Gibbons Creek Environmental Redevelopment Group, LLC

April 19, 2024

Eun Ju Lee, Ph.D., P.E.
Industrial & Hazardous Waste Permits Section
Waste Permits Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

Re: Technical NOD5 New CCR Registration
Gibbons Creek Environmental Redevelopment Group, LLC – Anderson, Grimes County
New Coal Combustion Residuals (CCR) Registration No. CCR113
Industrial Solid Waste Registration No. 32271
EPA Identification No. TXD000751073
Tracking No. 27262344; RN100214550/CN6505860162

Dear Ms. Lee,

In response to your review comments dated March 28, 2024 the following includes the clarifications and/or revisions as requested to complete the Permit Application for the Gibbons Creek Environmental Redevelopment Group (GCERG) facility.

32. 2023 Groundwater Report and Attachment S

a) Provide and explanation for how the facility would address two groundwater monitoring systems if the existing monitoring wells for Site F Landfill were not monitoring the same strata (shallow and deeper zones) based on well depths and screen depth intervals. Provide cross sections that clearly show the delineation of two different layers including well location, water level, and well/screen depth for each monitoring well.

Please see "CCR Groundwater Monitoring System" document in Response Item No. 32 Attachment A for the description of the shallow and deeper groundwater networks at the Site F Landfill. Cross sections delineating the two different layers, including well location, water level, and well/screen depth for each monitoring well are included in the attachment.

Additional information about the groundwater monitoring system can also be found in NOD 4 Response Item No. 31 - 2023 Alternate Source Demonstration, Section 4 (ASD).

b) Monitoring well MW-6, which is designated as an upgradient well instead of downgradient in the 2023 GW report, has exceedances for Beryllium, Cadmium, Cobalt, Lithium, Radium 226+228, and Thallium per the 2022 report SSIs. Therefore, MW-6 should not be used as a

background well and a new upgradient well(s) should be considered for the shallow zone in Site F Landfill that accurately represents the quality of background groundwater. Wells with confirmed SSIs should not be used to update background as indicated in EPA's Unified Guidance, 2009 (page 5-14).

With the benefit of 8 years of historical data from the Site F Landfill, the analysis performed to develop the 2023 ASD identified patterns in the groundwater that indicate there are two groundwater networks (shallow and deep) present. As such, a revision to the groundwater system is necessary to account for differences between these networks.

One major difference between these two networks is the direction of the groundwater flow. The deep network tends to flow to the south and southwest. The shallow network tends to flow to the south and southeast. This south and southeast flow places MW-6 upstream of the Site F Landfill which makes it appropriate to use for background groundwater data. As the background groundwater monitoring well for the shallow network, the concentrations of certain constituents present in the groundwater represent natural occurrences rather than SSIs associated with a possible release from the landfill. Based on the 2023 ASD results and analysis, MW-6 should have always been considered as a shallow network background well and any elevated concentrations of constituents of concern at MW-6, and by extension the other wells in the shallow network, were erroneously determined and reported. Additionally, background wells are present to identify existing groundwater conditions not associated with the facility landfills and former surface impoundments. SSIs present in the background well(s) are not indicative of adverse impacts from the presence of these CCR units.

It should also be noted that Unified Guidance 2009 (page 5-14) discusses retesting protocol rather than background contamination.

c) The background threshold value (BTV) for Radium in the shallow zone has a value of 32.6 (pCi/L) reported in 2023 groundwater report (GW) which is different from 9.82 (pCi/L) reported in 2022 GW report in Site F Landfill. The background for groundwater protection standards should not be updated using the wells in the shallow zone that are in the assessment monitoring program. Please see discussions in Item (b) above for use of MW-6 for establishing background for the shallow zone.

The shallow and deep networks have different background sets which results in different groundwater protection standards (GWPS). Please see discussions in Item (b) above.

d) Update Attachment S including Table(s) in the registration application for the new monitoring network systems.

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Dallas, TX 75248

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www.hdrinc.com

Please see Response Item No. 32 Attachment D for the revised Registration Application Attachment S and updated Section VI tables. These documents were revised to reflect the shallow and deep groundwater networks at the Site F Landfill and results of the 2023 Annual Groundwater Monitoring and Corrective Action Report. The following documents were developed or revised:

- *A new Groundwater Monitoring Plan, with professional engineering certificate, to replace in its entirety the old Groundwater Monitoring Plan in Attachment S of the Registration Application.*
- *Registration Application Table VI.A Groundwater Monitoring System*
- *Registration Application Table VI.D CCR Units Under Assessment Monitoring*
- *NOD 2 Response Item No. 21 Historical Groundwater Levels table*

33. Alternate Source Demonstration (ASD)

Provide site-specific information to demonstrate the "naturally occurring" evidence(s) for SSIs under the Site F Landfill unit, for the two monitoring network system, and not a result of leakage from CCR units. Information includes, but is not limited to, geotechnical/geological cross-sections in relation to location of CCR units. The cross-sections shall include the thickness of lignite and clay layers, and location of monitoring wells including water elevation for two different zones. Include any available boring logs for additional well(s) and revised wells.

Please see "CCR Groundwater Monitoring System" document in Response Item No. 32 Attachment A for the description of the shallow and deeper groundwater networks at the Site F Landfill. Cross sections delineating the two different layers, including well location, water level, and well/screen depth for each monitoring well are included in the attachment.

Please see 2023 ASD Appendix B for site bore logs.

32. 2023 Groundwater Report, ASD and Attachment S

Provide a justification for updating the monitoring network system for two different zones (Scrubber Sludge Pond and Ash Ponds) based on the differences in geochemistry measured (monitoring wells that monitor deeper groundwater versus shallow groundwater zones). Include site-specific information to demonstrate "naturally occurring" evidence(s) under Scrubber Sludge Pond and Ash Ponds and update Attachment S including Table(s) in the registration application accordingly if applicable.

Please note the groundwater monitoring network at the Scrubber Sludge Pond and Ash Ponds was not updated to reflect a shallow and a deep zone. This is primarily due to background groundwater monitoring well SSP/AP MW-1 is likely semi-confined and

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installed at a depth where it bridges the oxidized shallow and unoxidized deep networks. As such, the concentration differences between the two zones is muted since the samples are a combination of the two.

If you have any questions regarding this response, please give Dave Vogt a call at 972-960-4400 or Norman Divers at 704-472-3919. We look forward to continuing to work with you to complete the registration process.

Sincerely,

David C. Vogt, P.E.
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Suite 300
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RESPONSE ITEM NO. 32 ATTACHMENT A

GROUNDWATER MONITORING SYSTEM

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CCR Groundwater Monitoring System

Gibbons Creek Environmental Redevelopment Group, LLC

Site F Landfill – Shallow & Deep Networks
Scrubber Sludge Pond
Ash Ponds – A, B, C

Anderson, Texas

Updated April 2024

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Professional Engineer Certificate

"I hereby certify that the groundwater monitoring system described in this report for the CCR landfill known as the Site F Landfill CCR Unit, the CCR surface impoundment known as the Ash Ponds CCR Unit and the Scrubber Sludge Pond CCR Unit at the Gibbons Creek Steam Electric Station, owned by the Gibbons Creek Environmental Redevelopment Group, LLC., has been designed and constructed to meet the requirements of the Coal Combustion Residual Rule 40 CFR 257.91. I am a duly licensed Professional Engineer under the laws of the State of Texas."

Print Name: David C. Vogt

Signature:

Date: 4/19/2024

License #: 93905

My license renewal date is March 31, 2025.

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1 Introduction

On April 17, 2015 the U.S. Environmental Protection Agency (EPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA). The Federal CCR Rule – effective on October 19, 2015 – applies to Gibbons Creek Environmental Redevelopment Group's (GCERG's) Gibbons Creek Steam Electric Station (GCSES).

The GCSES is located at 12824 FM 244 Road, Anderson, Texas 77830. The GCSES was a single unit, 470-megawatt, coal-fired power plant. The GCSES initially operated by burning lignite from the adjacent Gibbons Creek Lignite Mine in 1982. In 1996, the GCSES converted to Powder River Basin coal and the lignite mine was closed. The GCSES was retired from the Electric Reliability Council of Texas (ERCOT) System on October 30, 2019. The Site was obtained by GCERG in 2021.

The CCR Rule, 40 CFR Subpart D-Standards for the Disposal of CCRs, Section §257.91 requires a groundwater monitoring system that consists of sufficient number of wells at appropriate locations and depths, based on site-specific technical information, to yield groundwater samples from the uppermost aquifer that:

- Accurately represent the quality of both background groundwater, and groundwater passing the boundary of the CCR unit
- Monitor potential contaminant pathways

The groundwater monitoring system at the GCSES for the Site F Landfill (SFL), Scrubber Sludge Pond and Ash Ponds CCR units was established and meets the requirements of the Federal CCR Rule. This report includes the following sections in support of the certification.

- Section 1.0 Introduction
- Section 2.0 Facility Background
- Section 3.0 GCSES Area Hydrogeology Summary
- Section 4.0 Groundwater Monitoring System

2 Facility Background

The Ash Ponds (APs) were clean closed in 2022. The APs were an unlined, interconnected, three-cell impoundment area which was separated by earthen dikes, constructed in 1977 to 1978 as part of the original GCSES construction. These ponds were approximately 260 ft wide, 1,800 ft long and 20 ft deep. The top of the perimeter berms/dikes were at an elevation of approximately 270 feet above mean sea level (AMSL).

The Scrubber Sludge Pond (SSP) was clean closed in 2022. The former SSP is located to the west of the APs and was a single impoundment constructed from 1977 to 1978. A liner was added to the bottom of the pond in 1983. The pond measurements were approximately 260 feet and 350 feet wide and 615 feet and 635 feet long (measured at the bottom of the impoundment).

GCERG has completed the clean closure process of the SSP & AP CCR units by dewatering and removing all CCR material and soil material beneath the CCR units. The CCR clean closure is

documented in the Closure Completion CCR Surface Impoundments, submitted on June 2, 2022. The CCR material removed from the SSP/AP CCR units was placed within the SFL CCR unit. In addition, the SFL CCR unit stormwater collection pond is currently being cleaned out, all stormwater control ditches around the area of the coal pile and coal pile runoff pond have been excavated, and the coal pile itself has been removed. These excavated materials are being dewatered and placed within the SFL CCR unit.

The SFL, located northeast of the decommissioned power generating plant and constructed in 1990, is approximately 114 acres in area and received solid CCR generated by the GCSES. The SFL CCR unit is currently being closed with the following capping system:

- 6-inches of erosion layer;
- Underlain by 18-inches of infiltration layer;
- Underlain by a geocomposite;
- Underlain by a 40-mil low-linear density polyethylene (LLDPE) geomembrane layer;
- Underlain by 2-feet of recompacted clay liner (RCL) with a hydraulic conductivity of $1x10^{-5}$ centimeters per second (cm/sec) or slower;
- Underlain by 1-foot of intermediate cover.

Closure activities associated with the SFL stormwater pond cleanout and SFL CCR unit is anticipated to be completed by end of year 2024.

3 GCSES Area Hydrogeology Summary

Geologically, the GCSES is located on an outcrop of the middle member of the Wellborn Formation of the Jackson-Yegua Group of the Tertiary-aged System. The Wellborn Formation is described as fine to very fine quartz sand interbedded with brown, lignitic clay and lignite, with abundant fossil wood and imprints of marine megafossils. Moving south of the GCSES Site, the Manning Formation overlies the Wellborn Formation. The Manning Formation is a lignite-bearing formation which is described as a fine to medium-grained, lignitic, quartz sand, interbedded with sandy, lignitic clay, and lignite, with abundant fossil wood. The Manning Formation has well developed lignite seams. The Gibbons Creek Lignite Mine was located in the Manning Formation located approximately two miles south of GCSES. Quaternary-aged alluvium and terrace deposits are present in the Brazos River, Navasota River, and Gibbons Creek valleys [Horbaczewski, 2011].

The geological formation of the GCSES area is based on the cyclothem model in which the sea transgressed over land and then regressed. Sedimentary rock was stacked over time in a pattern that was indicative of the presence and absence of the sea. This depositional process is described in more detail in the Field Guidebook Minesoil and Acid Seep Workshop document for the Gibbons Creek Lignite Mine [Horbaczewski, 2011]. The GCSES area is located in the Texas Coastal Plain region which was developed by this depositional process.

Lignite mining has been conducted in eastern and east-central Texas along the lignite belt depositional area. This lignite belt follows the Tertiary-aged coastal region.

Borings conducted at the site indicate a subsurface stratigraphy consisting of stratified, heterogeneous layers of clays, silts, and sands. The clay and silt intervals consisted of high plasticity material. Silty sand intervals generally consisted of fine, poorly graded sands with occasional high plasticity clay and silt lenses. Occasional sandstone layers were detected in select borings across the Site. Lignite and lignitic clay seams have been identified in soil borings at the Site. Bedrock material is sandstone [ERM, 2005]. Boring logs for monitoring wells included in the Site's groundwater monitoring network are provided in **Appendix A.**

The topography of the GCSES and locations of the CCR units are generally flat with surface elevation decreasing from north to south and southwest. Surface water drainage is generally to the south and southwest. Gibbons Creek Reservoir is located immediately adjacent to the GCSES and CCR units on the east and south sides. The reservoir was established as a cooling pond for the GCSES. Impoundment of Gibbons Creek Reservoir began in spring 1981. Discharge from the reservoir feeds into Gibbons Creek which is a tributary of the Navasota River which is a tributary of the Brazos River.

The uppermost groundwater at GCSES CCR units ranges from approximately 220 to 250 feet AMSL. The uppermost groundwater aquifer at the Site is considered confined to semi-confined due to the stratified nature of the sedimentary sediments and influences of weathering and erosion. General groundwater flow direction at the Site is from the northwest to southeast. The groundwater flow generally follows topography with the flow towards the Gibbons Creek Reservoir and the Gibbons Creek valley.

4 Groundwater Monitoring System

The CCR Rule requires, at a minimum, one upgradient and three downgradient monitoring wells per CCR unit to be completed in the uppermost aquifer. Section 40 CFR §257.90 of the Rule states that the operator: "…may install a multiunit groundwater monitoring system instead of separate groundwater monitoring systems for each CCR unit." In addition, the Rule states that downgradient monitoring wells should be installed to: "accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer."

4.1 Site F Landfill

The SFL CCR unit monitoring well network of both monitoring wells and piezometers installed by Amec Foster Wheeler in 2016 and 2017, and wells installed by Black and Veatch in 1988.

The SFL monitoring network has historically consisted of the following wells:

- Background Well: MNW-18
- Compliance Wells: SFL MW-2, SFL MW-3, SFL MW-4, SFL MW-5, SFL MW-6, SFL MW-7, and MNW-15
- Piezometers: MNW-11, MNW-16, and MNW-17

During the 2023 ASD (HDR, 2023), a review of boring logs at the Site and interpretation of historic monitoring data determined that multiple groundwater units are being monitored at the Site. Compound this with differences in pH and ORP of the shallow groundwater versus deeper monitored groundwater; background and compliance monitoring wells were deemed to not be monitoring the same groundwater unit.

For the SFL, monitoring well MNW-18 has historically been considered the up-gradient / background monitoring well used for the SFL CCR unit. The screen interval for monitoring well MNW-18 is below a confined portion of the aquifer. Compliance and water level only monitoring wells that are in the same aquifer unit as MNW-18 are MNW-11, MNW-16, MNW-17, SFL MW-4, and SFL MW-7. These monitoring wells had pH measurements that averaged greater than or equal to 6.2 and ORP, if data was available, averaged less than or equal to 22.1 millivolts (mV). The monitored groundwater at these wells was less oxidized and pH was less likely to be impacted by weathered pyrite.

Monitoring wells SFL MW-2, SFL MW-3, SFL MW-5, SFL MW-6, and MNW-15 monitor the shallower groundwater at the Site F Landfill. Based on the December 2022 groundwater elevation measurements, the water column relative to the top of screen (TOS) ranged from approximately -0.7 to 16.2 feet. These monitoring wells had pH measurements that averaged less than or equal to 6.2 and ORP averaged greater than or equal to 209.4 mV. The oxidized groundwater at these monitoring wells has lower pH due to the weathering of pyrite at the Site.

Based on the differences in chemistry measured at the SFL CCR unit, monitoring wells that monitor deeper groundwater versus shallower groundwater, the monitoring network was refined to accurately monitor down-gradient groundwater relative to the CCR unit. For the deeper monitoring network, groundwater generally flows south to southwest, and MNW-18 is still an up-gradient monitoring point relative to the CCR unit. For the shallow monitoring network, groundwater generally flows south to southeast and monitoring well SFL MW-6 is generally up-gradient to the CCR unit.

Figure 1 depicts the shallow monitoring well network and **Figure 2** depicts the deep monitoring well network for the SFL CCR Unit.

Table 1: Site F Landfill Monitoring Network

Monitoring Well	Date Installed	Well Depth	Top of Casing (feet AMSL)	Screen Interval (feet AMSL)	Monitoring Program
Shallow Monitoring Network					
Upgradient/ Background					
SLF MW-6	5/23/2016	20.0	286.66	264.0 – 269.0	Assessment
Downgradient/Compliance					
SFL MW-2	3/16/2016	21.0	268.31	244.7 – 249.7	Assessment
SFL MW-3	5/31/2016	24.5	275.00	247.2 – 252.2	Assessment
SFL MW-5	5/23/2016	21.0	276.25	252.3 – 257.3	Assessment
MNW-15	2/23/1988	34.5	257.33	230.3 – 235.3	Assessment
Deep Monitoring Network					
Upgradient/Background					
MNW-18	2/18/1988	48.9	270.76	219.7 – 224.7	Assessment
Downgradient/Compliance					
SFL MW-4	5/31/2016	39.5	269.53	227.0 – 232.0	Assessment
SFL MW-7	5/3/2017	55.0	264.63	209.8 – 214.8	Assessment
MNW-11	2/26/1988	47.5	267.95	220.7 – 225.7	Assessment
Water Level Only					
MNW-16	2/25/1988	28.8	263.19	222.8 – 227.8	WLO
MNW-17	2/17/1988	49.0	293.72	243.5 – 248.5	WLO

Notes:
AMSL = above mean sea level
WLO = Water Level Only

4.2 Scrubber Sludge Pond / Ash Ponds

The SSP/AP CCR unit monitoring well networks (as shown on **Figure 3**) consist of both monitoring wells and piezometers. The piezometers are used for water level data collection only, groundwater quality samples are only collected from monitoring wells. The monitoring well network includes:

Table 2: Scrubber Sludge Pond & Ash Ponds Monitoring Network

Monitoring Well	Date Installed	Well Depth	Top of Casing (feet AMSL)	Screen Interval (feet AMSL)	Monitoring Program
Scrubber Sludge Pond					
Upgradient/Background					
SSP/AP MW-1	5/26/2016	39.5	272.53	229.8 – 239.8	Assessment
Downgradient/Compliance					
SSP MW-2	6/2/2016	43.5	283.66	237.1 – 242.1	Assessment
SSP MW-3	6/3/2016	44.5	283.97	236.5 – 241.5	Assessment
SSP MW-4	6/3/2016	48.0	283.86	232.9 – 237.9	Assessment
Water Level Only					
SSP MW-1	3/14/2016	31.7	281.18	249.8 – 254.8	WLO
Ash Ponds Monitoring Network					
Upgradient/Background					
SSP/AP MW-1	5/26/2016	39.5	272.53	229.8 – 239.8	Assessment
Downgradient/Compliance					
AP MW-1D	5/24/2016	39.5	272.04	229.5 – 234.5	Assessment
AP MW-3	5/25/2016	39.5	274.68	232.0 – 237.0	Assessment
AP MW-4	6/1/2016	49.5	274.16	221.4 – 226.4	Assessment
AP MW-5	6/1/2016	35.5	274.13	235.7 – 240.7	Assessment
Water Level Only					
AP MW-1	3/15/2016	24.9	271.56	245.9 – 250.9	WLO
AP MW-2	3/15/2016	20.0	274.97	255.1 – 260.1	WLO
AP MW-6	5/5/2017	46.0	277.95	228.7 – 233.7	WLO
AP PZ-1	5/24/2016	26.0	265.67	236.7 – 241.7	WLO
AP PZ-2	5/24/2016	39.0	274.91	232.2 – 237.2	WLO
AP PZ-3	5/25/2016	39.5	259.11	216.3 – 221.3	WLO
AP PZ-4	6/2/2016	45.3	273.65	227.9 – 232.9	WLO

Notes:
AMSL = above mean sea level
WLO = Water Level Only

5 References

Amec Foster Wheeler Environment & Infrastructure, Inc. (AFWEI). 2017. *Groundwater Monitoring Plan: Gibbons Creek Steam Electric Station, Grimes County, Texas*. October 16.

Black & Veatch. 1986. *Texas Municipal Power Agency Gibbons Creek Steam Electric Station: Preliminary Ash and Sludge Disposal Study*. November.

ERM. 2005. *Phase IIn and IIp: Ground Water Monitor Well and Soil Boring Documentation*: *Texas Municipal Power Agency Gibbons Creek Steam Electric Station*. August 11.

Horbaczewski, J.K. 2011. *Field Guidebook Minesoil and Acid Seep Workshop*. February 2.

HDR. 2023. *Alternative Source Demonstration: Gibbons Creek Steam Electric Station*. September 2023.

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Figure 1

Site F Landfill CCR Unit

Shallow Groundwater Monitoring Network

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N

500 0 500 1000

SCALE IN FEET

LEGEND:

MONITORING WELL

WASTE BOUNDARY

NOTES:

1. * - WELLS ARE WATER LEVEL ONLY

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER

4/19/2024

GIBBONS CREEK STEAM ELECTRIC STATION
GCSES ENVIRONMENTAL REDEVELOPMENT GROUP
SITE F LANDFILL - SHALLOW NETWORK

CCR GROUNDWATER MONITORING SYSTEM

DATE
JANUARY 2024

FIGURE
FIGURE 1

C:\pwworking\central01\d3820433\Figure 1 - SITE F LANDFILL MONITORING NETWORK.dwg, SHALLOW, 1/18/2024 3:34:54 PM, WNICHOLSON

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Figure 2

Site F Landfill CCR Unit

Deep Groundwater Monitoring Network

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N

500 0 500 1000

SCALE IN FEET

LEGEND:

MONITORING WELL

WASTE BOUNDARY

NOTES:

1. * - WELLS ARE WATER LEVEL ONLY

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER

4/19/2024

GIBBONS CREEK STEAM ELECTRIC STATION
GCSES ENVIRONMENTAL REDEVELOPMENT GROUP
SITE F LANDFILL - DEEP NETWORK

CCR GROUNDWATER MONITORING SYSTEM

DATE
JANUARY 2024

FIGURE
FIGURE 1

C:\pwworking\central01\d3820433\Figure 1 - SITE F LANDFILL MONITORING NETWORK.dwg, SHALLOW, 1/18/2024 3:37:01 PM, WNICHOLSON

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Figure 3

Scrubber Sludge Pond & Ash Ponds CCR Unit

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N

400 0 400 800

SCALE IN FEET

LEGEND:

MONITORING WELL

POND BOUNDARIES

NOTES:

1. * - WELLS ARE WATER LEVEL ONLY

STATE OF TEXAS
DAVID C. VOGT
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PROFESSIONAL ENGINEER

4/19/2024

GIBBONS CREEK STEAM ELECTRIC STATION
GCSES ENVIRONMENTAL REDEVELOPMENT GROUP
SCRUBBER SLUDGE/ASH PONDS MONITORING NETWORK

CCR GROUNDWATER MONITORING SYSTEM

DATE
JANUARY 2024

FIGURE
FIGURE 3

C:\pwworking\central01\d3820433\Figure 2 - ASH POND_SCRUBBER SLUDGE MONITORING NETWORK.dwg, Layout1, 1/18/2024 3:15:21 PM, WNICHOLSON

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Appendix A

GCSES Monitoring Well Documentation

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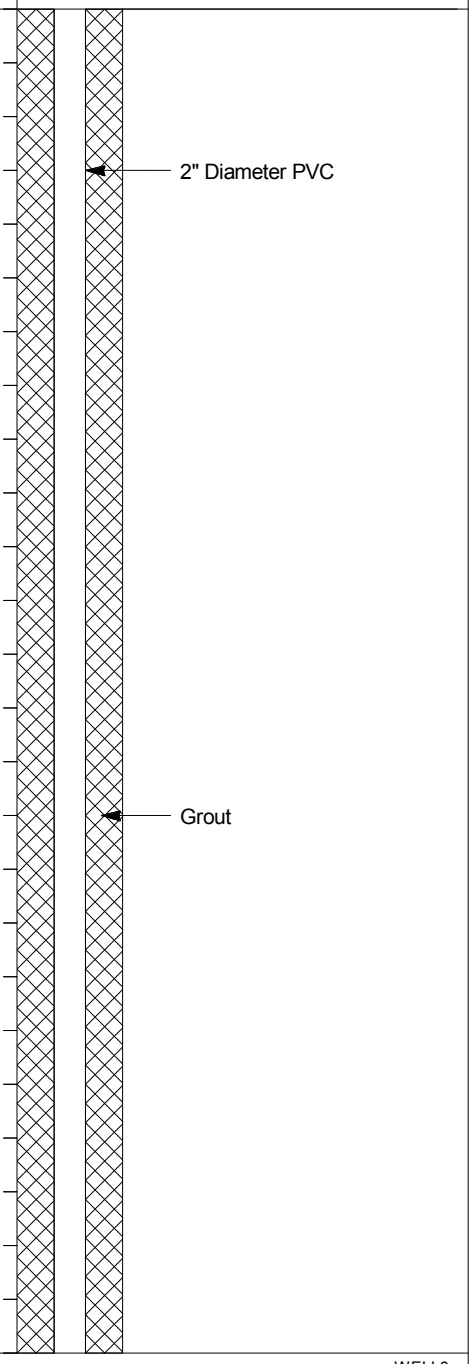
PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP MW-1D**
BORING LOCATION: Northeast Corner of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/24/16 / DATE FINISHED: 5/24/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34.5'-39.5
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 35 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

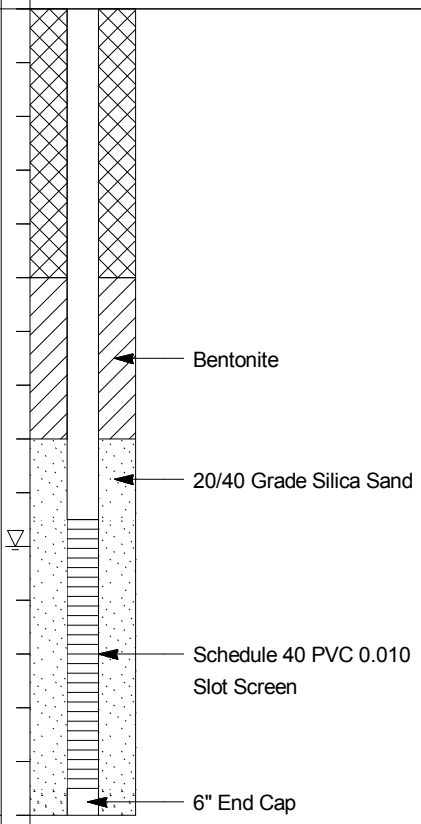
DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Sandy clay fill to 4.5'	
5					Slightly SANDY CLAY (CH): light yellowish-brown, dry, hard, trace calcium carbonate nodules, fine-grained sand to 5' SANDY CLAY (CH): light yellowish-brown, slightly moist, hard, fine-grained sand, trace pebbles	
					Lignite, dark brown, slighly moist, firm 7'-8.5'	
10					SANDY CLAY (CL): light olive brown, moist, very stiff, fine-grained sand, trace of small gravel size nodules, minor ferrous staining SANDY CLAY (CL): light olive brown, brown lenses, dry, fine-grained sand, stiff	
					SILTY SAND (SM): dark gray, very moist	
15					CLAYEY SAND (SC): light olive brown, moist, very stiff, fine-grained sand CLAYEY SAND (SC): light olive brown, moist, firm, fine-grained sand SILTY SAND (SM): light olive brown, wet, loose, fine-grained at 16'	
20					SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand	
25						



WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP MW-1D (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
30					1" hard shaley sand lenses at 25.5' SILTY SAND (SM): light olive brown, wet, loose, fine-grained, one ferrsous stained sand lense at 16' SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand 2" sandstone lense, hard at 31.5'	
35					4" sandstone lense, hard at 33' 3" sandstone lense, ferrous staining, hard, blocky at 34.25' SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand SILTY SAND (SM): light olive brown with very thin lignite lenses 2" hard sandstone layer at 40'	
40					Total Depth = 40'	
45						
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP-MW-3**
BORING LOCATION: Northeast Corner of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/25/16 / DATE FINISHED: 5/25/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34.5'-39.5
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 20 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

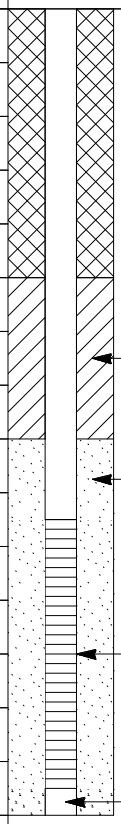
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					SANDY CLAY with gravel (CH): brown, moist, firm, fine-grained sand, few small gravel, (fill)	2" Diameter PVC
5					SANDY CLAY with gravel (CL): brown and reddish-brown, moist, very stiff, fine-grained sand, few small gravel, few clay clasts, 3-4' layers (fill)	
10					SANDY CLAY with gravel (CL): brown mottled, moist, very stiff, fine-grained sand, trace of small gravel (fill)	
					SILTY SAND (SM): light olive brown, moist, firm, fine-grained sand	
15					SILTY SAND (SM): light olive brown, moist, fine-grained sand	Grout
20					SILTY SAND (SM): light olive brown, wet, fine-grained sand	▽
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP-MW-3 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive brown, wet, fine-grained sand	
					- siltsone interbedded with loose sand 27.5'-28.75'	
					Siltstone, light olive gray, dry, hard at 28.75' and 29.5'	
30					SILTY SAND (SM): light olive brown, moist, fine-grained sand SITLY SAND (SM): light olive brown, wet, fine-grained sand	Bentonite
						20/40 Grade Silica Sand
35					SILTY SAND (SM): light olive brown, wet, fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
40					Total Depth = 40'	6" End Cap
45						
50						
55						



WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP MW-4**
BORING LOCATION: East of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 6/1/16 / DATE FINISHED: 6/1/16
DRILLING METHOD: CME 75 HSA	TOTAL DEPTH (ft.): 50.0 / SCREEN INTERVAL (ft.): 44.5'-49.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 48 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation:	
					SANDY CLAY (CL): dark yellowish-brown, brown, moist, stiff, fine-grained sand, sand fill to 3.5'	
					SANDY CLAY (CH): brown, moist, stiff, fine-grained sand	2" Diameter PVC
5					SANDY CLAY (CH): brown, mottled, moist, firm, clay clasts, fine-grained sand	
10					SANDY CLAY (CL): yellowish-brown, moist, firm, fine-grained sand, few pebbles	
					SANDY CLAY (CL): olive brown and yellowish-brown, moist, stiff, 3" lignite lense at 14.75'	
15					SANDY CLAY (CL): yellowish-brown, moist, stiff, fine-grained sand, bedding planes, yellow and black streaks	Grout
20					SANDY CLAY (CL): yellowish-brown, moist, stiff, fine-grained sand, bedding planes	
					Lignite, black, moist, firm 23.5'-25'	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP MW-4 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SANDY CLAY (CH): yellowish-brown, moist, soft, fine-grained sand, discontinous lignite lenses	
					Lignite, black, moist, firm 26.5'-30'	
30					SANDY CLAY (CH): olive-brown, moist, fine-grained sand, stiff	
					Perched water at 32'	
					Lignite, black, dry, stiff 34'-37.5'	
35					Interbedded silty sand and sandy clay, thin bedded (1/4" - 1/2"), olive brown, sandy clay, gray silty sand, dry, stiff, fine-grained sand	
					Lignite, black, dry, hard, 6"	Bentonite
40					CLAY (CL): black, dry, hard, blocky, some interbedded black lignite	
						20/40 Grade Silica Sand
45					SANDY CLAY (CL): black, dry, hard, fine-grained sand, platty	
						Schedule 40 PVC 0.010 Slot Screen
					SILTY SAND (SM): dark olive brown, wet, loose, bedding planes, fine-grained sand	
50					Total Depth =50'	6" End Cap
55						

WELL3

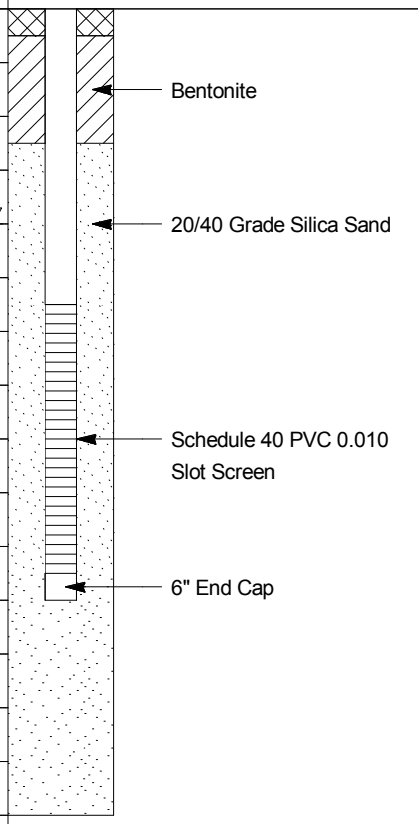
PROJECT: TMPA Gibbons Creek Plant Carlos, Texas		**Log of Well No. AP MW-5**	
BORING LOCATION: East Center of Ash Ponds		GROUND SURFACE ELEVATION AND DATUM: NA	
DRILLING CONTRACTOR: Best Drilling		DATE STARTED: 6/1/16	DATE FINISHED: 6/1/16
DRILLING METHOD: CME 75 HSA		TOTAL DEPTH (ft.): 40.0	SCREEN INTERVAL (ft.): 30.5'-35.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA		DEPTH TO WATER ATD: 29	CASING:
SAMPLING METHOD: 5' x 4" Core Barrel		LOGGED BY: Daniel B. Haug, P.G.	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G.	REG. NO. 1773

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Sand and clay fill to 2.5'	
					SANDY CLAY (CH): yellowish-brown, moist, firm to hard, fine-grained sand, some mottling	2" Diameter PVC
5					SANDY CLAY (CH): light yellowish-brown, moist, stiff, trace of small gravel, fine-grained sand	
10					SANDY CLAY (CL): reddish-brown then light yellowish-brown, (14'-15'), moist, stiff, sand lense at 14.5', fine-grained sand	Grout
15					SANDY CLAY (CH): yellowish-brown, moist, firm, fine-grained sand CLAYEY SAND (SC): yellowish-brown, wet, firm, fine-grained sand, few gravel	
20					SANDY CLAY (CL): yellowish-brown, moist, firm, fine-grained sand, clay clasts SANDY CLAY (CH): reddish-brown mottled with grayish-brown, moist, firm, fine-grained sand	
25					SANDY CLAY (CH): brown mottled with few reddish-brown streaks, moist, fine-grained sand, few pebbles	

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP MW-5 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SANDY CLAY (CH): brown, moist, fine-grained sand to small gravel	
					CLAYEY SAND (SC): brown, wet, firm, fine- to coarse-grained sand	
					SANDY CLAY (CL): light yellowish-brown, moist, stiff, fine-grained sand, ferrous staining	
					SANDY CLAY (CL): light yellowish-brown, very moist to wet, medium-grained sand	
					CLAYEY SILTY SAND (SC-SM): dark greenish gray, slightly moist, fine-grained sand	
					Total Depth = 40'	



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WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP MW-6**
BORING LOCATION: West Side of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Tolunay-Wong	DATE STARTED: 5/3/17 / DATE FINISHED: 5/5/17
DRILLING METHOD: HSA with Continous Core Barell	TOTAL DEPTH (ft.): 50.0 / SCREEN INTERVAL (ft.): 41'-46'
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER ATD: / CASING:
SAMPLING METHOD: 5' x 4.25" OD Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
				0.3	Grass at the surface, gravel, sand and clay material to 4.25' (probable fill)	2" Schedule 40 PVC Riser
5					SANDY CLAY (CL): yellowish-brown, moist, stiff, ferrous nodules, trace of caliche, fine-grained sand	
				0.1	SILT (ML) with lignite: reddish-brown, dry, firm, very little recovery	
10					CLAY (CL): reddish-brown, slightly moist, firm Lignite with clay, dark red, slightly moist, firm	
				0.1	SANDY CLAY (CL): yellowish-brown, dry, firm, very fine-grained sand	
15				1.8	2" lignite seam, dark reddish-brown, slightly moist, soft CLAY (CH): yellowish-brown, slightly moist to moist, stiff, ferrous staining Interbedded CLAY and LIGNITE (0-CL): black to reddish-brown, dry, frim to hard 1" cemented lenses with gypsum	Bentonite Grout
20				2.1	LIGNITE (0) with hard lenses of cemented clay and silt with organics: dark brown, dry, hard	
					SANDY CLAY (CL): dark brown, dry, stiff, very fine-grained sand, numerous thin very fine-grained sand partings, laminated	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP MW-6 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Interbedded SAND and LIGNITE (SP-0): sand - olive gray, lignite - black, very moist to wet, mostly sand, fine-grained sand	
				2.5	LIGNITE (0): black, dry, hard - Lignite to 30.25'	
30					CLAY (CL): light gray, slighltly moist, hard	Bentonite Grout
				4.3	CLAYEY SAND (SC): very dark grayish-brown, dry, dense, very fine-grained sand, lignite fragments	
35					CLAYEY SAND (SC): olive gray, slightly moist to moist, dense, fine-grained sand, weakly cemented, laminated	Bentonite Chips
				4.9		16/30 Grade Silica Sand
40					Slightly CLAYEY SAND (SC): olive gray, moist to very moist, 42.5'-43' wet, moist below 43' and silty, medium dense, very fine- to fine grained sand	
				4.4		2" Schedule 40 PVC Screen 0.010 Slot
45					Very slightly CLAYEY SILTY SAND (SM): olive gray, moist, dense, fine-grained sand, trace of lignite lenses	5.5" End Cap
				0.6		
					- Sulfur smell	
50					Total Depth = 50"	
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP PZ-1**
BORING LOCATION: West of Limestone Storage Building	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/24/16 / DATE FINISHED: 5/24/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 35.0 / SCREEN INTERVAL (ft.): 21'-26'
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 21 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation:	
					6" ash	
					Sandy clay with few small gravel fill to 2"	
					SANDY CLAY (CH): yellowish-brown, moist, stiff, fine- to coarse-grained sand	2" Diameter PVC
5					CLAYEY SAND (SC): light yellowish-brown, moist, stiff, fine-grained sand	Grout
					0.5" sandstone lense at 9.25'	
10					CLAYEY SAND (SC): light yellowish-brown, slightly moist, stiff, fine-grained sand	
					sandstone nodules and 0.5" sand lense at 12'-12.5'	
					- trace of ferrous staining	
15					- interbedded sand and sandy clay	
					CLAYEY SAND and SAND (SP, SC) olive-gray, dry to moist, loose to firm	
					CLAY (CL): brown, dry, hard, with interbedded sand and clay	Bentonite
					SILTY SAND (SM): brown, dry, loose to firm, fine-grained sand, clay lenses	
20					CLAY (CL): yellowish-brown, dry, hard, thin fine-grained sand lenses, trace of pebbles	20/40 Grade Silica Sand
					CLAYEY SAND with sandstone lenses, brown, wet, dense, fine-grained to small gravels size	
					SANDY CLAY (CL): brown, dry, hard, fine-grained sand lamina	
					SILTY SAND (SM): olive gray, moist, loose to firm, fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP PZ-1 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive gray, wet, hard, fine-grained sand, very thin lignite seams	6" End Cap
					CLAY (CH): olive, dry, hard, blocky	
30					CLAY (CH): olive, dry, hard, blocky	20/40 Grade Silica Sand
35					Total Depth = 35'	
40						
45						
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP PZ-2**
BORING LOCATION: North of Fly Ash Silos	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/23/16 / DATE FINISHED: 5/24/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34'-39'
DRILLING EQUIPMENT: 8 5/8" OD HSA 2" Rods	DEPTH TO WATER ATD: 39 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

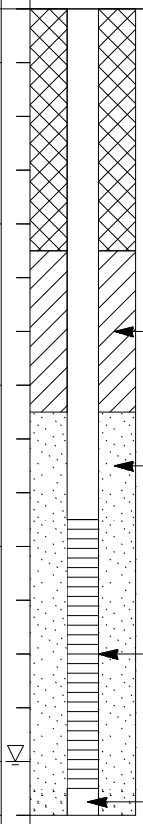
DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					SILTY SAND (SM): dark gray, slightly moist, loose, fine- to coarse-grained sand, roots, fly ash	
					SILTY SANDY CLAY (CH): brown, moist, firm, fine- to coarse-grained sand	
					SILTY SANDY CLAY (CL): brown, moist, firm, fine- to coarse-grained sand, increasing sand content	2" Diameter PVC
5					SANDY CLAY (CH): yellowish-brown, moist, soft, fine- to coarse-grained	
					SILTY SANDY CLAY (CH): yellowish-brown, moist, hard, fine-grained sand, ferrous staining - lignite seam 9'-9.5'	
10					CLAYEY SAND (SC): light olive brown, dry, dense, fine- to medium-grained sand, wood fragments	
					SILTY CLAYEY SAND (SC): light yellowish-brown, moist, firm, fine-grained sand	
					SANDY CLAY (CH): yellowish-brown, dry, hard, fine-grained sand, lignite seam (thin)	
15					CLAYEY SILTY SAND (SM): gray, wet, firm, fine-grained sand	Grout
					SANDY CLAY (CH): light yellowish-brown, dry, hard, layered, fine-grained sand	
20					SILTY SANDY CLAY (CL): light olive brown, dry with few moist intervals, hard to very stiff, fine-grained sand, drier after 22'	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP PZ-2 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive brown, very moist, fine-grained sand, soft	
					Sligthly SANDY CLAY (CH): brown, dry, hard, fine-grained sand lenses - increased sand content with depth	
30					SILTY SAND (SM): light olive brown, moist, fine-grained sand, firm	
					CLAYEY SILTY SAND (SM): light olive gray, very moist, firm, 1/4" lignite seams, fine-grained sand	Bentonite
					SANDY CLAY (CL): light olive brown, moist to dry, hard, fine-grained sand, very hard lenses, organics (wood) in sandstone	20/40 Grade Silica Sand
35					SILTY SAND (SM): light olive brown, wet to 39', tan lignite lenses (1/4"), fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
					CLAY (CH): brown, moist, hard	6" End Cap
40					Total Depth = 40'	
45						
50						
55						



WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP PZ-3**
BORING LOCATION: North of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/25/16 / DATE FINISHED: 5/25/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34.5'-39.5
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 25 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					SANDY CLAY with Gravel (CH): yellowish-brown, moist, very stiff, fine-grained sand, few small gravel, probably fill	
					SANDY CLAY (CL): olive brown, moist, very stiff, fine-grained sand	2" Diameter PVC
5					SANDY CLAY (CL): light olive brown, slightly moist to moist at 9', firm, layered, fine-grained sand	
10					SANDY CLAY (CL): light olive brown, moist to wet above underlying clay, fine-grained sand, loose CLAY (CH): light olive brown, dry, blocky, hard, layered SILTY SAND (SM): light olive brown, wet, fine-grained sand	
15						Grout
20					SILTY SAND (SM): light olive brown, wet, fine-grained sand, layered	
25					- interbedded sand and siltstone	

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP PZ-3 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive brown, wet, fine-grained sand, hard siltstone at 28.75' to 29' and 1" lense at 27.5' ferrous staining around siltstone lenses	
30					SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand Sandstone, light to olive brown, wet, hard, platy 32.5'-33'	Bentonite
					SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand Sandstone, pale yellow, wet, hard, platy 34'-34.5	20/40 Grade Silica Sand
35					SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand	
					Siltstone, olive brown, wet, hard, platy 36.5'-36.75' SILTY SAND (SM): light olive brown, wet, loose to firm, fine-grained sand SILTY SAND (SM): olive gray, wet, firm, fine-grained sand, layered	Schedule 40 PVC 0.010 Slot Screen
40					CLAY (CH): olive gray, dry, hard, blocky Total Depth = 40'	6" End Cap
45						
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas		**Log of Well No. AP PZ-4**	
BORING LOCATION: Southwest Corner of Ash Ponds		GROUND SURFACE ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Best Drilling		DATE STARTED: 6/2/2016	DATE FINISHED: 6/2/2016
DRILLING METHOD: HSA		TOTAL DEPTH (ft.): 45.0	SCREEN INTERVAL (ft.): 38.5'-43.5'
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig		DEPTH TO WATER ATD: 40	CASING:
SAMPLING METHOD: 5' x 4" Core Barrel		LOGGED BY: Daniel B. Haug, P.G.	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G.	REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Clay and gravel fill to 3'	
					SANDY CLAY (CL): light yellowish-brown, moist, stiff, fine-grained sand	2" Diameter PVC
5					Interbedded sandstone and SANDY CLAY (CL): light yellowish-brown, moist, hard, fine-grained sand	
					SANDY CLAY (CL): light yellowish-brown, moist, stiff, fine-grained sand, ferrous partings	
10					SANDY CLAY (CL): light yellowish-brown, moist, stiff to 14.5', hard to 15', fine-grained sand, ferrous staining, reddish-brown with increased clay content at 14.5-15'	
15					SANDY CLAY (CL): olive brown, dry, hard, very fine-grained sand, discontinous silt and sand partings	Grout
20					SANDY CLAY (CL): olive brown, dry, very stiff, fine-grained sand	
					Lignite, black, dry, hard 23.5'-25' - 2" sand and clay lenses	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

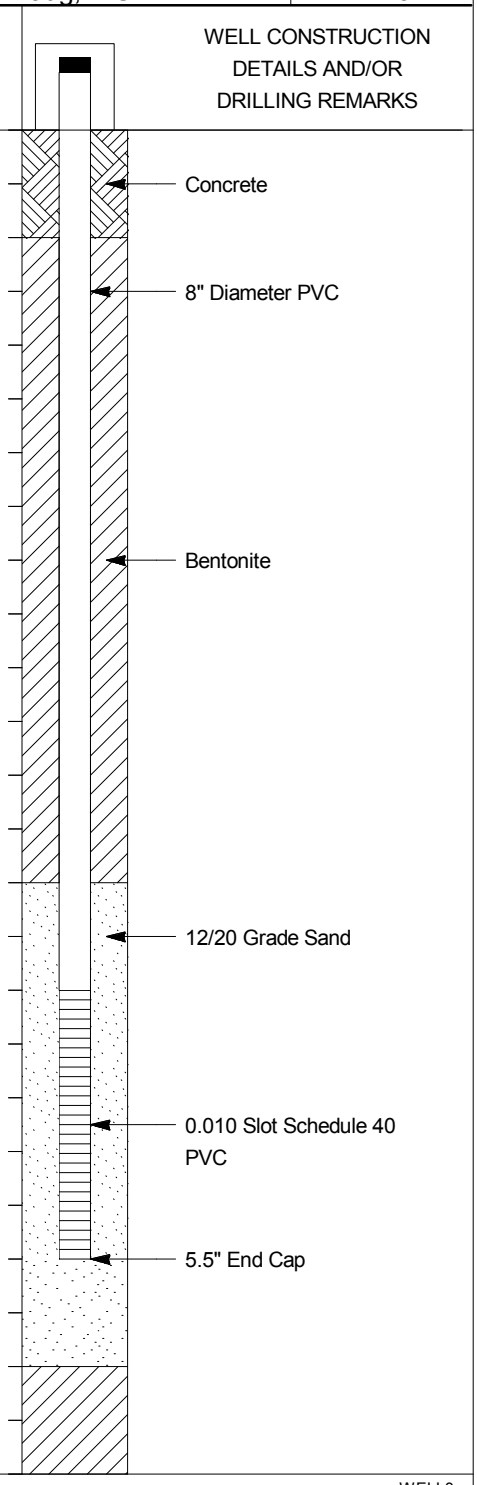
Log of Well No. AP PZ-4 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Lignite, dark brown and black, dry, stiff, few interbedded ironstone, sand, clay (thin beds-large majority lignite 25'-30')	
30					Sandstone: olive brown, moist, hard	
					Lignite, brown to dark brown, dry, stiff 31'-32.75' Interbedded olive brown sand, brown clay and lignite Lignite, brown to dark brown, dry, stiff, platy 33'-35' Lignite, brown to dark brown, dry, stiff, blocky 35'-36'	Bentonite
35					Interbedded sandy clay, lignite (thin beds), medium gray sand, fine-grained sand, dark brown clay and lignite	20/40 Grade Silica Sand
					Lignite, brown to dark brown, dry, stiff, blocky 39'-40'	
40					Sand interbedded with lighnite, black, wet, loose, fine- to medium-grained Lignite, black dry, very stiff 41'-41.75 SANDY SILT (ML): olive gray, slightly moist, stiff, very fine-grained sand	Schedule 40 PVC 0.010 Slot Screen 6" End Cap
45					Total Depth = 45'	
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-2**
BORING LOCATION: South Side of Landfill F, West of Outfall	GROUND SURFACE ELEVATION AND DATUM: 269'
DRILLING CONTRACTOR: Vortex Drilling	DATE STARTED: 3/16/16 / DATE FINISHED: 3/16/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 50.0 / SCREEN INTERVAL (ft.): 16'-21'
DRILLING EQUIPMENT: 4 1/4 ID HSA (8" Borehole)	DEPTH TO WATER ATD: 17.5' / CASING:
SAMPLING METHOD: Split Spoon	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA
			1/1/4	0.0	CLAY CH): dark gray, moist, soft, grading to yellowish-brown at 2'
			3/7 50/1"	0.0	CLAYEY SILTY SAND (SM-SC): light yellowish-brown, dry, hard, platy, fine-grained sand
5			50/1"	3.0	SANDY SILT (ML): pale yellow, moist, hard, very fine-grained sand SILT (ML): pale yellow, moist, hard, very fine-grained sand
10			50/5" 21/35	3.0 0.8	SILT (ML): pale yellow, moist to wet, hard, very fine-grained sand SANDY SILT (ML): pale yellow, moist to wet, hard, wet to 13', then very moist, siltier-a trace of clay (unconsolidated)
15			11/ 24/ 30	5.0	
			30/ 50/2"	4.3	SILTY SAND (SM): light yellowish-brown, moist, hard, unconsolidated, very fine- to fine-grained sand, trace iron oxide staining
20			19/ 31/ 32	3.8	SILTY SAND (SM): light yellowish-brown, moist to wet, hard, unconsolidated, very fine- to fine-grained sand, iron oxide staining 19-20'
			20/ 50/4"	3.9	SANDY SILTY (SM): light yellowish-brown, wet, unconsolidated, hard, iron oxide staining
			41/ 60/6"	2.3	SILTY CLAY (CL): brown, dry, hard at 22.25 SANDY SILTY CLAY (CL): dark gray, dry, hard, bedding planes SANDY SILTY CLAY (CL): dark gray, dry, hard, bedding
25					



WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SFL MW-2 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
			20/ 50/5"	3.7	CLAY (CH): dark gray, dry, hard, lenses of sandy clay, fine-grained sand SANDY CLAY (CL): olive gray, moist (clayey interval, dry), hard, fine-grained sand	
			15/ 21/ 37	3.2	SANDY CLAY (CL): olive gray, dry, hard, fine-grained sand	
30			15/ 21/ 21	2.0	Slightly SANDY CLAY (CL): dark gray, dry, hard, fine-grained sand	
			12/ 29/ 40	2.5	SILTY CLAY (CH): dark gray, dry, hard, thin linear structures in the clay	
35			20/20 60/6"	2.0	SILTY CLAY (CH): olive gray, dry, hard, silt lenses at 35.5', moist	Bentonite
			10/ 17/ 17	1.1	SILTY CLAY (CH): olive gray, dry, hard, silt lenses <1/4, thin, dry	
40			10/ 11/ 15	1.9	SILTY CLAY (CH): olive gray, moist, firm to hard, few silt partings	
			8/ 12/ 15	2.1	SILTY CLAY (CH): olive gray, moist, firm to hard, few silt partings, one pyrite nodule	
45			12/ 12/ 17	2.2	CLAY (CH): olive gray, moist, firm to hard, silt partings	
			10/ 12/ 31	2.2	CLAY (CH): olive gray, moist, firm to hard, few silt partings	
50					Total Depth = 50'	
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-3**
BORING LOCATION: Southeast of Landfill F	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/31/16 / DATE FINISHED: 5/31/16
DRILLING METHOD: CME 75 HSA (Buggy Rig)	TOTAL DEPTH (ft.): 25.0 / SCREEN INTERVAL (ft.): 19.5'-24.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 22 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light yellowish-brown, moist, loose, fine-grained sand, trace ferrous staining	2" Diameter PVC
5					SANDY CLAY (CH): brown mottled with blackish-brown, moist, firm, fine-grained sand, minor ferrous staining SANDY CLAY (CH): brown, mottled, moist, firm, fine-grained sand	Grout
10					SANDY CLAY (CL): yellowish-brown, slightly moist, fine-grained sand, bedding planes, stiff Slightly SANDY SILTY CLAY (CL): yellowish-brown, slightly moist, very firm, fine-grained sand	
15					SANDY SILTY CLAY (CL): yellowish-brown, slightly moist, stiff, very fine-grained sand, few bedding planes	Bentonite 20/40 Grade Silica Sand
20					Interbedded sandy clay and sandstone, reddish-brown, hard to very stiff, fine-grained sand SILTY SAND (SM): light olive brown, wet, loose to firm, fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
25					CLAY (CL): light to olive green, dry, hard Total Depth = 25'	6" End Cap

WELL3

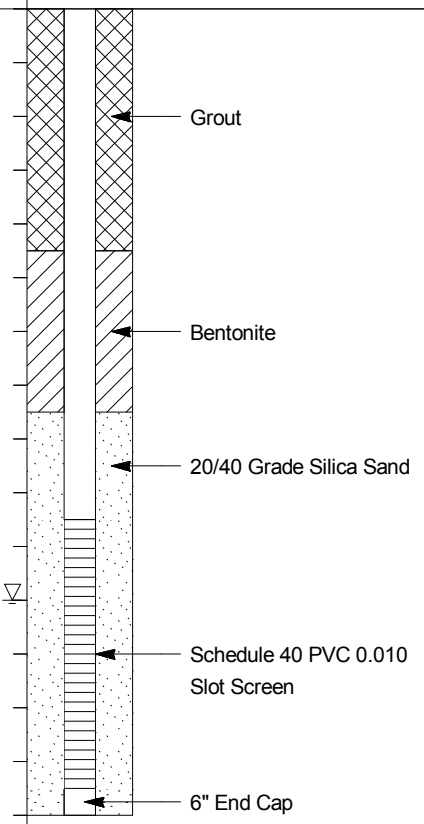
PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-4**
BORING LOCATION: South of Landfill F	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/31/16 / DATE FINISHED: 5/31/16
DRILLING METHOD: CME 75 HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34.5'-39.5
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 36 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					CLAYEY SAND (SC): medium gray, moist, firm, fine-grained sand Interbedded silty sand and sandstone, medium gray, slighly moist, firm to hard, fine-grained CLAYEY SILTY SAND (SC-SM): medium gray, slighty moist, very firm, fine-grained sand	2" Diameter PVC
5					SANDY CLAY (CL): light olive brown, dry, hard, fine-grained sand, ferrous staining SANDY SILTY CLAY (CL): light olive brown, slightly moist, very fine-grained sand	
10					SANDY SILTY CLAY (CL): light olive brown, slightly moist, very fine-grained sand, minor ferrous staining	
15					SANDY SILTY CLAY (CL): brown, dry, very stiff, bedding planes, fine-grained sand	Grout
20					SANDY CLAY (CL): dark olive brown, dry, hard, bedding planes, trace of gypsum, fine-grained sand Lignite lense, dark gray to balck, loose to firm SILTY SAND (SM): light olive gray, slightly moist, fine-grained sand, bedding planes, firm	
25						

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SFL MW-4 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive gray, dry, very fine-grained sand, 25'-26' interbedded siltstone	
					CLAYEY SANDY SILT (ML): dark gray, dry, fine-grained sand, discontinous thin sand lenses	
30					SANDY SILTY CLAY (CL): dark gray, dry, very fine-grained sand, discontinuous thin silt lenses	
35					Interbedded clay and sand; clay, black, dry, hard; sand, olive gray, dry, loose, very fine-grained sand	
					SAND (SP): olive gray, wet, loose, very fine-grained sand	
					SILTY SAND (SM): olive gray, dry, firm, fine-grained sand	
40					Total Depth = 40'	
45						
50						
55						



WELL3

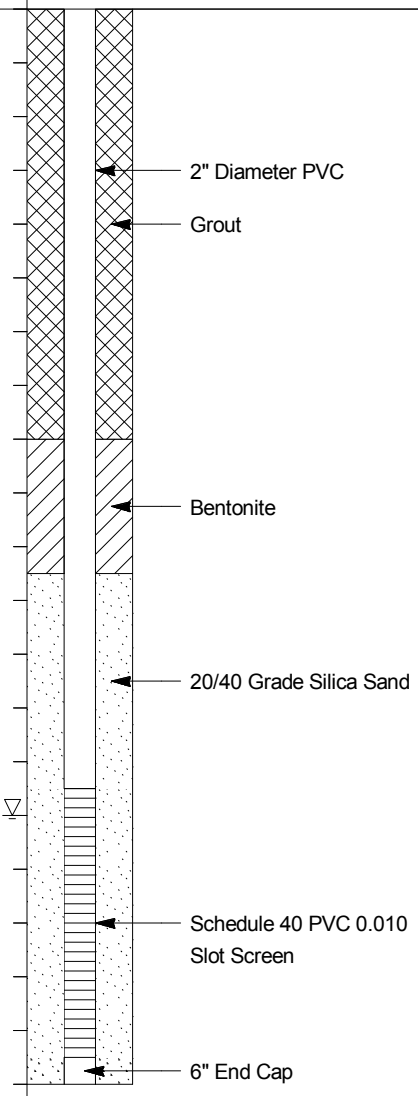
PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-5**
BORING LOCATION: Landfill F	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/23/16 / DATE FINISHED: 5/23/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 25.0 / SCREEN INTERVAL (ft.): 16'-21'
DRILLING EQUIPMENT: 8 5/8" OD HSA 2" Rods	DEPTH TO WATER ATD: 16 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): dark grayish-brown, moist, loose, fine-grained sand, roots	
					SANDY CLAY (CH): dark yellowish-brown, moist, soft, fine-grained sand, roots	
					SILTY SANDY CLAY (CL): yellowish-brown, dark yellowish-brown lenses, moist, fine-grained sand, firm	2" Diameter PVC
5					SILTY SANDY CLAY (CL): yellowish-brown, dry, hard, very fine-grained sand, ferrous staining	Grout
					SILTY SAND (SM): light brownish-gray, mottled with brownish-yellow, soft, moist (slightly) increasing clay content to 8.5', fine-grained sand	
					Slightly CLAYEY SILTY SAND (SM): light olive brown, loose, moist, fine-grained sand	
10					Slightly CLAYEY SILTY SAND (SM): light olive brown, slightly firm, moist, trace of pebbles	Bentonite
15					SILTY SAND (SM): light olive brown, wet to very moist, firm, faint stratification, fine-grained sand	20/40 Grade Silica Sand Schedule 40 PVC 0.010 Slot Screen
20					SANDSTONE (SS): light yellowish-brown, dry, hard, ferrous staining along fractures, layered	6" End Cap
					Shale (SILTY CLAY) (CL): gray, dry, hard, very fine-grained sand, silt partings	
25					Total Depth = 25'	

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-6**
BORING LOCATION: Southwest Corner of Landfill	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/23/16 / DATE FINISHED: 5/23/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): 14.5'-19.5
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 15 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
					Surface Elevation:
					Sandy Clay fill, few gravel fill to 4.5'
5					SANDY SILTY CLAY (CL): pale brown, dry, hard, dark gray partings, very fine-grained sand
					CLAYEY SAND SILT (ML): pale brown, dry, very stiff to hard, dark gray clay partings, fine-grained sand, increased ferrous staining after 8', few sand partings, wood fragments in a few partings
10					SILTY SANDY CLAY (CH): pale brown, dry, hard, light brown partings to reddish-brown, fine-grained sand, ferrous staining
15					Layered SILTY SAND (SM) and SANDY SILTY CLAY (CL): pale brown, some brown layers after 17', very moist to dry, fine-grained sand
20					SANDY SILTY CLAY (CL): gray silt and sand, dark gray clay, layered, dry, hard, very fine sand
					Total Depth = 20'
25					



WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-7**
BORING LOCATION: Southeast Side of Landfill F	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Tolunay-Wong	DATE STARTED: 5/2/17 / DATE FINISHED: 5/3/17
DRILLING METHOD: HSA with Continous Core Barell	TOTAL DEPTH (ft.): 55.0 / SCREEN INTERVAL (ft.): 50'-55'
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER ATD: / CASING:
SAMPLING METHOD: 5' x 4.25" OD Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Grass at surface	
				2.6	SILTY SAND (SM): yellowish-brown, dry, firm, very fine-grained sand (fill)	
5					SANDY CLAY (CH): gray, slightly moist, firm, very fine-grained sand	8" Diameter PVC
				1.1		
10					SANDY CLAY (CH): brown, slightly moist to moist, firm, olive gray mottling and some ferrous staining, very fine-grained sand, fill to □ppro□i□ □t□l□12'	
				0.8	SANDY CLAY (CL): brown, slightly moist, very fine-grained sand, some lammination, couple of thin greenish-□r□□sand lenses	
15					CLAY (CL): dark brown, slightly moist, very fine-grained sand intervals (thin)	
				0.4	SANDY CLAY (CL) with lignite fragments: very dark brown, hard, very fine-grained sand, slightly moist to dry	
20					- Layered sand and clay with lignite 19.5'-20', very dark brown to light gray, hard, slightly moist, pyrite nodules	Bentonite Grout
				0.8	CLAY (CH): very dark gray, dry, hard, very thin sand lenses, greenish-gray, lignite fragments along bedding planes, platy	
25					CLAY (CH) with interbedded thin sand lenses: very dark gray, dry, hard, very fine-grained sand, lignite fragments along bedding planes in the clay, clay breaks along horizontal laminae, platy	
				0.4		
30						

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SFL MW-7 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
35				0.3	CLAY (CL): with numerous thin sand lenses interbedded with clay: very dark gray clay, greenish-gray sand, dry, hard, lignite fragments along bedding planes in the clay, very fine-grained sand, platy	2" Schedule 40 PVC Riser
				0.3	CLAY (CH): with sand partings: very dark gray, dry, hard, very fine-grained sand, lignite fragments along bedding planes in the clay, platy, sand greenish-gray	
40				0.2	CLAY (CH) with SAND partings: very dark gray, dry, hard, very fine-grained sand, lignite fragmenst along bedding planes in the clay, platy, sand greenish-gray	Bentonite Chips
45					SAND (SP): olive gray, wet, loose, fine- to very fine-grained sand	
				0.2	CLAY (CH): dark greenish-gray, dry to hard at 46'	16/30 Grade Sand
					CLAY (CH): very dark gray, dry, hard, platy	
50				0.2	SILTY SAND (SM): dark gray, wet, loose, very fine- to fine-grained sand	2" Schedule 40 PVC Screen 0.010 Slot
					Interbedded SAND (SP) and lignite: olive gray, wet, loost to firm	
					2" lignite seam	
55					SAND (SP) with thin lignite lenses, olive gray, wet, loose to firm	5.5" End Cap
					Total Depth = 55'	
60						
65						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SSP/AP MW-1**
BORING LOCATION: North of Sludge Pond	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/25/16 / DATE FINISHED: 5/26/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 29.5'-39.5'
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 30 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

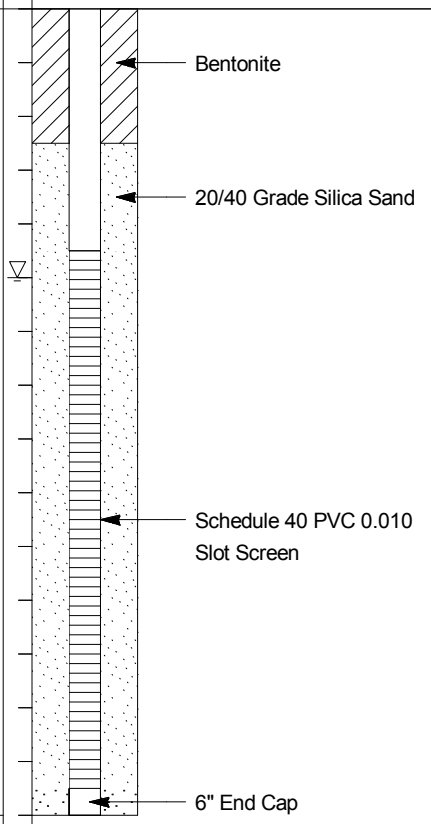
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Silty sand, fly ash and sandy clay, fill to 3.5'	2" Diameter PVC
					SANDY CLAY (CL): light yellowish-brown, moist, very stiff, fine-grained sand	
5					SILT (ML): yellowish-red, moist, firm to hard, after 3" grading to clay, yellowish-red, moist, hard	
					SANDY CLAY (CL): reddish-brown, moist, very stiff, fine-grained sand	
10					Slightly SANDY CLAY (CH): reddish-brown, moist, very stiff, very fine-grained sand	Grout
					Lignite, black, dry, hard 12'-16'	
15					Slightly SANDY CLAY (CH): dark grayish-brown, dry, hard, very fine-grained sand	
20					SANDY CLAY (CL): dark grayish-brown, moist, hard, fine-grained sand, lithofied sandy lenses from 20.5' to 25', sandier and softer toward 25', platy where hard	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SSP/AP MW-1 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
30					SILTY SAND (SM): dark olive brown, slightly moist, hard, platy when hard, fine-grained sand	Bentonite; 20/40 Grade Silica Sand
35					Slightly SILTY SAND (SM): dark olive brown, wet, loose, fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
40					CLAYEY SILTY SAND (SM-SC): dark olive brown, dry to moist, fine-grained sand, firm	6" End Cap
					Total Depth = 40'	
45						
50						
55						



WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SSP MW-2**
BORING LOCATION: West of Center of Scrubber Sludge Pone	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 6/2/06 / DATE FINISHED: 6/2/06
DRILLING METHOD: CME 75 HSA	TOTAL DEPTH (ft.): 45.0 / SCREEN INTERVAL (ft.): 38.5'-43.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 30 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					9" ash, black, loose SANDY CLAY (CL): yellowish-brown, moist, firm, fine-grained sand, few pebbles	2" Diameter PVC
5					SANDY CLAY (CL): medium gray, moist, firm, fine-grained sand, few pebbles SANDY CLAY (CL): brown, moist, firm, fine-grained sand, few small gravel	
10					SANDY CLAY (CH) with small gravel: brown, moist, firm to stiff, fine-grained sand with pebbles and small gravel, clay clasts, some red and greenish-gray streaking, trace yellow nodules	
15					SANDY SILTY CLAY (CL): brown, moist, stiff, fine-grained sand, trace roots, few bedding planes	Grout
20					SILTY SAND (SM): light olive brown, moist, firm, fine-grained sand, bedding planes, brown organic lenses, very thin	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SSP MW-2 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					CLAYEY SILTY SAND (SC-SM): light olive brown, moist, firm, fine-grained sand	
30					SILTY SAND (SM): light olive brown, wet, 30'-33', sandstone at 33', fine-grained sand	Grout
					Slightly SILTY SAND (SM): light olive brown, slightly moist, firm, fine-grained sand	Bentonite
35						20/40 Grade Silica Sand
40					SANDY CLAY (CH) with few gravel: reddish-brown, wet, firm	Schedule 40 PVC 0.010 Slot Screen
					SANDY CLAY (CH): dark olive brown, moist, stiff, fine-grained sand	6" End Cap
45					CLAYEY SILTY SAND (SM-SC): dark olive brown, dry, dense, fine-grained sand	
					Total Depth = 45'	
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SSP MW-3**
BORING LOCATION: Southwest Corner of Scrubber Sludge Pond	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 6/3/16 / DATE FINISHED: 6/3/16
DRILLING METHOD: CME 75 HSA	TOTAL DEPTH (ft.): 45.0 / SCREEN INTERVAL (ft.): 39.5'-44.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 33 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

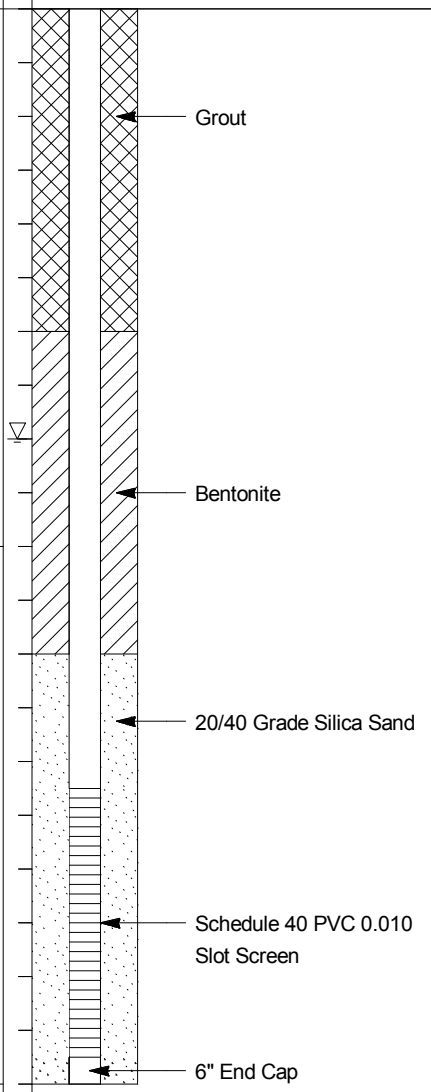
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation:	
					Gravelly sandy clay at surface to 1.5'	
					SANDY CLAY (CL): yellowish-brown, moist, stiff, fine-grained sand	2" Diameter PVC
5					SANDY CLAY (CL) with gravel: yellowish-brown, moist, stiff, fine-grained sand	
10					CLAY and SANDY CLAY (CL-CH): yellowish-brown, reddish-brown, reddish-gray layers (fill), moist, stiff, fine-grained sand	
					Probably fill above 14'	
15					Slightly SANDY CLAY (CH): olive gray to 17.5', moist, stiff, fine-grained sand	Grout
					SANDY CLAY (CL): reddish-yellow, moist, stiff, fine-grained sand	
20					SANDY CLAY (CL): light reddish-brown, dry, stiff, fine-grained sand	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SSP MW-3 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SANDY CLAY (CL): light brown, dry, hard	
					Sandstone, light brown, dry, hard 29.5'-30'	
30					1" of sandstone in core barrel, loose, fine-grained wet sand washed out of core barrel	
35					SILTY SAND (SM): light olive brown, wet, soft, fine-grained sand	
40					SILTY SAND (SM): light olive brown, wet, soft, fine-grained sand 1" lignite seam, brown, wet, soft at 41.75, very thin lignite lenses at 42' and 43.5'	
45					SILTY SAND (SM): light olive brown, wet, stiff, fine-grained sand Total Depth = 45'	
50						
55						



WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas		**Log of Well No. SSP MW-4**	
BORING LOCATION: Southeast Corner of Scrubber Sludge Pond		GROUND SURFACE ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Best Drilling		DATE STARTED: 6/3/16	DATE FINISHED: 6/3/16
DRILLING METHOD: CME 75 HSA		TOTAL DEPTH (ft.): 50.0	SCREEN INTERVAL (ft.): 43'-48'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA		DEPTH TO WATER ATD: 44.75	CASING:
SAMPLING METHOD: 5' x 4" Core Barrel		LOGGED BY: Daniel B. Haug, P.G.	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G.	REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation:	
					Sand, gravel, clay fill	
					SANDY CLAY (CH): layered yellowish-brown, moist, stiff, fine-grained sand, probable fill	2" Diameter PVC
5					SANDY CLAY - CLAYEY SAND (CH-SC): brown, moist, firm, fine-grained sand, probable fill	
10					SANDY CLAY (CH): brown and olive brown layered (fill); moist, stiff, fine-grained sand	
					Probably fill above 14'	
15					SANDY CLAY (CL): yellowish-brown, moist, firm, fine-grained sand, black organic streaks	Grout
20					SANDY CLAY (CH): yellowish-red, very moist, fine-grained sand, soft CLAY (CH): dark reddish-brown, moist, firm	
					Lignite, black, moist, firm 22.5'-23'	
25					SANDY CLAY (CL): light yellowish-brown, moist, stiff, fine-grained sand	

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SSP MW-4 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SANDY CLAY (CL): light yellowish-brown, moist, very stiff, fine-grained sand, ferrous streaks	
30					SANDY CLAY (CL): light yellowish-brown, moist, vey stiff, fine-grained sand, ferrous streaks	Grout
35					Lignite, black, moist, firm 34.75'-35.25' SANDY CLAY (CL): dark grayish-brown, dry, hard, fine-grained sand	
					Lignite, dark brown, dry, hard 38.25'-38.75	
40					SANDY CLAY (CL): dark grayish-brown, dry, hard, fine-grained sand, interbedded black clay lenses Interbedded sand and clay to 44.75'; CLAY (CH): black, dry, hard and; SAND (SP): olive gray, dry, dense	Bentonite 20/40 Grade Silica Sand
45					SAND (SP): olive gray, moist, dense, fine-grained sand, wet SANDY CLAY (CL): dark gray, moist, wet at 45'-46' (sandier interval), moist to dry below 46', hard, fine-grained sand	▽ Schedule 40 PVC 0.010 Slot Screen 6" End Cap
50					Total Depth = 50'	
55						

WELL3

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

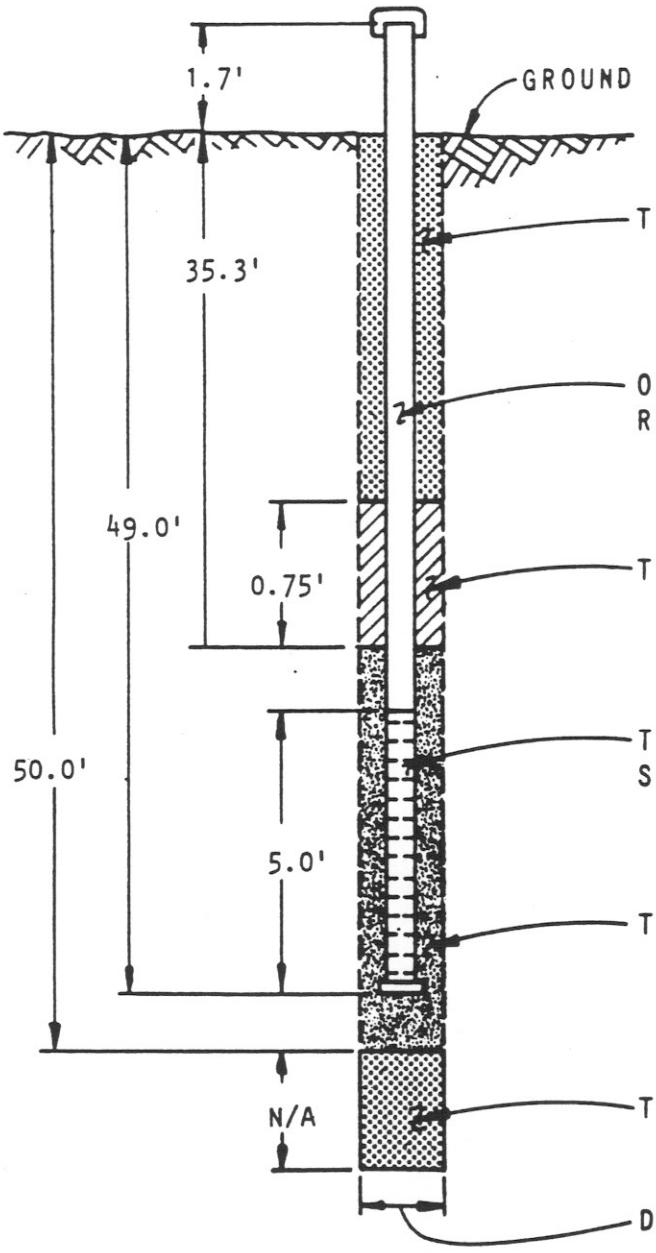
PIEZOMETER NO. B-11

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N378330 E3339148	266.8'	2-26-88

STRATUM MONITORED	INSPECTOR
Sandstone and clay	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh



Volclay Grout and Initiator Cement/Bentonite

2" PVC glued joints Schedule 40

Bentonite Pellets 1/2"

.01" Slots

Pea gravel

N/A

4 1/2"

METHOD OF INSTALLATION: Boring drilled to completion; set riser pipe and screen; placed filter and seal; grouted to surface; poured surface pad

REMARKS: Installed piezometer in fluid-filled hole; added approximately 2 gallons of bentonite pellets for seal but only 9" arrived at 35'- rest hung up- didn't have any more bentonite developed well on 2-27-88 by flushing w/clean water for 3 minutes and blowing it out w/air

P-ST-021

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

CLIENT: Texas Municipal Power Agency		PROJECT: Gibbons Creek SES	PROJECT NO.: 14578
PROJECT LOCATION: Carlos, Texas	COORDINATES: N378329 E3339148	ELEVATION (DATUM): 266.7' / TOTAL DEPTH: 50'	DATE START: 2-26-88
SURFACE CONDITIONS: Clearing in woods		INSPECTOR: K. M. Blevins-McCosh	DATE FINISH: 2-26-88
	CHECKED BY: M. C. Schluter	APPROVED BY: L. J. Almaleh	

SAMP TYPE / CORE SIZE	SAMP NO. / RUN NO.	SET 6" / RUN LENG	2ND 6" / RUN RECV	3RD 6" / RQD RECV	N VAL / % RECV	SAMP RECV / RQD	DEPTH IN FEET
TW	1					1.6	0–2
TW	2					0.8	2–4
TW	3					1.1	4–6
TW	4					1.2	6–8
TW	5					1.4	8–10
TW	6					1.2	10–12
TW	7					1.5	12–14
TW	8					1.3	14–16
TW	9					1.5	16–18
TW	10					1.5	18–20
TW	11					1.8	20–22
TW	12					1.9	22–24
TW	13					1.9	24–26
TW	14					1.7	26–28
TW	15					2.0	28–30

CLASSIFICATION OF MATERIAL

0–6 ft: Silty CLAY; reddish-brown; stiff; high plasticity; moist; organics; roots; iron staining (Top soil)

Grading brown w/some sand; trace gravel below 2'

Grading w/some sandstone seams and some gravel w/trace roots below 4'

6–8 ft: Sandy CLAY; tan to buff; stiff; low plasticity; moist; iron stained; w/trace gravel and some silt

8–18.5 ft: Clayey SILT; tan to buff; hard; high plasticity; moist; some sand; iron staining especially on joints; joints spaced 2-6" horizontal

Interbedded with silty sand below 10'

Grading tan to brown with iron nodules and few cemented sand fragments; platy below 12'

Blocky structure below 14'

Cemented sand grades out below 14';

Cemented sand layer at 18'

18.5–30 ft: CLAY; greenish-grey; hard; high plasticity; moist w/silt filled joints and some silt; trace sand; trace lignite 22'-24'

Grading greenish-grey and dark grey banded below 23'

Slickensided below 26'

REMARKS

Advanced boring w/4 1/2" rotary wash

pp. 2.75

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-11
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N378329 E3339148	266.7'	50'	2-26-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in woods	K. M. Blevins-McCosh	2-26-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
TW	16					1.8								1		
														2	Trace pyrite below 32'	pp. 4+
TW	17					1.9								3		
														4	Bands grading out below 34'	
TW	18					1.9								35		
														6		
TW	19					2.0								7		
														8		pp. 4+
TW	20					1.7								9		
														40		
TW	21					1.9								1	Trace lignite below 41'	
														2	Grading dark grey below 42'; 1/2" silt seam at 42.3'	
TW	22					2.0								3		
														4		pp. 4+
TW	23					1.1								45	Silty CLAY; dark grey; hard; high plasticity; dry; some iron staining	
														6		
TW	24					0								7		TW 24 no sample cored w/2' core barrel
										48'				8		
3"	1	2				17				1.3	0.3	65		9	SANDSTONE; argillaceous; grey; fine grained; slightly weathered; w/trace lignite; horizontal joints	
										50'				50		Bottom of boring 49.8'. Groundwater level unknown. Reamed 0-3' w/6 7/8" bit Reamed 3-50' w/4 1/2" bit. Installed 2-20' sections of 2" PVC pipe; 1-7.2' section of 2" PVC and 1-5' screen.
														1		
														2		
														3		
														4		
														55		
														6		
														7		
														8		
														9		
														60		

P-STI-D

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

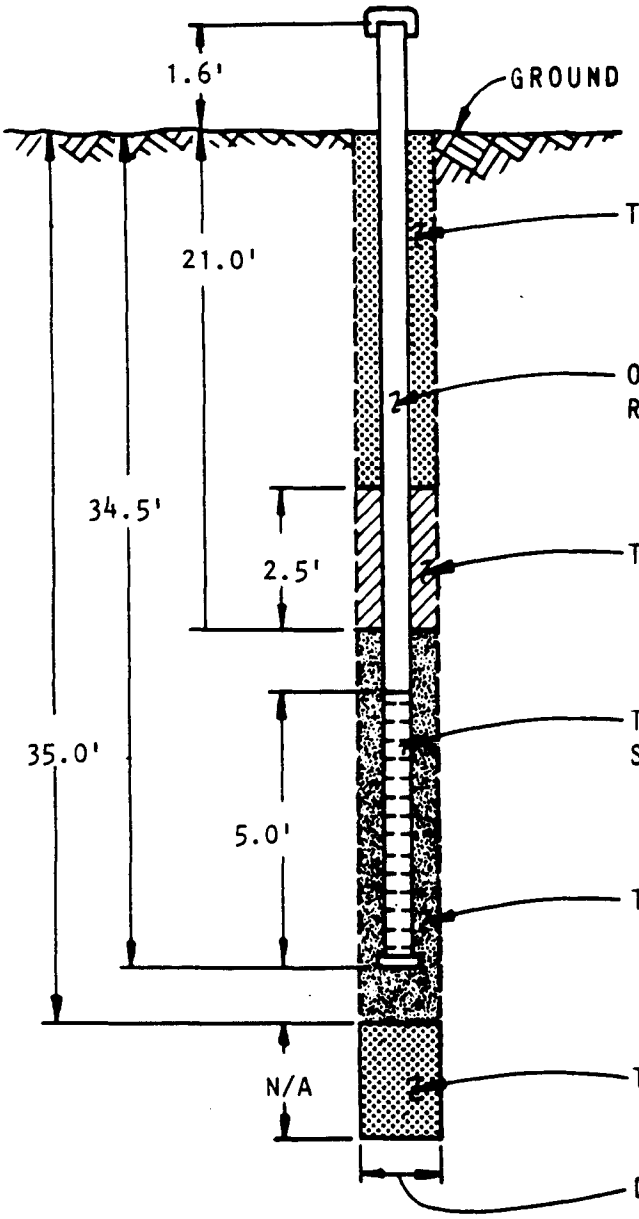
PIEZOMETER NO. B-15

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N378200 E3342496	261.5'	2-23-88

STRATUM MONITORED	INSPECTOR
Sandstone	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh



Volclay grout and Initiator
Cement-Bentonite

2" PVC-glued joints
Schedule 40

Bentonite
1/2" Tablets

.01" Slots

Pea gravel

N/A

4 1/2"

METHOD OF INSTALLATION: Boring drilled to completion; set riser pipe and screen; placed filter and seal; grouted to surface; poured surface pad.

REMARKS: Flushed cuttings from hole; hole remained fluid filled during installation. Developed well on 2-27-88 by flushing well with clean water for 6 min. blew out water from well with air compressor water level recorded at 23'-10" from TOC

P-ST-021B

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-15
SHEET 1 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N378200 E3342496	261.5'	35.0'	2-23-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Open pasture	K. M. Blevins-McCosh	2-23-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
														1		Undifferentiated overburden	Advanced hole using 4 1/2" rotary wash
TW	1					1.2								2		Silty CLAY; brown; medium dense; stiff to hard; low plasticity; moist; some sand	
														3		Grading to more silt at 3'-3.5'	
TW	2					0.8								4			
														5			
TW	3					0.5								6		Sandy CLAY; tan to brown; hard; low plasticity; moist; trace silt	
														7			pp. 4+
TW	4					0.8								8			
														9			Tried to push TW Tried SPT - cored at 10' so reamed w/rotary wash looked at cuttings
									10'					10		Clayey SAND; tan to brown; poorly graded; fine grained; some silt; iron staining	
3"	1	2						1		0	0	0	0	1		SANDSTONE; argillaceous; yellowish-tan; fine to medium grained; iron staining; highly weathered	
			12'											2			Sample recovery below 12' in 1-3" sections
3"	2	2	1.3	0	65	0		2						3			
			14'											4		Argillaceous grading out below 14'	
3"	3	2	1.2	0	60	0		3						15			
			16'											6			
3"	4	2	0	0	0	0		4						7		Grading grey below 16'	
			18'											8			Missed sample at 18-20' rotary washed. Continued drilling with 3" diameter 5' core barrel below 20'.
3"	5	2	0	0	0	0		5						9			
			20'											20		Iron staining on joints below 20'	
														1			
														2		Lignite partings starting at 21.7'	
3"	6	5	4.5	0.33	90	7		6						3			
														4		Grading greenish-grey below 23' and slightly argillaceous	
			25'											25			
3"	7	5	4	0.83	80	12		7						6			
														7			
														8		Lignite partings grading out below 27.5'	
														9			
			30'											30			

P-STO-

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-15
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N378200 E3342496	261.5'	35.0'	2-23-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Open pasture	K. M. Blevins-McCosh	2-23-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV

CORING						
CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
3"	8	5	30' 2.2	0	44	0
			35'			

DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
1		Horizontal fractures spaced generally from 1-3" apart; numerous lignite partings below 30'	
35			Bottom of boring 35'. Ground water level unknown. Reamed hole using 4 1/2" bit. Flush cuttings out of hole installed 1-20' section and 1-11' section of 2" PVC and 5' section of screen.

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

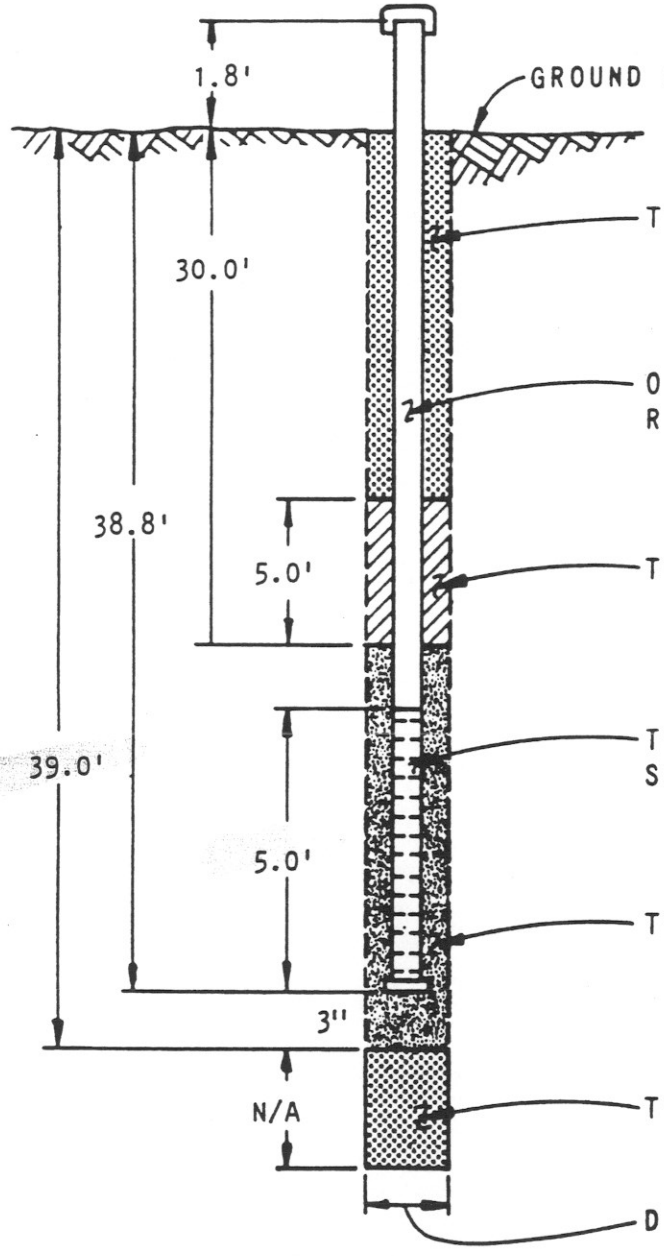
PIEZOMETER NO. B-16

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N379581 E3339416	261.7'	2-25-88

STRATUM MONITORED	INSPECTOR
Sandstone	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	I. J. Almaleh



TYPE OF SEAL	Volclay grout Cement/Bentonite
O.D. & TYPE OF RISER PIPE	4" PVC flush jointed Schedule 40
TYPE OF SEAL	Bentonite Pellets 1/2"
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Slots
TYPE OF FILTER	Pea Gravel
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	7"

METHOD OF INSTALLATION: Boring drilled to completion; set riser pipe and screen; placed filter and seal; grouted to surface; poured surface pad

REMARKS: Cuttings washed from hole; piezometer installed in fluid-filled hole; well developed on 2-27-88 by flushing hole w/clean water for 8 min. and pumping until dry. Water level recorded at 38.2' from TOC.

P-ST-02

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-16
SHEET 1 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N379581 E3339416	261.7'	39.0'	2-25-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in woods	K. M. Blevins-McCosh	2-25-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
TW	1					0.7								1		Silty CLAY; dark brown; medium dense; high plasticity; moist; organics; roots (Top soil)	Boring advanced using 6 7/8" rotary wash
TW	2					1.5								2		CLAY; dark brown; stiff; high plasticity; moist; some silt	
														3			pp. 1.25
TW	3					1.1								4		Trace gravel and iron staining below 4'	pp. 1.5
TW	4					1.8								5			pp. 2.0
TW	5					1.7								6		Silty CLAY; brown; stiff; high plasticity; moist; iron staining; jointed Gypsum seam at 7.5' and 9'; slickensided below 7'	
TW	6					1.8								7			
TW	7					1.5								8		Horizontal and 45° to vertical joints below 10' filled w/gypsum crystals and iron staining	pp. 2.5
TW	8					1.7								9			pp. 2.75
TW	9					1.7								10			
TW	10					1.7								1			
TW	11					1.6								2			
TW	12					1.3								3		Gypsum filled vertical joint at 14'-joint is 4" long; banded brown and dark brown below 14'. Gypsum filled joint spacing generally 8"-1.5'	
TW	13					1.3								4			
TW	14					1.2								15			pp. 2.75 pp. 3.5
	15					0.4								6			
														7			pp. 3.0
														8			
														9		CLAY; olive grey to dark grey; hard; high plasticity; moist; with silt seams on joints below 20'; trace iron staining; trace sand in joints; occasional silty sand pockets below 16'; thinly bedded	
														20			pp. 4+
														1			
														2			pp. 4+
														3			
														4			pp. 4+
														25			pp. 4+
														6			
														7			
														8			
														9		Lignitic below 29' - lignite seams up to 1"	
														30			

PISTO3

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-16
SHEET 2 of 2

CLIENT		PROJECT		PROJECT NO.
Texas Municipal Power Agency		Gibbons Creek SES		14578
PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N379581 E3339416	261.7'	39.0'	2-25-88
SURFACE CONDITIONS		INSPECTOR		DATE FINISH
Clearing in woods		K. M. Blevins-McCosh		2-25-88
CHECKED BY		APPROVED BY		
M. C. Schluter		L. J. Almaleh		

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
3"	1	1	0.2	0	20	0								1	SANDSTONE; argillaceous; greenish-grey; fine grained; weathered	
			31'											2		
TW	16					0.5								3	Clayey SAND; greenish-grey; partially cemented; fine grained; poorly graded; some silt (maybe extremely weathered sandstone)	
														4		
			34'											35		
3"	2	5	4	1.3	80	26								6	SANDSTONE; argillaceous; greenish-grey; fine grained; weathered; w/lignite seams; horizontal and vertical joints - weathering on joints	
														7		
														8		
			39'											9		Bottom of boring at 39'. Groundwater level unknown. Reamed hole w/6 7/8" bit. Installed 3-10' sections 4" PVC and 1-5.8' section 4" PVC; set 1-5' section .01" slot screen.
														40		
														1		
														2		
														3		
														4		
														45		
														6		
														7		
														8		
														9		
														50		
														1		
														2		
														3		
														4		
														55		
														6		
														7		
														8		
														9		
														60		

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

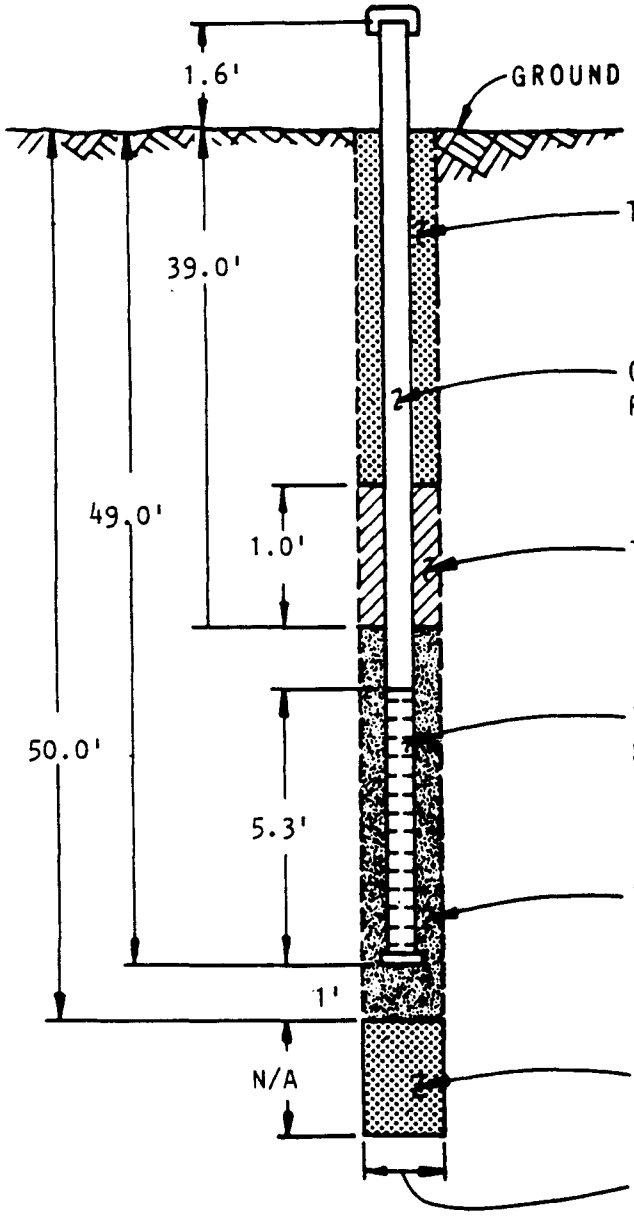
PIEZOMETER NO. B-17

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N381087 E3340991	292.3'	2-17-88

STRATUM MONITORED	INSPECTOR
Clay	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	I. J. Almaleh



TYPE OF SEAL	Volclay grout & Initiator (Cement-Bentonite)
O.D. & TYPE OF RISER PIPE	4" PVC flush-jointed Schedule 40
TYPE OF SEAL	Bentonite Pellets 1/4"
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Slots
TYPE OF FILTER	Pea Gravel
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	7"

METHOD OF INSTALLATION: Boring drilled to completion' set riser pipe and screen; placed filter and seal; grouted to within 5' of ground surface filled remaining 5' with dry grout and cuttings

REMARKS: Developed well on 2-27-88 by flushing w/clean water for 7 min.; pumped well dry; water level recorded at 48.5' from TOC.

P-ST-021B

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-17
SHEET 1 of 2

CLIENT	PROJECT		PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES		14578
PROJECT LOCATION	**COORDINATES**	**ELEVATION (DATUM) / TOTAL DEPTH**	**DATE START**
Carlos, Texas	N381083 E3340991	292.3' / 50.0'	2-17-88
SURFACE CONDITIONS	**INSPECTOR**		**DATE FINISH**
Clearing in pasture	K. M. Blevins-McCosh		2-17-88
CHECKED BY	**APPROVED BY**		
M. C. Schluter	L. J. Almaleh		

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
														1		10" Undifferentiated overburden	Advanced hole by rotary wash
TW	1					1.5								2		Silty CLAY; brown; stiff; med. plasticity; very moist; w/some roots	pp. 1.0
TW	2					1.2								3		Roots grade out below 3' Grading grey below 2.5 with trace sand	
TW	3					1.1								4		1" sand layer at 4.25'	pp. 4+
TW	4					0.9								5			pp. 4+
TW	5					1.2								6			
TW	6					0.9								7		Clayey SILT; brown to tan; hard; poorly graded; moist; with sand; trace lignite below 11'	
TW	7					0.7								8			
TW	8					1.3								9			
TW	9					1.5								10			
TW	10					0.9								1			
TW	11					0.8								2		CLAY; tan; hard; high plasticity; moist with cemented sand stringers; platy in areas with iron staining at plate faces	pp. 4+
TW	12					1.2								3			
TW	13					1.8								4			
TW	14					1.2								15		Grading silty with 2" sandy silt seam at approximately 15.7'	
TW	15					1.4								6			
														7		Clayey SILT; tan to buff; hard; low plasticity; moist; with some sand and iron staining on plates	
														8			
														9		Sandy SILT; tan to buff; poorly graded; moist with some clay; trace iron staining	
														20			
														1		Silty CLAY; brown/tan mottled; hard; high plasticity; moist; with trace sand and iron staining; platy	
														2			
														3		3" sandy silt layer at 22.5'; grading brown below 23	
														4			
														25		CLAY; brown; hard; high plasticity; moist; iron staining on plates and joints; gypsum crystals at 25.8'	
														6			pp. 4+
														7		Clayey SILT; brown; high plasticity; moist; iron staining	
														8			
														9		CLAY; greenish-grey; high plasticity; hard; moist; with trace silt; trace iron	
														30			

P-STD

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-17
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N381083 E3340991	292.3'	50.0'	2-17-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in pasture	K. M. Blevins-McCosh	2-17-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
TW	16					2.0								1			
														2			
TW	17					1.8								3			
														4			
TW	18					1.8								35		Grading to trace silt below 35'	
														6			
TW	19					1.7								7			
														8		Grading to laminated banded (greenish-grey and grey) below 38' with trace lignite at 39.8';	
TW	20					1.9								9			
														40			
TW	21					1.9								1			
														2			
TW	22					1.8								3			
														4		Banding grading out below 44'	
TW	23					2.0								45			
														6			pp. 4+
TW	24					1.8								7		Banded below 47'	
														8			
TW	25					1.6								9			
														50			Bottom of boring at 50'. Groundwater level unknown. Hole reamed using 6 1/2" diameter auger bit.
														1			
														2			
														3			
														4			Set 4-10' and 1-4.6' section of 4" diameter schedule 40 threaded flush-jointed PVC pipe, 5' screen.
														55			
														6			
														7			
														8			
														9			
														60			

P I S E 3 6 D

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

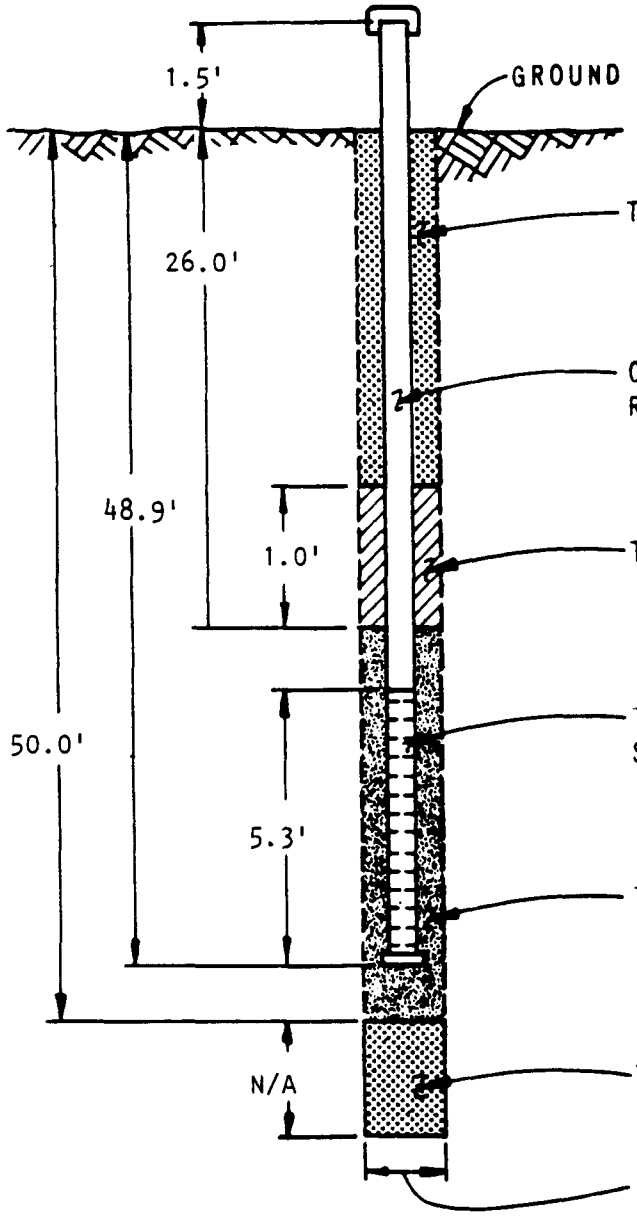
PIEZOMETER NO. B-18

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N381539 E3342922	269.1'	2-18-88

STRATUM MONITORED	INSPECTOR
Clay	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh



TYPE OF SEAL	Volclay Grout & Initiator (Cement-Bentonite)
O.D. & TYPE OF RISER PIPE	4" PVC flush-jointed Schedule 40
TYPE OF SEAL	Bentonite Pellets
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Slots
TYPE OF FILTER	Pea Gravel
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	7"

METHOD OF INSTALLATION: Boring drilled to completion; set riser pipe and screen; placed filter and seal; grouted to surface; poured surface pad.

REMARKS: Riser pipe started to rise so had to fill with water during installations; well developed on 2-27-88 by flushing w/clean water for 7 min., and then pumping well dry. Water level 50' from TOC.

P-ST-021B

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-18
SHEET 1 of 2

CLIENT		PROJECT		PROJECT NO.
Texas Municipal Power Agency		Gibbons Creek SES		14578
PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N381539 E3342922	269.1	50.0'	2-17-88
SURFACE CONDITIONS		INSPECTOR		DATE FINISH
Clearing in pasture		K. M. Blevins-McCosh		2-17-88
CHECKED BY		APPROVED BY		
M. C. Schluter		L. J. Almaleh		

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
														1		Undifferentiated overburden	Boring advanced using 4 1/2" rotary wash
														2			
TW	1					0.6								3		Sandy SILT; tan; poorly graded; moist; with cemented sand stringers; some clay; iron staining	
														4			
TW	2					1.5								5		Clayey SILT; reddish-brown; hard; high plasticity; moist; trace sand; iron staining; grading some sand below 7'	
														6			
TW	3					1.3								7			pp. 4+
														8			
TW	4					1.7								9		Sandy SILT; reddish-brown; poorly graded; moist; with clay and iron staining; grading to silty clay; interbedding with lignitic clay below 10'; few gypsum crystals	
														10			
TW	5					1.3								1			
														2			
TW	6					1.5								3		Silty CLAY; dark brown to black; hard; highly plastic; moist; lignitic; iron staining; with trace sand below 16'	
														4			pp. 4+
TW	7					0.9								15			
														6			
TW	8					0.9								7			pp. 4+
														8		Silty SAND; tan; poorly graded; moist; trace clay; iron staining	
TW	9					0.7								9			pp. 4+
														20		Clayey SILT; greenish-grey; highly plastic; moist; with trace thin silty sand laminae; trace iron staining	
TW	10					1.4								1			
														2			
TW	11					1.8								3			
														4			
TW	12					0.8								25		Sandy SILT; greenish-grey; poorly graded; moist; with trace to some clay	
														6			
TW	13					1.2								7		Silty CLAY; greenish-grey; high plasticity; moist; with some sandy silt layers	
														8			
TW	14					1.3								9			
														30			

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-18
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N381539 E3342922	269.1	50.0'	2-17-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in pasture	K. M. Blevins-McCosh	2-17-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
TW	15						TW	15					1.4	1			
TW	16						TW	16					1.4	2		2" sandy silt seam at 32.5'; grading to low plasticity; sandy silt filled fractures spacing about 4" in sample	
TW	17						TW	17					1.5	3			
TW	18						TW	18					0.9	4		Grading to interbedded green and greenish grey silty clay below 34'; trace cemented sand	
TW	19						TW	19					2.0	35			
TW	20						TW	20					2.1	6			
TW	21						TW	21					2.0	7		2" sandy silt seam at 37.8' Grading greenish-grey below 38'	
TW	22						TW	22					1.7	8			
TW	23						TW	23					1.9	9			
TW	24						TW	24					1.6	40		Grading to high plasticity below 40'; sandy silt seam grading out; becoming greenish grey and grey banded clay	
														1			
														2			
														3			
														4			
														45		Slickensides at 44.5'	
														6			
														7			
														8			
														9			
														50			Bottom of boring at 50'. Groundwater level unknown. Reamed hole twice using 6 3/4" auger bit. Installed 4-10' and 1-5.5' section of 4" PVC, 1-5' section of screen.
														1			
														2			
														3			
														4			
														55			
														6			
														7			
														8			
														9			
														60			

RESPONSE ITEM NO. 32 ATTACHMENT A

HYDROGEOLOGICAL SITE CROSS SECTIONS

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HDR
Firm Registration No. F-754

17111 Preston Road, Suite 300
Dallas, Texas 75248-1229
972.960.4400

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER D. VOGT, P.E.

PROJECT NUMBER 10290148

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER

10/5/2023

Gibbons Creek Steam Electric Plant
GCSES Environmental Redevelopment Group

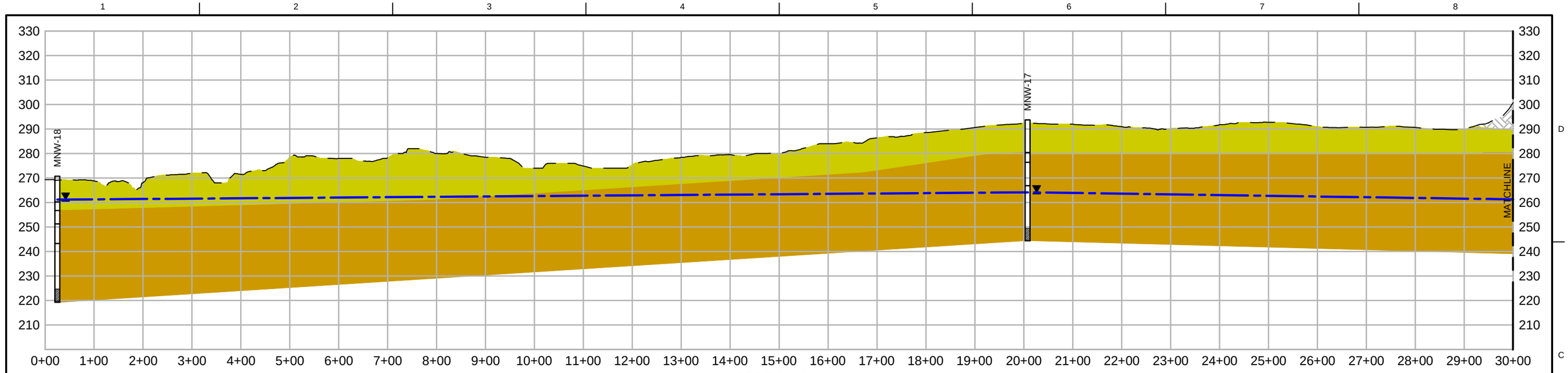
HYDROGEOLOGICAL SECTION PLAN
Anderson, Texas

SITE PLAN

0 1" 2"

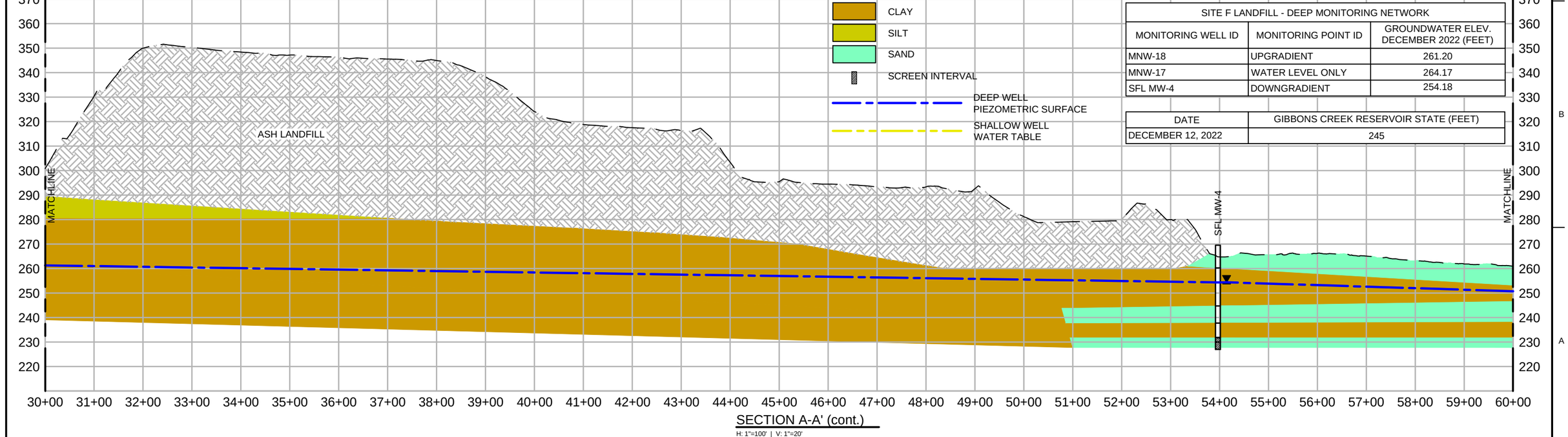
FILENAME 00G-01.dwg
SCALE 1"=500'

SHEET
Figure 2



SECTION A-A'

H: 1"=100' | V: 1"=20'



SECTION A-A' (cont.)

H: 1"=100' | V: 1"=20'

STRATA LEGEND

- CLAY
- SILT
- SAND
- SCREEN INTERVAL
- DEEP WELL PIEZOMETRIC SURFACE
- SHALLOW WELL WATER TABLE

NOTES

1. SOIL AND GEOLOGIC DESCRIPTIONS ARE BASED ON VISUAL OBSERVATIONS MADE BY FIELD PERSONNEL. THE STRATIFICATION LINES REPRESENT THE APPROXIMATE TRANSITION BETWEEN DIFFERING SOIL TYPES AND/OR ROCK TYPES. IN-SITU TRANSITIONS MAY BE GRADUAL.
2. GROUNDWATER ELEVATIONS CALCULATED FROM MEASUREMENTS CONDUCTED ON DECEMBER 12 AND 13, 2022.

SITE F LANDFILL - DEEP MONITORING NETWORK		
MONITORING WELL ID	MONITORING POINT ID	GROUNDWATER ELEV. DECEMBER 2022 (FEET)
MNW-18	UPGRADIENT	261.20
MNW-17	WATER LEVEL ONLY	264.17
SFL MW-4	DOWNGRADIENT	254.18

DATE	GIBBONS CREEK RESERVOIR STATE (FEET)
DECEMBER 12, 2022	245

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HDR
Firm Registration No. F-754

17111 Preston Road, Suite 300
Dallas, Texas 75248-1229
972.960.4400

ISSUE	DATE	DESCRIPTION
0	4/19/2024	ISSUED FOR PERMITTING

PROJECT MANAGER D. VOGT, P.E.

PROJECT NUMBER 10290148

4/19/2024

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER

Gibbons Creek Steam Electric Plant
GCSES Environmental Redevelopment Group

HYDROGEOLOGICAL SECTION PLAN
Anderson, Texas

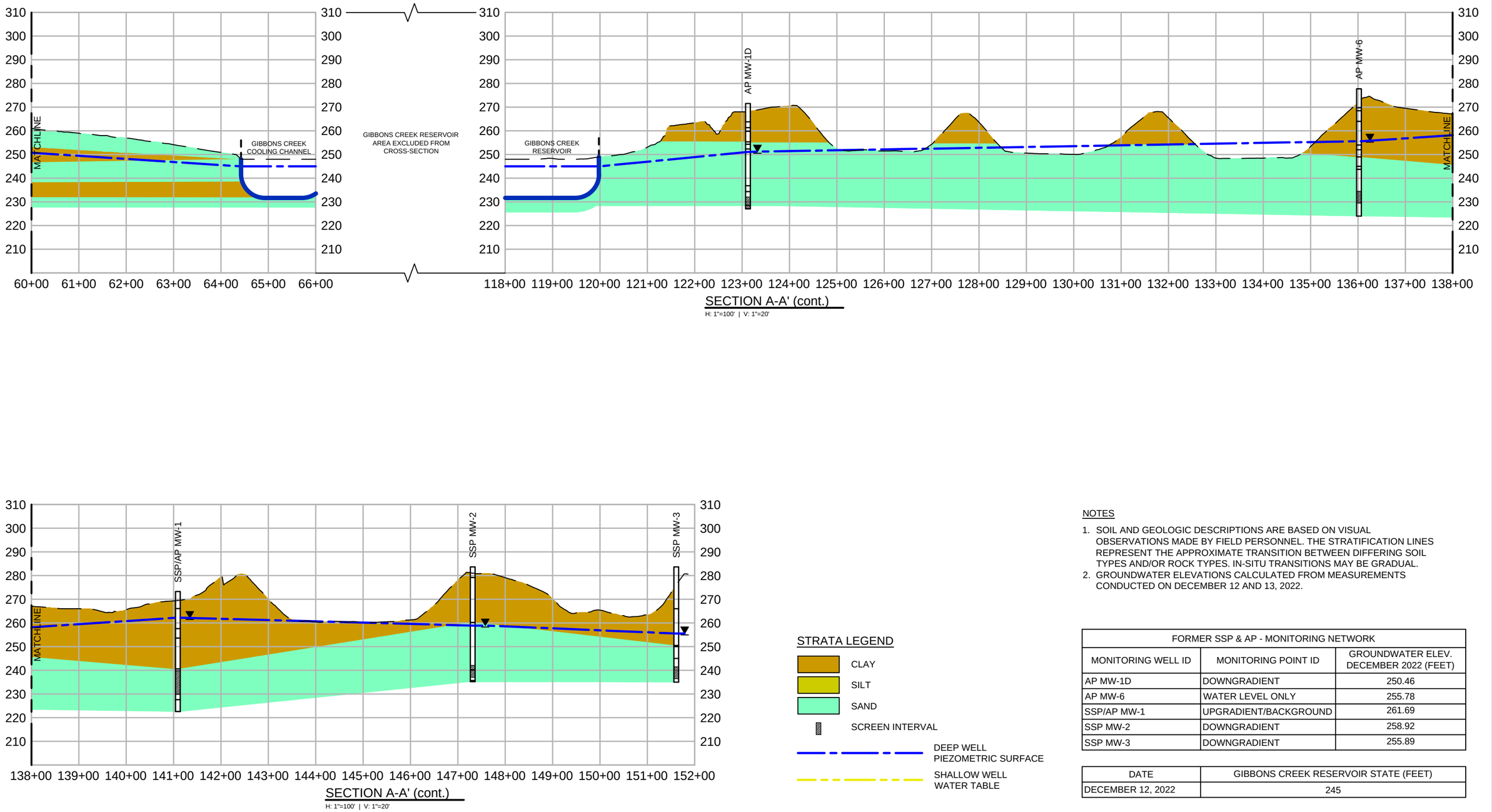
HYDROGEOLOGICAL CROSS SECTION A-A'

0 1" 2"

FILENAME 00G-03.dwg

SCALE 1"=200'

SHEET **Figure 3**



SECTION A-A' (cont.)

H: 1"=100' | V: 1"=20'

STRATA LEGEND

- CLAY
- SILT
- SAND
- SCREEN INTERVAL
- DEEP WELL PIEZOMETRIC SURFACE
- SHALLOW WELL WATER TABLE

NOTES

1. SOIL AND GEOLOGIC DESCRIPTIONS ARE BASED ON VISUAL OBSERVATIONS MADE BY FIELD PERSONNEL. THE STRATIFICATION LINES REPRESENT THE APPROXIMATE TRANSITION BETWEEN DIFFERING SOIL TYPES AND/OR ROCK TYPES. IN-SITU TRANSITIONS MAY BE GRADUAL.
2. GROUNDWATER ELEVATIONS CALCULATED FROM MEASUREMENTS CONDUCTED ON DECEMBER 12 AND 13, 2022.

FORMER SSP & AP - MONITORING NETWORK		
MONITORING WELL ID	MONITORING POINT ID	GROUNDWATER ELEV. DECEMBER 2022 (FEET)
AP MW-1D	DOWNGRADIENT	250.46
AP MW-6	WATER LEVEL ONLY	255.78
SSP/AP MW-1	UPGRADIENT/BACKGROUND	261.69
SSP MW-2	DOWNGRADIENT	258.92
SSP MW-3	DOWNGRADIENT	255.89

DATE	GIBBONS CREEK RESERVOIR STATE (FEET)
DECEMBER 12, 2022	245

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Firm Registration No. F-754

17111 Preston Road, Suite 300
Dallas, Texas 75248-1229
972.960.4400

ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER D. VOGT, P.E.

PROJECT NUMBER 10290148

4/19/2024

STATE OF TEXAS · DAVID C. VOGT · 93905 · LICENSED · PROFESSIONAL ENGINEER

Gibbons Creek Steam Electric Plant
GCSES Environmental Redevelopment Group

HYDROGEOLOGICAL SECTION PLAN
Anderson, Texas

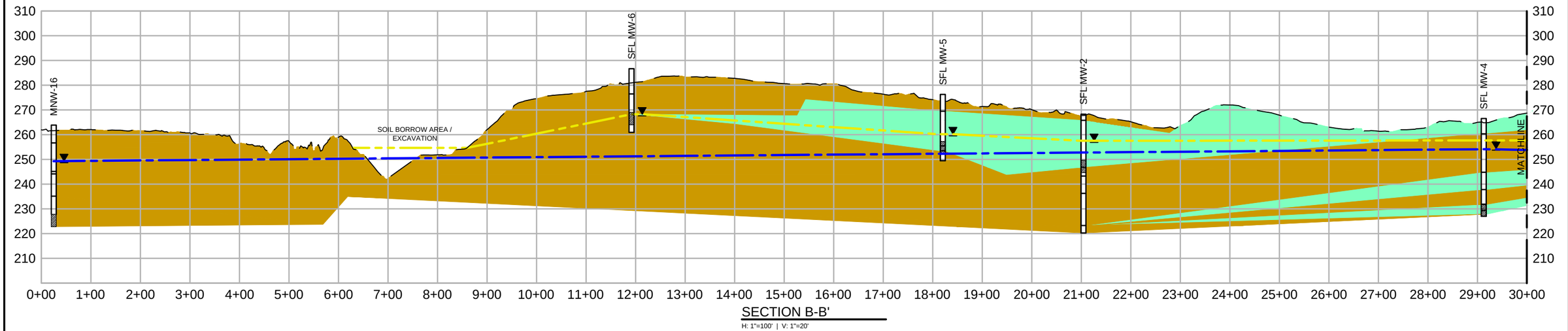
HYDROGEOLOGICAL CROSS SECTION A-A'

0 1" 2"

FILENAME 00G-03.dwg

SCALE 1"=200'

SHEET **Figure 4**



SECTION B-B'

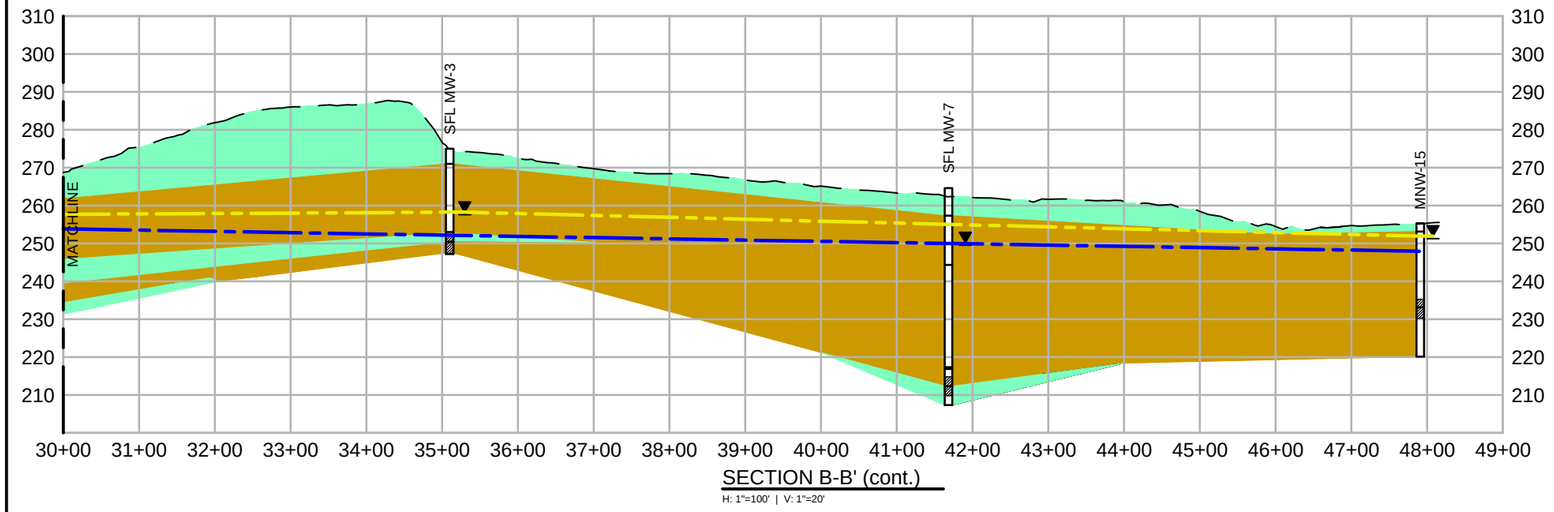
H: 1"=100' | V: 1"=20'

NOTES

1. SOIL AND GEOLOGIC DESCRIPTIONS ARE BASED ON VISUAL OBSERVATIONS MADE BY FIELD PERSONNEL. THE STRATIFICATION LINES REPRESENT THE APPROXIMATE TRANSITION BETWEEN DIFFERING SOIL TYPES AND/OR ROCK TYPES. IN-SITU TRANSITIONS MAY BE GRADUAL.
2. GROUNDWATER ELEVATIONS CALCULATED FROM MEASUREMENTS CONDUCTED ON DECEMBER 12 AND 13, 2022.

STRATA LEGEND

- CLAY
- SILT
- SAND
- SCREEN INTERVAL
- DEEP WELL PIEZOMETRIC SURFACE
- SHALLOW WELL WATER TABLE



SECTION B-B' (cont.)

H: 1"=100' | V: 1"=20'

SITE F LANDFILL - DEEP MONITORING NETWORK		
MONITORING WELL ID	MONITORING POINT ID	GROUNDWATER ELEV. DECEMBER 2022 (FEET)
MNW-16	WATER LEVEL ONLY	248.31
SFL MW-4	DOWNGRADIENT	254.18
SFL MW-7	DOWNGRADIENT	250.22

SITE F LANDFILL - SHALLOW MONITORING NETWORK		
MONITORING WELL ID	MONITORING POINT ID	GROUNDWATER ELEV. DECEMBER 2022 (FEET)
SFL MW-6	UPGRADIENT	268.29
SFL MW-5	DOWNGRADIENT	260.11
SFL MW-2	DOWNGRADIENT	257.27
SFL MW-3	DOWNGRADIENT	257.81
MNW-15	DOWNGRADIENT	251.47

DATE	GIBBONS CREEK RESERVOIR STATE (FEET)
DECEMBER 12, 2022	245

HDR
Firm Registration No. F-754

17111 Preston Road, Suite 300
Dallas, Texas 75248-1229
972.960.4400

ISSUE	DATE	DESCRIPTION
0	4/19/2024	ISSUED FOR PERMITTING

PROJECT MANAGER D. VOGT, P.E.

PROJECT NUMBER 10290148

4/19/2024

STATE OF TEXAS · DAVID C. VOGT · 93905 · LICENSED · PROFESSIONAL ENGINEER

Gibbons Creek Steam Electric Plant
GCSES Environmental Redevelopment Group

HYDROGEOLOGICAL SECTION PLAN
Anderson, Texas

HYDROGEOLOGICAL CROSS SECTION B-B'

0 1" 2"

FILENAME 00G-04.dwg

SCALE 1"=200'

SHEET **Figure 5**

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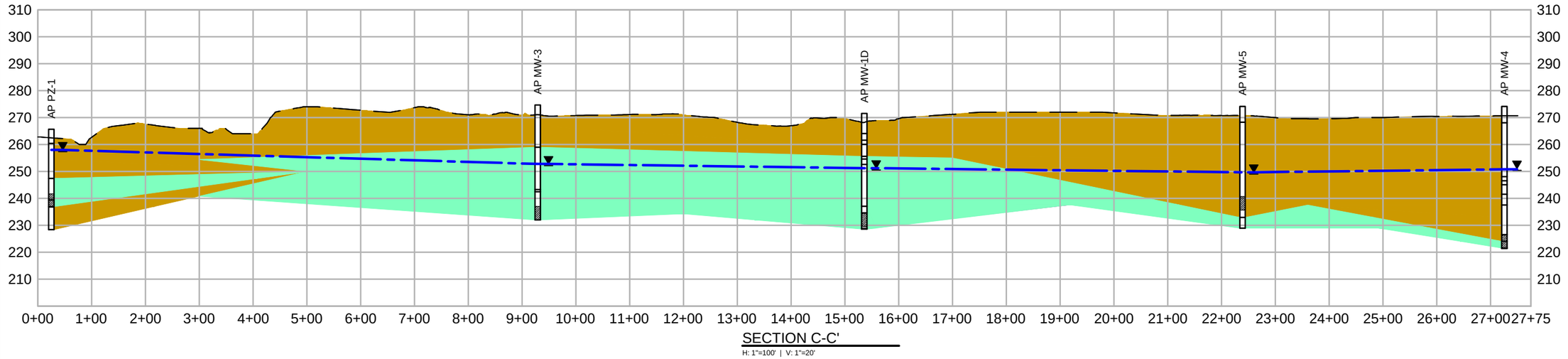

SECTION C-C'

H: 1"=100' | V: 1"=20'

STRATA LEGEND

- CLAY
- SILT
- SAND
- SCREEN INTERVAL
- DEEP WELL PIEZOMETRIC SURFACE
- SHALLOW WELL WATER TABLE

NOTES

1. SOIL AND GEOLOGIC DESCRIPTIONS ARE BASED ON VISUAL OBSERVATIONS MADE BY FIELD PERSONNEL. THE STRATIFICATION LINES REPRESENT THE APPROXIMATE TRANSITION BETWEEN DIFFERING SOIL TYPES AND/OR ROCK TYPES. IN-SITU TRANSITIONS MAY BE GRADUAL.
2. GROUNDWATER ELEVATIONS CALCULATED FROM MEASUREMENTS CONDUCTED ON DECEMBER 12 AND 13, 2022.

FORMER SSP & AP - MONITORING NETWORK		
MONITORING WELL ID	MONITORING POINT ID	GROUNDWATER ELEV. DECEMBER 2022 (FEET)
AP PZ-1	WATER LEVEL ONLY	258.01
AP MW-3	DOWNGRADIENT	253.13
AP MW-1D	DOWNGRADIENT	250.46
AP MW-5	DOWNGRADIENT	249.71
AP MW-4	DOWNGRADIENT	251.10

DATE	GIBBONS CREEK RESERVOIR STATE (FEET)
DECEMBER 12, 2022	245

HDR
Firm Registration No. F-754

17111 Preston Road, Suite 300
Dallas, Texas 75248-1229
972.960.4400

ISSUE	DATE	DESCRIPTION
0	4/19/2024	ISSUED FOR PERMITTING

PROJECT MANAGER D. VOGT, P.E.

PROJECT NUMBER 10290148

4/19/2024

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER

Gibbons Creek Steam Electric Plant
GCSES Environmental Redevelopment Group

HYDROGEOLOGICAL SECTION PLAN
Anderson, Texas

HYDROGEOLOGICAL CROSS SECTION C-C'

0 1" 2"

FILENAME 00G-05.dwg

SCALE 1"=200'

SHEET **Figure 6**

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RESPONSE ITEM NO. 32 ATTACHMENT D

GROUNDWATER MONITORING PLAN

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Gibbons Creek Steam Electric Station

Groundwater Monitoring Plan

Gibbons Creek Environmental Redevelopment Group, LLC

Grimes County, Anderson, Texas

April 19, 2024

HDR Engineering, Inc.
Texas Firm Registration No. F-754

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CONTENTS

List of Tables

List of Figures

List of Appendices

Professional Engineer Certificate

"I hereby certify that the groundwater monitoring plan described in this report for the CCR landfill known as the Site F Landfill CCR Unit, the CCR surface impoundment known as the Ash Ponds CCR Unit and the Scrubber Sludge Pond CCR Unit at the Gibbons Creek Steam Electric Station, owned by the Gibbons Creek Environmental Redevelopment Group, LLC., has been designed and constructed to meet the requirements of the Coal Combustion Residual Rule 40 CFR 257.91. I am a duly licensed Professional Engineer under the laws of the State of Texas."

Print Name: David C. Vogt

Signature:

Date: 4/19/2024

License #: 93905

My license renewal date is March 31, 2025.

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1 INTRODUCTION

Groundwater monitoring will be conducted at the active coal combustion residual landfill and ponds at the Gibbons Creek Steam Electric Station (GCSES) to comply with the requirements of the Coal Combustion Residuals (CCR) regulations found in 40 CFR parts 257 and 261 and 30 TAC 352. This groundwater monitoring plan includes procedures to be used to collect samples to comply with these regulations.

1.1 Monitoring Objectives

The groundwater monitoring objectives are as follows:

- Collect representative groundwater samples from both the uppermost and confined aquifer at the following designated CCR units (Figure 1.1)
  - Site F Landfill
  - Ash Ponds
  - Scrubber Sludge Pond
- Measure groundwater levels in the uppermost aquifer
- Measure groundwater piezometric levels in the confined aquifer
- Determine groundwater flow rate and direction in the confined aquifer
- Determine background groundwater quality for both shallow and confined aquifer
- Evaluate whether any Appendix III of Part 257 constituents had a statistically significant increase over groundwater background levels at the CCR unit monitoring wells

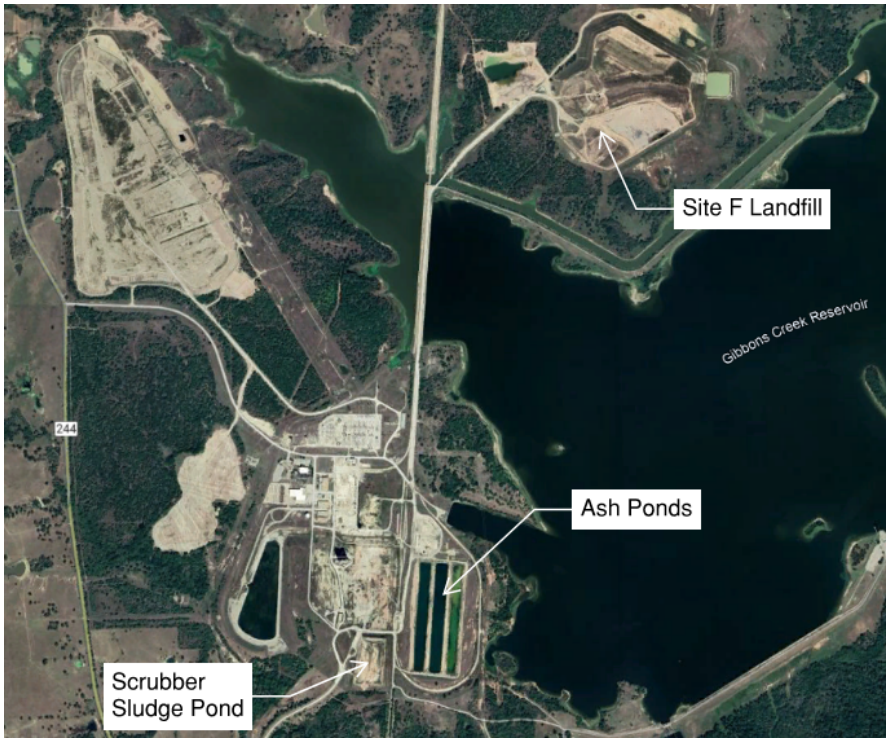

Figure 1.1: Gibbons Creek CCR Units

2 GCSES HYDROGEOLOGIC SETTING

Geologically, the GCSES is located on an outcrop of the middle member of the Wellborn Formation of the Jackson-Yegua Group of the Tertiary-aged System. The Wellborn Formation is described as fine to very fine quartz sand interbedded with brown, lignitic clay and lignite, with abundant fossil wood and imprints of marine megafossils. Moving south of the GCSES Site, the Manning Formation overlies the Wellborn Formation. The Manning Formation is a lignite-bearing formation which is described as a fine to medium-grained, lignitic, quartz sand, interbedded with sandy, lignitic clay, and lignite, with abundant fossil wood. The Manning Formation has well developed lignite seams. The Gibbons Creek Lignite Mine was located in the Manning Formation located approximately two miles south of GCSES. Quaternary-aged alluvium and terrace deposits are present in the Brazos River, Navasota River, and Gibbons Creek valleys [Horbaczewski, 2011].

The geological formation of the GCSES area is based on the cyclothem model in which the sea transgressed over land and then regressed. Sedimentary rock was stacked over time in a pattern that was indicative of the presence and absence of the sea. This depositional process is described in more detail in the Field Guidebook Minesoil and Acid Seep Workshop document for the Gibbons Creek Lignite Mine [Horbaczewski, 2011]. The GCSES area is located in the Texas Coastal Plain region which was developed by this depositional process.

Lignite mining has been conducted in eastern and east-central Texas along the lignite belt depositional area. This lignite belt follows the Tertiary-aged coastal region.

Borings conducted at the site indicate a subsurface stratigraphy consisting of stratified, heterogeneous layers of clays, silts, and sands. The clay and silt intervals consisted of high plasticity material. Silty sand intervals generally consisted of fine, poorly graded sands with occasional high plasticity clay and silt lenses. Occasional sandstone layers were detected in select borings across the Site. Lignite and lignitic clay seams have been identified in soil borings at the Site. Bedrock material is sandstone [ERM, 2005]. Boring logs for monitoring wells included in the Site's groundwater monitoring network are provided in the Alternative Source Demonstration dated October 6, 2023

The topography of the GCSES and locations of the CCR units are generally flat with surface elevation decreasing from north to south and southwest. Surface water drainage is generally to the south and southwest. Gibbons Creek Reservoir is located immediately adjacent to the GCSES and CCR units on the east and south sides. The reservoir was established as a cooling pond for the GCSES. Impoundment of Gibbons Creek Reservoir began in spring 1981. Discharge from the reservoir feeds into Gibbons Creek which is a tributary of the Navasota River which is a tributary of the Brazos River.

The uppermost groundwater at GCSES CCR units ranges from approximately 220 to 250 feet above mean sea level (amsl). The uppermost groundwater aquifer at the Site is considered confined to semi-confined due to the stratified nature of the sedimentary sediments and influences of weathering and erosion. General groundwater flow direction at the Site is from the northwest to southeast. The groundwater flow generally follows topography with the flow towards the Gibbons Creek Reservoir and the Gibbons Creek valley.

3 GROUNDWATER MONITORING NETWORK

Groundwater monitoring networks have been established at the three CCR units at the GCSES; the Site F Landfill – Shallow, Site F Landfill - Deep, and Ash Ponds & Scrubber Sludge The monitoring networks are shown in **Figures 3.1, 3.2** and **3.3**. Construction details for the monitoring wells that comprise the networks are summarized in **Table 3-1**. Borehole and well construction logs are provided in **Appendix A**.

3.1 Site F Landfill monitoring well network

3.1.1 GCSES Area Hydrogeologic Setting

Based on an analysis of historical groundwater data from groundwater monitoring wells at the Site F Landfill, HDR determined that there were two distinct groundwater units (shallow and deep) in the uppermost aquifer (HDR, 2023).

For the deeper monitoring network, groundwater generally flows south to southwest. For the shallow monitoring network, groundwater generally flows south to southeast (See **Figures 3.4 & 3.5**).

3.1.2 Monitoring Well Locations and Designated Use

The Site F Landfill monitoring well network is shown on **Figures 3.1 & 3.2** and consists of wells installed by Amec Foster Wheeler in 2016 and 2017, and wells installed by Black and Veatch in 1988.

The shallow Site F Landfill monitoring network consists of the following wells:

- Background Well: SFL MW-6
- Compliance Wells: SFL-MW-2, SFL MW-3, SFL MW-5 and MNW-15

The deep Site F Landfill monitoring network consists of the following wells:

- Background Well: MNW-18
- Compliance Wells: SFL MW-4, SFL MW-7 and MNW-11
- Water Level Only Wells: MNW-16 and MNW-17

3.2 Scrubber Sludge Pond/Ash Ponds Monitoring Well Network

3.2.1 Hydrogeologic Setting

The Ash Ponds and Scrubber Sludge Pond are underlain by interbedded silty and sandy clays, clay, clayey sands and silty sand. Hard sandstone intervals are intermittently present, as are thin lenses of lignite or lignitic silts. Groundwater is considered confined to semi-confined, and generally encountered at depths of 30 to 40 feet below ground surface. The elevation of monitoring well screened intervals ranges from approximately 240 ft amsl to 220 ft amsl.

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Table 3-1: Monitoring Well Construction Details

Well ID	Northing[1]	Easting[1]	Land Surface Elevation (ft. amsl)	Measuring Point Elevation (ft. amsl)	Total Well Depth (ft. below TOC)	Total Well Depth (ft. bgs)	Total Borehole Depth (ft. bgs)	Total Depth (elevation)	Screen Interval (ft. bgs)		Screen Interval (elevation)	
									Top	Bottom	Top	Bottom
AP MW-1D	10213589.808	3635630.942	269.02	272.04	43.0	40.0	40.0	229.0	34.5	39.5	234.5	229.5
AP MW-3	10213665.476	3635026.590	271.46	274.68	43.4	40.2	40.0	231.3	34.5	39.5	237.0	232.0
AP MW-4	10212415.597	3635562.990	270.93	274.16	52.8	49.6	50.0	221.4	44.5	49.5	226.4	221.4
AP MW-5	10212901.968	3635577.940	271.16	274.13	43.1	40.1	40.0	231.0	30.5	35.5	240.7	235.7
AP MW-6	10212689.394	3634726.766	274.74	277.95	48.1	44.9	50.0	229.9	41.0	46.0	233.7	228.7
AP PZ-1[2]	10214173.721	3634278.958	262.70	265.67	29.4	26.4	35.0	236.3	21.0	26.0	241.7	236.7
AP PZ-2[2]	10214308.029	3634847.514	271.71	274.91	43.2	40.0	40.0	231.7	34.5	39.5	237.2	232.2
AP PZ-3[2]	10213822.938	3635414.358	255.76	259.11	43.1	39.7	40.0	216.0	34.5	39.5	221.3	216.3
AP PZ-4[2]	10211826.931	3634752.131	271.39	273.65	45.3	43.0	45.0	228.4	38.5	43.5	232.9	227.9
SSP MW-2	10212007.735	3633835.274	280.62	283.66	46.9	43.9	45.0	236.8	38.5	43.5	242.1	237.1
SSP MW-3	10211581.588	3633889.744	280.95	283.97	48.2	45.2	45.0	235.8	39.5	44.5	241.5	236.5
SSP MW-4	10211577.225	3634198.516	280.86	283.86	51.5	48.5	50.0	232.3	43.0	48.0	237.9	232.9
SSP/AP MW-1	10212432.016	3634290.363	269.33	272.53	43.2	40.0	40.0	229.3	29.5	39.5	239.8	229.8
SFL MW-2	10220908.018	3636738.712	265.69	268.31	23.6	21.0	50.0	244.7	16.0	21.0	249.7	244.7
SFL MW-3	10220174.555	3637846.961	271.65	275.00	28.2	24.9	25.0	246.8	19.5	24.5	252.2	247.2
SFL MW-4	10220291.840	3637261.610	266.46	269.53	42.7	39.6	40.0	226.8	34.5	39.5	232.0	227.0
SFL MW-5	10221191.234	3636721.834	273.33	276.25	24.3	21.4	25.0	251.9	16.0	21.0	257.3	252.3
SFL MW-6	10221819.634	3636700.033	283.49	286.66	23.1	19.9	20.0	263.6	14.5	19.5	269.0	264.0
SFL MW-7	10220517.925	3638408.836	264.83	264.63	58.1	58.3	55.0	206.5	50.0	55.0	214.8	209.8
MNW-11	10220909.018	3635624.897	268.12	267.95	47.3	47.5	48.0	220.7	42.5	47.5	225.7	220.7
MNW-15	10220778.128	3638974.095	257.536	257.331	27.0	27.2	27.7	230.3	22.2	27.2	235.3	230.3
MNW-16[2]	10222188.729	3635593.380	263.333	263.191	40.4	40.5	41.0	222.8	35.5	40.5	227.8	222.8
MNW-17[2]	10223663.517	3637468.447	293.864	293.724	50.2	50.4	50.9	243.5	45.4	50.4	248.5	243.5
MNW-18	10224118.439	3639397.902	270.912	270.755	51.0	51.2	51.7	219.7	46.2	51.2	224.7	219.7

[1]Datum - NAD 1983 (Conus)

[2]Water levels only, not used in groundwater quality monitoring

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Groundwater investigations by others (ERM, 2013, 2014) indicated that groundwater flow directions are controlled by the local topography and a groundwater divide exists between the Ash Ponds and the Scrubber Sludge Pond. Groundwater level monitoring completed by Amec Foster Wheeler using an expanded monitoring network confirms the presence of the groundwater divide and flow direction to the east beneath the Ash Ponds. Groundwater flows to the southwest beneath the Scrubber Sludge Pond. The background groundwater quality monitoring well is located on the groundwater divide and provides background data for both networks.

3.2.2 Monitoring Well Locations and Designated Use

The Ash Ponds and Scrubber Sludge Pond monitoring well networks are shown on **Figure 3.3** and consist of both monitoring wells and piezometers. The piezometers are used for water level data collection only; groundwater quality samples are only collected from monitoring wells.

The monitoring well network includes:

Background Well: SSP/AP MW-1 (used as background for both Ash Ponds and Scrubber Sludge Pond networks)

Scrubber Sludge Pond Boundary Wells: SSP MW-2, SSP MW-3, SSP MW-4

Ash Ponds Boundary Wells: AP MW-1D, AP MW-3, AP MW-4, AP MW-5

Ash Ponds Piezometers: AP MW-1, AP MW-2, AP MW-6, AP PZ-1, AP PZ-2, AP PZ-3, AP PZ-4

3.3 Monitoring Frequency

The CCR regulations require the collection and analysis of a minimum of eight independent samples from each background and downgradient well for the constituents listed in Appendix III and IV of Part 257 by no later than October 17, 2017. In order to meet this requirement, monitoring was conducted at a bimonthly schedule. Groundwater monitoring events occurred in June 2016, August 2016, October 2016, December 2016, February 2017, April 2017, June 2017, and August 2017. Additional groundwater monitoring events were scheduled, as wells were added to the monitoring network.

Semi-annual monitoring frequency for *detection monitoring* was implemented after October 2017. The CCR rules allow for reducing the monitoring frequency to annually, based on the availability of groundwater. If annual monitoring is justified by the site-specific conditions, the sampling frequency will be adjusted.

3.4 Analytical Parameters

As noted above, eight independent groundwater samples were collected prior to October 17, 2017, and analyzed for the Appendix III and IV constituents designated in Part 257, which are listed in **Table 3-2**.

Table 3-2. Constituents for Detection and Assessment Monitoring under the CCR Rule

Constituent	MCL (mg/L)	Analytical Method	Reporting Limit
Appendix III to Part 257 - Constituents for Detection Monitoring			
Boron	--	E200.7	0.05
Calcium	--	E200.7	1
Chloride	--	E300.0	1
Fluoride	4	A4500-F C	0.1
Sulfate	--	E300.0	1
pH (std)	--	A4500-H B	0.1
Total Dissolved Solids	--	A2540 C	40
Appendix IV to Part 257 - Constituents for Assessment Monitoring			
Antimony	0.006	E200.7	0.05
Arsenic	0.01	E200.8	0.01
Barium	2	E200.7	0.01
Beryllium	0.004	E200.7	0.001
Cadmium	0.005	E200.7	0.01
Chromium (Total)	0.1	E200.7	0.01
Cobalt	--	E200.7	0.02
Fluoride	4		0.1
Lead	0.015	E200.8	0.01
Lithium	--	E200.7	
Mercury	0.002	E245.1	0.001
Molybdenum	--	E200.7	0.05
Radium 226		E903.0	
Radium 228		RA-05	
Radium 226 and 228 combined	5 pCi/L	A7500-RA	
Selenium	0.05	E200.8	0.01
Thallium	0.002	E200.8	0.01

Semi-annual *detection monitoring* started after October 2017 and groundwater samples were analyzed for Appendix III constituents only. Starting in 2019, the site went into *assessment monitoring* after some Appendix III constituents had concentrations exceeding the groundwater protection standard (GWPS). In April 2019, an Alternate Source Demonstration (ASD) was completed by Wood Environment & Infrastructure Solutions, Inc. (Wood) on behalf of the Texas Municipal Power Agency (TMPA), the previous owner of GCSES. The ASD accounted for select constituents of concern exceeding the GWPS at a statistically significant level (SSL).

During *assessment monitoring*, groundwater samples are semi-annually analyzed for all constituents in Appendix III and IV. After two consecutive sampling events that demonstrate all constituents to be at or below background values, the Site monitoring program may return to *detection monitoring*.

4 FIELD SAMPLING PROCEDURES

The groundwater monitoring program involves collecting groundwater level measurements from the designated wells and piezometers and collecting groundwater samples from the designated wells. This section presents the specific procedures for performing these activities, including:

- groundwater monitoring locations,
- field measurement procedures and criteria,
- sampling methods,
- quality control sample protocols,
- sample container requirements,
- sample preservation methods,
- decontamination procedures, and
- documentation of sampling activities.

This section is intended to be a field manual, and provides field personnel with easy-to-use procedures and methods for consistently collecting quality, representative groundwater samples and measurements. Field personnel must understand and use these field sampling procedures (FSPs) during groundwater sampling events, consistently follow the specified procedures and protocols, and clearly document deviations from the FSPs, along with reasons for deviations.

Monitoring wells are listed in **Table 3-1** along with their respective construction details. Borehole and well construction logs are provided in **Appendix A**. **Appendix B** contains field form templates for each monitoring event.

4.1 Groundwater Level Monitoring

Groundwater level measurements are collected from all monitoring wells and piezometers at the beginning of each monitoring event, and prior to sampling. Groundwater levels are measured to the nearest 0.01 foot, from their respective well reference points (i.e., the top of the inner casing).

Groundwater level measurements are compared to the most recent measurements obtained for that well or piezometer. If the measurements differ by more than 0.5-foot, a second groundwater level measurement is collected for verification purposes.

Groundwater levels are measured using a decontaminated water level indicator. If multiple meters are used, the calibration of each meter is checked for accuracy. The following procedures are followed each time water levels are measured in a monitoring well:

1. Turn on water level meter. Depending on the condition of the water level meter, the sensitivity may have to be adjusted by turning the power switch dial to the desired sensitivity level. Typically, the water level meter works best adjusted to a low sensitivity.
2. Press the appropriate button to test the meter.
3. Clean the meter and/or confirm that the meter has been properly decontaminated.
4. Open/unlock well head.
5. Don a new pair of nitrile gloves.
6. Water level readings are measured relative to the surveyed mark on the top of the well's inner casing. If a mark is not present, measure from the northernmost top of well casing.
7. Lower the water level meter probe into the well. When the buzzer sounds and/or the light turns on, stop the probe's descent. Gently raise the probe until the buzzing stops. Gently lower the probe until the buzzing starts again and stop. The cable should be immediately next to the measuring mark from now until the final reading is measured. If the buzzer stays on, or is very weak, adjust the sensitivity.
8. Without changing the hold on the cable, raise the probe out of the water and retest the measurement.
9. Keep adjusting the hand location until two identical readings are noted. Identical readings will be the same to 0.01 of a foot.
10. If the numbers on the cable can be observed, read the measurement at the mark to the nearest 0.01 foot.
11. If the numbers on the cable cannot be observed, place fingers around the cable at the location where the buzzer sounds relative to the reference point, pull the cable out without moving your hand with respect to its location on the cable, and record the reading.
12. If the two readings are within 0.01 foot, record the depth to water reading on the appropriate form.
13. Remove the probe from the well. Take note where the cable becomes wet. The cable and probe below this point needs to be decontaminated.
14. Decontaminate the probe and two feet (or the appropriate length if more than two feet immersed in water column) of cable by immersing in an Alconox® solution followed by immersing in tap water and deionized water rinses, respectively.
15. Spool the remaining cable.
16. Secure the probe in the holder.

17. Turn off water level meter.
18. Commence sample collection procedures or close and lock the well.

4.2 Groundwater Quality Monitoring

Groundwater quality monitoring includes field and laboratory analyses. Only meters that were calibrated at the beginning of the work day are used to measure field water quality parameters, which include temperature, pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, and specific conductance (SC). Field water quality parameters are measured in a flow-through cell at regular intervals (typically every five minutes) during the low-flow process.

Samples analyzed by the contract laboratories are collected in new sample containers that are provided by the laboratory.

4.2.1 Groundwater Sample Collection Procedures

The goal of groundwater sampling is to collect samples that are representative of in-situ groundwater conditions and to minimize changes in groundwater chemistry that would adversely affect analyte concentrations during sample collection and handling. To achieve this goal, groundwater samples are collected from the monitoring wells using U.S. Environmental Protection Agency's (EPA's) *Low Stress (low-flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells* guidance (EQASOP-GW4), and summarized below.

Beginning with upgradient wells first and progressing sequentially through wells with the lowest to highest contaminant concentrations, groundwater conditions are stabilized and samples collected in a consistent manner for each well. A submersible bladder pump or peristaltic pump is used to purge and collect groundwater samples from well.

The following procedures will be used when groundwater from monitoring wells, using the low-flow, minimal drawdown method:

1. Arrive at well location and start to fill out Well Sampling Record. Fill out: Date, Time, Well ID, and Sampler.
2. Put on new nitrile gloves.
3. Using a decontaminated water level meter, measure and record the depth to water from the measuring point to an accuracy of 0.01 foot. The measuring point is marked on the top of the inner casing.
4. If using a submersible pump, decontaminate the pump and connect the sacrificial tubing to the submersible pump.
5. Lower the submersible pump to the sampling depth. If using a peristaltic pump, feed the sacrificial tubing down to the sampling depth, then connect the tubing to the peristaltic pump.
6. Verify that the pump controller is at the lowest setting and start the pump.
7. Adjust the setting on the pump controller to the point where water is produced from the well.

8. Measure and record the pumping rate in milliliters per minute (ml/min) by collecting the discharged water in a beaker or graduated cylinder. Adjust the controller setting as needed so that the flow rate is between 100 and 500 ml/min.
9. Once maximum discharge rate is achieved without lowering water level more than 0.3 feet, record the final purge settings on the Well Sampling Record for use in future sampling events. The purge time starts when the settings are adjusted.
10. Collect purge water into five-gallon plastic containers as needed.
11. Connect the discharge line to the flow-through cell.
12. After the flow-through cell is connected and air bubbles evacuated to the extent possible, water quality parameters (pH, DO, ORP, SC, temperature, and turbidity) and depth to water (DTW) are measured and recorded at approximate five-minute intervals. The relative percent difference (RPD) and delta calculations are conducted and recorded between the readings.
13. When the well has been purged for 60 minutes or field water quality readings have stabilized, the well is ready to be sampled. The field parameters are considered stable when three consecutive field measurements meet the criteria listed in **Table 4-1**. If the well has been purged for 60 minutes and the field parameters have not stabilized, it is noted on the sampling log, and samples are collected from the well.
14. Collect a groundwater sample following the sample collection procedures in Section 4.2.3.
15. Stop the pump. Disconnect the pump from the controller.
16. Place the sample bottles into a plastic bag and into a cooler with ice.
17. Disconnect the tubing from the submersible/peristaltic pump and dispose of the sacrificial tubing.
18. Decontaminate the water level meter and submersible pump (if used) following the procedures indicated in **Section 4.8**.
19. Pack up the equipment and mobilize to the next well.
20. The purge and decontamination waters can be discharged to the ground near the well or Ash Ponds or Scrubber Sludge Pond.

The submersible pump (if used) and sacrificial tubing are positioned at the same depth (approximately halfway through the screened interval) in each well for each sampling event. The purge rates for each well typically are similar during successive sampling events. The purge rate for the low-flow method wells initially can be set to the rate used in previous events and adjusted as needed based on current groundwater conditions.

4.2.2 Field Parameter Measurements and Stabilization

Field water quality data are recorded during well purging to determine when groundwater conditions in the well have stabilized, and representative formation water is being sampled. As stated above, field parameters are measured in a flow-through cell at regular intervals (typically every three to five minutes) during the low-flow purging process, and purging continues until the field parameters have stabilized based on the criteria summarized in **Table 4-1**, or until the maximum purge volume/time is met.

Table 4-1. Field Parameter Stabilization Criteria for Monitor Well Purging and Sampling

Parameter	Low-Flow Method
pH	+/- 0.1 S.U.
Conductivity	+/- 3%
Temperature	+/- 3%
Dissolved Oxygen	+/- 10% or +/- 0.1 mg/l if <2.0
ORP	+/- 10% or +/- 10 mV if < 100
Turbidity	<10 NTU or +/- 10%
Drawdown	<0.3’
Pumping rate	100-500 ml/min
Volume	No Criteria
Time	Maximum of 60 min

Notes:

- All percentages are relative percent difference.
- The stabilization criteria are also listed on the well sampling forms in **Appendix B**.

4.2.3 Sample Collection

When the stabilization criteria are met, a groundwater sample is collected. Groundwater samples are collected from the pump discharge line directly into laboratory-supplied containers appropriate for the specific analysis being conducted. Specific procedures for collecting groundwater samples include the following:

1. Fill out the sample bottle labels using a pen with black waterproof ink. Place the preservative provided by the lab in the appropriate bottle(s).
2. Don new nitrile gloves.
3. Disconnect the pump’s discharge line from the flow-through cell.
4. Fill the sample bottles being careful not to overfill bottles with preservative.
5. Stop the pump.
6. Place the bottles into a cooler with ice.

Other general procedures that are followed during sampling include:

- Avoid rinsing the sample bottles before filling.
- Collect water sample from the pump’s discharge line directly into laboratory-supplied containers appropriate for the specific analysis being conducted.
- Open only one sample container at a time. Immediately replace the container’s cap and make sure the label is completed before starting to fill the next bottle.

- Minimize the potential for contamination to sample containers and equipment by sampling up wind and/or removing contaminants before opening containers. Common contaminants may include dust or other particulate matter.
- Immediately put the cap on each bottle after filling it.
- Place filled sample bottle into an iced cooler (except for radiochemical analysis) and enter sample information onto the appropriate chain of custody (COC) forms.

4.2.4 Sample Containers, Preservation, and Holding Times

Table 3-2 lists the number of sample bottles, the laboratory analyte(s), the type and size of the sample containers, the preservatives, and holding times. All samples are collected into new bottles supplied by the laboratory. If preservatives are added into the sample containers by the laboratory, that information is clearly marked on the container.

Table 4-2 Sample Parameter Groups, Container Sizes, Preservation Methods, Holding Times

Qty.(1)	Analyte(s)	Type-Size	Preservative	Method	Holding Time
1	Appendix III Constituents(2)	Polyethylene-1 L	None	No filter	28 days
	TDS(2)				7 days
1	Appendix III & IV Metals(3)	Polyethylene-250 ml (alternate - 16 oz.)	Nitric Acid to pH < 2	No filter	28 days for mercury, 6 months for others
1	Appendix IV Radium 226 and 228	Polyethylene-2L (alternate - 0.5 gal.)	Hydrochloric Acid to pH < 2	No filter	28 days

Notes:

(1) Number of sample bottles filled for analyte(s).

(2) pH, total dissolved solids (TDS), boron, cadmium, chloride, sulfate, fluoride,

(3) Antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, lead, lithium, mercury, molybdenum, selenium, thallium.

"L"=liter "ml"=milliliters

4.3 Documentation of Field Activities

All field activities, including daily activities, sample locations and identification numbers, and significant observations or events, are documented by field staff on the appropriate forms. Specific forms for water level monitoring, equipment calibration, and groundwater sampling are included in **Appendix B**. The data are intended to record events in sufficient detail to allow personnel, at a later date, to reconstruct events that transpired during the life of the project. Entries are written in black indelible ink to allow preservation of information. The general documentation requirements are summarized as follows:

1. Entries will be legible.
2. Entries will be written in indelible black ink.
3. Mistakes will be corrected by drawing a single line though the error. Corrections will be initialed. No entries will be obliterated for any reason.
4. The tops of pages will be numbered sequentially and dated. The sampler will initial and date the bottom of each page and sign the last page for each day.
5. There will be no pages left blank.
6. Opinion or subjective material will not be entered into the logbook.

Each day, the following data are recorded in the logbook:

1. Project name and date.
2. Daily objectives and task progress throughout the day.
3. Weather (temperature, cloudiness, barometric pressure, wind).
4. Water quality and turbidity meters used (type, model).
5. Person calibrating meter(s).
6. Calibration results (buffers used with manufacturer, lot numbers, and expiration dates).
7. Problems calibrating meters.
8. Objective status at the end of the say, and issues encountered.

At each well, the following data is recorded in the logbook:

1. Well name and arrival time.
2. Person(s) sampling.
3. Purging method (low-flow or well volume).
4. QA/QC samples collected and the sample designation.
5. Samples preservation (ice, acid preservative).
6. Equipment decontamination procedures.
7. Decontamination/purge water disposal.
8. Comments (difficulties, questionable data, deviations from this plan, etc.).
9. Problems with field meters.
10. Visitors (name, title, organization).

4.4 Sample Identification, Documentation, and Custody

Collected samples are labeled in water-proof ink with the following information:

- sample name,
- date and time of collection,

- name or initials of person collecting the sample, and
- analyte list.

Similar information is also entered on the COC form, which remains with the respective collected sample through delivery to the analytical laboratory. Samplers maintain proper custody of their respective samples until delivery to the laboratory, or the samples are relinquished to another party. A sample is considered to be under a person's custody if:

- the sample is in the person's physical possession;
- the sample is in view of the person after that person has taken possession of the sample;
- the sample is secured by that person so that no individual can tamper with the sample; or
- the sample is secured by that person in an area that is restricted to authorized personnel.

Completed COC forms are delivered with the samples to the analytical laboratory. Each COC form must match the samples included in the associated cooler. The COC forms include the following information:

- Project name.
- Unique sample identification number.
- Unique COC number.
- Sample collection date and time.
- Sample matrix.
- Number and type of containers submitted.
- Preservation method, if applicable.
- Analyses requested for each sample.
- Special handling or analysis requirements.
- Courier shipment tracking number.
- Dated signature of the person collecting the samples.
- Dated signature(s) of persons, other than the sampler, involved in the delivery of the samples to the laboratory.
- Dated signature of the laboratory acknowledging receipt of the collected samples.

The COC form is filled out and signed in black indelible ink. The COC number and the date and time of delivery to the laboratory are noted in the field logbook. A copy of the COC form is delivered to and retained by the Project Manager.

4.5 Sample Packing and Transport

Once collected, groundwater samples are packed for transport to the analytical laboratory. Care should be taken in packing the groundwater samples so that there is no damage to sample containers during transport to the contract laboratory. Samples will be hand delivered to the contract laboratory or sent to the contract laboratory using an overnight delivery service for next day delivery.

Custody seals will not be required on the coolers if they are turned over directly to laboratory personnel at the time of delivery. Coolers delivered to the laboratory after hours will be placed in the designated receiving storage locker and custody seals placed on the right and left front and back sides across the gap between the lid and the cooler. The storage locker will be locked and the laboratory notified that coolers have been placed in the after-hours storage locker.

4.6 Field Equipment Calibration

Detection instrumentation will be calibrated in accordance with manufacturers' specifications prior to each sampling event. Calibration results will be recorded in the sampling log. Stabilization will be correlated with purge flow rates and time.

4.7 Sample Documentation and Records

Field activities, including daily activities, sample locations and identification numbers, and any significant observations or events, are described in detail on the appropriate forms and/or in a field notebook. The activities and details, complete with time tags, are also written in the bound field logbook. There are individual forms for water level monitoring, equipment calibration, and groundwater sampling. Copies of these forms are included in **Appendix B**. The data are intended to record events in sufficient detail to allow personnel, at a later date, to reconstruct events that transpired during the life of the project. Entries are written in black indelible ink to allow preservation of data. Mistakes are corrected by drawing a single line though the error and the author initialing next to the deleted error. No entries will be obliterated for any reason.

4.8 Equipment Decontamination

Water level monitoring and non-dedicated groundwater sampling equipment that come in contact with groundwater are cleaned prior to use and between sampling locations. The non-dedicated submersible pump is decontaminated by pumping a series of solutions through the pump. The solutions are pumped in the following order: non-phosphate detergent (Alconox®), tap water, and deionized water. The last two feet of the water level meter cable is decontaminated by immersion in a non-phosphate detergent solution followed by immersion in tap water and deionized water rinses, respectively. After decontamination, equipment is stored and/or transported under clean conditions. Typically, equipment is stored in a clean plastic bag until reuse.

4.9 Handling and Disposition of Investigation-Derived Wastes

Due to the low levels of target parameters, purge water can be discharged to the ground in the vicinity of the well.

5 QUALITY ASSURANCE/QUALITY CONTROL

5.1 Standard Operating Procedures

The groundwater sampling procedures in Section 4.0 will be followed when collecting groundwater samples and measuring water levels and field parameters. The use of these standard operating procedures is meant to ensure consistency across multiple sampling events and possibly different personnel.

5.2 Sample Analysis Validation

The type and reliability of methods used to analyze samples is important to ensure data quality. This section describes the collection of Quality Assurance/Quality Control (QA/QC) samples and the data review procedures that will be followed to ensure acceptable data.

5.2.1 Quality Assurance and Quality Control Samples

Samples are collected at regular intervals for QA/QC purposes. These samples include duplicate, field blank, and/or equipment rinse samples. The designations given to QA/QC samples and the associated original samples are documented on the sampling logs and in the logbook.

Duplicate samples are used to compare results from two separate samples taken from the same location at a rate of one duplicate per ten samples (or less). For each duplicate, a second set of bottles is filled following the same procedures as used for the original sample. The duplicate and original sample bottles are filled by alternating the discharge between the bottles after each one-third of the bottle is filled. Duplicate samples are designated by adding the suffix “-FD” to the well name from which the duplicate was collected (e.g., a duplicate sample from SFL MW-3 is designated as SFL MW-3 -FD). Wells selected for duplicate analysis change with each sampling event and are identified on the sampling log.

Field blanks and equipment rinsate blanks are collected during each sampling event. Blank samples are used to evaluate cross-contamination Each blank sample is a full bottle set with a unique sample designation. Field blanks are designated as “FB”, whereas equipment rinse blanks are designated as “EQ”. Each blank is sequentially numbered in the order collected starting with “01”. The sample bottles are filled with deionized (DI) water in the same manner as the original sample. Field blanks are collected at a rate of one blank for every 20 samples (or less). Equipment rinsate blanks are collected when non-dedicated sampling equipment is used, at a rate of one sample per workday. Once sampling equipment has been decontaminated, DI water is pumped through the equipment into the appropriate sample bottles. The well locations from where field and equipment rinse blanks are collected are documented on the Well Sampling Record and the field logbook.

5.2.2 Data Review Procedures

To ensure quality data collection and compliance with CCR data quality regulations, a data review will be conducted for each sampling event. The contract laboratory will complete a review of the data in accordance with its internal laboratory guidelines and the applicable

analytical methods used during sample analysis. Each data package from the laboratory will include a QC summary report.

A data usability review will be completed for each sampling event. A Data Usability Summary (DUS) will be prepared in accordance with TCEQ RG-366/TRRP-13. The DUS procedures were developed by the TCEQ for use in its Texas Risk Reduction Program but provide a common, known methodology for evaluating data usability. A DUS report will be prepared and included in the project file.

6 REFERENCES

Amec Foster Wheeler Environment & Infrastructure, Inc. (AFWEI). 2017. *Groundwater Monitoring Plan: Gibbons Creek Steam Electric Station, Grimes County, Texas*. October 16.

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ERM. 2005. *Phase IIn and IIp: Ground Water Monitor Well and Soil Boring Documentation*: *Texas Municipal Power Agency Gibbons Creek Steam Electric Station*. August 11.

Horbaczewski, J.K. 2011. *Field Guidebook Minesoil and Acid Seep Workshop*. February 2.

HDR. 2023. *Alternative Source Demonstration: Gibbons Creek Steam Electric Station*. September 2023.

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Figure 3-1

Site F Landfill CCR Unit

Shallow Groundwater Monitoring Network

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N

500 0 500 1000

SCALE IN FEET

LEGEND:

MONITORING WELL

WASTE BOUNDARY

NOTES:

1. * - WELLS ARE WATER LEVEL ONLY

STATE OF TEXAS
DAVID C. VOGT
93905
LICENSED
PROFESSIONAL ENGINEER
1/29/2024

GIBBONS CREEK STEAM ELECTRIC STATION
GCSES ENVIRONMENTAL REDEVELOPMENT GROUP
SITE F LANDFILL - SHALLOW NETWORK

CCR GROUNDWATER MONITORING SYSTEM

DATE
JANUARY 2024

FIGURE
FIGURE 3.1

C:\pwworking\central01\d3820433\Figure 1 - SITE F LANDFILL MONITORING NETWORK.dwg, SHALLOW, 1/18/2024 3:34:54 PM, WNICHOLSON

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Figure 3-2

Site F Landfill CCR Unit

Deep Groundwater Monitoring Network

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N

500 0 500 1000

SCALE IN FEET

LEGEND:

MONITORING WELL

WASTE BOUNDARY

NOTES:

1. * - WELLS ARE WATER LEVEL ONLY

STATE OF TEXAS
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1/29/2024

GIBBONS CREEK STEAM ELECTRIC STATION
GCSES ENVIRONMENTAL REDEVELOPMENT GROUP
SITE F LANDFILL - DEEP NETWORK

CCR GROUNDWATER MONITORING SYSTEM

DATE
JANUARY 2024

FIGURE
FIGURE 3.2

C:\pwworking\central01\d3820433\Figure 1 - SITE F LANDFILL MONITORING NETWORK.dwg, SHALLOW, 1/18/2024 3:37:01 PM, WNICHOLSON

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Figure 3-3

Scrubber Sludge Pond & Ash Ponds Groundwater Monitoring Network

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N

400 0 400 800

SCALE IN FEET

LEGEND:

MONITORING WELL

POND BOUNDARIES

NOTES:

1. * - WELLS ARE WATER LEVEL ONLY

STATE OF TEXAS
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GIBBONS CREEK STEAM ELECTRIC STATION
GCSES ENVIRONMENTAL REDEVELOPMENT GROUP
SCRUBBER SLUDGE/ASH PONDS MONITORING NETWORK

CCR GROUNDWATER MONITORING SYSTEM

DATE
JANUARY 2024

FIGURE
FIGURE 3.3

C:\pwworking\central01\d3820433\Figure 2 - ASH POND_SCRUBBER SLUDGE MONITORING NETWORK.dwg, Layout1, 1/18/2024 3:15:21 PM, WNICHOLSON

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Figure 3.4

Site F Landfill

Shallow Network
Groundwater Flow

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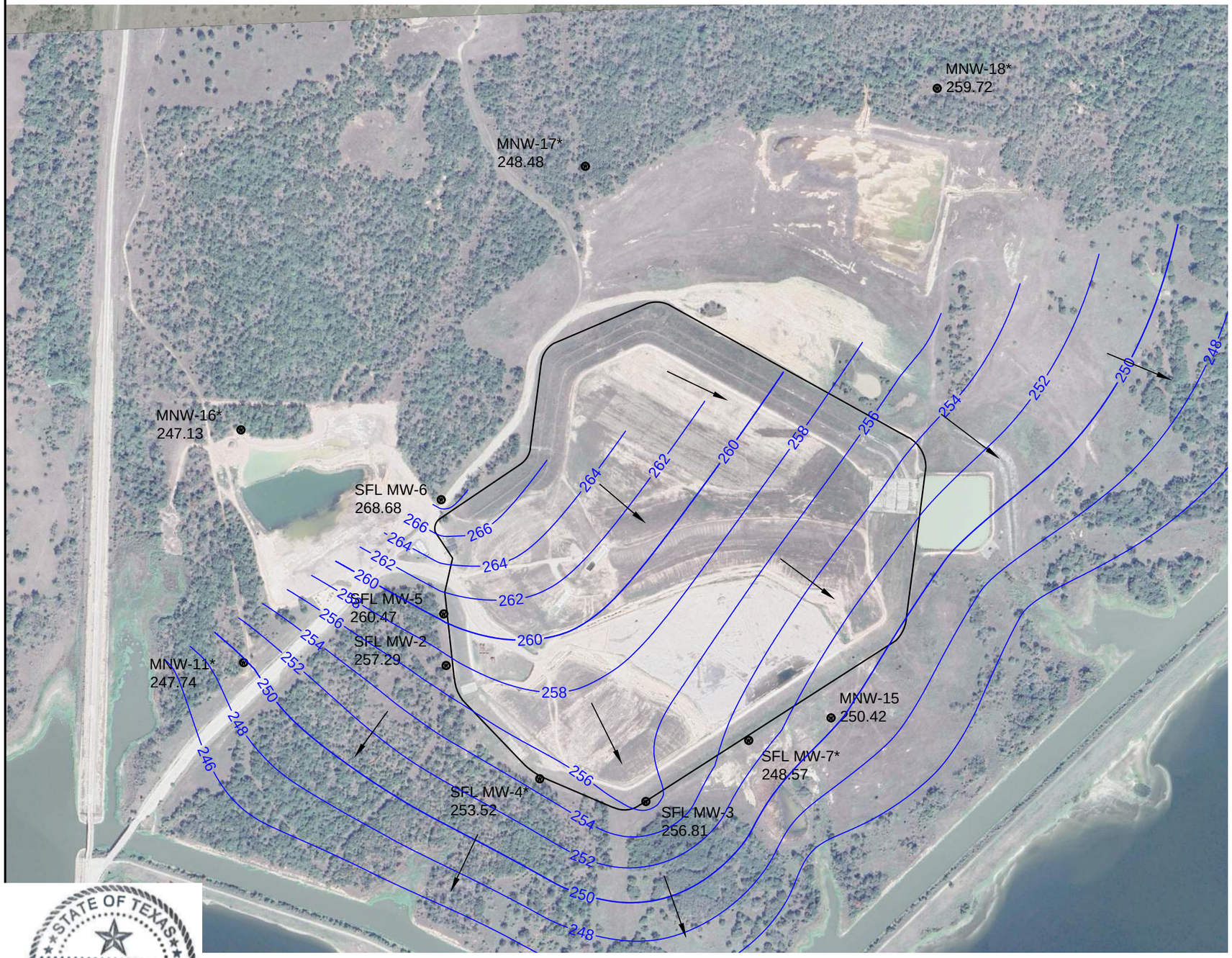

N

600 0 600 1200

SCALE IN FEET

LEGEND:

- MONITORING WELL
- WASTE BOUNDARY
- GROUNDWATER CONTOUR
- INFERRED GROUNDWATER CONTOUR
- FLOW DIRECTION

NOTES:

1. ALL ELEVATIONS RECORDED AS ABOVE MEAN SEA LEVEL.
2. " * " DENOTES STATIC WATER LEVEL WAS NOT UTILIZED IN GENERATION OF GROUNDWATER CONTOUR MAP DUE TO WELLS SCREENED BELOW CONFINING LAYER.
3. WELLS USED FOR GENERATION OF CONTOURS ARE SCREENED ABOVE THE CONFINING LAYER. WELLS UTILIZED ARE:
   - SFL MW-2
   - SFL MW-3
   - SFL MW-5
   - SFL MW-6
   - MNW-15
4. GROUNDWATER CONTOURS ARE DEVELOPED IN CONJUNCTION WITH SURFACE WATER ELEVATIONS OF THE GIBBONS CREEK RESERVOIR. DATA OBTAINED FROM WATER DATA FOR TEXAS.ORG. SURFACE WATER ELEVATION = 243 FEET AMSL.

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1/29/2024

GIBBONS CREEK STEAM ELECTRIC STATION
GCSES ENVIRONMENTAL REDEVELOPMENT GROUP
SITE F LANDFILL - NOVEMBER 2023 CONTOUR MAP - SHALLOW

2023 GROUNDWATER MONITORING & CORRECTIVE ACTION REPORT

DATE
JANUARY 2024

FIGURE
FIGURE 3.4

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Figure 3.5

Site F Landfill

Deep Network

Groundwater Flow

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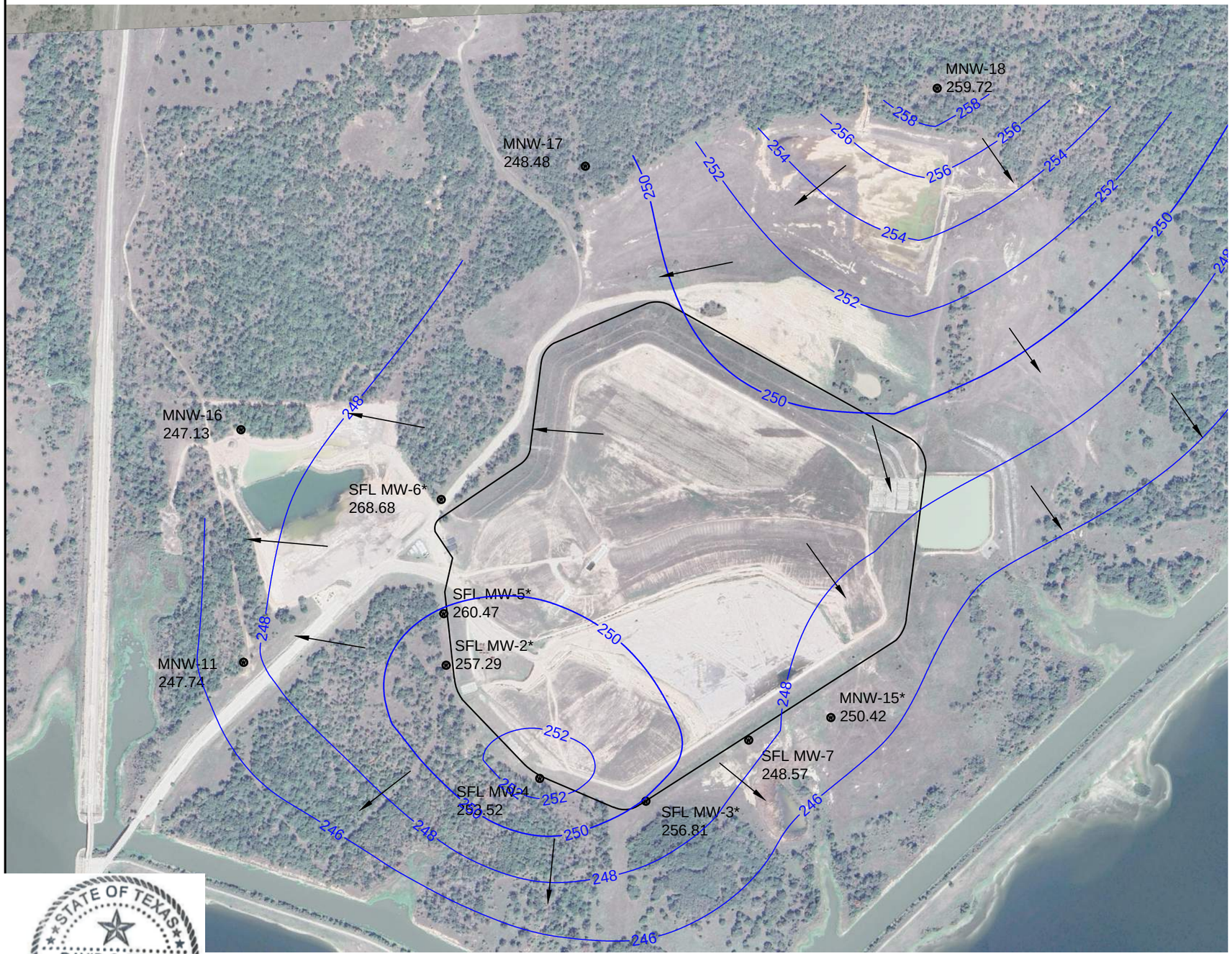

N

600 0 600 1200

SCALE IN FEET

LEGEND:

- MONITORING WELL
- WASTE BOUNDARY
- GROUNDWATER CONTOUR
- INFERRED GROUNDWATER CONTOUR
- FLOW DIRECTION

NOTES:

1. ALL ELEVATIONS RECORDED AS ABOVE MEAN SEA LEVEL.
2. " * " DENOTES STATIC WATER LEVEL WAS NOT UTILIZED IN GENERATION OF GROUNDWATER CONTOUR MAP DUE TO WELLS SCREENED ABOVE CONFINING LAYER.
3. WELLS USED FOR GENERATION OF CONTOURS ARE SCREENED BELOW THE CONFINING LAYER. WELLS UTILIZED ARE:
   - SFL MW-4
   - SFL MW-7
   - MNW-11
   - MNW-16
   - MNW-17
   - MWN-18
4. GROUNDWATER CONTOURS ARE DEVELOPED IN CONJUNCTION WITH SURFACE WATER ELEVATIONS OF THE GIBBONS CREEK RESERVOIR. DATA OBTAINED FROM WATER DATA FOR TEXAS.ORG. SURFACE WATER ELEVATION = 243 FEET AMSL.

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GIBBONS CREEK STEAM ELECTRIC STATION
GCSES ENVIRONMENTAL REDEVELOPMENT GROUP
SITE F LANDFILL - NOVEMBER 2023 CONTOUR MAP - DEEP

2023 GROUNDWATER MONITORING & CORRECTIVE ACTION REPORT

DATE
JANUARY 2024

FIGURE
FIGURE 3.5

C:\pwworking\central01\d3820433\Figure 1D - SITE F LANDFILL Groundwater Contours_DEEP - NOVEMBER.dwg, Layout1, 1/23/2024 7:52:54 AM, WNICHOLSON

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Appendix A

Monitoring Well Construction Data

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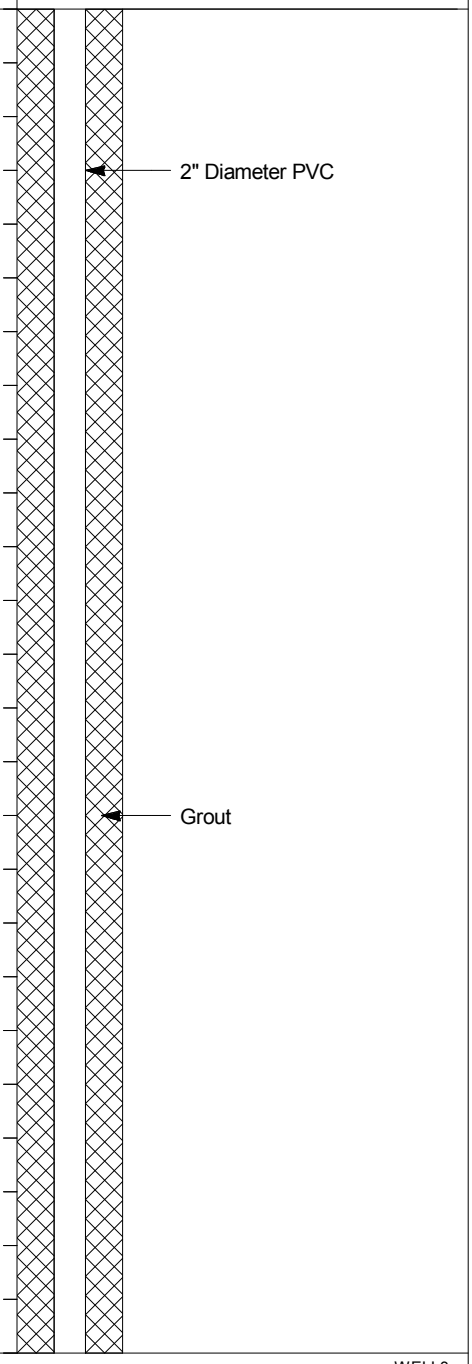
PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP MW-1D**
BORING LOCATION: Northeast Corner of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/24/16 / DATE FINISHED: 5/24/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34.5'-39.5
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 35 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

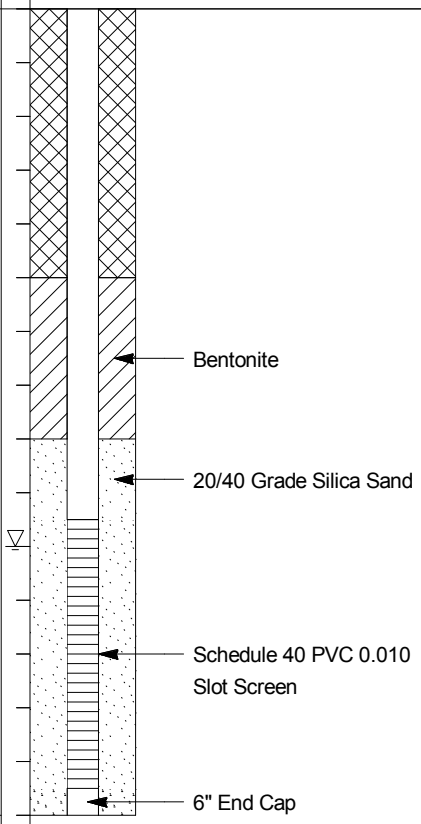
DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Sandy clay fill to 4.5'	
5					Slightly SANDY CLAY (CH): light yellowish-brown, dry, hard, trace calcium carbonate nodules, fine-grained sand to 5' SANDY CLAY (CH): light yellowish-brown, slightly moist, hard, fine-grained sand, trace pebbles	
					Lignite, dark brown, slighly moist, firm 7'-8.5'	
10					SANDY CLAY (CL): light olive brown, moist, very stiff, fine-grained sand, trace of small gravel size nodules, minor ferrous staining SANDY CLAY (CL): light olive brown, brown lenses, dry, fine-grained sand, stiff	
					SILTY SAND (SM): dark gray, very moist	
15					CLAYEY SAND (SC): light olive brown, moist, very stiff, fine-grained sand CLAYEY SAND (SC): light olive brown, moist, firm, fine-grained sand SILTY SAND (SM): light olive brown, wet, loose, fine-grained at 16'	
20					SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand	
25						



WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP MW-1D (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
30					1" hard shaley sand lenses at 25.5' SILTY SAND (SM): light olive brown, wet, loose, fine-grained, one ferrsous stained sand lense at 16' SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand 2" sandstone lense, hard at 31.5'	
35					4" sandstone lense, hard at 33' 3" sandstone lense, ferrous staining, hard, blocky at 34.25' SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand SILTY SAND (SM): light olive brown with very thin lignite lenses 2" hard sandstone layer at 40'	
40					Total Depth = 40'	
45						
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP-MW-3**
BORING LOCATION: Northeast Corner of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/25/16 / DATE FINISHED: 5/25/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34.5'-39.5
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 20 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

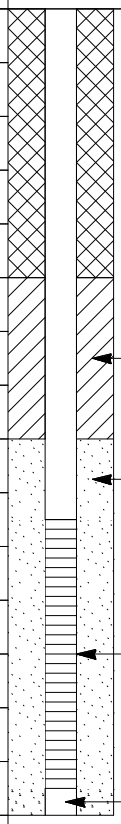
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					SANDY CLAY with gravel (CH): brown, moist, firm, fine-grained sand, few small gravel, (fill)	2" Diameter PVC
5					SANDY CLAY with gravel (CL): brown and reddish-brown, moist, very stiff, fine-grained sand, few small gravel, few clay clasts, 3-4' layers (fill)	
10					SANDY CLAY with gravel (CL): brown mottled, moist, very stiff, fine-grained sand, trace of small gravel (fill)	
					SILTY SAND (SM): light olive brown, moist, firm, fine-grained sand	
15					SILTY SAND (SM): light olive brown, moist, fine-grained sand	Grout
20					SILTY SAND (SM): light olive brown, wet, fine-grained sand	▽
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP-MW-3 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive brown, wet, fine-grained sand	
					- siltsone interbedded with loose sand 27.5'-28.75'	
					Siltstone, light olive gray, dry, hard at 28.75' and 29.5'	
30					SILTY SAND (SM): light olive brown, moist, fine-grained sand SITLY SAND (SM): light olive brown, wet, fine-grained sand	Bentonite
						20/40 Grade Silica Sand
35					SILTY SAND (SM): light olive brown, wet, fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
40					Total Depth = 40'	6" End Cap
45						
50						
55						



WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP MW-4**
BORING LOCATION: East of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 6/1/16 / DATE FINISHED: 6/1/16
DRILLING METHOD: CME 75 HSA	TOTAL DEPTH (ft.): 50.0 / SCREEN INTERVAL (ft.): 44.5'-49.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 48 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation:	
					SANDY CLAY (CL): dark yellowish-brown, brown, moist, stiff, fine-grained sand, sand fill to 3.5'	
					SANDY CLAY (CH): brown, moist, stiff, fine-grained sand	2" Diameter PVC
5					SANDY CLAY (CH): brown, mottled, moist, firm, clay clasts, fine-grained sand	
10					SANDY CLAY (CL): yellowish-brown, moist, firm, fine-grained sand, few pebbles	
					SANDY CLAY (CL): olive brown and yellowish-brown, moist, stiff, 3" lignite lense at 14.75'	
15					SANDY CLAY (CL): yellowish-brown, moist, stiff, fine-grained sand, bedding planes, yellow and black streaks	Grout
20					SANDY CLAY (CL): yellowish-brown, moist, stiff, fine-grained sand, bedding planes	
					Lignite, black, moist, firm 23.5'-25'	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP MW-4 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SANDY CLAY (CH): yellowish-brown, moist, soft, fine-grained sand, discontinous lignite lenses	
					Lignite, black, moist, firm 26.5'-30'	
30					SANDY CLAY (CH): olive-brown, moist, fine-grained sand, stiff	
					Perched water at 32'	
					Lignite, black, dry, stiff 34'-37.5'	
35					Interbedded silty sand and sandy clay, thin bedded (1/4" - 1/2"), olive brown, sandy clay, gray silty sand, dry, stiff, fine-grained sand	
					Lignite, black, dry, hard, 6"	Bentonite
40					CLAY (CL): black, dry, hard, blocky, some interbedded black lignite	
						20/40 Grade Silica Sand
45					SANDY CLAY (CL): black, dry, hard, fine-grained sand, platty	
						Schedule 40 PVC 0.010 Slot Screen
					SILTY SAND (SM): dark olive brown, wet, loose, bedding planes, fine-grained sand	
50					Total Depth =50'	6" End Cap
55						

WELL3

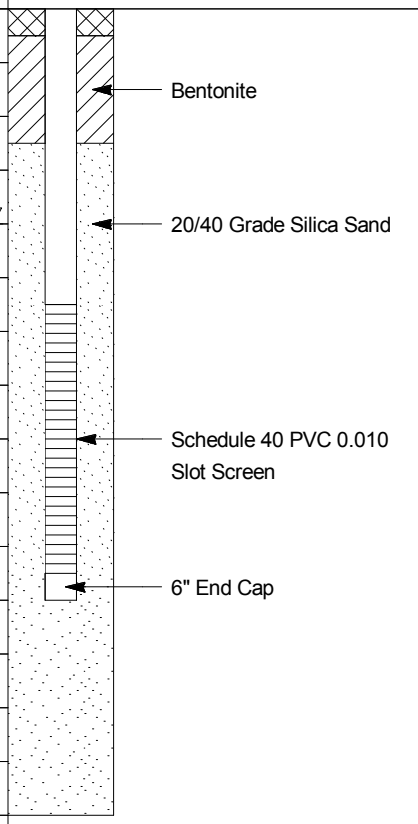
PROJECT: TMPA Gibbons Creek Plant Carlos, Texas		**Log of Well No. AP MW-5**	
BORING LOCATION: East Center of Ash Ponds		GROUND SURFACE ELEVATION AND DATUM: NA	
DRILLING CONTRACTOR: Best Drilling		DATE STARTED: 6/1/16	DATE FINISHED: 6/1/16
DRILLING METHOD: CME 75 HSA		TOTAL DEPTH (ft.): 40.0	SCREEN INTERVAL (ft.): 30.5'-35.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA		DEPTH TO WATER ATD: 29	CASING:
SAMPLING METHOD: 5' x 4" Core Barrel		LOGGED BY: Daniel B. Haug, P.G.	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G.	REG. NO. 1773

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Sand and clay fill to 2.5'	
					SANDY CLAY (CH): yellowish-brown, moist, firm to hard, fine-grained sand, some mottling	2" Diameter PVC
5					SANDY CLAY (CH): light yellowish-brown, moist, stiff, trace of small gravel, fine-grained sand	
10					SANDY CLAY (CL): reddish-brown then light yellowish-brown, (14'-15'), moist, stiff, sand lense at 14.5', fine-grained sand	Grout
15					SANDY CLAY (CH): yellowish-brown, moist, firm, fine-grained sand CLAYEY SAND (SC): yellowish-brown, wet, firm, fine-grained sand, few gravel	
20					SANDY CLAY (CL): yellowish-brown, moist, firm, fine-grained sand, clay clasts SANDY CLAY (CH): reddish-brown mottled with grayish-brown, moist, firm, fine-grained sand	
25					SANDY CLAY (CH): brown mottled with few reddish-brown streaks, moist, fine-grained sand, few pebbles	

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP MW-5 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SANDY CLAY (CH): brown, moist, fine-grained sand to small gravel	
					CLAYEY SAND (SC): brown, wet, firm, fine- to coarse-grained sand	
					SANDY CLAY (CL): light yellowish-brown, moist, stiff, fine-grained sand, ferrous staining	
					SANDY CLAY (CL): light yellowish-brown, very moist to wet, medium-grained sand	
					CLAYEY SILTY SAND (SC-SM): dark greenish gray, slightly moist, fine-grained sand	
					Total Depth = 40'	



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WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP MW-6**
BORING LOCATION: West Side of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Tolunay-Wong	DATE STARTED: 5/3/17 / DATE FINISHED: 5/5/17
DRILLING METHOD: HSA with Continous Core Barell	TOTAL DEPTH (ft.): 50.0 / SCREEN INTERVAL (ft.): 41'-46'
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER ATD: / CASING:
SAMPLING METHOD: 5' x 4.25" OD Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
				0.3	Grass at the surface, gravel, sand and clay material to 4.25' (probable fill)	2" Schedule 40 PVC Riser
5					SANDY CLAY (CL): yellowish-brown, moist, stiff, ferrous nodules, trace of caliche, fine-grained sand	
				0.1	SILT (ML) with lignite: reddish-brown, dry, firm, very little recovery	
10					CLAY (CL): reddish-brown, slightly moist, firm Lignite with clay, dark red, slightly moist, firm	
				0.1	SANDY CLAY (CL): yellowish-brown, dry, firm, very fine-grained sand	
15				1.8	2" lignite seam, dark reddish-brown, slightly moist, soft CLAY (CH): yellowish-brown, slightly moist to moist, stiff, ferrous staining Interbedded CLAY and LIGNITE (0-CL): black to reddish-brown, dry, frim to hard 1" cemented lenses with gypsum	Bentonite Grout
20				2.1	LIGNITE (0) with hard lenses of cemented clay and silt with organics: dark brown, dry, hard	
					SANDY CLAY (CL): dark brown, dry, stiff, very fine-grained sand, numerous thin very fine-grained sand partings, laminated	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP MW-6 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Interbedded SAND and LIGNITE (SP-0): sand - olive gray, lignite - black, very moist to wet, mostly sand, fine-grained sand	
				2.5	LIGNITE (0): black, dry, hard - Lignite to 30.25'	
30					CLAY (CL): light gray, slighltly moist, hard	Bentonite Grout
				4.3	CLAYEY SAND (SC): very dark grayish-brown, dry, dense, very fine-grained sand, lignite fragments	
35					CLAYEY SAND (SC): olive gray, slightly moist to moist, dense, fine-grained sand, weakly cemented, laminated	Bentonite Chips
				4.9		16/30 Grade Silica Sand
40					Slightly CLAYEY SAND (SC): olive gray, moist to very moist, 42.5'-43' wet, moist below 43' and silty, medium dense, very fine- to fine grained sand	
				4.4		2" Schedule 40 PVC Screen 0.010 Slot
45					Very slightly CLAYEY SILTY SAND (SM): olive gray, moist, dense, fine-grained sand, trace of lignite lenses	5.5" End Cap
				0.6		
					- Sulfur smell	
50					Total Depth = 50"	
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP PZ-1**
BORING LOCATION: West of Limestone Storage Building	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/24/16 / DATE FINISHED: 5/24/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 35.0 / SCREEN INTERVAL (ft.): 21'-26'
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 21 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation:	
					6" ash	
					Sandy clay with few small gravel fill to 2"	
					SANDY CLAY (CH): yellowish-brown, moist, stiff, fine- to coarse-grained sand	2" Diameter PVC
5					CLAYEY SAND (SC): light yellowish-brown, moist, stiff, fine-grained sand	Grout
					0.5" sandstone lense at 9.25'	
10					CLAYEY SAND (SC): light yellowish-brown, slightly moist, stiff, fine-grained sand	
					sandstone nodules and 0.5" sand lense at 12'-12.5'	
					- trace of ferrous staining	
15					- interbedded sand and sandy clay	
					CLAYEY SAND and SAND (SP, SC) olive-gray, dry to moist, loose to firm	
					CLAY (CL): brown, dry, hard, with interbedded sand and clay	Bentonite
					SILTY SAND (SM): brown, dry, loose to firm, fine-grained sand, clay lenses	
20					CLAY (CL): yellowish-brown, dry, hard, thin fine-grained sand lenses, trace of pebbles	20/40 Grade Silica Sand
					CLAYEY SAND with sandstone lenses, brown, wet, dense, fine-grained to small gravels size	
					SANDY CLAY (CL): brown, dry, hard, fine-grained sand lamina	
					SILTY SAND (SM): olive gray, moist, loose to firm, fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP PZ-1 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive gray, wet, hard, fine-grained sand, very thin lignite seams	6" End Cap
					CLAY (CH): olive, dry, hard, blocky	
30					CLAY (CH): olive, dry, hard, blocky	20/40 Grade Silica Sand
35					Total Depth = 35'	
40						
45						
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP PZ-2**
BORING LOCATION: North of Fly Ash Silos	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/23/16 / DATE FINISHED: 5/24/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34'-39'
DRILLING EQUIPMENT: 8 5/8" OD HSA 2" Rods	DEPTH TO WATER ATD: 39 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

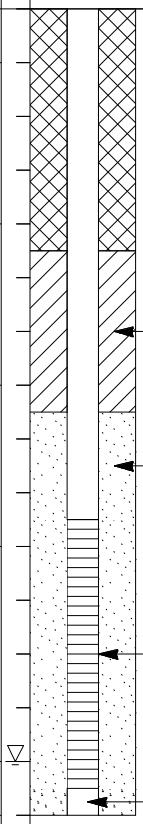
DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					SILTY SAND (SM): dark gray, slightly moist, loose, fine- to coarse-grained sand, roots, fly ash	
					SILTY SANDY CLAY (CH): brown, moist, firm, fine- to coarse-grained sand	
					SILTY SANDY CLAY (CL): brown, moist, firm, fine- to coarse-grained sand, increasing sand content	2" Diameter PVC
5					SANDY CLAY (CH): yellowish-brown, moist, soft, fine- to coarse-grained	
					SILTY SANDY CLAY (CH): yellowish-brown, moist, hard, fine-grained sand, ferrous staining - lignite seam 9'-9.5'	
10					CLAYEY SAND (SC): light olive brown, dry, dense, fine- to medium-grained sand, wood fragments	
					SILTY CLAYEY SAND (SC): light yellowish-brown, moist, firm, fine-grained sand	
					SANDY CLAY (CH): yellowish-brown, dry, hard, fine-grained sand, lignite seam (thin)	
15					CLAYEY SILTY SAND (SM): gray, wet, firm, fine-grained sand	Grout
					SANDY CLAY (CH): light yellowish-brown, dry, hard, layered, fine-grained sand	
20					SILTY SANDY CLAY (CL): light olive brown, dry with few moist intervals, hard to very stiff, fine-grained sand, drier after 22'	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP PZ-2 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive brown, very moist, fine-grained sand, soft	
					Sligthly SANDY CLAY (CH): brown, dry, hard, fine-grained sand lenses - increased sand content with depth	
30					SILTY SAND (SM): light olive brown, moist, fine-grained sand, firm	
					CLAYEY SILTY SAND (SM): light olive gray, very moist, firm, 1/4" lignite seams, fine-grained sand	Bentonite
					SANDY CLAY (CL): light olive brown, moist to dry, hard, fine-grained sand, very hard lenses, organics (wood) in sandstone	20/40 Grade Silica Sand
35					SILTY SAND (SM): light olive brown, wet to 39', tan lignite lenses (1/4"), fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
					CLAY (CH): brown, moist, hard	6" End Cap
40					Total Depth = 40'	
45						
50						
55						



WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. AP PZ-3**
BORING LOCATION: North of Ash Ponds	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/25/16 / DATE FINISHED: 5/25/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34.5'-39.5
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 25 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					SANDY CLAY with Gravel (CH): yellowish-brown, moist, very stiff, fine-grained sand, few small gravel, probably fill	
					SANDY CLAY (CL): olive brown, moist, very stiff, fine-grained sand	2" Diameter PVC
5					SANDY CLAY (CL): light olive brown, slightly moist to moist at 9', firm, layered, fine-grained sand	
10					SANDY CLAY (CL): light olive brown, moist to wet above underlying clay, fine-grained sand, loose CLAY (CH): light olive brown, dry, blocky, hard, layered SILTY SAND (SM): light olive brown, wet, fine-grained sand	
15						Grout
20					SILTY SAND (SM): light olive brown, wet, fine-grained sand, layered	
25					- interbedded sand and siltstone	

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. AP PZ-3 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive brown, wet, fine-grained sand, hard siltstone at 28.75' to 29' and 1" lense at 27.5' ferrous staining around siltstone lenses	
30					SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand Sandstone, light to olive brown, wet, hard, platy 32.5'-33'	Bentonite
					SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand Sandstone, pale yellow, wet, hard, platy 34'-34.5	20/40 Grade Silica Sand
35					SILTY SAND (SM): light olive brown, wet, loose, fine-grained sand	
					Siltstone, olive brown, wet, hard, platy 36.5'-36.75' SILTY SAND (SM): light olive brown, wet, loose to firm, fine-grained sand SILTY SAND (SM): olive gray, wet, firm, fine-grained sand, layered	Schedule 40 PVC 0.010 Slot Screen
40					CLAY (CH): olive gray, dry, hard, blocky Total Depth = 40'	6" End Cap
45						
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas		**Log of Well No. AP PZ-4**	
BORING LOCATION: Southwest Corner of Ash Ponds		GROUND SURFACE ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Best Drilling		DATE STARTED: 6/2/2016	DATE FINISHED: 6/2/2016
DRILLING METHOD: HSA		TOTAL DEPTH (ft.): 45.0	SCREEN INTERVAL (ft.): 38.5'-43.5'
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig		DEPTH TO WATER ATD: 40	CASING:
SAMPLING METHOD: 5' x 4" Core Barrel		LOGGED BY: Daniel B. Haug, P.G.	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G.	REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Clay and gravel fill to 3'	
					SANDY CLAY (CL): light yellowish-brown, moist, stiff, fine-grained sand	2" Diameter PVC
5					Interbedded sandstone and SANDY CLAY (CL): light yellowish-brown, moist, hard, fine-grained sand	
					SANDY CLAY (CL): light yellowish-brown, moist, stiff, fine-grained sand, ferrous partings	
10					SANDY CLAY (CL): light yellowish-brown, moist, stiff to 14.5', hard to 15', fine-grained sand, ferrous staining, reddish-brown with increased clay content at 14.5-15'	
15					SANDY CLAY (CL): olive brown, dry, hard, very fine-grained sand, discontinous silt and sand partings	Grout
20					SANDY CLAY (CL): olive brown, dry, very stiff, fine-grained sand	
					Lignite, black, dry, hard 23.5'-25' - 2" sand and clay lenses	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

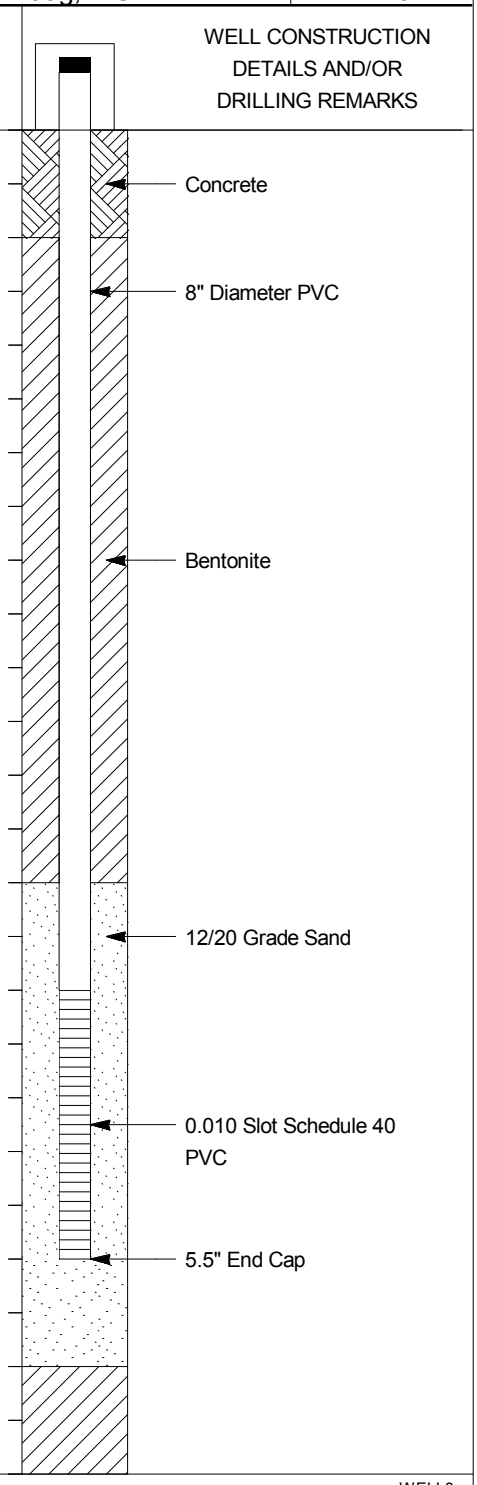
Log of Well No. AP PZ-4 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Lignite, dark brown and black, dry, stiff, few interbedded ironstone, sand, clay (thin beds-large majority lignite 25'-30')	
30					Sandstone: olive brown, moist, hard	
					Lignite, brown to dark brown, dry, stiff 31'-32.75' Interbedded olive brown sand, brown clay and lignite Lignite, brown to dark brown, dry, stiff, platy 33'-35' Lignite, brown to dark brown, dry, stiff, blocky 35'-36'	Bentonite
35					Interbedded sandy clay, lignite (thin beds), medium gray sand, fine-grained sand, dark brown clay and lignite	20/40 Grade Silica Sand
					Lignite, brown to dark brown, dry, stiff, blocky 39'-40'	
40					Sand interbedded with lighnite, black, wet, loose, fine- to medium-grained Lignite, black dry, very stiff 41'-41.75 SANDY SILT (ML): olive gray, slightly moist, stiff, very fine-grained sand	Schedule 40 PVC 0.010 Slot Screen 6" End Cap
45					Total Depth = 45'	
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-2**
BORING LOCATION: South Side of Landfill F, West of Outfall	GROUND SURFACE ELEVATION AND DATUM: 269'
DRILLING CONTRACTOR: Vortex Drilling	DATE STARTED: 3/16/16 / DATE FINISHED: 3/16/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 50.0 / SCREEN INTERVAL (ft.): 16'-21'
DRILLING EQUIPMENT: 4 1/4 ID HSA (8" Borehole)	DEPTH TO WATER ATD: 17.5' / CASING:
SAMPLING METHOD: Split Spoon	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation: NA
			1/1/4	0.0	CLAY CH): dark gray, moist, soft, grading to yellowish-brown at 2'
			3/7 50/1"	0.0	CLAYEY SILTY SAND (SM-SC): light yellowish-brown, dry, hard, platy, fine-grained sand
5			50/1"	3.0	SANDY SILT (ML): pale yellow, moist, hard, very fine-grained sand SILT (ML): pale yellow, moist, hard, very fine-grained sand
10			50/5" 21/35	3.0 0.8	SILT (ML): pale yellow, moist to wet, hard, very fine-grained sand SANDY SILT (ML): pale yellow, moist to wet, hard, wet to 13', then very moist, siltier-a trace of clay (unconsolidated)
15			11/ 24/ 30	5.0	
			30/ 50/2"	4.3	SILTY SAND (SM): light yellowish-brown, moist, hard, unconsolidated, very fine- to fine-grained sand, trace iron oxide staining
20			19/ 31/ 32	3.8	SILTY SAND (SM): light yellowish-brown, moist to wet, hard, unconsolidated, very fine- to fine-grained sand, iron oxide staining 19-20'
			20/ 50/4"	3.9	SANDY SILTY (SM): light yellowish-brown, wet, unconsolidated, hard, iron oxide staining
			41/ 60/6"	2.3	SILTY CLAY (CL): brown, dry, hard at 22.25 SANDY SILTY CLAY (CL): dark gray, dry, hard, bedding planes SANDY SILTY CLAY (CL): dark gray, dry, hard, bedding
25					



WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SFL MW-2 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
			20/ 50/5"	3.7	CLAY (CH): dark gray, dry, hard, lenses of sandy clay, fine-grained sand SANDY CLAY (CL): olive gray, moist (clayey interval, dry), hard, fine-grained sand	
			15/ 21/ 37	3.2	SANDY CLAY (CL): olive gray, dry, hard, fine-grained sand	
30			15/ 21/ 21	2.0	Slightly SANDY CLAY (CL): dark gray, dry, hard, fine-grained sand	
			12/ 29/ 40	2.5	SILTY CLAY (CH): dark gray, dry, hard, thin linear structures in the clay	
35			20/20 60/6"	2.0	SILTY CLAY (CH): olive gray, dry, hard, silt lenses at 35.5', moist	Bentonite
			10/ 17/ 17	1.1	SILTY CLAY (CH): olive gray, dry, hard, silt lenses <1/4, thin, dry	
40			10/ 11/ 15	1.9	SILTY CLAY (CH): olive gray, moist, firm to hard, few silt partings	
			8/ 12/ 15	2.1	SILTY CLAY (CH): olive gray, moist, firm to hard, few silt partings, one pyrite nodule	
45			12/ 12/ 17	2.2	CLAY (CH): olive gray, moist, firm to hard, silt partings	
			10/ 12/ 31	2.2	CLAY (CH): olive gray, moist, firm to hard, few silt partings	
50					Total Depth = 50'	
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-3**
BORING LOCATION: Southeast of Landfill F	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/31/16 / DATE FINISHED: 5/31/16
DRILLING METHOD: CME 75 HSA (Buggy Rig)	TOTAL DEPTH (ft.): 25.0 / SCREEN INTERVAL (ft.): 19.5'-24.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 22 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light yellowish-brown, moist, loose, fine-grained sand, trace ferrous staining	2" Diameter PVC
5					SANDY CLAY (CH): brown mottled with blackish-brown, moist, firm, fine-grained sand, minor ferrous staining SANDY CLAY (CH): brown, mottled, moist, firm, fine-grained sand	Grout
10					SANDY CLAY (CL): yellowish-brown, slightly moist, fine-grained sand, bedding planes, stiff Slightly SANDY SILTY CLAY (CL): yellowish-brown, slightly moist, very firm, fine-grained sand	
15					SANDY SILTY CLAY (CL): yellowish-brown, slightly moist, stiff, very fine-grained sand, few bedding planes	Bentonite 20/40 Grade Silica Sand
20					Interbedded sandy clay and sandstone, reddish-brown, hard to very stiff, fine-grained sand SILTY SAND (SM): light olive brown, wet, loose to firm, fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
25					CLAY (CL): light to olive green, dry, hard Total Depth = 25'	6" End Cap

WELL3

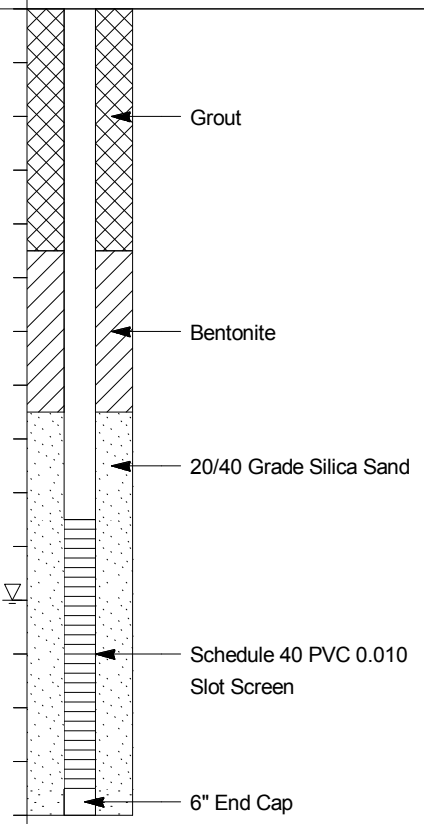
PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-4**
BORING LOCATION: South of Landfill F	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/31/16 / DATE FINISHED: 5/31/16
DRILLING METHOD: CME 75 HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 34.5'-39.5
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 36 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					CLAYEY SAND (SC): medium gray, moist, firm, fine-grained sand Interbedded silty sand and sandstone, medium gray, slighly moist, firm to hard, fine-grained CLAYEY SILTY SAND (SC-SM): medium gray, slighty moist, very firm, fine-grained sand	2" Diameter PVC
5					SANDY CLAY (CL): light olive brown, dry, hard, fine-grained sand, ferrous staining SANDY SILTY CLAY (CL): light olive brown, slightly moist, very fine-grained sand	
10					SANDY SILTY CLAY (CL): light olive brown, slightly moist, very fine-grained sand, minor ferrous staining	
15					SANDY SILTY CLAY (CL): brown, dry, very stiff, bedding planes, fine-grained sand	Grout
20					SANDY CLAY (CL): dark olive brown, dry, hard, bedding planes, trace of gypsum, fine-grained sand Lignite lense, dark gray to balck, loose to firm SILTY SAND (SM): light olive gray, slightly moist, fine-grained sand, bedding planes, firm	
25						

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SFL MW-4 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): light olive gray, dry, very fine-grained sand, 25'-26' interbedded siltstone	
					CLAYEY SANDY SILT (ML): dark gray, dry, fine-grained sand, discontinous thin sand lenses	
30					SANDY SILTY CLAY (CL): dark gray, dry, very fine-grained sand, discontinuous thin silt lenses	
35					Interbedded clay and sand; clay, black, dry, hard; sand, olive gray, dry, loose, very fine-grained sand	
					SAND (SP): olive gray, wet, loose, very fine-grained sand	
					SILTY SAND (SM): olive gray, dry, firm, fine-grained sand	
40					Total Depth = 40'	
45						
50						
55						



WELL3

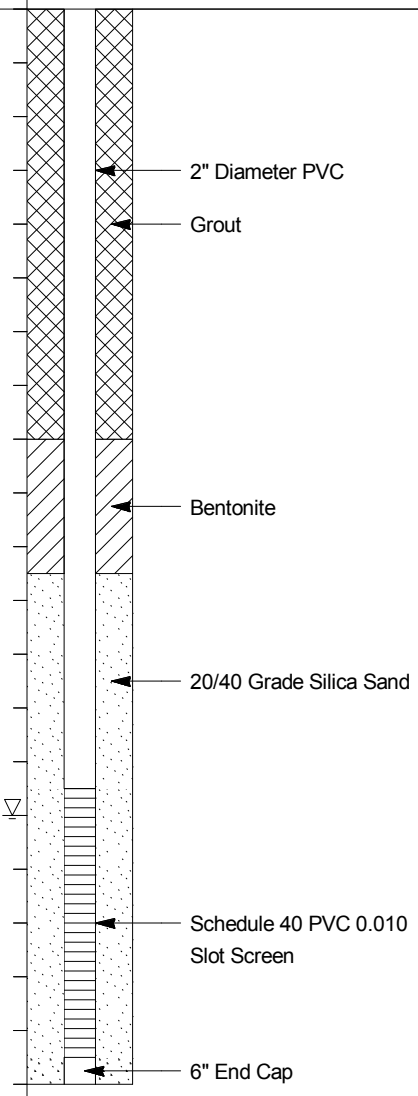
PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-5**
BORING LOCATION: Landfill F	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/23/16 / DATE FINISHED: 5/23/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 25.0 / SCREEN INTERVAL (ft.): 16'-21'
DRILLING EQUIPMENT: 8 5/8" OD HSA 2" Rods	DEPTH TO WATER ATD: 16 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SILTY SAND (SM): dark grayish-brown, moist, loose, fine-grained sand, roots	
					SANDY CLAY (CH): dark yellowish-brown, moist, soft, fine-grained sand, roots	
					SILTY SANDY CLAY (CL): yellowish-brown, dark yellowish-brown lenses, moist, fine-grained sand, firm	2" Diameter PVC
5					SILTY SANDY CLAY (CL): yellowish-brown, dry, hard, very fine-grained sand, ferrous staining	Grout
					SILTY SAND (SM): light brownish-gray, mottled with brownish-yellow, soft, moist (slightly) increasing clay content to 8.5', fine-grained sand	
					Slightly CLAYEY SILTY SAND (SM): light olive brown, loose, moist, fine-grained sand	
10					Slightly CLAYEY SILTY SAND (SM): light olive brown, slightly firm, moist, trace of pebbles	Bentonite
15					SILTY SAND (SM): light olive brown, wet to very moist, firm, faint stratification, fine-grained sand	20/40 Grade Silica Sand Schedule 40 PVC 0.010 Slot Screen
20					SANDSTONE (SS): light yellowish-brown, dry, hard, ferrous staining along fractures, layered	6" End Cap
					Shale (SILTY CLAY) (CL): gray, dry, hard, very fine-grained sand, silt partings	
25					Total Depth = 25'	

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-6**
BORING LOCATION: Southwest Corner of Landfill	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/23/16 / DATE FINISHED: 5/23/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 20.0 / SCREEN INTERVAL (ft.): 14.5'-19.5
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 15 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.
					Surface Elevation:
					Sandy Clay fill, few gravel fill to 4.5'
5					SANDY SILTY CLAY (CL): pale brown, dry, hard, dark gray partings, very fine-grained sand
					CLAYEY SAND SILT (ML): pale brown, dry, very stiff to hard, dark gray clay partings, fine-grained sand, increased ferrous staining after 8', few sand partings, wood fragments in a few partings
10					SILTY SANDY CLAY (CH): pale brown, dry, hard, light brown partings to reddish-brown, fine-grained sand, ferrous staining
15					Layered SILTY SAND (SM) and SANDY SILTY CLAY (CL): pale brown, some brown layers after 17', very moist to dry, fine-grained sand
20					SANDY SILTY CLAY (CL): gray silt and sand, dark gray clay, layered, dry, hard, very fine sand
					Total Depth = 20'
25					



WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SFL MW-7**
BORING LOCATION: Southeast Side of Landfill F	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Tolunay-Wong	DATE STARTED: 5/2/17 / DATE FINISHED: 5/3/17
DRILLING METHOD: HSA with Continous Core Barell	TOTAL DEPTH (ft.): 55.0 / SCREEN INTERVAL (ft.): 50'-55'
DRILLING EQUIPMENT: CME 75	DEPTH TO WATER ATD: / CASING:
SAMPLING METHOD: 5' x 4.25" OD Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Grass at surface	
				2.6	SILTY SAND (SM): yellowish-brown, dry, firm, very fine-grained sand (fill)	
5					SANDY CLAY (CH): gray, slightly moist, firm, very fine-grained sand	8" Diameter PVC
				1.1		
10					SANDY CLAY (CH): brown, slightly moist to moist, firm, olive gray mottling and some ferrous staining, very fine-grained sand, fill to □ppro□i□ □t□l□12'	
				0.8	SANDY CLAY (CL): brown, slightly moist, very fine-grained sand, some lammination, couple of thin greenish-□r□□sand lenses	
15					CLAY (CL): dark brown, slightly moist, very fine-grained sand intervals (thin)	
				0.4	SANDY CLAY (CL) with lignite fragments: very dark brown, hard, very fine-grained sand, slightly moist to dry	
20					- Layered sand and clay with lignite 19.5'-20', very dark brown to light gray, hard, slightly moist, pyrite nodules	Bentonite Grout
				0.8	CLAY (CH): very dark gray, dry, hard, very thin sand lenses, greenish-gray, lignite fragments along bedding planes, platy	
25					CLAY (CH) with interbedded thin sand lenses: very dark gray, dry, hard, very fine-grained sand, lignite fragments along bedding planes in the clay, clay breaks along horizontal laminae, platy	
				0.4		
30						

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SFL MW-7 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
35				0.3	CLAY (CL): with numerous thin sand lenses interbedded with clay: very dark gray clay, greenish-gray sand, dry, hard, lignite fragments along bedding planes in the clay, very fine-grained sand, platy	2" Schedule 40 PVC Riser
				0.3	CLAY (CH): with sand partings: very dark gray, dry, hard, very fine-grained sand, lignite fragments along bedding planes in the clay, platy, sand greenish-gray	
40				0.2	CLAY (CH) with SAND partings: very dark gray, dry, hard, very fine-grained sand, lignite fragmenst along bedding planes in the clay, platy, sand greenish-gray	Bentonite Chips
45					SAND (SP): olive gray, wet, loose, fine- to very fine-grained sand	
				0.2	CLAY (CH): dark greenish-gray, dry to hard at 46'	16/30 Grade Sand
					CLAY (CH): very dark gray, dry, hard, platy	
50				0.2	SILTY SAND (SM): dark gray, wet, loose, very fine- to fine-grained sand	2" Schedule 40 PVC Screen 0.010 Slot
					Interbedded SAND (SP) and lignite: olive gray, wet, loost to firm	
					2" lignite seam	
55					SAND (SP) with thin lignite lenses, olive gray, wet, loose to firm	5.5" End Cap
					Total Depth = 55'	
60						
65						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SSP/AP MW-1**
BORING LOCATION: North of Sludge Pond	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 5/25/16 / DATE FINISHED: 5/26/16
DRILLING METHOD: HSA	TOTAL DEPTH (ft.): 40.0 / SCREEN INTERVAL (ft.): 29.5'-39.5'
DRILLING EQUIPMENT: 8 5/8" OD HSA Truck Mounded Rig	DEPTH TO WATER ATD: 30 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

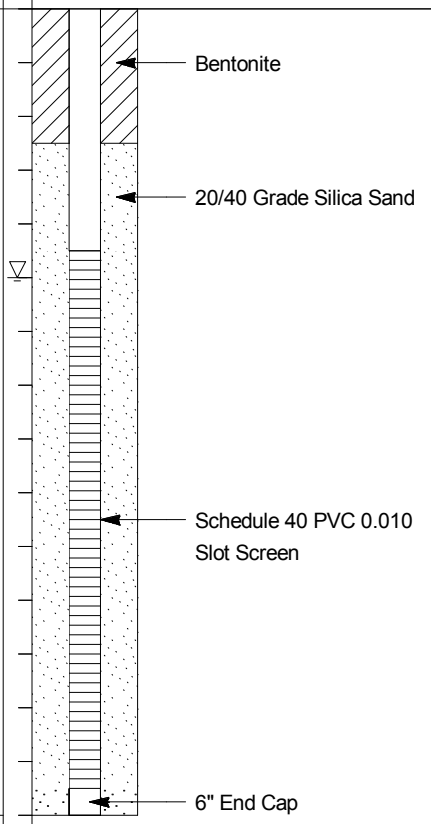
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Silty sand, fly ash and sandy clay, fill to 3.5'	2" Diameter PVC
					SANDY CLAY (CL): light yellowish-brown, moist, very stiff, fine-grained sand	
5					SILT (ML): yellowish-red, moist, firm to hard, after 3" grading to clay, yellowish-red, moist, hard	
					SANDY CLAY (CL): reddish-brown, moist, very stiff, fine-grained sand	
10					Slightly SANDY CLAY (CH): reddish-brown, moist, very stiff, very fine-grained sand	Grout
					Lignite, black, dry, hard 12'-16'	
15					Slightly SANDY CLAY (CH): dark grayish-brown, dry, hard, very fine-grained sand	
20					SANDY CLAY (CL): dark grayish-brown, moist, hard, fine-grained sand, lithofied sandy lenses from 20.5' to 25', sandier and softer toward 25', platy where hard	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SSP/AP MW-1 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
30					SILTY SAND (SM): dark olive brown, slightly moist, hard, platy when hard, fine-grained sand	Bentonite; 20/40 Grade Silica Sand
35					Slightly SILTY SAND (SM): dark olive brown, wet, loose, fine-grained sand	Schedule 40 PVC 0.010 Slot Screen
40					CLAYEY SILTY SAND (SM-SC): dark olive brown, dry to moist, fine-grained sand, firm	6" End Cap
					Total Depth = 40'	
45						
50						
55						



WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SSP MW-2**
BORING LOCATION: West of Center of Scrubber Sludge Pone	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 6/2/06 / DATE FINISHED: 6/2/06
DRILLING METHOD: CME 75 HSA	TOTAL DEPTH (ft.): 45.0 / SCREEN INTERVAL (ft.): 38.5'-43.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 30 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter. Surface Elevation:	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
0					9" ash, black, loose SANDY CLAY (CL): yellowish-brown, moist, firm, fine-grained sand, few pebbles	2" Diameter PVC
5					SANDY CLAY (CL): medium gray, moist, firm, fine-grained sand, few pebbles SANDY CLAY (CL): brown, moist, firm, fine-grained sand, few small gravel	
10					SANDY CLAY (CH) with small gravel: brown, moist, firm to stiff, fine-grained sand with pebbles and small gravel, clay clasts, some red and greenish-gray streaking, trace yellow nodules	
15					SANDY SILTY CLAY (CL): brown, moist, stiff, fine-grained sand, trace roots, few bedding planes	Grout
20					SILTY SAND (SM): light olive brown, moist, firm, fine-grained sand, bedding planes, brown organic lenses, very thin	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SSP MW-2 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					CLAYEY SILTY SAND (SC-SM): light olive brown, moist, firm, fine-grained sand	
30					SILTY SAND (SM): light olive brown, wet, 30'-33', sandstone at 33', fine-grained sand	Grout
					Slightly SILTY SAND (SM): light olive brown, slightly moist, firm, fine-grained sand	Bentonite
35						20/40 Grade Silica Sand
40					SANDY CLAY (CH) with few gravel: reddish-brown, wet, firm	Schedule 40 PVC 0.010 Slot Screen
					SANDY CLAY (CH): dark olive brown, moist, stiff, fine-grained sand	6" End Cap
45					CLAYEY SILTY SAND (SM-SC): dark olive brown, dry, dense, fine-grained sand	
					Total Depth = 45'	
50						
55						

WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas	**Log of Well No. SSP MW-3**
BORING LOCATION: Southwest Corner of Scrubber Sludge Pond	GROUND SURFACE ELEVATION AND DATUM:
DRILLING CONTRACTOR: Best Drilling	DATE STARTED: 6/3/16 / DATE FINISHED: 6/3/16
DRILLING METHOD: CME 75 HSA	TOTAL DEPTH (ft.): 45.0 / SCREEN INTERVAL (ft.): 39.5'-44.5'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA	DEPTH TO WATER ATD: 33 / CASING:
SAMPLING METHOD: 5' x 4" Core Barrel	LOGGED BY: Daniel B. Haug, P.G.
HAMMER WEIGHT: NA / DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G. / REG. NO. 1773

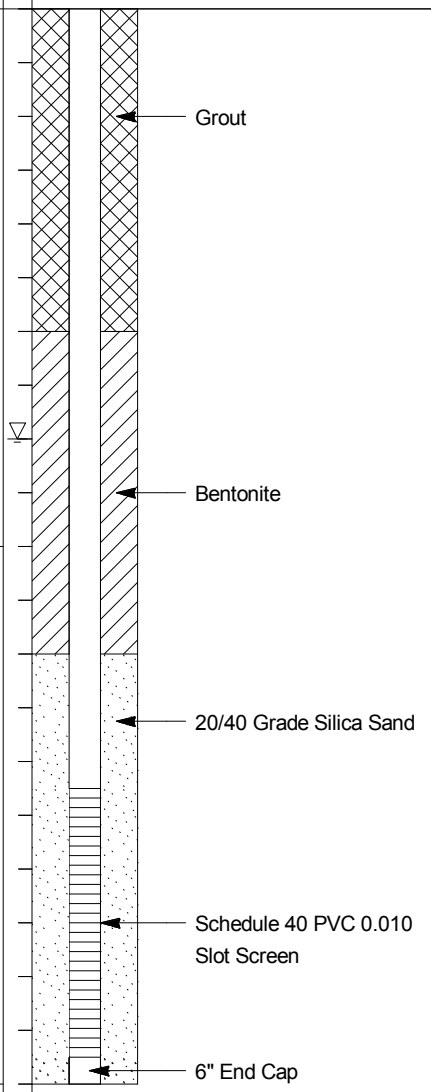
DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation:	
					Gravelly sandy clay at surface to 1.5'	
					SANDY CLAY (CL): yellowish-brown, moist, stiff, fine-grained sand	2" Diameter PVC
5					SANDY CLAY (CL) with gravel: yellowish-brown, moist, stiff, fine-grained sand	
10					CLAY and SANDY CLAY (CL-CH): yellowish-brown, reddish-brown, reddish-gray layers (fill), moist, stiff, fine-grained sand	
					Probably fill above 14'	
15					Slightly SANDY CLAY (CH): olive gray to 17.5', moist, stiff, fine-grained sand	Grout
					SANDY CLAY (CL): reddish-yellow, moist, stiff, fine-grained sand	
20					SANDY CLAY (CL): light reddish-brown, dry, stiff, fine-grained sand	
25						

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SSP MW-3 (cont'd)

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SANDY CLAY (CL): light brown, dry, hard	
					Sandstone, light brown, dry, hard 29.5'-30'	
30					1" of sandstone in core barrel, loose, fine-grained wet sand washed out of core barrel	
35					SILTY SAND (SM): light olive brown, wet, soft, fine-grained sand	
40					SILTY SAND (SM): light olive brown, wet, soft, fine-grained sand 1" lignite seam, brown, wet, soft at 41.75, very thin lignite lenses at 42' and 43.5'	
45					SILTY SAND (SM): light olive brown, wet, stiff, fine-grained sand Total Depth = 45'	
50						
55						



WELL3

PROJECT: TMPA Gibbons Creek Plant Carlos, Texas		**Log of Well No. SSP MW-4**	
BORING LOCATION: Southeast Corner of Scrubber Sludge Pond		GROUND SURFACE ELEVATION AND DATUM:	
DRILLING CONTRACTOR: Best Drilling		DATE STARTED: 6/3/16	DATE FINISHED: 6/3/16
DRILLING METHOD: CME 75 HSA		TOTAL DEPTH (ft.): 50.0	SCREEN INTERVAL (ft.): 43'-48'
DRILLING EQUIPMENT: CME 75 8 5/8" OD HSA		DEPTH TO WATER ATD: 44.75	CASING:
SAMPLING METHOD: 5' x 4" Core Barrel		LOGGED BY: Daniel B. Haug, P.G.	
HAMMER WEIGHT: NA	DROP: NA	RESPONSIBLE PROFESSIONAL: Daniel B. Haug, P.G.	REG. NO. 1773

DEPTH (feet)	SAMPLES Sample No.	SAMPLES Sample	SAMPLES Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					Surface Elevation:	
					Sand, gravel, clay fill	
					SANDY CLAY (CH): layered yellowish-brown, moist, stiff, fine-grained sand, probable fill	2" Diameter PVC
5					SANDY CLAY - CLAYEY SAND (CH-SC): brown, moist, firm, fine-grained sand, probable fill	
10					SANDY CLAY (CH): brown and olive brown layered (fill); moist, stiff, fine-grained sand	
					Probably fill above 14'	
15					SANDY CLAY (CL): yellowish-brown, moist, firm, fine-grained sand, black organic streaks	Grout
20					SANDY CLAY (CH): yellowish-red, very moist, fine-grained sand, soft CLAY (CH): dark reddish-brown, moist, firm	
					Lignite, black, moist, firm 22.5'-23'	
25					SANDY CLAY (CL): light yellowish-brown, moist, stiff, fine-grained sand	

WELL3

PROJECT: TMPA Gibbons Creek Plant
Carlos, Texas

Log of Well No. SSP MW-4 (cont'd)

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	OVM Reading	DESCRIPTION NAME (USCS): color, moist, % by wt., plast. density, structure, cementation, react. w/HCl, geo. inter.	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
					SANDY CLAY (CL): light yellowish-brown, moist, very stiff, fine-grained sand, ferrous streaks	
30					SANDY CLAY (CL): light yellowish-brown, moist, vey stiff, fine-grained sand, ferrous streaks	Grout
35					Lignite, black, moist, firm 34.75'-35.25' SANDY CLAY (CL): dark grayish-brown, dry, hard, fine-grained sand	
					Lignite, dark brown, dry, hard 38.25'-38.75	
40					SANDY CLAY (CL): dark grayish-brown, dry, hard, fine-grained sand, interbedded black clay lenses Interbedded sand and clay to 44.75'; CLAY (CH): black, dry, hard and; SAND (SP): olive gray, dry, dense	Bentonite 20/40 Grade Silica Sand
45					SAND (SP): olive gray, moist, dense, fine-grained sand, wet SANDY CLAY (CL): dark gray, moist, wet at 45'-46' (sandier interval), moist to dry below 46', hard, fine-grained sand	▽ Schedule 40 PVC 0.010 Slot Screen 6" End Cap
50					Total Depth = 50'	
55						

WELL3

BLACK & VEATCH
CONSULTING ENGINEERS

PIEZOMETER INSTALLATION LOG

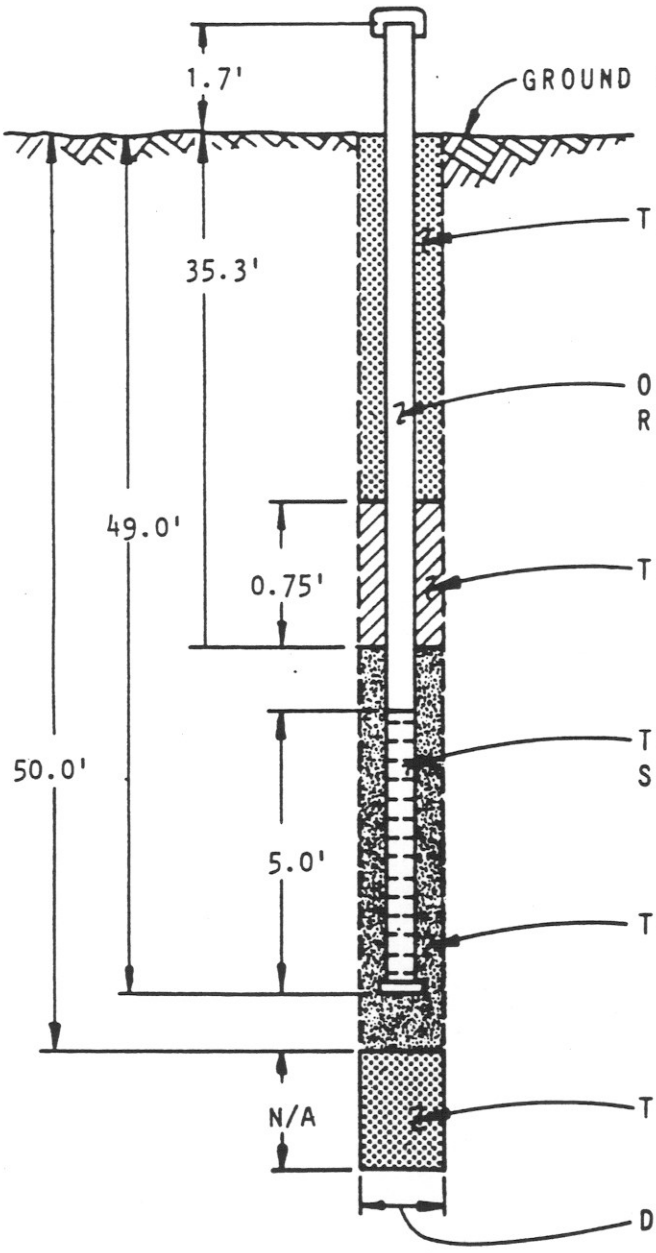
PIEZOMETER NO. B-11

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N378330 E3339148	266.8'	2-26-88

STRATUM MONITORED	INSPECTOR
Sandstone and clay	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh



Volclay Grout and Initiator Cement/Bentonite

2" PVC glued joints Schedule 40

Bentonite Pellets 1/2"

.01" Slots

Pea gravel

N/A

4 1/2"

METHOD OF INSTALLATION: Boring drilled to completion; set riser pipe and screen; placed filter and seal; grouted to surface; poured surface pad

REMARKS: Installed piezometer in fluid-filled hole; added approximately 2 gallons of bentonite pellets for seal but only 9" arrived at 35'- rest hung up- didn't have any more bentonite developed well on 2-27-88 by flushing w/clean water for 3 minutes and blowing it out w/air

P-ST-021

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N378329 E3339148	266.7'	50'	2-26-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in woods	K. M. Blevins-McCosh	2-26-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING: SAMP TYPE / CORING: CORE SIZE	SAMP NO. / RUN NO.	SET 6" / RUN LENG	2ND 6" / RUN RECV	3RD 6" / RQD RECV	N VAL / % RECV	SAMP RECV / RQD
TW	1					1.6
TW	2					0.8
TW	3					1.1
TW	4					1.2
TW	5					1.4
TW	6					1.2
TW	7					1.5
TW	8					1.3
TW	9					1.5
TW	10					1.5
TW	11					1.8
TW	12					1.9
TW	13					1.9
TW	14					1.7
TW	15					2.0

DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
0–6	Silty CLAY; reddish-brown; stiff; high plasticity; moist; organics; roots; iron staining (Top soil) Grading brown w/some sand; trace gravel below 2' Grading w/some sandstone seams and some gravel w/trace roots below 4'	Advanced boring w/4 1/2" rotary wash pp. 2.75
6–8	Sandy CLAY; tan to buff; stiff; low plasticity; moist; iron stained; w/trace gravel and some silt	
8–18.5	Clayey SILT; tan to buff; hard; high plasticity; moist; some sand; iron staining especially on joints; joints spaced 2-6" horizontal Interbedded with silty sand below 10' Grading tan to brown with iron nodules and few cemented sand fragments; platy below 12' Blocky structure below 14' Cemented sand grades out below 14'; Cemented sand layer at 18'	
18.5–30	CLAY; greenish-grey; hard; high plasticity; moist w/silt filled joints and some silt; trace sand; trace lignite 22'-24' Grading greenish-grey and dark grey banded below 23' Slickensided below 26'	

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-11
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N378329 E3339148	266.7'	50'	2-26-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in woods	K. M. Blevins-McCosh	2-26-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
TW	16					1.8								1		
														2	Trace pyrite below 32'	pp. 4+
TW	17					1.9								3		
														4	Bands grading out below 34'	
TW	18					1.9								35		
														6		
TW	19					2.0								7		
														8		pp. 4+
TW	20					1.7								9		
														40		
TW	21					1.9								1	Trace lignite below 41'	
														2	Grading dark grey below 42'; 1/2" silt seam at 42.3'	
TW	22					2.0								3		
														4		pp. 4+
TW	23					1.1								45	Silty CLAY; dark grey; hard; high plasticity; dry; some iron staining	
														6		
TW	24					0								7		TW 24 no sample cored w/2' core barrel
										48'				8		
3"	1	2				17				1.3	0.3	65		9	SANDSTONE; argillaceous; grey; fine grained; slightly weathered; w/trace lignite; horizontal joints	
										50'				50		Bottom of boring 49.8'. Groundwater level unknown. Reamed 0-3' w/6 7/8" bit Reamed 3-50' w/4 1/2" bit. Installed 2-20' sections of 2" PVC pipe; 1-7.2' section of 2" PVC and 1-5' screen.
														1		
														2		
														3		
														4		
														55		
														6		
														7		
														8		
														9		
														60		

P-STI-D

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PIEZOMETER INSTALLATION LOG

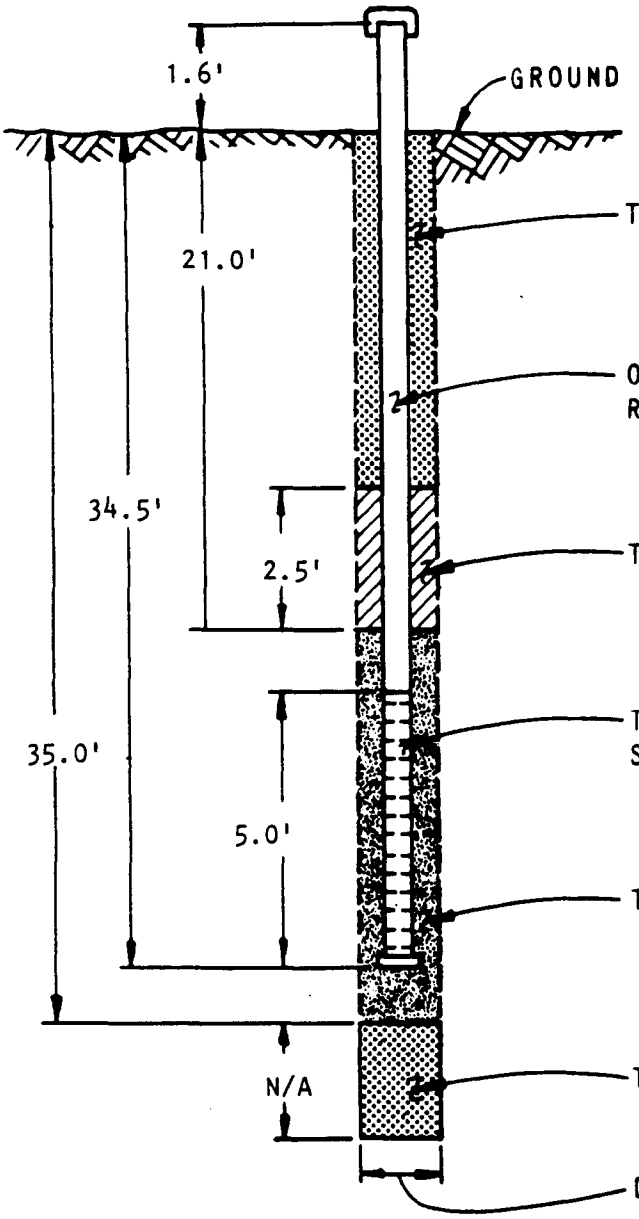
PIEZOMETER NO. B-15

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N378200 E3342496	261.5'	2-23-88

STRATUM MONITORED	INSPECTOR
Sandstone	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh



Volclay grout and Initiator
Cement-Bentonite

2" PVC-glued joints
Schedule 40

Bentonite
1/2" Tablets

.01" Slots

Pea gravel

N/A

4 1/2"

METHOD OF INSTALLATION: Boring drilled to completion; set riser pipe and screen; placed filter and seal; grouted to surface; poured surface pad.

REMARKS: Flushed cuttings from hole; hole remained fluid filled during installation. Developed well on 2-27-88 by flushing well with clean water for 6 min. blew out water from well with air compressor water level recorded at 23'-10" from TOC

P-ST-021B

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-15
SHEET 1 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N378200 E3342496	261.5'	35.0'	2-23-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Open pasture	K. M. Blevins-McCosh	2-23-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
														1		Undifferentiated overburden	Advanced hole using 4 1/2" rotary wash
TW	1					1.2								2		Silty CLAY; brown; medium dense; stiff to hard; low plasticity; moist; some sand	
														3		Grading to more silt at 3'-3.5'	
TW	2					0.8								4			
														5			
TW	3					0.5								6		Sandy CLAY; tan to brown; hard; low plasticity; moist; trace silt	
														7			pp. 4+
TW	4					0.8								8			
														9			Tried to push TW Tried SPT - cored at 10' so reamed w/rotary wash looked at cuttings
									10'					10		Clayey SAND; tan to brown; poorly graded; fine grained; some silt; iron staining	
3"	1	2						1		0	0	0	0	1		SANDSTONE; argillaceous; yellowish-tan; fine to medium grained; iron staining; highly weathered	
			12'											2			Sample recovery below 12' in 1-3" sections
3"	2	2	1.3	0	65	0		2						3			
			14'											4		Argillaceous grading out below 14'	
3"	3	2	1.2	0	60	0		3						15			
			16'											6			
3"	4	2	0	0	0	0		4						7		Grading grey below 16'	
			18'											8			Missed sample at 18-20' rotary washed. Continued drilling with 3" diameter 5' core barrel below 20'.
3"	5	2	0	0	0	0		5						9			
			20'											20		Iron staining on joints below 20'	
														1			
														2		Lignite partings starting at 21.7'	
3"	6	5	4.5	0.33	90	7		6						3			
														4		Grading greenish-grey below 23' and slightly argillaceous	
			25'											25			
3"	7	5	4	0.83	80	12		7						6			
														7			
														8		Lignite partings grading out below 27.5'	
														9			
			30'											30			

P-STO-

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-15
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N378200 E3342496	261.5'	35.0'	2-23-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Open pasture	K. M. Blevins-McCosh	2-23-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING						
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV

CORING						
CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD
3"	8	5	30' 2.2	0	44	0
			35'			

DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
1		Horizontal fractures spaced generally from 1-3" apart; numerous lignite partings below 30'	
35			Bottom of boring 35'. Ground water level unknown. Reamed hole using 4 1/2" bit. Flush cuttings out of hole installed 1-20' section and 1-11' section of 2" PVC and 5' section of screen.

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PIEZOMETER INSTALLATION LOG

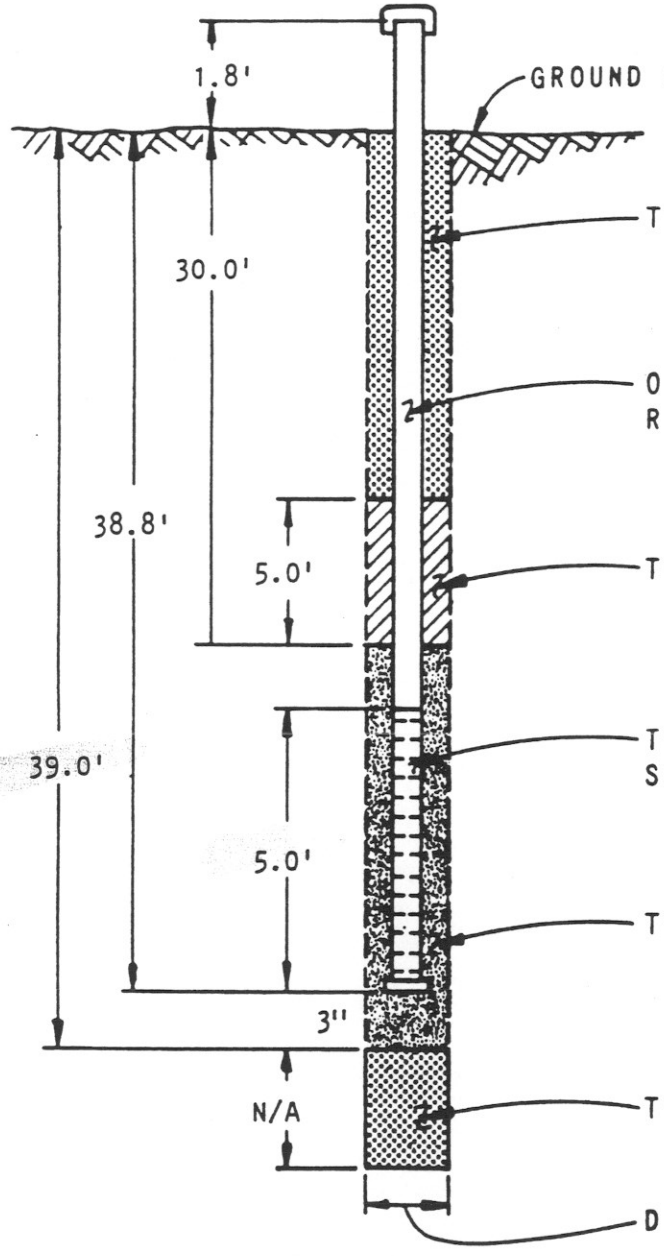
PIEZOMETER NO. B-16

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N379581 E3339416	261.7'	2-25-88

STRATUM MONITORED	INSPECTOR
Sandstone	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	I. J. Almaleh



TYPE OF SEAL	Volclay grout Cement/Bentonite
O.D. & TYPE OF RISER PIPE	4" PVC flush jointed Schedule 40
TYPE OF SEAL	Bentonite Pellets 1/2"
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Slots
TYPE OF FILTER	Pea Gravel
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	7"

METHOD OF INSTALLATION: Boring drilled to completion; set riser pipe and screen; placed filter and seal; grouted to surface; poured surface pad

REMARKS: Cuttings washed from hole; piezometer installed in fluid-filled hole; well developed on 2-27-88 by flushing hole w/clean water for 8 min. and pumping until dry. Water level recorded at 38.2' from TOC.

P-ST-02

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-16
SHEET 1 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N379581 E3339416	261.7'	39.0'	2-25-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in woods	K. M. Blevins-McCosh	2-25-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
TW	1					0.7								1		Silty CLAY; dark brown; medium dense; high plasticity; moist; organics; roots (Top soil)	Boring advanced using 6 7/8" rotary wash
TW	2					1.5								2		CLAY; dark brown; stiff; high plasticity; moist; some silt	
														3			pp. 1.25
TW	3					1.1								4		Trace gravel and iron staining below 4'	pp. 1.5
TW	4					1.8								5			pp. 2.0
TW	5					1.7								6		Silty CLAY; brown; stiff; high plasticity; moist; iron staining; jointed Gypsum seam at 7.5' and 9'; slickensided below 7'	
TW	6					1.8								7			
TW	7					1.5								8		Horizontal and 45° to vertical joints below 10' filled w/gypsum crystals and iron staining	pp. 2.5
TW	8					1.7								9			pp. 2.75
TW	9					1.7								10			
TW	10					1.7								1			
TW	11					1.6								2			
TW	12					1.3								3		Gypsum filled vertical joint at 14'-joint is 4" long; banded brown and dark brown below 14'. Gypsum filled joint spacing generally 8"-1.5'	
TW	13					1.3								4			
TW	14					1.2								15			pp. 2.75 pp. 3.5
	15					0.4								6			
														7			pp. 3.0
														8			
														9		CLAY; olive grey to dark grey; hard; high plasticity; moist; with silt seams on joints below 20'; trace iron staining; trace sand in joints; occasional silty sand pockets below 16'; thinly bedded	
														20			pp. 4+
														1			
														2			pp. 4+
														3			
														4			pp. 4+
														25			pp. 4+
														6			
														7			
														8			
														9		Lignitic below 29' - lignite seams up to 1"	
														30			

PISTO3

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-16
SHEET 2 of 2

CLIENT		PROJECT		PROJECT NO.
Texas Municipal Power Agency		Gibbons Creek SES		14578
PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N379581 E3339416	261.7'	39.0'	2-25-88
SURFACE CONDITIONS		INSPECTOR		DATE FINISH
Clearing in woods		K. M. Blevins-McCosh		2-25-88
CHECKED BY		APPROVED BY		
M. C. Schluter		L. J. Almaleh		

SAMPLING							CORING								
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	CLASSIFICATION OF MATERIAL	REMARKS
3"	1	1	0.2	0	20	0								1	SANDSTONE; argillaceous; greenish-grey; fine grained; weathered	
			31'											2		
TW	16					0.5								3	Clayey SAND; greenish-grey; partially cemented; fine grained; poorly graded; some silt (maybe extremely weathered sandstone)	
														4		
			34'											35		
3"	2	5	4	1.3	80	26								6	SANDSTONE; argillaceous; greenish-grey; fine grained; weathered; w/lignite seams; horizontal and vertical joints - weathering on joints	
														7		
														8		
			39'											9		Bottom of boring at 39'. Groundwater level unknown. Reamed hole w/6 7/8" bit. Installed 3-10' sections 4" PVC and 1-5.8' section 4" PVC; set 1-5' section .01" slot screen.
														40		
														1		
														2		
														3		
														4		
														45		
														6		
														7		
														8		
														9		
														50		
														1		
														2		
														3		
														4		
														55		
														6		
														7		
														8		
														9		
														60		

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PIEZOMETER INSTALLATION LOG

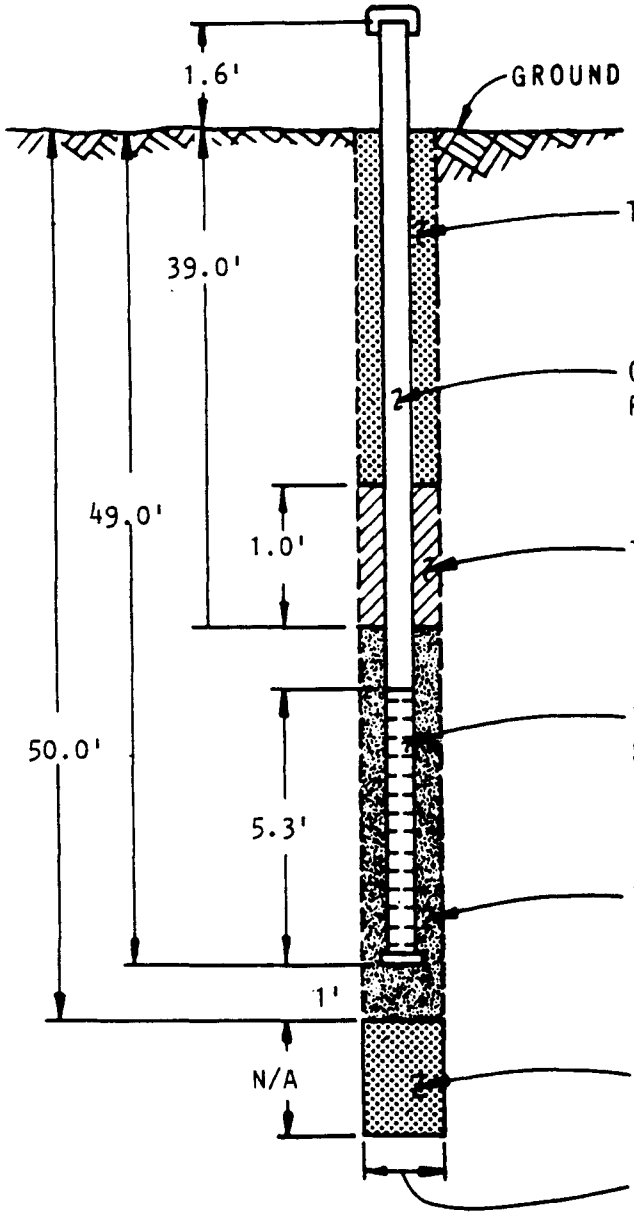
PIEZOMETER NO. B-17

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N381087 E3340991	292.3'	2-17-88

STRATUM MONITORED	INSPECTOR
Clay	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	I. J. Almaleh



TYPE OF SEAL	Volclay grout & Initiator (Cement-Bentonite)
O.D. & TYPE OF RISER PIPE	4" PVC flush-jointed Schedule 40
TYPE OF SEAL	Bentonite Pellets 1/4"
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Slots
TYPE OF FILTER	Pea Gravel
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	7"

METHOD OF INSTALLATION: Boring drilled to completion' set riser pipe and screen; placed filter and seal; grouted to within 5' of ground surface filled remaining 5' with dry grout and cuttings

REMARKS: Developed well on 2-27-88 by flushing w/clean water for 7 min.; pumped well dry; water level recorded at 48.5' from TOC.

P-ST-021B

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-17
SHEET 1 of 2

CLIENT	PROJECT		PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES		14578
PROJECT LOCATION	**COORDINATES**	**ELEVATION (DATUM) / TOTAL DEPTH**	**DATE START**
Carlos, Texas	N381083 E3340991	292.3' / 50.0'	2-17-88
SURFACE CONDITIONS	**INSPECTOR**		**DATE FINISH**
Clearing in pasture	K. M. Blevins-McCosh		2-17-88
CHECKED BY	**APPROVED BY**		
M. C. Schluter	L. J. Almaleh		

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
														1		10" Undifferentiated overburden	Advanced hole by rotary wash
TW	1					1.5								2		Silty CLAY; brown; stiff; med. plasticity; very moist; w/some roots	pp. 1.0
TW	2					1.2								3		Roots grade out below 3' Grading grey below 2.5 with trace sand	
TW	3					1.1								4		1" sand layer at 4.25'	pp. 4+
TW	4					0.9								5			pp. 4+
TW	5					1.2								6			
TW	6					0.9								7		Clayey SILT; brown to tan; hard; poorly graded; moist; with sand; trace lignite below 11'	
TW	7					0.7								8			
TW	8					1.3								9			
TW	9					1.5								10			
TW	10					0.9								1			
TW	11					0.8								2		CLAY; tan; hard; high plasticity; moist with cemented sand stringers; platy in areas with iron staining at plate faces	pp. 4+
TW	12					1.2								3			
TW	13					1.8								4			
TW	14					1.2								15		Grading silty with 2" sandy silt seam at approximately 15.7'	
TW	15					1.4								6			
														7		Clayey SILT; tan to buff; hard; low plasticity; moist; with some sand and iron staining on plates	
														8			
														9		Sandy SILT; tan to buff; poorly graded; moist with some clay; trace iron staining	
														20			
														1		Silty CLAY; brown/tan mottled; hard; high plasticity; moist; with trace sand and iron staining; platy	
														2			
														3		3" sandy silt layer at 22.5'; grading brown below 23	
														4			
														25		CLAY; brown; hard; high plasticity; moist; iron staining on plates and joints; gypsum crystals at 25.8'	
														6			pp. 4+
														7		Clayey SILT; brown; high plasticity; moist; iron staining	
														8			
														9		CLAY; greenish-grey; high plasticity; hard; moist; with trace silt; trace iron	
														30			

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ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-17
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N381083 E3340991	292.3'	50.0'	2-17-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in pasture	K. M. Blevins-McCosh	2-17-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
TW	16					2.0								1			
														2			
TW	17					1.8								3			
														4			
TW	18					1.8								35		Grading to trace silt below 35'	
														6			
TW	19					1.7								7			
														8		Grading to laminated banded (greenish-grey and grey) below 38' with trace lignite at 39.8';	
TW	20					1.9								9			
														40			
TW	21					1.9								1			
														2			
TW	22					1.8								3			
														4		Banding grading out below 44'	
TW	23					2.0								45			
														6			pp. 4+
TW	24					1.8								7		Banded below 47'	
														8			
TW	25					1.6								9			
														50			Bottom of boring at 50'. Groundwater level unknown. Hole reamed using 6 1/2" diameter auger bit.
														1			
														2			
														3			
														4			Set 4-10' and 1-4.6' section of 4" diameter schedule 40 threaded flush-jointed PVC pipe, 5' screen.
														55			
														6			
														7			
														8			
														9			
														60			

P I S E 3 6 D

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PIEZOMETER INSTALLATION LOG

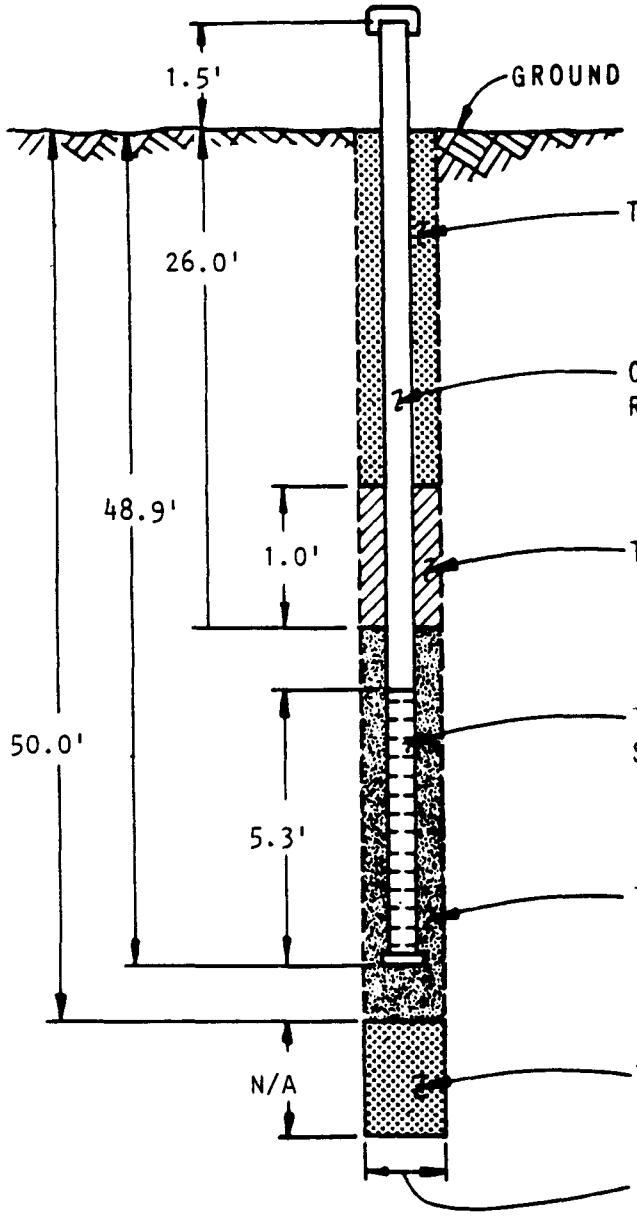
PIEZOMETER NO. B-18

CLIENT	PROJECT	PROJECT NO
Texas Municipal Power Agency	Gibbons Creek	14578

PROJECT LOCATION	COORDINATES	GROUND ELEVATION	DATE
Carlos, Texas	N381539 E3342922	269.1'	2-18-88

STRATUM MONITORED	INSPECTOR
Clay	K. M. Blevins-McCosh

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh



TYPE OF SEAL	Volclay Grout & Initiator (Cement-Bentonite)
O.D. & TYPE OF RISER PIPE	4" PVC flush-jointed Schedule 40
TYPE OF SEAL	Bentonite Pellets
TYPE AND SIZE OF SCREEN OR OPENINGS	.01" Slots
TYPE OF FILTER	Pea Gravel
TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	7"

METHOD OF INSTALLATION: Boring drilled to completion; set riser pipe and screen; placed filter and seal; grouted to surface; poured surface pad.

REMARKS: Riser pipe started to rise so had to fill with water during installations; well developed on 2-27-88 by flushing w/clean water for 7 min., and then pumping well dry. Water level 50' from TOC.

P-ST-021B

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-18
SHEET 1 of 2

CLIENT		PROJECT		PROJECT NO.
Texas Municipal Power Agency		Gibbons Creek SES		14578
PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N381539 E3342922	269.1	50.0'	2-17-88
SURFACE CONDITIONS		INSPECTOR		DATE FINISH
Clearing in pasture		K. M. Blevins-McCosh		2-17-88
CHECKED BY		APPROVED BY		
M. C. Schluter		L. J. Almaleh		

SAMPLING SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORING CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD	DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
														1		Undifferentiated overburden	Boring advanced using 4 1/2" rotary wash
														2			
TW	1					0.6								3		Sandy SILT; tan; poorly graded; moist; with cemented sand stringers; some clay; iron staining	
														4			
TW	2					1.5								5		Clayey SILT; reddish-brown; hard; high plasticity; moist; trace sand; iron staining; grading some sand below 7'	
														6			
TW	3					1.3								7			pp. 4+
														8			
TW	4					1.7								9		Sandy SILT; reddish-brown; poorly graded; moist; with clay and iron staining; grading to silty clay; interbedding with lignitic clay below 10'; few gypsum crystals	
														10			
TW	5					1.3								1			
														2			
TW	6					1.5								3		Silty CLAY; dark brown to black; hard; highly plastic; moist; lignitic; iron staining; with trace sand below 16'	
														4			pp. 4+
TW	7					0.9								15			
														6			
TW	8					0.9								7			pp. 4+
														8		Silty SAND; tan; poorly graded; moist; trace clay; iron staining	
TW	9					0.7								9			pp. 4+
														20		Clayey SILT; greenish-grey; highly plastic; moist; with trace thin silty sand laminae; trace iron staining	
TW	10					1.4								1			
														2			
TW	11					1.8								3			
														4			
TW	12					0.8								25		Sandy SILT; greenish-grey; poorly graded; moist; with trace to some clay	
														6			
TW	13					1.2								7		Silty CLAY; greenish-grey; high plasticity; moist; with some sandy silt layers	
														8			
TW	14					1.3								9			
														30			

BLACK & VEATCH
ENGINEERS-ARCHITECTS

LOG OF BORING

BORING NO. B-18
SHEET 2 of 2

CLIENT	PROJECT	PROJECT NO.
Texas Municipal Power Agency	Gibbons Creek SES	14578

PROJECT LOCATION	COORDINATES	ELEVATION (DATUM)	TOTAL DEPTH	DATE START
Carlos, Texas	N381539 E3342922	269.1	50.0'	2-17-88

SURFACE CONDITIONS	INSPECTOR	DATE FINISH
Clearing in pasture	K. M. Blevins-McCosh	2-17-88

CHECKED BY	APPROVED BY
M. C. Schluter	L. J. Almaleh

SAMPLING							CORING							DEPTH IN FEET	SAMPLE TYPE / GRAPHICS LOG	CLASSIFICATION OF MATERIAL	REMARKS
SAMP TYPE	SAMP NO.	SET 6"	2ND 6"	3RD 6"	N VAL	SAMP RECV	CORE SIZE	RUN NO.	RUN LENG	RUN RECV	RQD RECV	% RECV	RQD				
TW	15						TW	15					1.4	1			
TW	16						TW	16					1.4	2		2" sandy silt seam at 32.5'; grading to low plasticity; sandy silt filled fractures spacing about 4" in sample	
TW	17						TW	17					1.5	3			
TW	18						TW	18					0.9	4		Grading to interbedded green and greenish grey silty clay below 34'; trace cemented sand	
TW	19						TW	19					2.0	35			
TW	20						TW	20					2.1	6			
TW	21						TW	21					2.0	7		2" sandy silt seam at 37.8' Grading greenish-grey below 38'	
TW	22						TW	22					1.7	8			
TW	23						TW	23					1.9	9			
TW	24						TW	24					1.6	40		Grading to high plasticity below 40'; sandy silt seam grading out; becoming greenish grey and grey banded clay	
														1			
														2			
														3			
														4			
														45		Slickensides at 44.5'	
														6			
														7			
														8			
														9			
														50			Bottom of boring at 50'. Groundwater level unknown. Reamed hole twice using 6 3/4" auger bit. Installed 4-10' and 1-5.5' section of 4" PVC, 1-5' section of screen.
														1			
														2			
														3			
														4			
														55			
														6			
														7			
														8			
														9			
														60			

Appendix B

Field Sampling Forms

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DAILY FIELD RECORD

Project and Task Number:	Date:
Project Name:	Field Activity:
Location:	Weather:

PERSONNEL: Name	Company	Time In	Time Out

PERSONAL SAFETY CHECKLIST

	Steel-toed Boots		Hard Hat		Tyvek Coveralls
	Rubber Gloves		Safety Goggles		1/2-Face Respirator

DRUM I.D.	DESCRIPTION OF CONTENTS AND QUANTITY	LOCATION

TIME	DESCRIPTION OF WORK PERFORMED

DAILY FIELD RECORD (continued)

Page _____of _____

Project and Task Number:	Date:

TIME	DESCRIPTION OF WORK PERFORMED

Water Level Monitoring Record

Project Name: **Project and Task Number:** _____

Date: _____ Measured by: _____ Instrument Used:

_____ Note: For your convenience, the following abbreviations may be used.

P = Pumping I = Inaccessible D = Dedicated Pump
ST = Steel Tape ES = Electric Sounder MP = Measuring Point WL = Water Level

Well No.	Time	MP Elevation (feet)	Water Level Below MP (feet)	Water Level Elevation (feet)	Previous Water Level Below MP	Remarks

WELL SAMPLING AND/OR DEVELOPMENT RECORD

Well ID: _____
Sample ID: _____ **Duplicate ID:** _____
Sample Depth: _____
Project and Task No.: _____
Project Name: _____
Date: _____
Sampled By: _____
Method of Purging: _____
Method of Sampling: _____

Initial Depth to Water: _____
Depth to Water after Sampling: _____
Total Depth to Well: _____
Well Diameter: _____
1 Casing/Borehole Volume: (Circle one) _____
4 Casing/Borehole Volumes: (Circle one) _____
Total Casing/Borehole Volumes Removed: _____

Time	Intake Depth	Rate (ml/min)	Cum. Vol. (gal.)	Temp. (°C)	pH (units)	Specific Electrical Conductance (µS/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	Remarks (color, turbidity, and sediment)
Low Flow Stabilization Criteria				**+/- 3%**	**+/- 0.1**	**+/- 3%**	**+/- 10%**	**+/- 10%**	

pH CALIBRATION (choose two)				
Buffer Solution	pH 4.0	pH 7.0	pH 10.0	
Field Temperature °C				
Instrument Reading				

Model or Unit No.:

SPECIFIC ELECTRICAL CONDUCTANCE (SEC) – CALIBRATION			
KCl Solution (µS/cm=µmhos/cm)	1413 at 25°C	12880 at 25°C	
Field Temperature °C			
Instrument Reading			

Model or Unit No.:

ORP/REDOX CALIBRATION		DISSOLVED OXYGEN CALIBRATION		Notes:
Standard Solution (mV)		Altitude / Salinity %		
Field Temperature °C		Field Temperature °C		
Instrument Reading (mV)		Instrument Reading (mg/L)		
Model or Unit No.:		Model or Unit No.:		

FIELD INSTRUMENT CALIBRATION SHEET

Project Name: _____ Project Number: _____

Date: _____

Equipment Type: _____

Manufacturer: _____

Model Number: _____ Serial Number: _____

Calibration (as necessary, minimum twice per day):

Calibration #1	pH	Cond.	Turb.	DO	ORP	Time: _____
Calibration Standard:	4.0	4.49	0.0	--	200-300	
Instrument Reading:						

Calibration (as necessary, minimum twice per day):

Calibration #2	pH	Cond.	Turb.	DO	ORP	Time: _____
Calibration Standard:	4.0	4.49	0.0	--	200-300	
Instrument Reading:						

Calibration (as necessary, minimum twice per day):

Calibration #3	pH	Cond.	Turb.	DO	ORP	Time: _____
Calibration Standard:	4.0	4.49	0.0	--	200-300	
Instrument Reading:						

Calibration (as necessary, minimum twice per day):

Calibration #4	pH	Cond.	Turb.	DO	ORP	Time: _____
Calibration Standard:	4.0	4.49	0.0	--	200-300	
Instrument Reading:						

Date of Last Calibration: _____ Date(s) Instrument Used: _____

Name of person(s) who calibrated instruments:

Calibration Standards Used:

(1) _____

(2) _____

(3) _____

Source of Calibration Standards:

Miscellaneous Comments:

_____

_____

Calibrated by:

_____

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RESPONSE ITEM NO. 32 ATTACHMENT D

REGISTRATION APPLICATION TABLES

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Table VI.A. – Unit Groundwater Detection Monitoring Systems

Waste Management Unit/Area Name[1]						
Well Number(s):	AP MW-1D	AP MW-3	AP MW-4	AP MW-5	AP MW-6	AP PZ-1
Hydrogeologic Unit Monitored	Ash Ponds	Ash Ponds	Ash Ponds	Ash Ponds	Ash Ponds	Ash Ponds
Type (e.g., point of compliance, background, observation, etc.)	Compliance	Compliance	Compliance	Compliance	Piezometer	Piezometer
Up or Down Gradient	Down Grad.	Down Grad.	Down Grad.	Down Grad.	Down Grad.	Down Grad.
Casing Diameter and Material	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC
Screen Diameter and Material	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC
Screen Slot Size (in.)	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in
Top of Casing Elevation (Ft, Mean Sea Level *[MSL]*)	272.04	274.68	274.16	274.13	277.95	265.67
Grade or Surface Elevation (Ft, MSL)	269.02	271.46	270.93	271.16	274.74	262.70
Well Depth (Ft, Below Grade Surface *[BGS]*)	40 Feet	40.2 Feet	49.6 Feet	40.1 Feet	44.9 Feet	26.4 Feet
Well Depth (Ft, Below Top of Casing *[BTOC]*)	43 Feet	43.4 Feet	52.8 Feet	43.1 Feet	48.1 Feet	29.4 Feet
Screen Interval From (Ft, BGS) To (Ft, BGS)	34.5 FT BGS 39.5 FT BGS	34.6 FT BGS 39.5FT BGS	44.5FT BGS 49.5FT BGS	30.5 FT BGS 35.5FT BGS	41.0 FT BGS 46.0FT BGS	21 FT BGS 26.5 FT BGS
Screen Interval From (Ft, BTOC) To (Ft, BTOC)						

1 From Tables in Section I.; *MSL*: Mean Sea Level; *BGS*: Below Grade Surface; *BTOC*: Below Top of Casing

Table VI.A. – Unit Groundwater Detection Monitoring Systems (Continued)

Well Number(s):	AP PZ-2	AP PZ-3	AP PZ-4	SFL MW-2	SFL MW-3	SFL MW-4	SFL MW-5	SFL MW-6	SFL MW-7
Hydrogeologic Unit Monitored	Ash Ponds	Ash Ponds	Ash Ponds	Site F Landfill	Site F Landfill	Site F Landfill	Site F Landfill	Site F Landfill	Site F Landfill
				Shallow Net.	Shallow Net.	Deep Network	Shallow Net.	Shallow Net.	Deep Network
Type (e.g., point of compliance, background, observation, etc.)	Piezometer	Piezometer	Piezometer	Compliance	Compliance	Compliance	Compliance	Background	Compliance
Up or Down Gradient	Down Gradient	Down Gradient	Down Gradient	Down Gradient	Down Gradient	Down Gradient	Down Gradient	Up Gradient	Down Gradient
Casing Diameter and Material	2" PVC	2" PVC	2" PVC	8" PVC	2" PVC	2" PVC	2" PVC	2" PVC	8" PVC
Screen Diameter and Material	2" PVC	2" PVC	2" PVC	8" PVC	2" PVC	2" PVC	2" PVC	2" PVC	8" PVC
Screen Slot Size (in.)	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in
Top of Casing Elevation (Ft, Mean Sea Level *[MSL]*)	274.91	259.11	273.65	268.31	275	269.53	276.25	286.66	264.83
Grade or Surface Elevation (Ft, MSL)	271.71	255.76	271.39	265.69	271.65	266.46	273.33	283.49	264.63
Well Depth (Ft, Below Grade Surface *[BGS]*)	40 Feet	39.7 Feet	43 Feet	21 Feet	24.9 Feet	39.6 Feet	21.4 Feet	19.9 Feet	58.1 Feet
Well Depth (Ft, Below Top of Casing *[BTOC]*)	43.2 Feet	43.1 Feet	45.3 Feet	23.6 Feet	28.2 Feet	42.7 Feet	24.3 Feet	23.1 Feet	58.3 Feet
Screen Interval									
From (Ft, BGS)	34-FT BGS	34.5-FT BGS	38.5-FT BGS	16-FT BGS	19.5-FT BGS	34.5-FT BGS	16-FT BGS	14.5-FT BGS	50-FT BGS
To (Ft, BGS)	39-FT BGS	39.5-FT BGS	43.5-FT BGS	21-FT BGS	24.5-FT BGS	39.5-FT BGS	21-FT BGS	19.5-FT BGS	55-FT BGS
Screen Interval									
From (Ft, BTOC)									
To (Ft, BTOC)									

Well Number(s):	SSP/AP MW-1	SSP MW-2	SSP MW-3	SSP MW-4	MNW-11	MNW-15	MNW-16	MNW-17	MNW-18
Hydrogeologic Unit Monitored	Scrubber/Ash	Scrubber Pond	Scrubber Pond	Scrubber Pond	Scrubber Pond	Site F Landfill	Site F Landfill	Site F Landfill	Site F Landfill
					Deep Network	Shallow Net.	Deep Network	Deep Network	Deep Network
Type (e.g., point of compliance, background, observation, etc.)	Background	Compliance	Compliance	Compliance	Compliance	Compliance	Piezometer	Piezometer	Background
Up or Down Gradient	Upgradient	Down Gradient	Down Gradient	Down Gradient	Down Gradient	Down Gradient	Down Gradient	Down Gradient	Upgradient
Casing Diameter and Material	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC	4" PVC	4" PVC	4" PVC
Screen Diameter and Material	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC	2" PVC	4" PVC	4" PVC	4" PVC
Screen Slot Size (in.)	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in	0.01 in
Top of Casing Elevation (Ft, Mean Sea Level *[MSL]*)	272.53	283.66	283.97	283.86	268.12	257.54	263.19	293.86	270.91
Grade or Surface Elevation (Ft, MSL)	269.33	280.62	280.95	280.86	267.95	257.33	263.33	293.72	270.76
Well Depth (Ft, Below Grade Surface *[BGS]*)	40 Feet	43.9 Feet	45.2 Feet	48.5 Feet	47.3 Feet	27.0 Feet	40.4 Feet	50.2 Feet	51.0 Feet
Well Depth (Ft, Below Top of Casing *[BTOC]*)	43.2 Feet	46.9 Feet	48.2 Feet	51.5 Feet	47.5 Feet	27.2 Feet	40.5 Feet	50.4 Feet	51.2 Feet
Screen Interval									
From (Ft, BGS)	29.5-FT BGS	38.5-FT BGS	39.5-FT BGS	43-FT BGS	42.5-FT BGS	22.2-FT BGS	33.5-FT BGS	45.4-FT BGS	46.2-FT BGS
To (Ft, BGS)	39.5-FT BGS	43.5-FT BGS	44.5-FT BGS	48-FT BGS	47.5-FT BGS	27.2-FT BGS	40.5-FT BGS	50.4-FT BGS	51.2-FT BGS
Screen Interval									
From (Ft, BTOC)									
To (Ft, BTOC)									

Registration No.: 32271 (CCR113)
Registrant: Gibbons Creek Environmental Redevelopment Group, LLC.

Historical Water Surface Level Data[1] at Gibbons Creek SES Monitoring Wells, Years 2018 through 2023

Well	TOC Elevation	2023		2022		2021		2020		2019		2018	
		23-Jun	23-Nov	Jul-22	Dec-22	Jul-21	Feb-22	Jun-20	Dec-19	Jun-19	Jan-19	Jun-18	Mar-18
AP MW-1	271.56	254.34	253.34	251.38	250.57	258.53	258.34	264.40	264.45	265.21	264.73	264.74	265.17
AP MW-1D	272.04	253.96	252.86	251.22	250.46	257.56	257.21	257.53	257.07	257.90	257.94	258.16	258.38
AP MW-2	274.97	263.68	260.90	257.57	258.29	262.32	267.46	NC[2]	NC[2]	NC[2]	NC[2]	NC[2]	NC[2]
AP MW-3	274.68	261.02	259.06	253.87	253.13	262.09	263.29	263.50	263.18	264.04	264.00	264.06	264.04
AP MW-4	274.16	257.91	256.99	250.66	251.10	259.47	260.64	260.79	260.15	261.06	261.00	261.07	261.40
AP MW-5	274.13	256.62	255.75	249.41	249.71	259.66	262.04	262.38	261.89	262.86	262.75	263.01	262.94
AP MW-6	277.95	258.85	258.25	255.30	255.78	260.92	261.31	261.39	261.05	261.76	261.62	261.41	262.19
AP PZ-1	265.67	257.86	254.79	255.20	258.01	260.31	259.03	258.97	259.56	259.28	260.05	257.98	259.26
AP PZ-2	274.91	256.60	253.60	255.58	254.46	257.84	254.45	256.00	254.39	257.72	257.76	256.15	256.81
AP PZ-3	259.11	252.41	250.96	250.67	249.56	254.35	253.11	253.85	253.46	254.52	254.46	254.30	254.68
AP PZ-4	273.65	259.20	259.82	255.93	257.43	259.62	263.30	263.41	262.76	264.11	264.79	264.94	264.97
SSP MW-1	281.18	263.97	262.73	263.94	263.45	267.23	265.32	264.40	264.45	265.21	264.73	264.74	265.17
SSP MW-2	283.66	259.86	258.18	258.70	258.92	260.64	259.82	260.01	260.26	262.48	261.84	261.48	261.64
SSP MW-3	283.97	256.82	254.82	255.31	255.89	256.85	255.79	256.30	256.07	257.62	257.53	256.38	257.14
SSP MW-4	283.86	258.65	257.97	258.06	258.38	259.38	259.21	259.16	259.35	259.99	260.04	259.49	260.02
SSP/AP MW-1	272.53	261.27	261.40	262.22	261.69	264.82	264.19	264.40	264.45	265.21	264.73	264.74	265.17
SFL MW-2	268.31	258.61	257.29	257.80	257.27	257.93	256.74	257.60	257.30	258.20	257.50	257.40	257.43
SFL MW-3	275	257.28	256.81	258.26	257.81	257.08	256.88	257.45	258.02	258.61	258.00	258.08	258.24
SFL MW-4	269.53	254.94	253.52	254.40	254.18	254.75	253.85	254.32	255.18	255.32	254.93	254.73	255.10
SFL MW-5	276.25	261.82	260.47	260.37	260.11	260.17	259.81	260.52	260.35	261.22	260.45	260.42	260.46
SFL MW-6	286.66	268.08	269.69	267.85	268.29	267.66	268.07	268.35	269.41	269.35	268.17	268.09	268.36
SFL MW-7	264.63	250.57	248.57	249.23	250.22	251.41	250.05	250.63	249.66	251.66	252.19	251.70	251.86
MNW-11	267.95	247.35	247.74	247.31	247.79	247.25	247.68	247.58	248.11	247.25	248.67	248.15	248.38
MNW-15	257.331	252.50	250.42	251.92	251.47	252.45	251.11	252.27	251.44	253.52	253.73	253.23	253.61
MNW-16	263.191	248.14	247.13	249.30	248.31	250.69	249.07	250.16	248.94	250.84	251.39	250.71	251.02
MNW-17	293.724	259.09	248.48	256.60	264.47	264.36	260.22	248.22	253.85	250.01	259.04	248.39	260.73
MNW-18	270.755	261.78	259.72	261.07	261.20	262.05	262.40	263.41	261.59	262.54	265.28	261.98	262.49

[1] Historical data is from annual groundwater monitoring reports. 2024 levels have not yet been reported.

[2] NC for Not Collected. The reason for not collecting the water surface elevation is unknown.

Table VI.D. – CCR Units Under Assessment Monitoring

N.O.R. Unit No.	Unit Description[1,2]	Well(s)	Constituent(s)	Date of SSI Determination[4]	Date of Assessment Monitoring Notification[3]
	Site F Landfill (SFL) Shallow Network	SFL MW-2 SFL MW-3 SFL MW-5 SFL MW-15	Boron, Cadmium, Cobalt, Lead, and pH.	January 2024	August 18, 2018
	Site F Landfill (SFL) Deep	SFL MW-4 SFL MW-3	Boron, Chloride, and TDS.	January 2024	August 18, 2018
	Scrubber Sludge Pond (SSP)	SSP MW-2 SSP MW-3 SSP MW-4	Beryllium, Cadmium, Calcium, Chloride, Chromium, Cobalt, Boron, Mercury, Molybdenum, Radium 226+228, Thallium, Selenium, and pH.	January 2024	August 18, 2018
	Ash Ponds (AP)	AP MW-1D AP MW-3 AP MW-4 AP MW-5	Arsenic, Beryllium, Boron, Cadmium, Cobalt, Fluoride, Mercury, Beryllium, Thallium, Molybdenum, TDS, and pH.	January 2024	August 18, 2018

1 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been requested pursuant to 40 CFR §257.103.
2 Indicates a unit for which a 30 TAC Chapter 352/40 CFR Part 257, Subpart D alternative closure determination has been made pursuant to 40 CFR §257.103.
3 Enter month, day, and year

4 Most recent determination reported in the 2023 annual report.