

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID	Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L	MPM08	**0.2**	**5**	**0.3**	**10**

Purging Information **Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65** **Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026 3/8" =0.006**

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) -	Depth to Water (ft) =	Water Column (ft) x	Well Capacity (gal) =	1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x	Tubing Length (ft)) +	Pump Volume (gal) +	Cell Volume (gal) =	1 Eqpt. Volume (gal)	
BBS-CCR-3	2	10	18.23	23.23	**6.52**	16.71	0.16	**2.67**	0.0026	24.23	0	0.06	**0.12**	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	10:22	180	0.43	0.43	6.72	6.47	27.31	1785	0.36	1.59	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	10:24	190	0.10	0.53	6.72	6.45	27.20	1763	0.50	1.13	Temp°C+/- 0.2	STABLE	Pump:	PP
10:13	10:26	190	0.10	0.63	6.71	6.44	27.18	1747	0.37	2.39	Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
10:26											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At	**10:16**	**Gallons to Purge**	**0.12**	Stablility Values =		6.44	27.18	1747	0.37	2.39				

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft) -	Depth to Water (ft) =	Water Column (ft) x	Well Capacity (gal) =	1 Well Volume (gal)	(Tubing Capacity (gal/ft.) x	Tubing Length (ft)) +	Pump Volume (gal) +	Cell Volume (gal =	1 Eqpt. Volume (gal)	
	2	10	14	18		18.00	0.16	**2.88**	0.0026	100	0	0.06	**0.32**	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
											ph:+/- 0.2		Level Meter:	WLM08
Purge Start:											Temp°C+/- 0.2		Pump:	PP
											Cond % +/- 5		Tubing:	PE/S
Purge End:											DO % Sat.< 20		Dedicated ☐	Yes
											Turb. NTU < 20		Tubing? ☐	No
Purge Complete At		**Gallons to Purge**	**0.32**	Stablity Values =										

Comments:

Total Time Total Miles

Site: **Big Bend** Date: 10/13/17 File Name: 101317_Wells_RAB Weather: Partly Cloudy & Warm Sampler(s) / Initials RAB /TECO Initials

LIMS #	Loction Code	Time	FE²	pH (SU)	Temp °C	Cond(uMHOS)	DO Mg/L	Turbidity(NTU)	Redox (mv)	Sulfite (mg/L)	Color	Odor	NGVD	
			mg/l	PH	TEMP-C	COND-F	DO	TURB-N-F	REDOX	SO3-TR	$COLOR-W	$ODOR-W	Time	LEVEL
L17J115-04 A	BBS-CCR-BW-1	10:04		6.6	27.9	4570	0.4	2.5	-18.4		Clear	None		
L17J115-05 A	BBS-CCR-BW-2	9:40		6.7	28.0	1699	0.3	4.0	-72.1		Lt. Yellow	None		

LIMS #	250ml Cyan (3)	1L Inorg (1)	500ml Inorg (2)	250ml Inorg (3)	1L Mtls (1)	250ml Mtls (3)	1L Rads (1)	500ml Sulfide (2)	500ml Mtls (2)	250ml Nuts (3)	40ml Vial (6)	500 ml Nuts (2)	1L Rads Diss. (1)	Total Containers
L17J115-04 A	☐		1		☐	☑ 2	☑ 2							10
L17J115-05 A	☐		1		☐	☑ 2	☑ 2	☐		☐	☐	☐	☐	

(1) 1L plastic (PP)	(2) 500ml plastic (PP)	(3) 250ml plastic (PP)	(4) 100ml coliform bottle	(5) 1L amber glass (AG)	(6) 40ml VOA vial (CG)	Samples On Ice	Sample Reciept
ESS 0107301Y	ESS 0218201Y	ESS 0307301Y	ESS	ESS	ESS	☑ Yes ☐ No	Time 14:18
							Temp 1.4 C

Preservation	Pres ID	Preservation	Pres ID	Preservation	Pres ID
1L bottles (rads): 5 ml HNO3 to pH <2	L 012558 ☑	250ml bottles (nuts): 1 ml H2SO4 to pH <2	L ☐	500 ml bottles(Sulfide) 2ml NAOH/Zinc Acet. to pH >12	L ☐
500 ml bottles (metals): 2 ml HNO3 to pH <2	L ☐	40 ml Vial (TOC): 0.5 ml H2SO4 to pH <2	L ☐	250 ml bottles (Cyan) 1g NAOH to pH >12	L ☐
250 ml bottles (metal): 1 ml HNO3 to pH <2	L 012558 ☑	1L bottles (diss. rads): filtered with 0.45um, 5 ml HNO3 to pH <2	L ☐	**A checked box indicates that the sample was verified to a pH of <2**	

pH Meter Calibration	Buffer ID	Buffer Value	Cal	Time	ICV	Time	CCV	Time
Meter ID: MPM08	L 019949D	7	7	7:02	7.03	7:06	7.11	14:29
FDEP FT 1100	L 019074C	10	10	7:02	QC: (pH +/- 0.2) (Cond +/- 5%) (DO +/- 0.3mg/L) (Redox +/- 10mv)			
Units: SU	L 019303D	4	4	7:02	A checked box indicates ICV / CCV passed			

Redox Cal	Time	Temp °C	Reading mv	Theo Value mv
Meter ID:	7:10	21.5	236.0	236.2
MPM08	14:33	21.1	233.5	236.2
Zobell Sol ID:				
L 019150B				

Conductivity Meter Calib.	Standard ID	Std Value	Cal	Time	ICV	Time	CCV	Time
Meter ID: MPM08	L 018805E	1000	1000	7:14				
FDEP FT 1200, Units: uMHOS	L 019100B	10000			9830	7:18	9791	14:01

DO Meter Cal	Time	Temp °C	Reading mg/l	Theo Value mg/l
Meter ID:	6:54	21.4	8.90	8.863
MPM08	14:42	20.8	8.97	8.950
Barom. Pres				
760				

Turbidity Meter Calibration	Standard ID	Std Value	Acceptability Range		ICV	Time	CCV	Time
Meter ID: TM07	L 019883	5.56	5.00	6.12	5.60	6:43	5.61	13:59
FDEP FT 1600, Units: NTU	L 0							

Sulfite Info (QC Check) (EPA 377.1)	QC Result mg/l	Time	Titrator ID	Na Thio ID	DO 3 Pillow ID	Starch Ind. ID	Iodate/Iodide ID
QC Std: 5ml (NaThio)/500ml DI=10mg/L				L	L	L	L

Therm ID	pH	Conduct.(%)	DO (mg/l)	Redox (mv)
MPM08	**0.2**	**5**	**0.3**	**10**

Purging Information Well Capacities (gallons/ ft): 2" = 0.16 4" =0.65 Tubing Inside Diam. Capacities Gallons/ft): 1/4" =0.0026 3/8" =0.006

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft)	- Depth to Water (ft)	= Water Column (ft)	x Well Capacity (gal)	= 1 Well Volume (gal)	(Tubing Capacity (gal/ft.)	x Tubing Length (ft))	+ Pump Volume (gal)	+ Cell Volume (gal)	= 1 Eqpt. Volume (gal)	
BBS-CCR-BW-1	2	10	39.3	44.3	29.60	14.70	0.16	**2.35**	0.0026	100	0	0.06	**0.32**	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	9:57	2600	5.49	5.49	30.43	6.55	27.81	4384	0.87	7.30	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	9:59	2600	1.37	6.86	30.42	6.55	27.81	4499	0.57	4.40	Temp°C+/- 0.2	STABLE	Pump:	ESP
9:49	10:01	2600	1.37	8.23	30.41	6.55	27.86	4570	0.40	2.51	Cond % +/- 5	STABLE	Tubing:	PE
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☐	Yes
10:01											Turb. NTU < 20	STABLE	Tubing? ☑	No
Purge Complete At	**9:49**	**Gallons to Purge**	**0.32**	Stability Values =		6.55	27.86	4570	0.40	2.51				

Well #	Diam/ Comp	Screen Interval (ft)	Intake Depth (ft)	Well Depth (ft)	- Depth to Water (ft)	= Water Column (ft)	x Well Capacity (gal)	= 1 Well Volume (gal)	(Tubing Capacity (gal/ft.)	x Tubing Length (ft))	+ Pump Volume (gal)	+ Cell Volume (gal)	= 1 Eqpt. Volume (gal)	
BBS-CCR-BW-2	2	10	18.49	23.84	7.38	16.46	0.16	**2.63**	0.0026	24.64	0	0.06	**0.12**	

Purge Meth:	Time	Rate (ml/min)	Volume (gal)	Total Vol. (gal)	Water Depth (ft)	pH (SU)	Temp °C	Cond (uMHOS)	DO (mg/L)	Turbidity (NTU)	Purge Criteria	Status	Equipment ID	Eqpt. Table
1A	9:28	510	1.75	1.75	7.61	6.68	27.92	1706	0.39	4.98	ph:+/- 0.2	STABLE	Level Meter:	WLM08
Purge Start:	9:30	500	0.26	2.01	7.62	6.69	27.95	1702	0.31	6.12	0.2	STABLE	Pump:	PP
9:15	9:32	500	0.26	2.27	7.62	6.70	27.98	1699	0.28	3.96	Temp°C+/ Cond % +/- 5	STABLE	Tubing:	PE/S
Purge End:											DO % Sat.< 20	STABLE	Dedicated ☑	Yes
9:32											Turb. NTU < 20	STABLE	Tubing? ☐	No
Purge Complete At	**9:16**	**Gallons to Purge**	**0.12**	Stability Values =		6.70	27.98	1699	0.28	3.96				

Comments:

Total Time Total Miles

APPENDIX D

Geosyntec Data Validation Reports – Second and Third Detection Monitoring Events

Geosyntec consultants

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Memorandum

Date: 25 May 2018

To: Todd Kafka

From: Chris Pracheil

CC: J. Caprio

Subject: Stage 2A Data Validation – Level II Data Deliverable – Tampa Electric Laboratory Services #L18D079 and L18D116, TestAmerica #660-86743-1 and KNL Environmental Testing # L18D079 and L18D116

SITE: Big Bend Power Station, Apollo Beach, Florida

INTRODUCTION

This report summarizes the findings of the Stage 2A data validation of five water samples, collected on April 13, 2018 and one water sample, collected on April 25, 2018 as part of the Big Bend Power Station coal combustion residuals (CCR) groundwater monitoring program plan. The lithium analyses were performed by TestAmerica Laboratories, Inc., Tampa, Florida (TA). The radium analyses were performed by KNL Environmental Testing, Tampa, Florida (KNL). The rest of the analyses were performed by Tampa Electric Laboratory Services, Tampa, Florida (TELS). The samples were analyzed for the following:

- Metals by EPA Methods 200.8 and 6010B
- Mercury by EPA Method 7470A
- Radium-226 by EPA Method 903.0
- Radium-228 by EPA Method Ra-05
- Chloride, Fluoride and Sulfate by EPA Method 300.0
- Total Dissolved Solids by Standard Method 2540C

EXECUTIVE SUMMARY

The samples were handled, prepared, and measured in the same manner under similar prescribed conditions.

Overall, based on this Stage 2A data validation covering the quality control (QC) parameters listed below, the data as qualified are usable for meeting project objectives. The qualified data should be used within the limitations of the qualifications.

The inorganic data were reviewed based on the following: CCR Groundwater Monitoring Program Plan, Big Bend Power Station, Apollo Beach, Florida, September 2016 (GWMP), USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, January 2017 (OLEM 9355.0-135, EPA 540-R-2017-001), as well as by the pertinent methods referenced by the data package and professional and technical judgment.

The following samples were analyzed and validated at a Stage 2A level in the data set:

Laboratory ID	Client ID
L18D079-01	BBS-CCR-1 (4/13/18)
L18D079-02	BBS-CCR-2 (4/13/18)
L18D079-03	BBS-CCR-3 (4/13/18)

Laboratory ID	Client ID
L18D079-04	BBS-CCR-BW-1 (4/13/18)
L18D079-05	BBS-CCR-BW-2 (4/13/18)
L18D116-01	BBS-CCR-2 (4/25/18)

The samples were received at the laboratories at 1.2^{o}C and 1.8^{o}C within the criteria of 0-6^{o}C. No sample preservation or sample receipt issues were noted by the laboratories.

1.0 TOTAL METALS

The samples were analyzed for total metals per EPA Methods 200.8 and 6010B.

The areas of data review are listed below. A leading check mark (✓) indicates an area of review in which the data were acceptable. A preceding crossed circle (⊗) signifies areas where issues were raised during the course of the validation review and should be considered to determine the impact on data quality and usability.

✓ Overall Assessment
✓ Holding Times
⊗ Method Blank
✓ Matrix Spike/Matrix Spike Duplicate
⊗ Laboratory Control Sample
✓ Serial Dilution
✓ Field Duplicate
✓ Sensitivity
✓ Electronic Data Deliverable Review

1.1 Overall Assessment

The metals data reported in this package are considered usable for meeting project objectives. The results are considered valid; analytical completeness, defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis for the data set is 100%.

1.2 Holding Times

The holding time for the metals analysis of waters is 180 days from sample collection to analysis. The holding times were met for the sample analyses.

1.3 Method Blank

Method blanks were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Three method blanks were reported (method 200.8 batch 18D0100 and method 6010B batches 18D0095 and 394328). Metals were not detected in the method blanks above the method detection limits (MDLs), with the following exceptions.

Calcium was detected at an estimated concentration, greater than the MDL and less than the reporting limit (RL) in the method blank associated with batch 18D0095 and cadmium, cobalt, lead and thallium were detected at estimated concentrations, greater than the MDLs and less than the RLs in the method blank associated with batch 18D0100. Therefore, the estimated concentrations of cadmium, cobalt, lead and thallium in the associated samples were U qualified as not detected at the RLs. Since calcium was detected above the RL in the associated samples no qualifications were applied to the calcium data.

Client Sample ID	Compound	Laboratory Result (µg/L)	Laboratory Flag	Validation Result (µg/L)	Validation Qualifier*	Reason Code**
BBS-CCR-1 (4/13/18)	Cadmium	0.25	V,I	0.5	U	3
BBS-CCR-1 (4/13/18)	Cobalt	0.522	V,I	2.0	U	3
BBS-CCR-1 (4/13/18)	Lead	0. 328	V,I	2.0	U	3
BBS-CCR-2 (4/13/18)	Cobalt	0.108	V,I	2.0	U	3
BBS-CCR-2 (4/13/18)	Lead	0. 167	V,I	2.0	U	3
BBS-CCR-3 (4/13/18)	Cobalt	0.154	V,I	2.0	U	3
BBS-CCR-3 (4/13/18)	Lead	0.0911	V,I	2.0	U	3
BBS-CCR-BW1 (4/13/18)	Cadmium	0.145	V,I	0.5	U	3
BBS-CCR-BW1 (4/13/18)	Cobalt	1.87	V,I	2.0	U	3
BBS-CCR-BW1 (4/13/18)	Lead	0.236	V,I	2.0	U	3

Client Sample ID	Compound	Laboratory Result (µg/L)	Laboratory Flag	Validation Result (µg/L)	Validation Qualifier*	Reason Code**
BBS-CCR-BW1 (4/13/18)	Thallium	0.101	V,I	0.5	U	3
BBS-CCR-BW2 (4/13/18)	Cobalt	0.247	V,I	2.0	U	3
BBS-CCR-BW2 (4/13/18)	Lead	0.112	V,I	2.0	U	3

µg/L-micrograms per liter
I- laboratory flag indicating the reported value is estimated, greater than MDL and less than RL
V- laboratory flag indicating analyte was detected in both the sample and the associated method blank
* Validation qualifiers are defined in Attachment 1 at the end of this report
**Reason codes are defined in Attachment 2 at the end of this report

1.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSDs were analyzed at the proper frequency for the number and types of samples analyzed (one pair per batch of 20 samples). A sample set specific MS/MSD pair was reported for the method 200.8 data using sample BBS-CCR-1 (4/13/18). The recovery and relative percent difference (RPD) results were within the laboratory specified acceptance criteria.

Batch MS/MSD pairs were reported for the method 6010B data. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

1.5 Laboratory Control Sample (LCS)

LCSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Three LCSs were reported; one for method 200.8 and two for method 6010B. The recovery results were within the laboratory specified acceptance criteria; however, it was noted that calcium was not included in the LCS spike for batch 18D0095. Therefore, the concentrations of calcium in the associated samples were J qualified as estimated.

Client Sample ID	Compound	Laboratory Result (µg/L)	Laboratory Flag	Validation Result (µg/L)	Validation Qualifier	Reason Code
BBS-CCR-1 (4/13/18)	Calcium	577,000	V	577,000	J	5
BBS-CCR-2 (4/13/18)	Calcium	183,000	V	183,000	J	5
BBS-CCR-3 (4/13/18)	Calcium	206,000	V	206,000	J	5
BBS-CCR-BW1 (4/13/18)	Calcium	694,000	V	694,000	J	5
BBS-CCR-BW2 (4/13/18)	Calcium	297,000	V	297,000	J	5

µg/L-micrograms per liter
V- laboratory flag indicating analyte was detected in both the sample and the associated method blank

1.6 Serial Dilution

Serial dilutions were not reported.

1.7 Field Duplicate

Field duplicates were not reported with the sample sets.

1.8 Sensitivity

The samples were reported to the MDLs. The MDLs met the limits listed in Table 4 of the CCR Groundwater Monitoring Plan.

1.9 Electronic Data Deliverable (EDD) Review

The results and sample identifications (IDs) in the EDD were reviewed against the information provided by the associated level II reports at a minimum of 20% as part of the data validation process. The laboratory flags used in the laboratory report did not match the flags used in the EDD. No other discrepancies were identified between the level II reports and the EDD.

2.0 MERCURY

The samples were analyzed for mercury per EPA Method 7470A.

The areas of data review are listed below. A leading check mark (✓) indicates an area of review in which the data were acceptable. A preceding crossed circle (⊗) signifies areas where issues were raised during the course of the validation review and should be considered to determine the impact on data quality and usability.

- ✓ Overall Assessment
- ✓ Holding Times
- ✓ Method Blank
- ✓ Matrix Spike/Matrix Spike Duplicate
- ✓ Laboratory Control Sample
- ✓ Field Duplicate
- ✓ Sensitivity
- ✓ Electronic Data Deliverable Review

2.1 Overall Assessment

The mercury data reported in this package are considered usable for meeting project objectives. The results are considered valid; analytical completeness, defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis for the data set is 100%.

2.2 Holding Times

The holding time for the mercury analysis of a water sample is 28 days from sample collection to analysis. The holding times were met for the sample analyses.

2.3 Method Blank

Method blanks were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One method blank was reported (batch 18D0103). Mercury was not detected in the method blank above the MDL.

2.4 Matrix Spike/Matrix Spike Duplicate

MS/MSD pairs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One sample set specific MS/MSD pair, using sample BBS-CCR-BW-2 (4/13/18), was reported. The recoveries and RPD results were within the laboratory specified acceptance criteria.

2.5 Laboratory Control Sample

LCSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One LCS was reported. The recovery result was within the laboratory specified acceptance criteria.

2.6 Field Duplicate

Field duplicates were not reported with the sample sets.

2.7 Sensitivity

The samples were reported to the MDL. No elevated non-detect results were reported. The MDL for mercury met the limit listed in Table 4 of the CCR Groundwater Monitoring Plan.

2.8 Electronic Data Deliverable Review

The results and sample IDs in the EDD were reviewed against the information provided by the associated level II reports at a minimum of 20% as part of the data validation process. No discrepancies were identified between the level II reports and the EDD.

3.0 RADIUM-226 AND RADIUM-228

The samples were analyzed for radium 226 and radium 228 per EPA Methods 903.0 and RA-05, respectively.

The areas of data review are listed below. A leading check mark (✓) indicates an area of review in which the data were acceptable. A preceding crossed circle (⊗) signifies areas where issues were raised during the course of the validation review and should be considered to determine the impact on data quality and usability.

- ✓ Overall Assessment
- ✓ Holding Times
- ✓ Method Blank
- ✓ Matrix Spike
- ✓ Laboratory Control Sample
- ✓ Laboratory Duplicate
- ✓ Sensitivity
- ✓ Electronic Data Deliverable Review

3.1 Overall Assessment

The radium-226 and radium-228 data reported in this package are considered usable for meeting project objectives. The results are considered valid; the analytical completeness, defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis for the data set is 100%.

3.2 Holding Times

The holding times for radium-226 and radium-228 analysis of waters are 180 days from sample collection to analysis. The holding times were met for the sample analyses.

3.3 Method Blank

Method blanks were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Six method blanks were reported (three for the radium-226 and three for the radium-228). The method blanks were within validation criteria with the following exceptions.

Radium-226 was detected at concentrations greater than 1.65 times the combined standard uncertainty (CSU) in batches L18D079 and L18D116. Since the detections of radium-226 and combined radium data (radium-226 + radium-228) were greater than 10 times the blank concentrations in the associated samples, no qualifications were applied to the data.

3.4 Matrix Spike

MSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One sample set specific MS, using sample BBS-CCR-BW-2 (4/13/18) was reported for radium-228. The recovery results were within the laboratory specified acceptance criteria.

Batch MSs were also reported for the radium-226 and radium-228 data. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

3.5 Laboratory Control Sample

LCSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Three LCSs were reported for radium-226 and three for radium-228. The recovery results were within the laboratory specified acceptance criteria.

3.6 Laboratory Duplicate

Laboratory duplicates were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One sample set specific laboratory duplicate, using sample BBS-CCR-BW-2 (4/13/18) was reported for radium-228. The RPD result for the laboratory duplicate was within the laboratory acceptance criteria.

Batch laboratory duplicates were also reported for the radium-226 and radium-228. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

3.7 Sensitivity

The samples were reported to the minimum detectable concentrations (MDCs). The reported MDCs met the limits listed in Table 4 of the CCR Groundwater Monitoring Plan.

3.8 Electronic Data Deliverable Review

The results and sample IDs in the EDD were reviewed against the information provided by the associated level II reports at a minimum of 20% as part of the data validation process. No discrepancies were identified between the level II reports and the EDD.

4.0 WET CHEMISTRY PARAMETERS

The samples were analyzed for chloride, fluoride and sulfate by EPA Method 300.0 and total dissolved solids by SM 2540C.

The areas of data review are listed below. A leading check mark (✓) indicates an area of review in which the data were acceptable. A preceding crossed circle (⊗) signifies areas where issues were raised during the course of the validation review and should be considered to determine any impact on data quality and usability.

⊗ Overall Assessment
✓ Holding Times
✓ Method Blank
✓ Matrix Spike/Matrix Spike Duplicate
✓ Laboratory Control Sample
✓ Laboratory Duplicate
✓ Field Duplicate
✓ Sensitivity
✓ Electronic Data Deliverables Review

4.1 Overall Assessment

The wet chemistry data reported in this package are considered usable for meeting project objectives. The results are considered to be valid; the analytical completeness, defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis, for the data set 100%.

4.1.1 Analytical Anomalies

The case narratives for laboratory report L18D079 noted that a constant weight could not be achieved after three consecutive weighing and drying cycles for the total dissolved solids analysis

of samples BBS-CCR-3 (4/13/18). Therefore, the concentration of total dissolved solid in this sample was J qualified as estimated.

Client Sample ID	Compound	Laboratory Result (mg/L)	Laboratory Flag	Validation Result (mg/L)	Validation Qualifier	Reason Code
BBS-CCR-3 (4/13/18)	Total Dissolved Solids	1310	J-	1310	J	13

mg/L-milligrams per liter
J--the reported value is an estimated value

4.2 Holding Times

The holding times for chloride, fluoride and sulfate by EPA method 300.0 are 28 days from sample collection to analysis and the holding time for total dissolved solids by SM 2540C is 7 days from sample collection to analysis. The holding times were met for the sample analyses.

4.3 Method Blanks

Method blanks were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Method blanks were reported for each analysis as appropriate. The wet chemistry parameters were not detected in the method blanks above the MDLs, with the following exceptions.

Chloride and fluoride were detected at estimated concentrations greater than the MDLs and less than the RLs in the method blank for batch 18D0099. Since chloride and fluoride were detected above the RLs in the associated samples, no qualifications were applied to the data.

4.4 Matrix Spike/Matrix Spike Duplicate

MS/MSDs were analyzed at the proper frequency for the number and types of samples analyzed (one pair per batch of 20 samples). A sample set specific MS/MSD pair was reported for the method 300.0 data using sample BBS-CCR-1 (4/13/18). The recovery and RPD results were within the laboratory specified acceptance criteria, with the following exceptions.

The recoveries of chloride and sulfate were low and outside the laboratory limits in the MS/MSD pair using sample BBS-CCR-1 (4/13/18). Based on the sample concentrations of chloride and sulfate compared to the spike amount (greater than four times the spike concentration), no qualifications were applied to the data based on technical and professional judgement.

A batch MS/MSD pair was also reported for the method 300.0 data. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

4.5 Laboratory Control Sample

LCSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). LCSs were reported for each analysis as appropriate. The recovery results were within the laboratory specified acceptance criteria.

4.6 Laboratory Duplicate

Laboratory duplicates were reported for the total dissolved solids data. One sample set specific laboratory duplicate was reported for total dissolved solids using sample BBS-CCR-1 (4/13/18). The RPD results were within the laboratory specified acceptance criteria.

A batch laboratory duplicate was also reported for the total dissolved solids data. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

4.7 Field Duplicate

Field duplicates were not reported with the sample sets.

4.8 Sensitivity

The samples were reported to the MDLs. The MDLs reported met the limits listed in Table 4 of the CCR Groundwater Monitoring Plan.

4.9 Electronic Data Deliverables Review

The results and sample identifications (IDs) in the EDD were reviewed against the information provided by the associated level II reports at a minimum of 20% as part of the data validation process. The laboratory flags used in the laboratory report did not match the flags used in the EDD. No other discrepancies were identified between the level II reports and the EDD.

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* * * * *

ATTACHMENT 1
DATA VALIDATION QUALIFIER DEFINITIONS AND INTERPRETATION KEY
Assigned by Geosyntec's Data Validation Team

DATA QUALIFIER DEFINITIONS

U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

J+ The analyte was positively identified; however, the associated numerical value is likely to be higher than the concentration of the analyte in the sample due to positive bias of associated QC or calibration data or attributable to matrix interference.

J- The analyte was positively identified; however, the associated numerical value is likely to be lower than the concentration of the analyte in the sample due to negative bias of associated QC or calibration data or attributable to matrix interference.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

ATTACHMENT 2
DATA VALIDATION REASON CODES
Assigned by Geosyntec's Data Validation Team

Valid Value	Description
1	Preservation requirement not met
2	Analysis holding time exceeded
3	Blank contamination (i.e., method, trip, equipment, etc.)
4	Matrix spike/matrix spike duplicate recovery or RPD outside limits
5	LCS or RPD recovery outside limits (LCS/LCSD)
6	Surrogate recovery outside limits
7	Field Duplicate RPD exceeded
8	Serial dilution percent difference exceeded
9	Calibration criteria not met
10	Linear range exceeded
11	Internal standard criteria not met
12	Lab duplicates RPD exceeded
13	Other

Geosyntec consultants

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Memorandum

Date: 15 November 2018

To: Todd Kafka

From: Chris Pracheil

CC: J. Caprio

Subject: Stage 2A Data Validation – Level II Data Deliverable – Tampa Electric Laboratory Service Work Order L18I055, TestAmerica Job ID 660-89608-1 and KNL Environmental Testing Order L18I055

SITE: Big Bend Power Station, Apollo Beach, Florida

INTRODUCTION

This report summarizes the findings of the Stage 2A data validation of five water samples, collected on September 12, 2018 as part of the Big Bend Power Station coal combustion residuals (CCR) groundwater monitoring program plan. The lithium analyses were performed by TestAmerica Tampa, Tampa, Florida (TA). The radium analyses were performed by KNL Environmental Testing, Tampa, Florida (KNL). The rest of the analyses were performed by Tampa Electric Laboratory Services, Tampa, Florida (TELS). The samples were analyzed for the following:

- Metals by EPA Methods 200.7 Rev. 4.4, 200.8 and 6010B
- Mercury by EPA Method 7470A
- Radium-226 by EPA Method 903.0
- Radium-228 by EPA Method Ra-05
- Chloride, Fluoride and Sulfate by EPA Method 300.0
- Total Dissolved Solids by Standard Method 2540C

EXECUTIVE SUMMARY

The samples were handled, prepared, and measured in the same manner under similar prescribed conditions.

Overall, based on this Stage 2A data validation covering the quality control (QC) parameters listed below, the data as qualified are usable for meeting project objectives. The qualified data should be used within the limitations of the qualifications.

The inorganic data were reviewed based on the following: CCR Groundwater Monitoring Program Plan, Big Bend Power Station, Apollo Beach, Florida, September 2016 (GWMP), USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, January 2017 (OLEM 9355.0-135, EPA 540-R-2017-001), as well as by the pertinent methods referenced by the data package and professional and technical judgment.

The following samples were analyzed and validated at a Stage 2A level in the data set:

Laboratory ID	Client ID
L18I055-01	BBS-CCR-1
L18I055-02	BBS-CCR-2
L18I055-03	BBS-CCR-3

Laboratory ID	Client ID
L18I055-04	BBS-CCR-BW1
L18I055-05	BBS-CCR-BW2

The samples were received at the laboratories within the criteria of 0-6^{o}C. No sample preservation or sample receipt issues were noted by the laboratories.

The laboratory report was revised on November 15, 2018, to correct a typographical error on BBS-CCR-1 Rad-226/228 results and BBS-CCR-3 Rad 226/228 Counting Error.

1.0 TOTAL METALS

The samples were analyzed for total metals per EPA Methods 200.7 Rev. 4.4, 200.8 and 6010B.

The areas of data review are listed below. A leading check mark (✓) indicates an area of review in which the data were acceptable. A preceding crossed circle (⊗) signifies areas where issues were raised during the course of the validation review and should be considered to determine the impact on data quality and usability.

- ✓ Overall Assessment
- ✓ Holding Times
- ✓ Method Blank
- ⊗ Matrix Spike/Matrix Spike Duplicate
- ⊗ Laboratory Control Sample
- ✓ Serial Dilution
- ✓ Field Duplicate
- ✓ Sensitivity
- ✓ Electronic Data Deliverable Review

1.1 Overall Assessment

The metals data reported in this package are considered usable for meeting project objectives. The results are considered valid; analytical completeness, defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis for the data set is 100%.

1.2 Holding Times

The holding time for the metals analysis of waters is 180 days from sample collection to analysis. The holding time was met for the sample analyses.

1.3 Method Blank

Method blanks were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Three method blanks were reported (method 200.7 batch 412052, method 200.8 batch 18I0070 and method 6010B batch 18I0068). Metals were not detected in the method blanks above the method detection limits (MDLs), with the following exception.

Boron was detected at an estimated concentration, greater than the MDL and less than the reporting limit (RL) in the method blank associated with batch 18I0068. Since boron was detected above the RL in the associated samples, no qualifications were applied to the data.

1.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

MS/MSDs were analyzed at the proper frequency for the number and types of samples analyzed (one pair per batch of 20 samples). Three sample set specific MS/MSD pairs were reported, two for the method 200.8 data using samples BBS-CCR-1 and BBS-CCR-BW2; and one for the method 6010B data using sample BBS-CCR-2. The recovery and relative percent difference (RPD) results were within the laboratory specified acceptance criteria, with the following exceptions.

The recoveries of barium, beryllium, boron and chromium were low and the recoveries of molybdenum were high, outside laboratory specified acceptance criteria in the MS/MSD pair using sample BBS-CCR-2. Therefore, the concentrations of barium and boron were J- qualified as estimated with low biases and the non-detect results of beryllium and chromium were UJ qualified as estimated less than the MDLs. Since molybdenum was not detected in sample BBS-CCR-2, no qualifications were applied to the molybdenum data.

A batch MS/MSD pair was reported for the method 200.7 data. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

It was noted that calcium was not included in the MS/MSD spike for the 6010B data. This did results in any qualifications to the data.

Client Sample ID	Compound	Laboratory Result (mg/L)	Laboratory Flag	Validation Result (mg/L)	Validation Qualifier*	Reason Code**
BBS-CCR-2	Barium	0.0652	J-	0.0652	J-	4
BBS-CCR-2	Boron	0.177	J-,V	0.177	J-	4

mg/L-milligrams per liter
J- the reported value is an estimated value
V-laboratory flag indicating analyte was detected in both the sample and the associated method blank
* Validation qualifiers are defined in Attachment 1 at the end of this report
**Reason codes are defined in Attachment 2 at the end of this report

Client Sample ID	Compound	Laboratory Result (µg/L)	Laboratory Flag	Validation Result (µg/L)	Validation Qualifier	Reason Code
BBS-CCR-2	Beryllium	0.500	J-,U	0.500	UJ	4
BBS-CCR-2	Chromium	1.60	J-,U	1.60	UJ	4

µg/L-micrograms per liter
J- the reported value is an estimated value
U-indicates that the compound was analyzed for but not detected

1.5 Laboratory Control Sample (LCS)

LCSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Three LCSs were reported. The recovery results were within the laboratory specified acceptance criteria; however, it was noted that calcium was not included in the LCS spike for batch 18I0068. Therefore, the concentrations of calcium in the associated samples were J qualified as estimated.

Client Sample ID	Compound	Laboratory Result (µg/L)	Laboratory Flag	Validation Result (µg/L)	Validation Qualifier	Reason Code
BBS-CCR-1	Calcium	549000	NA	549000	J	5
BBS-CCR-2	Calcium	218000	NA	218000	J	5
BBS-CCR-3	Calcium	191000	NA	191000	J	5
BBS-CCR-BW1	Calcium	664000	NA	664000	J	5
BBS-CCR-BW2	Calcium	344000	NA	344000	J	5

µg/L-micrograms per liter
NA-not applicable

1.6 Serial Dilution

Serial dilutions were not reported.

1.7 Field Duplicate

Field duplicates were not reported with the sample sets.

1.8 Sensitivity

The samples were reported to the MDLs. No elevated non-detect results were reported. The MDLs met the limits listed in Table 4 of the CCR Groundwater Monitoring Plan.

1.9 Electronic Data Deliverable (EDD) Review

The results and sample identifications (IDs) in the EDD were reviewed against the information provided by the associated level II reports at a minimum of 20% as part of the data validation process. The laboratory flags used in the laboratory report did not match the flags used in the EDD. No other discrepancies were identified between the level II reports and the EDD.

2.0 MERCURY

The samples were analyzed for mercury per EPA Method 7470A.

The areas of data review are listed below. A leading check mark (✓) indicates an area of review in which the data were acceptable. A preceding crossed circle (⊗) signifies areas where issues were raised during the course of the validation review and should be considered to determine the impact on data quality and usability.

- ✓ Overall Assessment
- ✓ Holding Times
- ✓ Method Blank
- ✓ Matrix Spike/Matrix Spike Duplicate
- ✓ Laboratory Control Sample
- ✓ Field Duplicate
- ✓ Sensitivity
- ✓ Electronic Data Deliverable Review

2.1 Overall Assessment

The mercury data reported in this package are considered usable for meeting project objectives. The results are considered valid; analytical completeness, defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis for the data set is 100%.

2.2 Holding Times

The holding time for the mercury analysis of a water sample is 28 days from sample collection to analysis. The holding times were met for the sample analyses.

2.3 Method Blank

Method blanks were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One method blank was reported (batch 18I0091). Mercury was not detected in the method blank above the MDL.

2.4 Matrix Spike/Matrix Spike Duplicate

MS/MSD pairs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One sample set specific MS/MSD pair, using sample BBS-CCR-3, was reported. The recoveries and RPD results were within the laboratory specified acceptance criteria.

One batch MS was also reported, since this was batch QC the results do not affect the samples in this data set and qualifications were not applied to the data.

2.5 Laboratory Control Sample

LCSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One LCS was reported. The recovery result was within the laboratory specified acceptance criteria.

2.6 Field Duplicate

Field duplicates were not reported with the sample sets.

2.7 Sensitivity

The samples were reported to the MDL. No elevated non-detect results were reported. The MDL for mercury met the limit listed in Table 4 of the CCR Groundwater Monitoring Plan.

2.8 Electronic Data Deliverable Review

The results and sample IDs in the EDD were reviewed against the information provided by the associated level II reports at a minimum of 20% as part of the data validation process. No discrepancies were identified between the level II reports and the EDD.

3.0 RADIUM-226 AND RADIUM-228

The samples were analyzed for radium 226 and radium 228 per EPA Methods 903.0 and RA-05, respectively.

The areas of data review are listed below. A leading check mark (✓) indicates an area of review in which the data were acceptable. A preceding crossed circle (⊗) signifies areas where issues were raised during the course of the validation review and should be considered to determine the impact on data quality and usability.

- ✓ Overall Assessment
- ✓ Holding Times
- ✓ Method Blank
- ✓ Matrix Spike
- ✓ Laboratory Control Sample
- ✓ Laboratory Duplicate
- ✓ Sensitivity
- ✓ Electronic Data Deliverable Review

3.1 Overall Assessment

The radium-226 and radium-228 data reported in this package are considered usable for meeting project objectives. The results are considered valid; the analytical completeness, defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis for the data set is 100%.

3.2 Holding Times

The holding times for radium-226 and radium-228 analysis of waters are 180 days from sample collection to analysis. The holding times were met for the sample analyses.

3.3 Method Blank

Method blanks were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Three method blanks were reported (one for the radium-226 data and two for the radium-228 data). The method blanks were within the validation criteria.

3.4 Matrix Spike

MSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Three batch MSs were reported. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

3.5 Laboratory Control Sample

LCSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). One LCS was reported for radium-226 and two LCSs were reported for radium-228. The recovery results were within the laboratory specified acceptance criteria.

3.6 Laboratory Duplicate

Batch laboratory duplicates were reported for the radium-226 and radium-228 data. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

3.7 Sensitivity

The samples were reported to the minimum detectable concentrations (MDCs). The reported MDCs met the limits listed in Table 4 of the CCR Groundwater Monitoring Plan.

3.8 Electronic Data Deliverable Review

The results and sample IDs in the EDD were reviewed against the information provided by the associated level II reports at a minimum of 20% as part of the data validation process. No discrepancies were identified between the level II reports and the EDD.

4.0 WET CHEMISTRY PARAMETERS

The samples were analyzed for chloride, fluoride and sulfate by EPA Method 300.0 and total dissolved solids by SM 2540C.

The areas of data review are listed below. A leading check mark (✓) indicates an area of review in which the data were acceptable. A preceding crossed circle (⊗) signifies areas where issues were raised during the course of the validation review and should be considered to determine any impact on data quality and usability.

✓ Overall Assessment
✓ Holding Times
⊗ Method Blank
✓ Matrix Spike/Matrix Spike Duplicate
✓ Laboratory Control Sample
✓ Laboratory Duplicate
✓ Field Duplicate
✓ Sensitivity
✓ Electronic Data Deliverables Review

4.1 Overall Assessment

The wet chemistry data reported in this package are considered usable for meeting project objectives. The results are considered to be valid; the analytical completeness, defined as the ratio of the number of valid analytical results (valid analytical results include values qualified as estimated) to the total number of analytical results requested on samples submitted for analysis, for the data set is 100%.

4.2 Holding Times

The holding times for chloride, fluoride and sulfate by EPA method 300.0 are 28 days from sample collection to analysis and the holding time for total dissolved solids by SM 2540C is 7 days from sample collection to analysis. The holding times were met for the sample analyses.

4.3 Method Blanks

Method blanks were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). Method blanks were reported for each analysis as appropriate. The wet chemistry parameters were not detected in the method blanks above the MDLs, with the following exception.

Fluoride was detected at an estimated concentration greater than the MDL and less than the RL in the method blank for batch 18I0170. Therefore, the estimated concentrations of fluoride in the associated samples were U qualified as not detected at the RL.

Client Sample ID	Compound	Laboratory Result (mg/L)	Laboratory Flag	Validation Result (mg/L)	Validation Qualifier	Reason Code
BBS-CCR-1	Fluoride	0.235	I,V	0.500	U	3
BBS-CCR-2	Fluoride	0.298	I,V	0.500	U	3
BBS-CCR-3	Fluoride	0.309	I,V	0.500	U	3
BBS-CCR-BW2	Fluoride	0.338	I,V	0.500	U	3

mg/L-milligrams per liter
I-the reported value is between the laboratory method detection limit and the laboratory practical quantitation limit
V-analyte detected in the method blank

4.4 Matrix Spike/Matrix Spike Duplicate

MS/MSDs were analyzed at the proper frequency for the number and types of samples analyzed (one pair per batch of 20 samples). Two batch MS/MSD pairs were reported for the method 300.0 data. Since these are batch QC, the results do not affect the samples in this data set and qualifications were not applied to the data.

4.5 Laboratory Control Sample

LCSs were analyzed at the proper frequency for the number and types of samples analyzed (one per batch of 20 samples). LCSs were reported for each analysis as appropriate. The recovery results were within the laboratory specified acceptance criteria.

4.6 Laboratory Duplicate

Laboratory duplicates were reported for the total dissolved solids data. One sample set specific laboratory duplicate was reported for total dissolved solids using sample BBS-CCR-1. The RPD results were within the laboratory specified acceptance criteria.

4.7 Field Duplicate

Field duplicates were not reported with the sample sets.

4.8 Sensitivity

The samples were reported to the MDLs. The MDLs reported met the limits listed in Table 4 of the CCR Groundwater Monitoring Plan.

4.9 Electronic Data Deliverables Review

The results and IDs in the EDD were reviewed against the information provided by the associated level II reports at a minimum of 20% as part of the data validation process. The laboratory flags used in the laboratory report did not match the flags used in the EDD. No other discrepancies were identified between the level II reports and the EDD.

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ATTACHMENT 1
DATA VALIDATION QUALIFIER DEFINITIONS AND INTERPRETATION KEY
Assigned by Geosyntec's Data Validation Team

DATA QUALIFIER DEFINITIONS

U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

J+ The analyte was positively identified; however, the associated numerical value is likely to be higher than the concentration of the analyte in the sample due to positive bias of associated QC or calibration data or attributable to matrix interference.

J- The analyte was positively identified; however, the associated numerical value is likely to be lower than the concentration of the analyte in the sample due to negative bias of associated QC or calibration data or attributable to matrix interference.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

ATTACHMENT 2
DATA VALIDATION REASON CODES
Assigned by Geosyntec's Data Validation Team

Valid Value	Description
1	Preservation requirement not met
2	Analysis holding time exceeded
3	Blank contamination (i.e., method, trip, equipment, etc.)
4	Matrix spike/matrix spike duplicate recovery or RPD outside limits
5	LCS or RPD recovery outside limits (LCS/LCSD)
6	Surrogate recovery outside limits
7	Field Duplicate RPD exceeded
8	Serial dilution percent difference exceeded
9	Calibration criteria not met
10	Linear range exceeded
11	Internal standard criteria not met
12	Lab duplicates RPD exceeded
13	Other