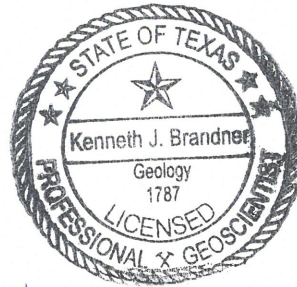


**American Electric Power Service  
Corporation**

**Landfill - CCR Groundwater  
Monitoring Well Network  
Evaluation**

J. Robert Welsh Power Plant  
1187 County Road 4865  
Titus County  
Pittsburg, Texas

February 5, 2018



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**Landfill - CCR Groundwater  
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Evaluation**

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Pittsburg, Texas

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**Acronyms and Abbreviation**

AEP	American Electric Power Service Cooperation
amsl	above mean sea level
ARCADIS	ARCADIS U.S., Inc.
BAP	bottom ash pond
CCR	Coal Combustion Residual
CFR	Code of Federal Regulations
EPRI	Electric Power Research Institute
FAP	fly ash pond
FGD	flue gas desulfurization
ft	feet
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
PTI	Permit to Install
TDS	total dissolved solids

## **1. Objective**

This report was prepared by ARCADIS U.S., Inc. (ARCADIS) for American Electric Power Service Corporation (AEP) to assess the adequacy of the groundwater monitoring well network included in the Coal Combustion Residual (CCR) requirements, as specified in Code of Federal Regulations (CFR) 40 CFR 257.91, for the existing landfill (CCR Unit) at the AEP J. Robert Welsh Generating Plant (Plant) located at 1187 County Road 4865 in Pittsburg, Titus County, Texas (**Figure 1**). The CCR requirements include an evaluation of the adequacy of the groundwater monitoring well network to characterize groundwater quality up and down gradient of the CCR unit.

Three regulated CCR units associated with the Plant were identified for review, which include the primary bottom ash pond, existing landfill, and bottom ash storage pond (**Figure 2**). This report summarizes the evaluation of the groundwater monitoring well network in the uppermost aquifer at the existing landfill (landfill). The evaluation of location restriction criteria is not included in this report and will be completed under separate cover.

This evaluation included a review of AEP-provided data associated with previously completed subsurface investigation activities in the vicinity of the landfill CCR unit, as well as publicly-available geologic and hydrogeologic data. This report also presents the current Conceptual Site Model based on all documents reviewed and will further describe the uppermost aquifer, include an evaluation of the adequacy of the existing monitoring well network, and provide recommendations for monitoring well augmentation, as necessary.

## **2. Background Information**

This section provides background information for the AEP Welsh Generating Plant landfill.

### **2.1 Facility Location Description**

The AEP J. Robert Welsh Plant is located in southern Titus County, approximately 8 miles northeast of Pittsburg, Texas, and approximately two miles northwest of Cason, Texas. The landfill CCR unit is located approximately 2,000 feet southwest of the Plant generating units, directly south of the primary bottom ash pond CCR unit, and approximately 800 feet west of the Welsh Reservoir (**Figures 1 and 2**).

### **2.2 Description of Landfill CCR Unit**

The following section will discuss the embankment configuration, area, volume, construction and operational history, and surface water control associated with the landfill.

#### **2.2.1 Embankment Configuration**

The landfill was placed into operation in approximately 1977, and is located in a topographically high area south of the primary bottom ash pond. The landfill is approximately 40 acres in size, and is located directly above native clayey soils. The base of the landfill ranges in elevation from approximately 355 feet amsl on the west side to 345 feet amsl on the east side. These landfill base elevations were confirmed by soil borings installed through the landfill in 2014 (ETTL, 2015).

The western two thirds of the landfill is used as a temporary storage and processing area for marketable CCR that is sold for beneficial reuse including road base material. The eastern third of the landfill is an approximate 13-acre active ash disposal area where ash is placed above the base of the landfill to a top surface elevation that currently ranges from approximately 364 to 380 feet amsl.

Ash material had previously been placed into the landfill against an earthen embankment with 2:1 side slopes (2 feet horizontal, 1 foot vertical). However, to reduce the potential for slope failure, the side slopes of the landfill embankment were re-graded to 3:1 (3 feet horizontal, 1 foot vertical) in 2010.

### 2.2.2 Area/Volume

The landfill occupies an area of approximately 40 acres. A capacity analysis of the landfill was conducted by AEP in 2008 (AEP, 2008). The capacity analysis concluded the landfill has a maximum ash storage capacity of approximately 1,770,000 cubic yards beyond April 2008. Based on soil borings installed through the landfill (ETTL, 2015), the maximum ash thickness is approximately 33 feet, and the average ash thickness within the 40-acre landfill is approximately 20 feet. This corresponds to a current ash volume of approximately 800 acre-feet (1,290,000 cubic yards).

### 2.2.3 Construction and Operational History

The AEP J. Robert Welsh Plant began operations in 1977 with three coal-fired generating units (Units 1, 2, and 3). Throughout the life of the generating plant, CCR materials (fly ash, bottom ash, economizer ash) have been generated. All of these byproducts were stored in the primary bottom ash pond and in the landfill that was constructed in the late 1970's. In 2000, the 22-acre bottom ash storage pond was installed south of the landfill (**Figure 3**).

The landfill received fly ash, bottom ash, and economizer ash from the generating plant. The ash was sluiced to the landfill between approximately 1982 and 2000. Currently, dry ash is trucked to the landfill. The landfill is also utilized for disposal of ash dredged from the bottom ash storage pond that was constructed in 2000. The ash is currently stored in the eastern third of the landfill, and the western two thirds of the landfill is currently used as a temporary storage and processing area for marketable ash material that is sold for beneficial reuse, loaded into trucks, and transported offsite for reuse (highway road base, etc.).

### 2.2.4 Surface Water Control

Surface water flow within the landfill is controlled by drainage ditches at the north and east toes of the landfill. Surface water in the drainage ditches flows to a culvert at the northeast corner of the landfill, then discharges into the primary ash pond directly north of the landfill.

## 2.3 Previous Investigations

The initial soils investigation for the site was provided in a 1973 report prepared by McClelland Engineers, Inc. entitled "*Soils Investigation, Welsh Power Plant, Cason,*

Texas". This investigation included advancement of soil borings in the primary bottom ash pond area, and geotechnical soil testing to characterize the area encompassed by the primary bottom ash pond.

In 2001, five monitoring wells (AD-1 through AD-5) were installed in the area of the primary bottom ash pond and bottom ash storage pond to obtain hydrologic data for the uppermost water-bearing unit. Twelve additional monitoring wells (AD-4a, AD-4b, AD-4c, AD-6 through AD-14) were installed in the area of the primary bottom ash pond, bottom ash storage pond, and landfill by Eagle Environmental Services in 2009 to obtain more detailed hydrologic data for the uppermost water-bearing unit. Monitoring well completion diagrams are provided in **Appendix A**.

In 2015, E TTL conducted a *Geotechnical Investigation* of the Landfill (E TTL, 2015). The report concluded the risk of slope failure due to liquefaction is very low, and recommended regrading of the top surface of the existing ash at the southeast corner of the landfill to eliminate ponding of surface water. The report also recommended dredged ash be spread out to drain water prior to placement in the landfill, emplacement of a 3-foot-thick clay cap on the existing side slopes in the eastern third of the landfill on a 3:1 slope (3 feet horizontal, 1 foot vertical), and improve drainage along the toe of the eastern third of the landfill using either horizontal drains at the toe of the slope or trenches containing perforated pipe with a geotextile cover.

In December 2015, Auckland Consulting further expanded the groundwater monitoring well system at the Plant by installation of monitoring wells AD-15 through AD-18 (Auckland Consulting, 2016). Monitoring well completion diagrams are provided in **Appendix A**.

#### **2.4 Hydrogeologic Setting**

The site area is located within the West Gulf Coastal Plain. Cretaceous formations crop out in belts that extend in a northeasterly direction parallel to the Gulf of Mexico, and dip gently southeast. The Site is located on the outcrop of the Eocene-age Recklaw Formation, which consists of very fine to fine grained sand and clay (Flawn, 1966).

These features are further illustrated on five lines of cross section that were prepared through the landfill area, with three lines trending from west to east (A-A'; B-B'; C-C'), and the other two lines trending from north to south (D-D'; E-E'). The cross section

location map is included as **Figure 3** and the lines of cross section are included as **Figure 4 (A-A')** through **Figure 8 (E-E')**.

#### 2.4.1 Climate and Water Budget

The climate of Titus County, Texas is moist subhumid. The average January temperature is 45° Fahrenheit (F), and the average July temperature is 82.9°F. The mean annual growing season is 228 days (Broom, 1965). Average annual precipitation (including liquid water equivalent from snowfall) is approximately 47 inches according to weatherdb.com.

#### 2.4.2 Regional and Local Geologic Setting

The Site is located on the outcrop of the Eocene-age Recklaw Formation, which consists of very fine to fine grained sand and clay (Flawn, 1966). The Recklaw Formation attains a thickness of approximately 110 feet in Titus County, and is underlain by the Eocene-age Carrizo Sand which consists of fine to coarse sand, silt, and clay (Broom, 1965). In the topographically low areas underling the Welsh Reservoir to the east of the landfill, Quarternary alluvial sediments associated with Swauano Creek are present (Flawn, 1966).

Detailed regional geologic characterization can be found in several published reports including Texas Water Commission Bulletin 6517 "*Ground-Water Resources of Camp, Franklin, Morris and Titus Counties, Texas*" (Broom, 1965), and The University of Texas at Austin Bureau of Economic Geology "*Geologic Atlas of Texas – Texarkana Sheet*" (Flawn, 1966).

Detailed regional and site geologic characterization can be found in the 2015 E TTL report entitled "*Geotechnical Investigation, Phase 1 Landfill Seepage Evaluation and Vertical Expansion, Pittsburg, Texas*" (ETTL, 2015).

#### 2.4.3 Surface Water and Surface Water Groundwater Interactions

The Site is generally less than one-half mile from Swauano Creek, which was dammed near the southern end of the site during plant development to form the Welsh Reservoir. Groundwater flow direction at the Site is generally from west to east, following surface topography towards the Welsh Reservoir. The Welsh Reservoir is likely a gaining surface water feature, and groundwater elevations on site are higher than the normal stage elevation of the Welsh Reservoir (approximately 320 feet amsl).

**Figure 9** and **Figure 10** are potentiometric surface maps for the uppermost aquifer at the Site based on March 2016 and February 2017 water level data, respectively. Water level elevations in the Site monitoring wells are summarized on **Table 1**. As shown on **Figures 9** and **10**, a hydraulic ridge is present in the uppermost aquifer in the area of monitoring well AD-12 at the west end of the landfill. Shallow groundwater flow often follows surface topography, and the hydraulic ridge location corresponds to a topographically high area of the Site. Shallow groundwater flow direction at the landfill is northeasterly to easterly toward the Welsh Reservoir at an average hydraulic gradient of approximately 0.01 foot per foot. Shallow groundwater flow directly west of the landfill in the area of monitoring well AD-17 is westerly toward a topographically low-lying area west of monitoring well AD-17.

#### 2.4.4 Water Users

A water well inventory conducted by Banks Information Solutions showed one water well within a ½-mile radius of the Site (Banks, 2013). The water well is located on-site to the northwest (up gradient) of the landfill, and was installed for Southwestern Electric Company in 1974 with screens from 515 to 535 feet below ground surface, and plugged at a later date.

### 3. Groundwater Monitoring Well Network Evaluation

The existing monitoring well network present at the Site was evaluated to determine if any of the wells were viable for continued use as part of the groundwater monitoring well network or also retained as part of a larger groundwater hydraulic monitoring well network. The hydrogeologic conditions were also evaluated to determine if the uppermost aquifer unit has an effective well network. The evaluation was completed in accordance with 40 CFR 257.91 to have an established monitoring well network that effectively monitors the uppermost aquifer upgradient and down gradient of the Site. The upgradient wells represent background groundwater quality and the down gradient wells are to be placed down gradient of the CCR unit boundary to monitor water quality.

#### 3.1 Hydrostratigraphic Units

##### 3.1.1 Horizontal and Vertical Position Relative to CCR Unit

Geologic data from soil borings and monitoring wells installed at the site show the uppermost aquifer in the area of the landfill is a very fine to fine grained clayey and silty sand stratum with an average thickness of approximately 10 feet that is located between an average elevation of approximately 325 and 335 feet amsl (**Appendix A**). The base of the landfill is at an elevation of approximately 345 to 355 feet amsl. This separation distance is further illustrated on cross section B-B' (**Figure 5**) and cross section D-D' (**Figure 7**).

##### 3.1.2 Overall Flow Conditions

Groundwater is recharged from regional precipitation infiltration and locally from ash pond use. The uppermost aquifer (clayey and silty sand) is expected to have a hydraulic conductivity of approximately  $10^{-4}$  centimeters per second (Fetter, 1980). Based on the hydraulic conductivity and saturated thickness (approximately 10 feet), the yield of the uppermost aquifer is anticipated to exceed the TCEQ non-useable (Class 3) limit of 150 gallons per day (TCEQ, 2010).

Available groundwater elevations are summarized on **Table 1** for 2011 through 2017. The most recent comprehensive groundwater data set from February 2017 is depicted on **Figure 10**. A hydraulic ridge is present in the uppermost aquifer in the area of monitoring well AD-12 at the west end of the landfill. The hydraulic ridge extends northerly from AD-12 toward monitoring well AD-18, which is located hydraulically



sidegradient of the landfill. Shallow groundwater flow direction at the landfill is easterly toward the Welsh Reservoir at an average hydraulic gradient of approximately 0.01 foot per foot. Shallow groundwater flow directly west of the landfill in the area of monitoring well AD-17 is westerly toward a topographically low-lying area west of monitoring well AD-17.

### **3.2 Uppermost Aquifer**

#### 3.2.1 CCR Rule Definition

The CCR rule definitions for an aquifer and the uppermost aquifer as specified in 40 CFR 257.53 indicates an aquifer is a geologic formation capable of yielding usable quantities of groundwater to wells or springs while an uppermost aquifer is defined as the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers, that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural groundwater surface to which the aquifer rises during the wet season.

##### *3.2.1.1 Common Definitions*

An aquifer is commonly defined as a geologic unit that stores and transmits water (readily or at sufficient flow rates) to supply wells and springs (USGS, 2015; Fetter, 2001). The uppermost aquifer is considered the first encountered aquifer below the CCR unit.

#### 3.2.2 Identified Onsite Hydrostratigraphic Unit

The identified on-Site hydrostratigraphic unit in the area of the landfill is the very fine to fine grained clayey and silty sand stratum that is located between an elevation of approximately 325 and 335 feet amsl. This unit is not used locally for groundwater supply or industrial water use, but meets the TCEQ definition of a useable aquifer.

### **3.3 Review of Existing Monitoring Well Network**

#### 3.3.1 Overview

The Site was visited by ARCADIS and AEP personnel on August 20, 2015 to review existing well network conditions and locations. A well construction table that summarizes the location, ground surface elevation, borehole depth, installation date,

and associated well construction details of the monitoring well network is included as **Table 2**. Photo documentation of the located wells during the August 20, 2015 site visit is provided in **Appendix B**.

Monitoring wells AD-11 through AD-14 were previously installed at the Site to monitor the uppermost aquifer (very fine to fine grained clayey and silty sand stratum) associated with the landfill. As discussed above in Section 3.1.1, the uppermost aquifer below the landfill is approximately 10 feet thick and is located between an elevation of approximately 325 and 335 feet amsl. In addition to these four monitoring wells, several soil borings were installed through the landfill as part of the E TTL geotechnical investigation of the landfill embankments (E TTL, 2015). These soil borings confirmed the presence of the uppermost aquifer beneath the landfill between an average elevation of approximately 325 and 335 feet amsl.

### 3.3.2 Gaps in Monitoring Network

As shown on the monitoring well completion diagrams in **Appendix A** and Geologic Cross Sections B-B' (**Figure 5**) and E-E' (**Figure 8**), existing monitoring wells AD-11, AD-13, and AD-14 are screened in the uppermost aquifer down gradient (east) of the landfill. These three monitoring wells will be utilized as down gradient monitoring wells for the landfill groundwater monitoring system. Existing monitoring wells AD-1 and AD-5 are screened in the uppermost aquifer south and north, respectively, of the landfill. As shown on **Figures 9** and **10**, the groundwater flow path at the landfill is easterly toward the Welsh Reservoir, and monitoring wells AD-1 and AD-5 are not within this groundwater flow path. Therefore, monitoring wells AD-1 and AD-5 will be utilized as background (upgradient) monitoring wells to collect background water quality data for the landfill.

As shown on **Figure 3** and Geologic Cross Section B-B' (**Figure 5**), existing monitoring well AD-12 is located in the upgradient (west) portion of the landfill, but is located within the landfill boundaries as confirmed by the presence of ash material in the uppermost 10 feet of the boring. Therefore, due to the presence of ash material at the AD-12 location, this monitoring well will not be utilized as an upgradient monitoring well. This data gap was addressed by installation of new monitoring wells AD-17 and AD-18 outside of the landfill boundary approximately 500 feet west and 700 feet northwest, respectively, of monitoring well AD-12. As shown on **Figures 9** and **10**, monitoring well AD-17 is located west of the hydraulic ridge along the western boundary of the landfill that extends north toward monitoring well AD-18. Therefore, monitoring well AD-17 will be utilized as a background (upgradient) monitoring well for the landfill groundwater



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monitoring system. Monitoring well AD-18 is located along the hydraulic ridge in uppermost aquifer in the western portion of the Site, and is therefore side gradient of the landfill. Therefore, monitoring well MW-18 may be utilized as a piezometer to obtain water level data for the uppermost aquifer. With the addition of monitoring wells AD-17 and AD-18 during December 2015, there are no data gaps remaining in the groundwater monitoring system for the landfill.

#### **4. Recommended Monitoring Network and PE Certification**

The recommended modifications to the existing groundwater monitoring well network are intended to meet specifications stated in 40 CFR 257.91. Recommended wells are further discussed with respect to location to the landfill (upgradient or down gradient), well depth, and well construction. The recommended network would provide an improved understanding of groundwater quality, hydraulics, and groundwater flow at the landfill.

##### **4.1 Recommended Monitoring Well Network Distribution**

A total of three down gradient well locations (existing monitoring wells AD-11, AD-13 and AD-14) and three upgradient well locations (existing monitoring wells AD-1, AD-5 and AD-17) are recommended to establish a groundwater quality monitoring well network for the landfill. In addition, existing monitoring wells AD-12 and AD-18 may be utilized as piezometers to obtain additional groundwater flow direction and gradient data for the landfill.

###### 4.1.1 Location

The recommended monitoring well network for groundwater quality of the uppermost aquifer at the landfill is summarized on **Table 3** and illustrated on **Figure 11**.

###### 4.1.2 Depth

The screen depths for the monitoring wells recommended for inclusion in the monitoring network are within the shallow saturated sand stratum (uppermost aquifer) that occurs beneath the landfill between an average elevation of approximately 325 and 335 feet amsl. The screen elevations are presented in **Table 3**.

###### 4.1.3 Well Construction

As discussed above in Section 3.3.2, the gap in the monitoring well network for the uppermost aquifer beneath the landfill was addressed by installation of monitoring wells AD-17 and AD-18 during December 2015. Monitoring wells AD-17 and AD-18 were installed by a Texas Department of Licensing and Regulation (TDLR)-licensed water well driller. Well construction data for the monitoring well network are summarized on **Tables 2** and **3**, and the monitoring well completion diagrams are provided in **Appendix A**.

4.2 Professional Engineer's Certification

I, Kenneth J. Brandner, certify that this report was prepared under my direction and supervision, and that the information contained herein is true and accurate to the best of my knowledge. Based on my experience and knowledge of the site, the proposed groundwater monitoring system will be adequate to meet the requirements of 40 CFR Part 257.91.

Kenneth J. Brandner  
Printed Name of Registered Professional Engineer

*Kenneth J. Brandner*  
Signature



69586  
Registration No.

TX  
Registration State

2-5-18  
Date

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**Tables**



**Table 1**  
**Water Level Data**  
**AEP J. Robert Welsh Power Plant - CCR Storage Areas**  
**Pittsburg, Titus County, Texas**

Well ID	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Borehole depth ft. bls	Date Installed	Screen Material	Well diameter inches	Top of Screen		Bottom of Screen		6/7/2011	12/6/2011	5/2/2012	11/1/2012	5/14/2013	11/19/2013	5/12/2014	11/16/2014	5/12/2015	3/4/2016	5/26/2016	7/27/2016	10/19/2016	12/12/2016	1/17/2017	2/23/2017	
									Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl	GW Elev. ft. msl
<b>Monitoring Wells</b>																													
AD-1 <sup>(a)</sup>	33° 02' 48"	94° 50' 47"	355.57	357.57	25.0	1/11/01	Sch. 40 PVC	2	15.0	340.57	25.0	330.57	338.46	334.92	337.88	337.18	337.43	336.73	338.03	337.64	340.82	342.83	344.89	342.89	341.23	340.58	341.18	339.74	
AD-2 <sup>(c)</sup>	33° 02' 37"	94° 50' 44"	344.16	346.16	25.0	4/26/01	Sch. 40 PVC	2	15.0	329.16	25.0	319.16	330.16	329.07	330.00	329.26	329.83	329.70	330.09	329.69	332.56	332.32	---	---	---	---	---	---	
AD-3 <sup>(c)</sup>	33° 02' 38"	94° 50' 37"	331.10	333.10	17.0	4/26/01	Sch. 40 PVC	2	7.0	324.10	17.0	314.10	323.81	323.19	323.99	323.29	323.77	323.98	324.12	323.28	325.58	325.12	324.59	323.70	323.47	323.78	325.04	324.92	
AD-4 <sup>(c)</sup>	33° 02' 43"	94° 50' 33"	340.61	342.61	30.0	4/26/01	Sch. 40 PVC	2	19.0	321.61	29.0	311.61	324.81	324.84	324.62	324.40	324.74	325.52	325.44	325.13	327.00	326.90	---	---	---	---	---	---	
AD-4a <sup>(a)</sup>	33.04527	94.84258	340.19	342.85	30.0	9/22/09	Sch. 40 PVC	2	20.0	320.19	30.0	310.19	325.01	324.19	325.24	322.90	324.86	324.68	325.64	325.34	327.19	327.12	---	---	---	---	---	---	
AD-4b <sup>(a)</sup>	33.04531	94.84230	329.55	333.23	15.0	9/23/09	Sch. 40 PVC	2	5.0	324.55	15.0	314.55	324.35	324.32	324.50	324.30	324.30	325.21	325.22	324.90	326.58	326.67	---	---	---	---	---	---	
AD-4c <sup>(a)</sup>	33.04507	94.84244	329.15	333.28	15.0	9/23/09	Sch. 40 PVC	2	5.0	324.15	15.0	314.15	324.18	324.50	324.64	324.37	324.11	325.06	325.01	324.71	326.50	326.19	325.89	324.01	323.76	325.07	326.39	324.89	
AD-5 <sup>(c)</sup>	33° 03' 13"	94° 51' 00"	349.00	351.00	30.0	1/11/01	Sch. 40 PVC	2	20.0	329.00	30.0	319.00	336.34	336.58	336.82	336.99	336.78	336.47	336.80	336.01	329.07	338.04	337.62	337.24	337.74	337.01	338.34	336.17	
AD-6 <sup>(a)</sup>	33.05235	94.84757	343.31	346.33	33.0	9/23/09	Sch. 40 PVC	2	23.0	320.31	33.0	310.31	333.04	333.02	332.83	333.02	333.11	332.81	333.11	332.81	333.38	334.00	---	---	---	---	---	---	
AD-7 <sup>(a)</sup>	33.05257	94.84219	347.86	350.82	38.0	9/24/09	Sch. 40 PVC	2	28.0	319.86	38.0	309.86	334.32	334.12	334.19	334.20	334.13	334.58	333.77	333.98	334.09	333.61	---	---	---	---	---	---	
AD-8 <sup>(a)</sup>	33.05187	94.84026	337.53	340.01	29.0	9/21/09	Sch. 40 PVC	2	16.0	321.53	26.0	311.53	325.41	324.09	325.69	325.15	325.79	325.75	325.98	325.77	326.05	325.70	325.68	325.05	325.29	325.92	326.76	324.27	
AD-9 <sup>(a)</sup>	33.04995	94.84196	340.32	343.09	35.0	9/21/09	Sch. 40 PVC	2	20.0	320.32	35.0	305.32	328.46	328.53	328.63	328.44	328.74	329.38	NM	330.18	329.98	329.74	329.28	329.53	328.92	329.31	330.50	328.05	
AD-10 <sup>(a)</sup>	33.04881	94.84047	340.23	343.01	35.0	9/22/09	Sch. 40 PVC	2	20.0	320.23	35.0	305.23	323.44	322.55	323.27	323.35	323.51	323.76	323.57	323.88	323.95	323.55	---	---	---	---	---	---	
AD-11 <sup>(a)</sup>	33.04824	94.84177	339.61	342.18	20.0	9/22/09	Sch. 40 PVC	2	10.0	329.61	20.0	319.61	327.99	328.37	327.82	327.93	327.94	328.13	328.20	327.97	328.96	328.13	328.39	328.14	327.87	328.20	328.90	328.25	
AD-12 <sup>(a)</sup>	33.04901	94.84977	366.27	369.33	30.0	9/24/09	Sch. 40 PVC	2	20.0	346.27	30.0	336.27	348.30	348.29	349.86	349.56	349.99	349.65	349.89	350.01	350.65	350.39	---	---	---	---	---	---	
AD-13 <sup>(a)</sup>	33.04918	94.84275	344.12	347.00	20.0	9/22/09	Sch. 40 PVC	2	6.0	338.12	16.0	328.12	332.36	332.24	333.09	332.26	332.68	333.25	333.35	332.01	337.58	334.76	334.54	332.93	332.39	332.84	334.54	331.83	
AD-14 <sup>(a)</sup>	33.04715	94.84256	342.32	345.43	19.0	9/22/09	Sch. 40 PVC	2	8.0	334.32	18.0	324.32	330.40	329.80	331.67	330.34	330.94	331.69	332.12	330.17	336.63	334.83	334.51	331.71	330.94	330.79	332.63	330.87	
AD-15 <sup>(d)</sup>	33° 03' 04"	94° 50' 27"	340.21	343.29	46.0	12/12/15	Sch. 40 PVC	2	25.5	314.71	45.5	294.71	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AD-16 <sup>(d)</sup>	33° 02' 49"	94° 50' 29"	350.86	353.97	21.0	12/10/15	Sch. 40 PVC	2	11.0	339.86	21.0	329.86	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AD-16R <sup>(e)</sup>	33° 02' 49"	94° 50' 28.9"	350.55	353.49	27.0	4/12/17	Sch. 40 PVC	2	12.0	338.55	27.0	323.55	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AD-17 <sup>(d)</sup>	33° 02' 57"	94° 51' 06"	353.99	357.10	40.0	12/10/15	Sch. 40 PVC	2	24.0	329.99	39.0	314.99	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
AD-18 <sup>(d)</sup>	33° 03' 03"	94° 51' 03"	346.17	349.28	29.0	12/11/15	Sch. 40 PVC	2	14.0	332.17	29.0	317.17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
<b>Piezometers</b>																													
B-2 <sup>(b)</sup>	33° 03.078'	94° 50.449'	339.7	339.7	50.0	10/28/09	Sch. 40 PVC	2	10.0	329.70	20.0	319.70	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	
B-4 <sup>(b)</sup>	33° 03.011'	94° 50.462'	340.6	340.6	50.0	10/27/09	Sch. 40 PVC	2	8.0	332.60	18.0	322.60	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	
B-5 <sup>(b)</sup>	33° 02.964'	94° 50.428'	340.0	340.0	50.0	10/27/09	Sch. 40 PVC	2	10.0	330.00	20.0	320.00	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	
B-6 <sup>(b)</sup>	33° 02.912'	94° 50.462'	340.1	340.1	50.0	10/28/09	Sch. 40 PVC	2	12.0	328.10	22.0	318.10	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	

NM - Not measured.  
(a) Source: Eagle Environmental Services Well Logs (2009).  
(b) Source: EITL Engineers & Consultants Inc. (June 21, 2010).  
(c) Source: Southwest Electric Power, State of Texas Well Report (2001).  
(d) Source: Auckland Consulting LLC (January 26, 2016). Monitoring wells AD-15 through AD-18 installed during December 2015.  
(e) Monitoring well installed by ARCADIS on April 12, 2017 as a replacement for monitoring well AD-16.  
Groundwater Elevation Source: AEP, Shallow Groundwater Data Summary through February 2017.

**Table 2**  
**Well Construction Details**  
**AEP J. Robert Welsh Power Plant - CCR Units**  
**Pittsburg, Titus County, Texas**

Well ID	Latitude	Longitude	Ground Surface Elevation	Borehole depth ft. bls	Date Installed	Screen Material	Well diameter inches	Top of Filter Pack		Bottom of Filter Pack		Top of Screen		Bottom of Screen	
								Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl	Depth ft. bls	Elevation ft. msl
<b>Monitoring Wells</b>															
AD-1 <sup>(c)</sup>	33° 02' 48"	94° 50' 47"	355.57	25.0	1/11/2001	PVC	2	13	343	25	331	15.0	340.57	25.0	330.57
AD-2 <sup>(c)</sup>	33° 02' 37"	94° 50' 44"	344.16	25.0	4/26/2001	PVC	2	12	332	25	319	15.0	329.16	25.0	319.16
AD-3 <sup>(c)</sup>	33° 02' 38"	94° 50' 37"	331.10	17.0	4/26/2001	PVC	2	5	326	17	314	7.0	324.10	17.0	314.10
AD-4 <sup>(c)</sup>	33° 02' 43"	94° 50' 33"	340.61	30.0	4/26/2001	PVC	2	16	325	30	311	19.0	321.61	29.0	311.61
AD-4a <sup>(a)</sup>	33.04527	94.84258	340.19	30.0	9/22/2009	PVC	2	17	323	30	310	20.0	320.19	30.0	310.19
AD-4b <sup>(a)</sup>	33.04531	94.84230	329.55	15.0	9/23/2009	PVC	2	4	326	15	315	5.0	324.55	15.0	314.55
AD-4c <sup>(a)</sup>	33.04507	94.84244	329.15	15.0	9/23/2009	PVC	2	4	325	15	314	5.0	324.15	15.0	314.15
AD-5 <sup>(c)</sup>	33° 03' 13"	94° 51' 00"	349.00	30.0	1/11/2001	PVC	2	16	333	30	319	20.0	329.00	30.0	319.00
AD-6 <sup>(a)</sup>	33.05235	94.84757	343.31	33.0	9/23/2009	PVC	2	21	322	33	310	23.0	320.31	33.0	310.31
AD-7 <sup>(a)</sup>	33.05257	94.84219	347.86	38.0	9/24/2009	PVC	2	26	322	38	310	28.0	319.86	38.0	309.86
AD-8 <sup>(a)</sup>	33.05187	94.84026	337.53	29.0	9/21/2009	PVC	2	14	324	29	309	16.0	321.53	26.0	311.53
AD-9 <sup>(a)</sup>	33.04995	94.84196	340.32	35.0	9/21/2009	PVC	2	18	322	35	305	20.0	320.32	35.0	305.32
AD-10 <sup>(a)</sup>	33.04881	94.84047	340.23	35.0	9/22/2009	PVC	2	18	322	35	305	20.0	320.23	35.0	305.23
AD-11 <sup>(a)</sup>	33.04824	94.84177	339.61	20.0	9/22/2009	PVC	2	8	332	20	320	10.0	329.61	20.0	319.61
AD-12 <sup>(a)</sup>	33.04901	94.84977	366.27	30.0	9/24/2009	PVC	2	18	348	30	336	20.0	346.27	30.0	336.27
AD-13 <sup>(a)</sup>	33.04918	94.84275	344.12	20.0	9/22/2009	PVC	2	4	340	20	324	6.0	338.12	16.0	328.12
AD-14 <sup>(a)</sup>	33.04715	94.84256	342.32	19.0	9/22/2009	PVC	2	6	336	18	324	8.0	334.32	18.0	324.32
AD-15 <sup>(d)</sup>	33° 03' 04"	94° 50' 27"	340.21	46.0	12/12/15	PVC	2	22	318	45.5	295	25.5	314.71	45.5	294.71
AD-16R	33° 02' 49"	94° 50' 29"	350.55	27.0	4/12/17	PVC	2	10	341	27	324	12.0	338.55	27.0	323.55
AD-17 <sup>(d)</sup>	33° 02' 57"	94° 51' 06"	353.99	40.0	12/10/15	PVC	2	22	332	39	315	24.0	329.99	39.0	314.99
AD-18 <sup>(d)</sup>	33° 03' 03"	94° 51' 03"	346.17	29.0	12/11/15	PVC	2	12	334	29	317	14.0	332.17	29.0	317.17
<b>Piezometers</b>															
B-2 <sup>(b)</sup>	33° 03.078'	94° 50.449'	339.7	50.0	10/28/2009	PVC	2	8	332	20	320	10.0	329.70	20.0	319.70
B-4 <sup>(b)</sup>	33° 03.011'	94° 50.462'	340.6	50.0	10/27/2009	PVC	2	8	333	18	323	8.0	332.60	18.0	322.60
B-5 <sup>(b)</sup>	33° 02.964'	94° 50.428'	340.0	50.0	10/27/2009	PVC	2	5	335	20	320	10.0	330.00	20.0	320.00
B-6 <sup>(b)</sup>	33° 02.912'	94° 50.462'	340.1	50.0	10/28/2009	PVC	2	4	336	22	318	12.0	328.10	22.0	318.10
AD-16 <sup>(d)</sup>	33° 02' 49"	94° 50' 29"	350.86	21.0	12/10/15	PVC	2	9	342	21	330	11.0	339.86	21.0	329.86

**General Notes:**  
Elevation in feet above mean sea level.

**Footnotes:**  
(a) Source: Eagle Environmental Services Well Logs (2009).  
(b) Source: E TTL Engineers & Consultants Inc. (June 21, 2010).  
(c) Source: Southwest Electric Power, State of Texas Well Report (2001).  
(d) Source: Auckland Consulting LLC (January 26, 2016). Monitoring wells AD-15 through AD-18 installed during December 2015.

**Acronyms and Abbreviations:**  
NA = Data not available  
ft = feet  
bls = below land surface  
msl = mean sea level

**Table 3  
Proposed Well Network  
AEP J. Robert Welsh Power Plant - Landfill  
Pittsburg, Titus County, Texas**

Well ID	Existing/ Proposed	Hydrostratigraphic Unit Target	Location Description		Screen Top Target Elevation <sup>(a)</sup> (ft amsl)	Screen Bottom Target Elevation <sup>(a)</sup> (ft amsl)	Screen Length (ft)	Comments
<b>Upgradient</b>								
AD-1	Existing	Uppermost Water-Bearing Unit	South of Landfill	Upgradient	340.6	330.6	10	Existing well installed in 2001; well will be utilized to establish background water quality
AD-5	Existing	Uppermost Water-Bearing Unit	NW of Landfill	Upgradient	329.0	319.0	10	Existing well installed in 2001; well will be utilized to establish background water quality
AD-17	Existing	Uppermost Water-Bearing Unit	West of Landfill	Upgradient	330.0	315.0	15	New monitoring well installed during December 2015 in uppermost shallow aquifer west of Landfill - upgradient; well will be utilized to establish background water quality
<b>Downgradient</b>								
AD-11	Existing	Uppermost Water-Bearing Unit	East of Landfill	Down gradient	329.6	319.6	10	Existing well installed in 2009; uppermost shallow aquifer adjacent to the landfill - downgradient
AD-13	Existing	Uppermost Water-Bearing Unit	East of Landfill	Down gradient	338.1	328.1	10	Existing well installed in 2009; uppermost shallow aquifer adjacent to the landfill - downgradient
AD-14	Existing	Uppermost Water-Bearing Unit	East of Landfill	Down gradient	334.3	324.3	10	Existing well installed in 2009; uppermost shallow aquifer adjacent to the landfill - downgradient
<b>Piezometers</b>								
AD-12	Existing	Uppermost Water-Bearing Unit	Within Landfill Boundary	Upgradient	346.3	336.3	10	Existing well installed in 2009; and utilized to obtain water level data for uppermost water-bearing unit
AD-18	Existing	Uppermost Water-Bearing Unit	NW of Landfill	Side gradient	332.2	317.2	15	New monitoring well installed during December 2015 in uppermost shallow aquifer sidegradient of Landfill: will be utilized to obtain water level data for uppermost water-bearing unit.

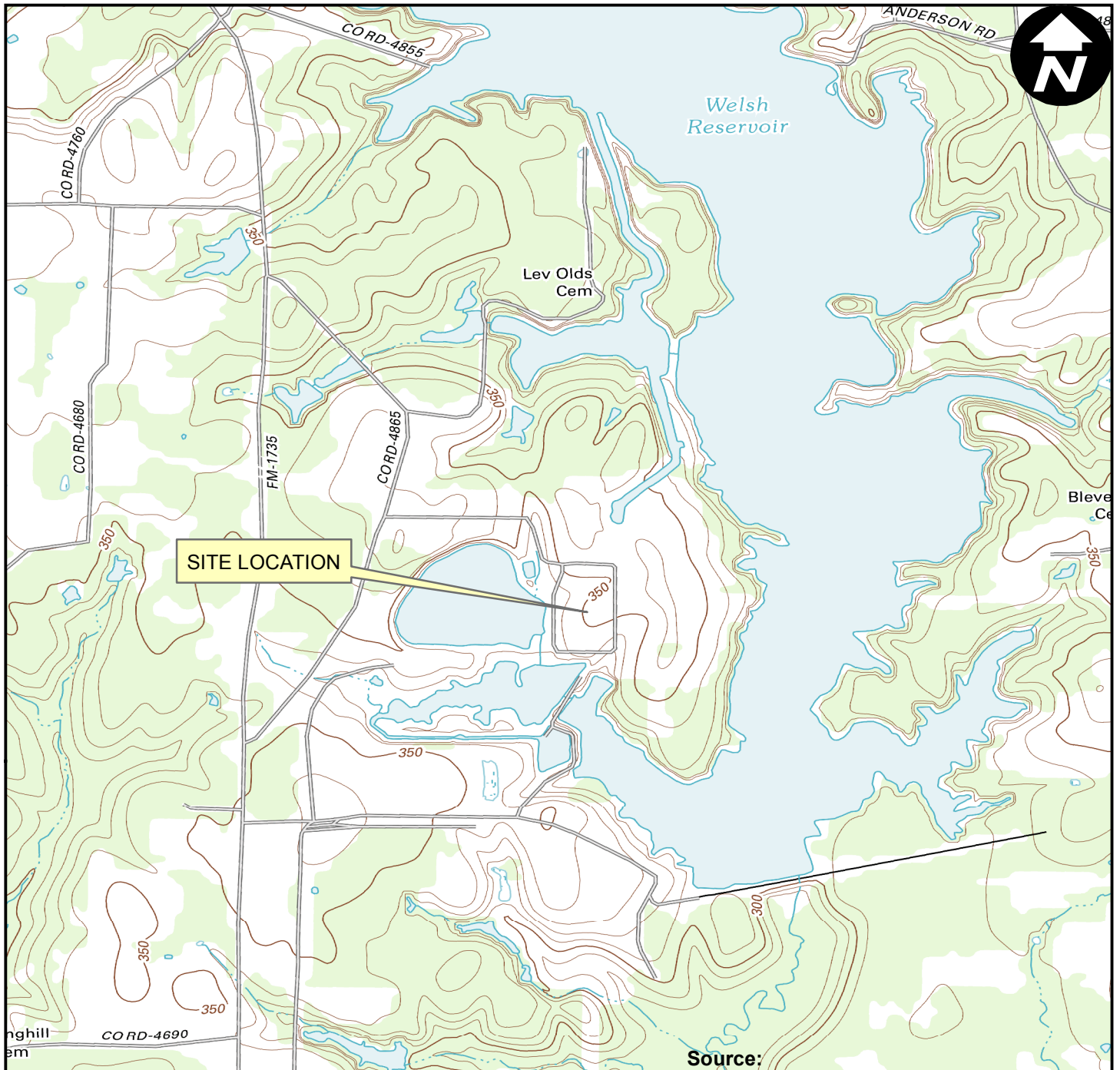
**Footnotes:**

a. Target elevations are an estimated range.

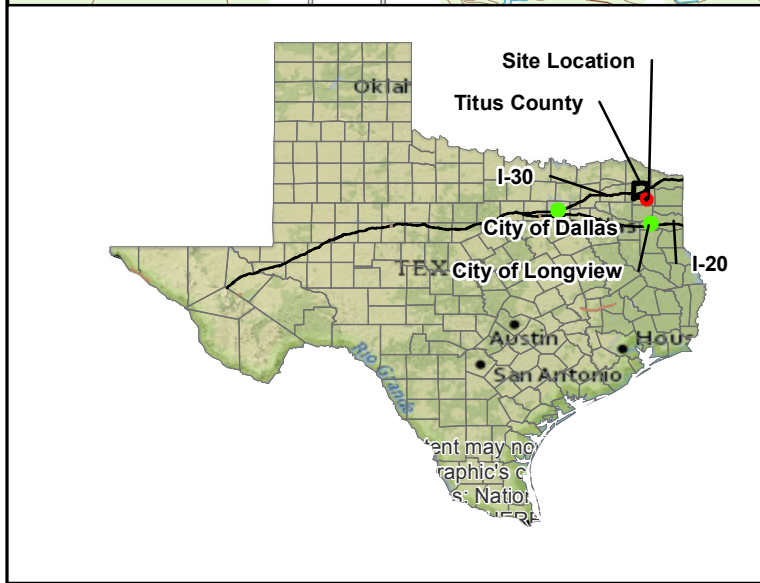
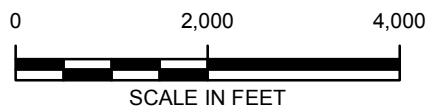
**Acronyms and Abbreviations:**

U=Upgradient  
D=Downgradient  
ft = feet  
amsl = above mean sea level

## Figures



Source:  
7.5 minute topographic quadrangle  
Cason, Texas, 2013

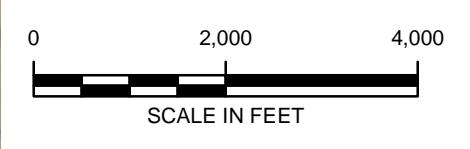
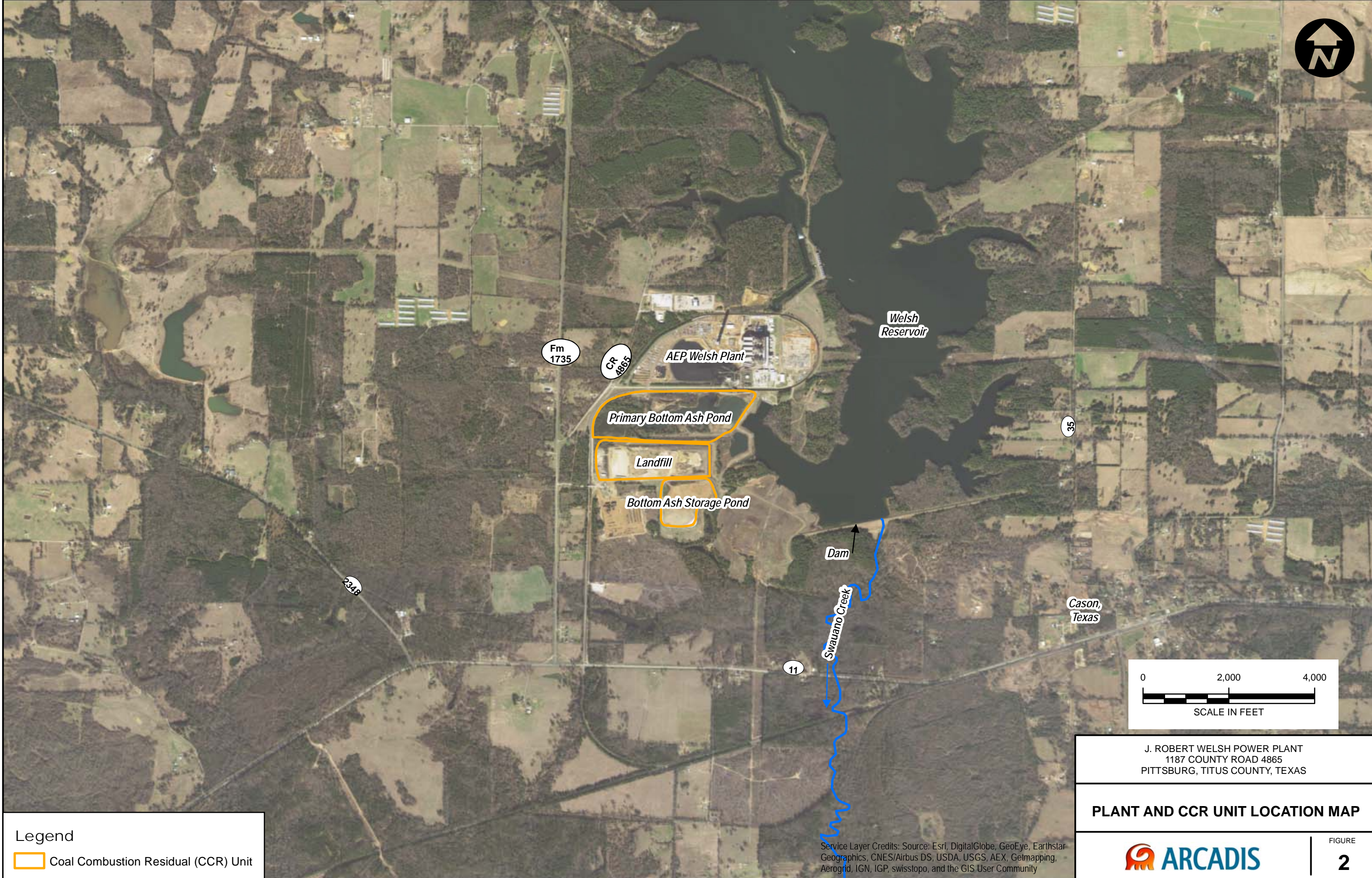


J. ROBERT WELSH POWER PLANT  
1187 COUNTY ROAD 4865  
PITTSBURG, TITUS COUNTY, TEXAS

**SITE LOCATION MAP**







J. ROBERT WELSH POWER PLANT  
1187 COUNTY ROAD 4865  
PITTSBURG, TITUS COUNTY, TEXAS

**PLANT AND CCR UNIT LOCATION MAP**

**Legend**  
Coal Combustion Residual (CCR) Unit

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



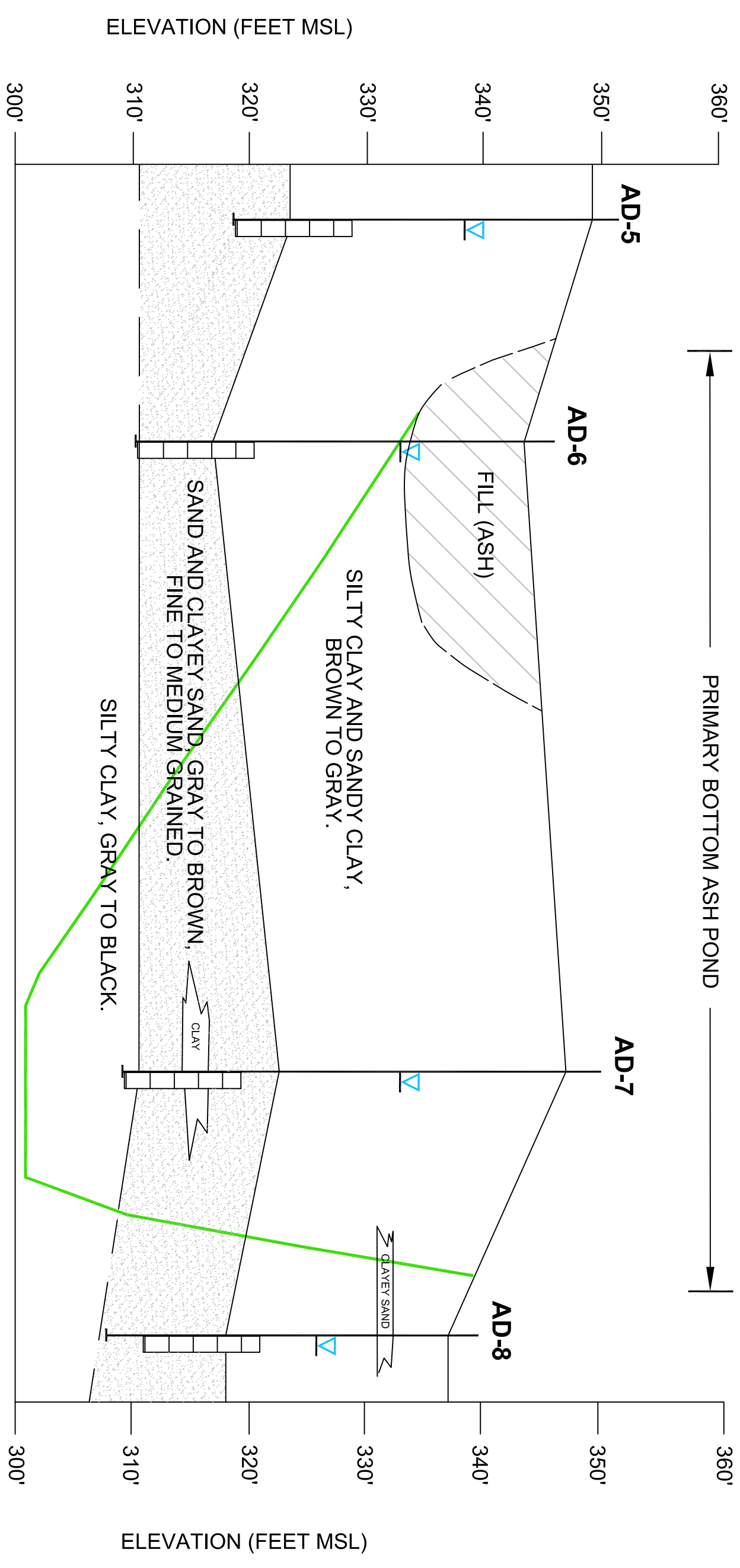
FIGURE  
**2**







**WEST** A A' **EAST**



NOTE: BASE OF PRIMARY BOTTOM ASH POND TAKEN FROM "WELSH POWER PLANT-UNIT 1 FLY ASH STORAGE AREA PHASE I" DRAWING ID WEPX-88, DATED 12-3-76; AND U.S. GEOLOGICAL SURVEY 7 1/2 MINUTE SERIES TOPOGRAPHIC MAP, CASON, TX QUADRANGLE, 1964 (PHOTO REVISED 1980).

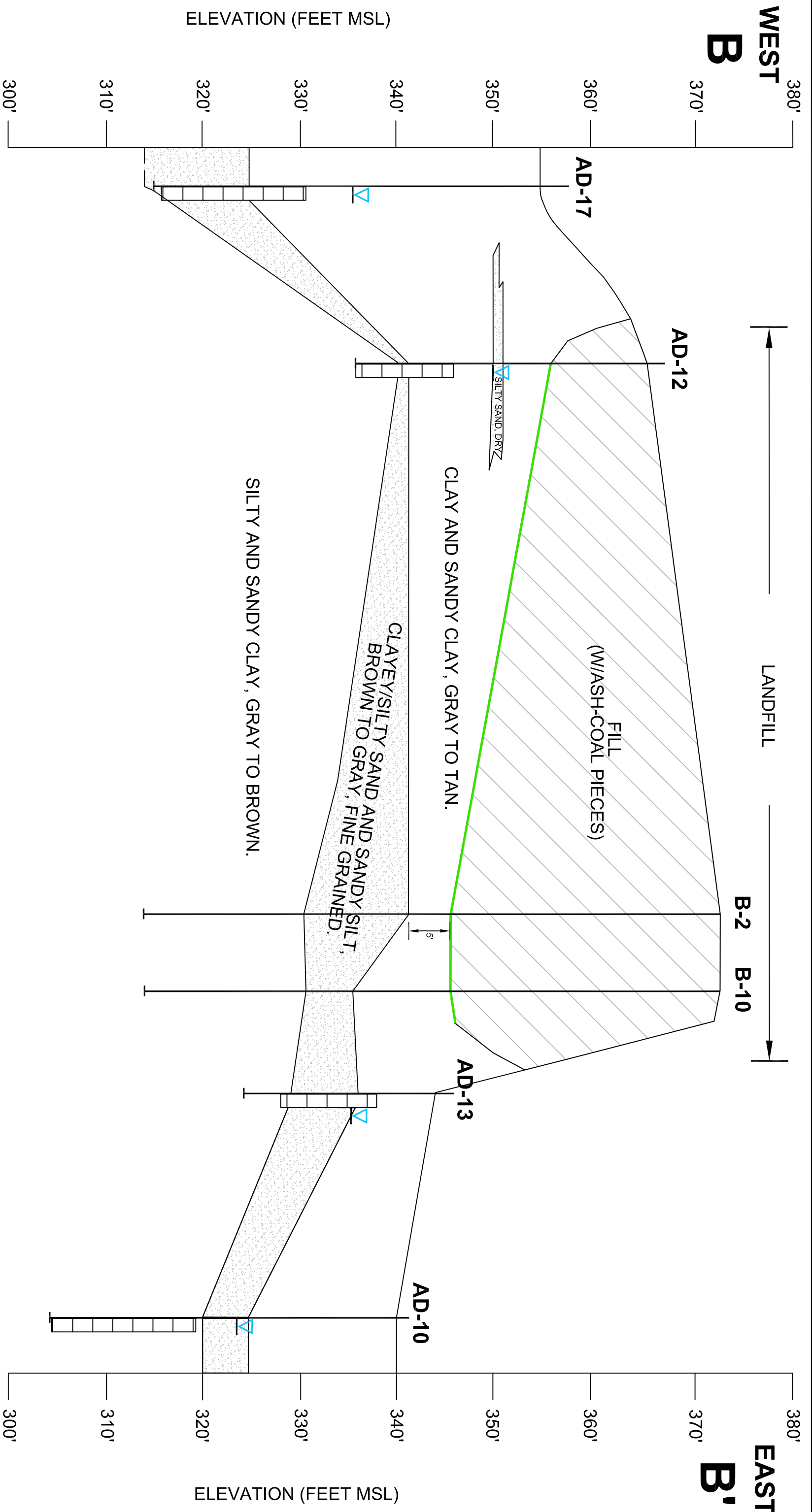
- LEGEND**
- MONITORING WELL SCREENED INTERVAL
  - WATER LEVEL IN MONITORING WELL (5/12/15)
  - PROJECTED BASE OF ASH POND (SEE NOTE)

J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

**CROSS SECTION  
 A - A'**







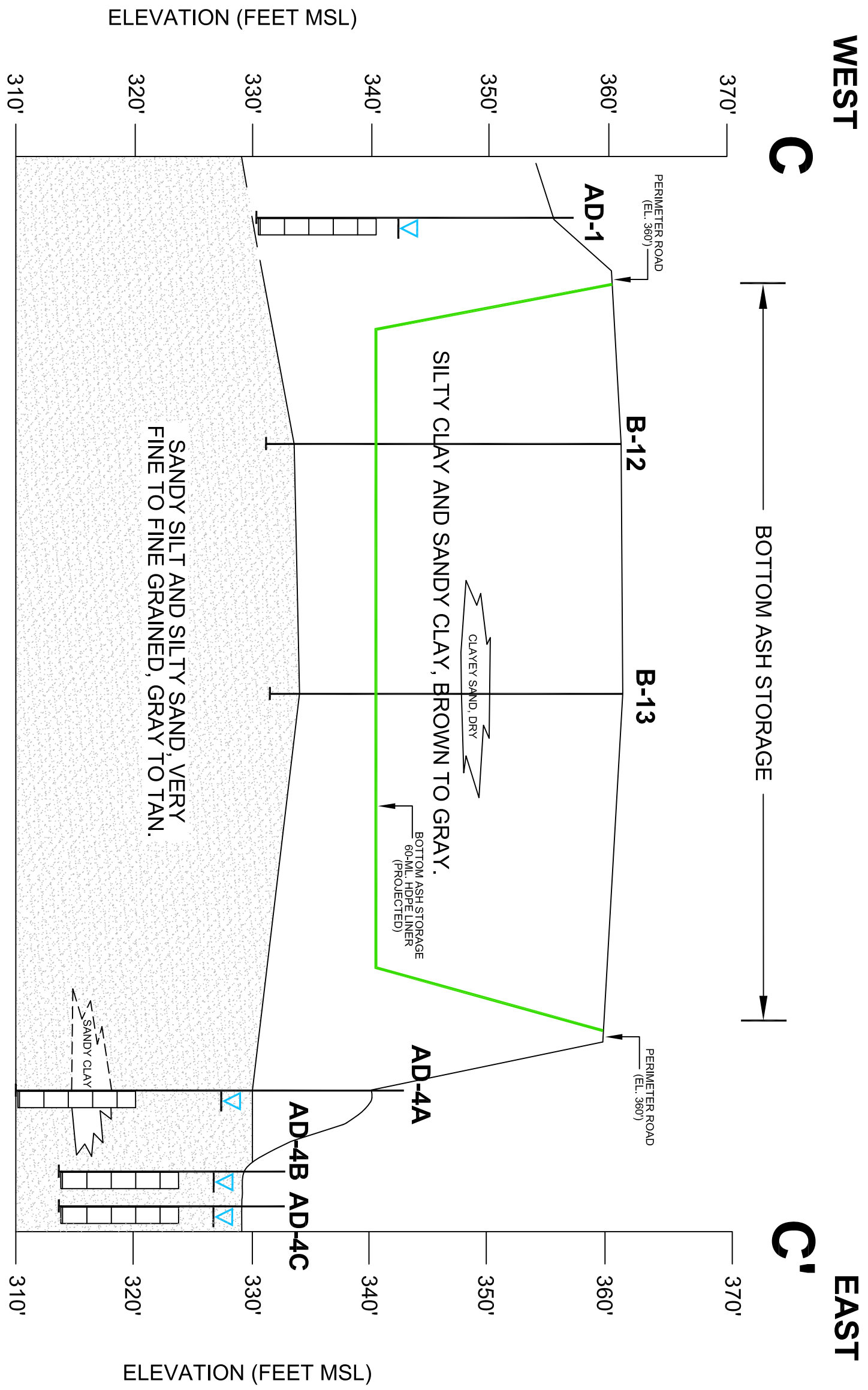
NOTE:  
 BASE OF LANDFILL ELEVATION TAKEN FROM  
 WELSH POWER PLANT - UNIT 1 FLY ASH STORAGE  
 AREA PHASE I DRAWING ID WEPX-88, DATED 12/3/76.

- LEGEND**
- MONITORING WELL SCREENED INTERVAL
  - WATER LEVEL IN MONITORING WELL (3/4/16)
  - BASE OF LANDFILL (SEE NOTE)

J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

**CROSS SECTION  
 B - B'**





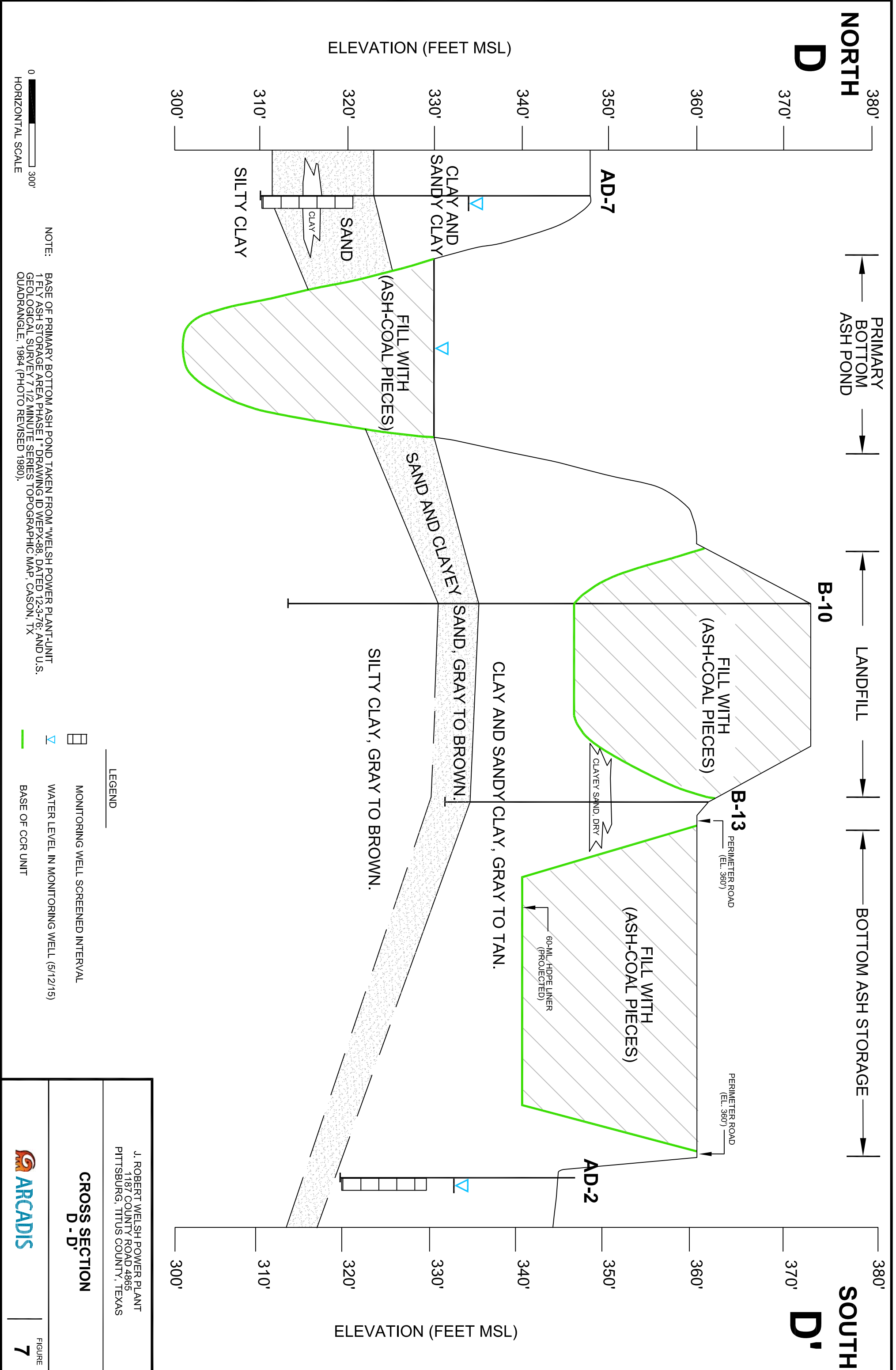
NOTE:  
 BASE OF BOTTOM ASH STORAGE HAS A 60-MIL. HDPE LINER AT ELEVATION 340.0'. TAKEN FROM FREEZE AND NICHOLS "HYDRAULIC ANALYSIS OF WELSH POWER PLANT ASH PONDS, AMERICAN ELECTRIC POWER COMPANY", DATED DECEMBER 2010.

- LEGEND
- MONITORING WELL SCREENED INTERVAL
  - WATER LEVEL IN MONITORING WELL (3/4/16)
  - PROJECTED BASE OF ASH STORAGE (SEE NOTE)

J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

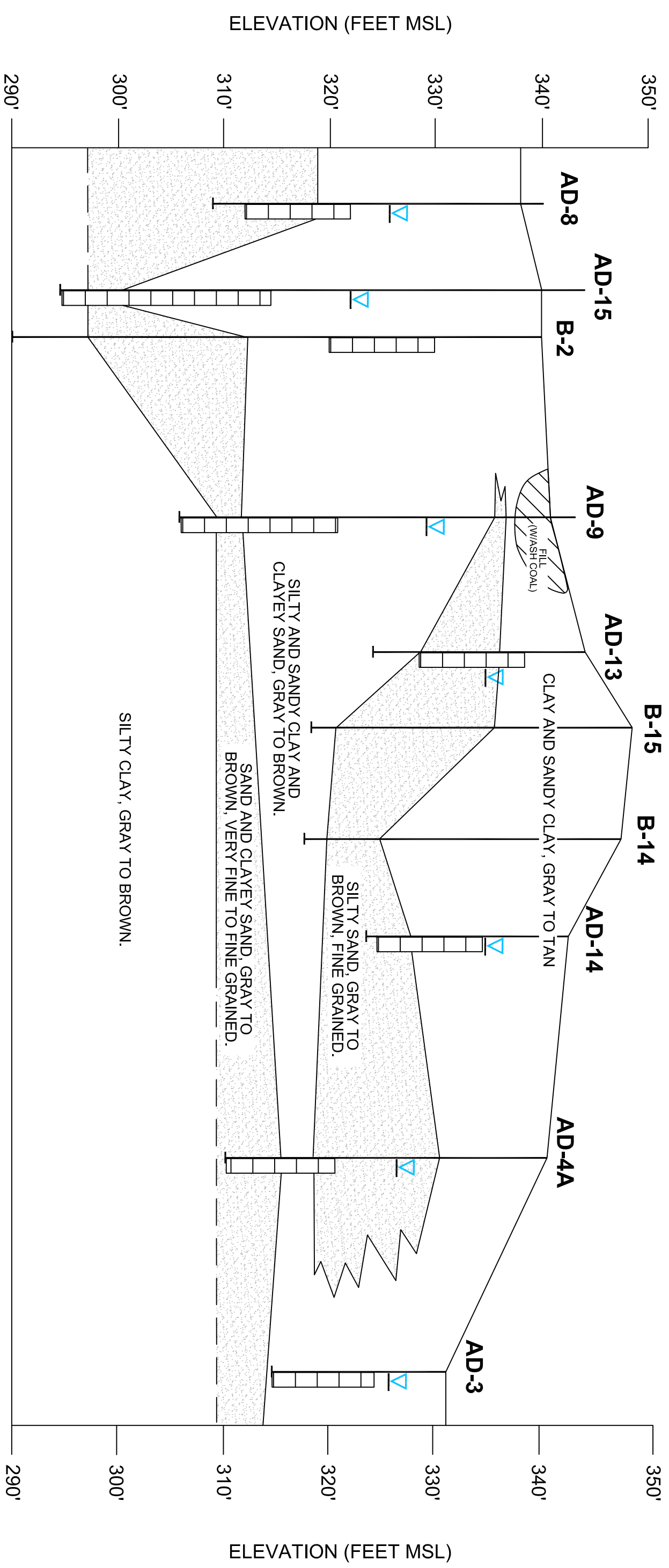
**CROSS SECTION**  
**C - C'**





**NORTH**  
**E**

**SOUTH**  
**E'**



- LEGEND**
- MONITORING WELL SCREENED INTERVAL
  - WATER LEVEL IN MONITORING WELL (3/4/16)
  - PROJECTED BASE OF ASH STORAGE (SEE NOTE)

J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

**CROSS SECTION**  
**E - E'**

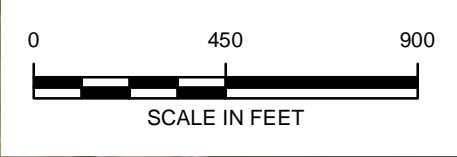






**Legend**

- Monitoring Well Location
- Piezometer Location
- Plugged Monitoring Well/Piezometer
- Soil Boring
- Site Features
- 340.82** Water Level Elevation (feet MSL)
- Groundwater Contour
- Groundwater Flow Direction



J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

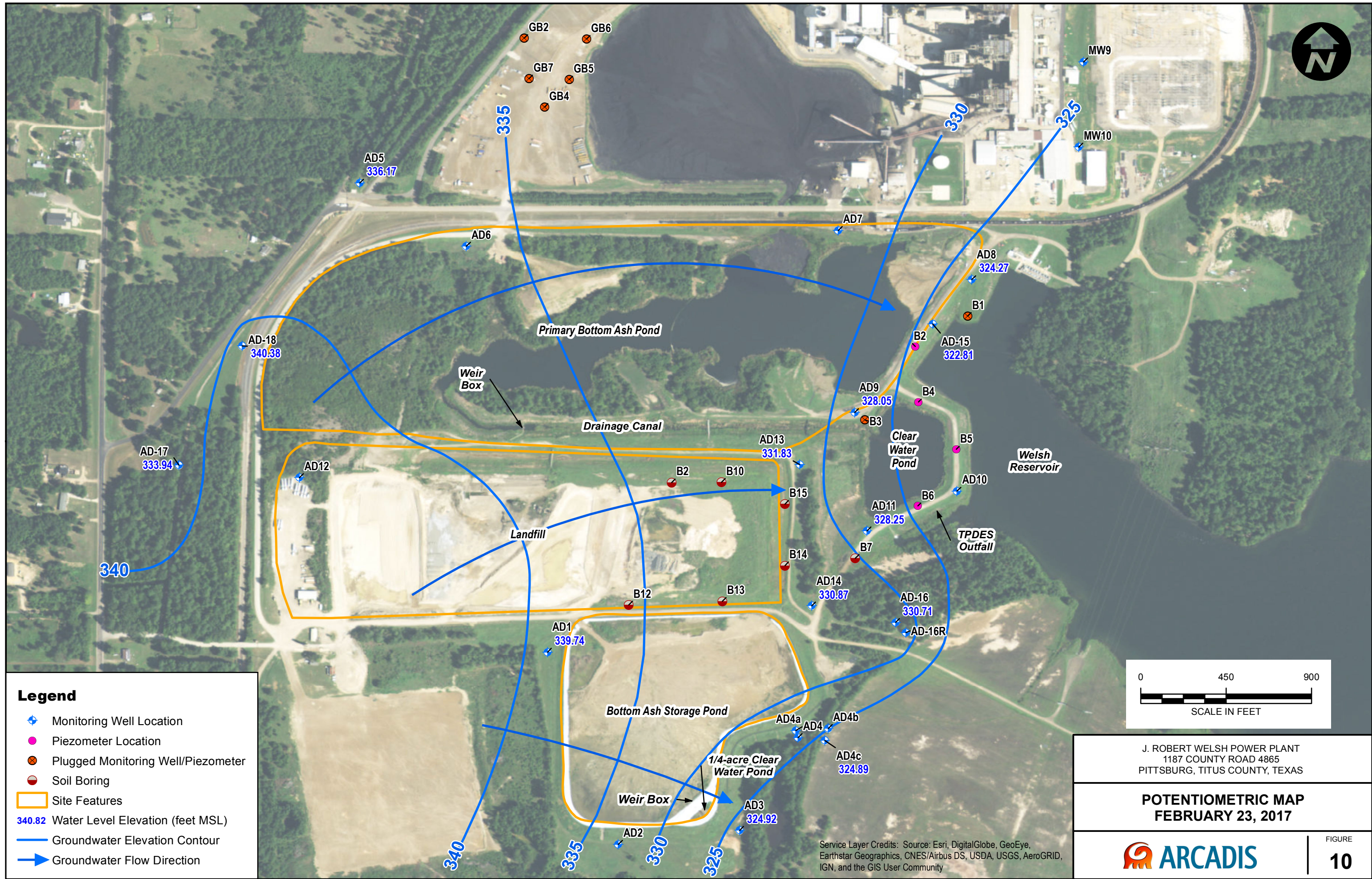
**WELL ELEVATIONS AND  
 POTENTIOMETRIC MAP  
 MARCH 4, 2016**

**ARCADIS**

FIGURE  
**9**

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community





**Legend**

- ◆ Monitoring Well Location
- Piezometer Location
- ⊗ Plugged Monitoring Well/Piezometer
- Soil Boring
- Site Features
- 340.82 Water Level Elevation (feet MSL)
- Groundwater Elevation Contour
- ➔ Groundwater Flow Direction



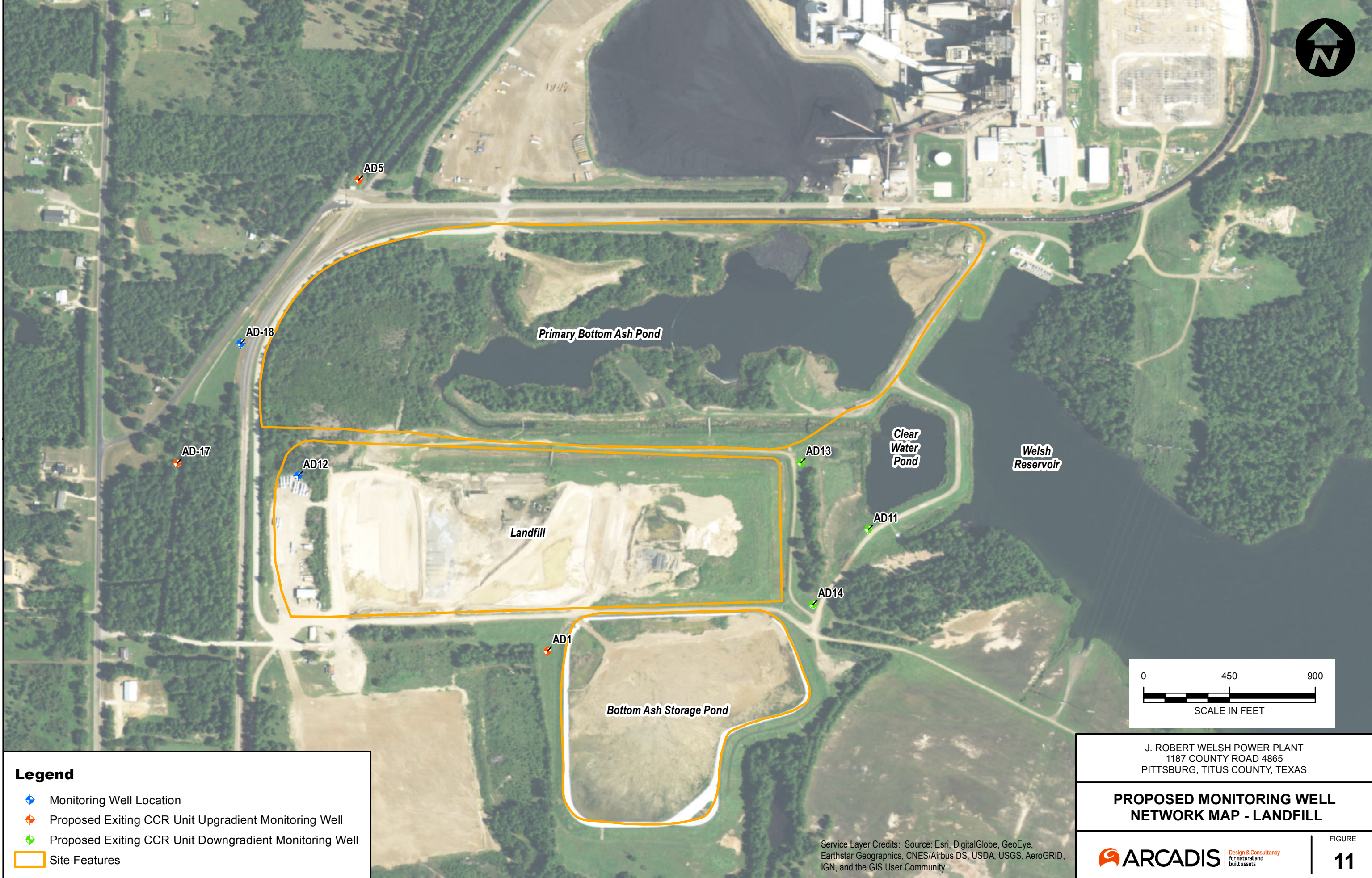
J. ROBERT WELSH POWER PLANT  
 1187 COUNTY ROAD 4865  
 PITTSBURG, TITUS COUNTY, TEXAS

**POTENTIOMETRIC MAP**  
**FEBRUARY 23, 2017**





**ARCADIS**

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community





**Legend**

-  Monitoring Well Location
-  Proposed Exiting CCR Unit Upgradient Monitoring Well
-  Proposed Exiting CCR Unit Downgradient Monitoring Well
-  Site Features

J. ROBERT WELSH POWER PLANT  
1187 COUNTY ROAD 4865  
PITTSBURG, TITUS COUNTY, TEXAS

**PROPOSED MONITORING WELL NETWORK MAP - LANDFILL**

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


 Design & Consultancy for natural and built assets

FIGURE **11**





Boring/Well Construction Logs



# AD-1

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

**State of Texas  
WELL REPORT**

Texas Water Well Drillers Advisory Council  
P.O. Box 13087  
Austin, TX 78711-3087  
512-239-0530

ATTENTION OWNER: Confidentiality  
Privilege Notice on Reverse Side

1) OWNER Southwestern Electric Power ADDRESS Rt. 4, Box 221 Pittsburg TX 75686  
(Name) (Street or RFD) (City) (State) (Zip)

2) ADDRESS OF WELL: Rt. 4, Box 221 Pittsburg TX 75686 GRID # 16-58-4  
County Camp (Street, RFD or other) (City) (State) (Zip)

3) TYPE OF WORK (Check):  
 New Well     Deepening  
 Reconditioning     Plugging

4) PROPOSED USE (Check):  Monitor     Environmental Soil Boring     Domestic  
 Industrial     Irrigation     Injection     Public Supply     De-watering     Testwell  
 If Public Supply well, were plans submitted to the TNRCC?  Yes     No

5) WELL LOG:  
 Date Drilling:  
 Started 1-11-2001  
 Completed 1-11-2001

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
8 1/4	Surface	25

6) DRILLING METHOD (Check):  Driven  
 Air Rotary     Mud Rotary     Bored  
 Air Hammer     Cable Tool     Jetted  
 Other \_\_\_\_\_

7) Borehole Completion (Check):  Open Hole     Straight Wall  
 Underreamed     Gravel Packed     Other \_\_\_\_\_  
 If Gravel Packed give interval ... from 13 ft. to 25 ft.

8) CASING, BLANK PIPE, AND WELL SCREEN DATA:

Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
2	N	riser	+2	15	sch 40
2	N	#105/67 screen	15	25	sch 40

9) CEMENTING DATA [Rule 338.44(1)]  
 Cemented from 13 ft. to 0 ft. No. of sacks used 6-50#  
 Method used bentonite  
 Cemented by \_\_\_\_\_  
 Distance to septic system field lines or other concentrated contamination \_\_\_\_\_ ft.  
 Method of verification of above distance \_\_\_\_\_

10) SURFACE COMPLETION  
 Specified Surface Slab Installed [Rule 338.44(2)(A)]  
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]  
 Pileless Adapter Used [Rule 338.44(3)(b)]  
 Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:  
 Static level 12' 8" ft. below land surface    Date 1-11-01  
 Artesian flow \_\_\_\_\_ gpm.    Date \_\_\_\_\_

12) PACKERS: NA    Type \_\_\_\_\_    Depth \_\_\_\_\_

13) TYPE PUMP: NA  
 Turbine     Jet     Submersible     Cylinder  
 Other \_\_\_\_\_  
 Depth to pump bowls, cylinder, jet, etc., \_\_\_\_\_ ft.

14) WELL TESTS: NA  
 Type test:  Pump     Bailor     Jetted     Estimated  
 Yield: \_\_\_\_\_ gpm with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.

15) WATER QUALITY:  
 Did you knowingly penetrate any strata which contained undesirable constituents?  
 Yes     No    If yes, submit "REPORT OF UNDESIRABLE WATER"  
 Type of water? \_\_\_\_\_    Depth of strata \_\_\_\_\_  
 Was a chemical analysis made?  Yes     No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME \_\_\_\_\_ (Type or print)    WELL DRILLER'S LICENSE NO. TX-52694-M

ADDRESS \_\_\_\_\_ (Street or RFD) (City) (State) (Zip)

(Signed) Robert M. [Signature] (Licensed Well Driller)    (Signed) \_\_\_\_\_ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

# AD-2

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

**State of Texas  
WELL REPORT**

Texas Water Well Drillers Advisory Council  
P.O. Box 13087  
Austin, TX 78711-3087  
512-239-0530

ATTENTION OWNER: Confidentiality  
Privilege Notice on Reverse Side

1) OWNER Southwestern Electric ADDRESS Rt. 4, Box 221 Pittsburg Tx 75686  
(Name) (Street or RFD) (City) (State) (Zip)

2) ADDRESS OF WELL: Rt. 4 Box 221 Pittsburg Tx 75686 GRID # 16-58-4  
County Camp (Street, RFD or other) (City) (State) (Zip)

3) TYPE OF WORK (Check):  
 New Well     Deepening  
 Reconditioning     Plugging

4) PROPOSED USE (Check):  Monitor     Environmental Soil Boring     Domestic  
 Industrial     Irrigation     Injection     Public Supply     De-watering     Testwell  
 If Public Supply well, were plans submitted to the TNRCC?  Yes     No

5) GPS  
33°02'37"N  
94°50'44"W

6) WELL LOG:  
 Date Drilling: \_\_\_\_\_  
 Started 4/26 <sup>18</sup> 2001  
 Completed 4/26 <sup>18</sup> 2001

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
<u>8 1/4</u>	Surface	<u>25</u>

7) DRILLING METHOD (Check):  Driven  
 Air Rotary     Mud Rotary     Bored  
 Air Hammer     Cable Tool     Jetted  
 Other \_\_\_\_\_

8) Borehole Completion (Check):  Open Hole     Straight Wall  
 Underreamed     Gravel Packed     Other \_\_\_\_\_  
 If Gravel Packed give interval ... from 12 ft. to 25 ft.

From (ft.)	To (ft.)	Description and color of formation material	CASING, BLANK PIPE, AND WELL SCREEN DATA:		Gage Casting Screen			
			Dia. (in.)	New or Used		Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.) From To	
<u>0</u>	<u>2</u>	<u>top soil</u>	<u>2</u>	<u>N</u>	<u>Riser</u>	<u>+2</u>	<u>15</u>	<u>See 40</u>
<u>2</u>	<u>5</u>	<u>red &amp; gray clay w/ silt</u>	<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>15</u>	<u>25</u>	<u>See 40</u>
<u>5</u>	<u>10</u>	<u>red &amp; gray clay w/ silt</u>						
<u>10</u>	<u>25</u>	<u>gray silty clay w/ tan streaks</u>						

9) CEMENTING DATA [Rule 338.44(1)]  
 Cemented from 12 ft. to 2 ft. No. of sacks used 5-50#  
 \_\_\_\_\_ ft. to \_\_\_\_\_ ft. No. of sacks used \_\_\_\_\_  
 Method used bentonite pellets  
 Cemented by \_\_\_\_\_  
 Distance to septic system field lines or other concentrated contamination \_\_\_\_\_ ft.  
 Method of verification of above distance \_\_\_\_\_

10) SURFACE COMPLETION  
 Specified Surface Slab Installed [Rule 338.44(2)(A)]  
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]  
 Pileless Adapter Used [Rule 338.44(3)(b)]  
 Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:  
 Static level \_\_\_\_\_ ft. below land surface    Date \_\_\_\_\_  
 Artesian flow \_\_\_\_\_ gpm.    Date \_\_\_\_\_

12) PACKERS: NA    Type \_\_\_\_\_    Depth \_\_\_\_\_

13) TYPE PUMP: NA  
 Turbine     Jet     Submersible     Cylinder  
 Other \_\_\_\_\_  
 Depth to pump bowls, cylinder, jet, etc., \_\_\_\_\_ ft.

14) WELL TESTS: NA  
 Type test:  Pump     Bailor     Jetted     Estimated  
 Yield: \_\_\_\_\_ gpm with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.

15) WATER QUALITY:  
 Did you knowingly penetrate any strata which contained undesirable constituents?  
 Yes     No    If yes, submit "REPORT OF UNDESIRABLE WATER"  
 Type of water? \_\_\_\_\_ Depth of strata \_\_\_\_\_  
 Was a chemical analysis made?  Yes     No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME \_\_\_\_\_ (Type or print)    WELL DRILLER'S LICENSE NO. TX-52694-M

ADDRESS \_\_\_\_\_ (Street or RFD)    (City)    (State)    (Zip)

(Signed) Richard M. Kelly (Licensed Well Driller)    (Signed) \_\_\_\_\_ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

ATTENTION OWNER: Confidentiality  
Privilege Notice on Reverse Side

## State of Texas WELL REPORT

Texas Water Well Drillers Advisory Council  
P.O. Box 13087  
Austin, TX 78711-3087  
512-239-0530

1) OWNER Southern Electric ADDRESS Rt. 4, Box 221 Pittsburg Tx 75686  
(Name) (Street or RFD) (City) (State) (Zip)

2) ADDRESS OF WELL: Rt. 4 Box 221 Pittsburg Tx 75686 GRID # 16-58-4  
County Camp (City) (State) (Zip)

3) TYPE OF WORK (Check):  
 New Well  Deepening  
 Reconditioning  Plugging

4) PROPOSED USE (Check):  Monitor  Environmental Soil Boring  Domestic  
 Industrial  Irrigation  Injection  Public Supply  De-watering  Testwell  
If Public Supply well, were plans submitted to the TNRCC?  Yes  No

5) GPS  
33°02'38"N  
94°50'37"W

6) WELL LOG:  
Date Drilling: \_\_\_\_\_  
Started 4/26 <sup>2001</sup>  
Completed 4/26 <sup>2001</sup>

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
<u>8 1/4</u>	Surface	<u>17</u>

7) DRILLING METHOD (Check):  Driven  
 Air Rotary  Mud Rotary  Bored  
 Air Hammer  Cable Tool  Jetted  
 Other \_\_\_\_\_

From (ft.)	To (ft.)	Description and color of formation material
<u>0</u>	<u>12</u>	<u>gray silty clay w/ tan streaks</u>
<u>12</u>	<u>15</u>	<u>very stiff gray/blood red clay</u>
<u>15</u>	<u>17</u>	<u>very stiff gray clay w/ red nodules and tan streaks</u>

8) Borehole Completion (Check):  Open Hole  Straight Wall  
 Underreamed  Gravel Packed  Other \_\_\_\_\_  
If Gravel Packed give interval ... from 5 ft. to 17 ft.

CASING, BLANK PIPE, AND WELL SCREEN DATA:					
Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen
			From	To	
<u>2</u>	<u>N</u>	<u>riser</u>	<u>+2</u>	<u>7</u>	<u>Sec 40</u>
<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>7</u>	<u>17</u>	<u>Sec 40</u>

AP-3

9) CEMENTING DATA [Rule 336.44(1)]  
Cemented from 2 ft. to 5 ft. No. of sacks used 2 1/2 - 50  
Method used bentonite pellets  
Cemented by \_\_\_\_\_  
Distance to septic system field lines or other concentrated contamination \_\_\_\_\_ ft.  
Method of verification of above distance \_\_\_\_\_

13) TYPE PUMP: NA  
 Turbine  Jet  Submersible  Cylinder  
 Other \_\_\_\_\_  
Depth to pump bowls, cylinder, jet, etc., \_\_\_\_\_ ft.

10) SURFACE COMPLETION  
 Specified Surface Slab Installed [Rule 338.44(2)(A)]  
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]  
 Pitless Adapter Used [Rule 338.44(3)(b)]  
 Approved Alternative Procedure Used [Rule 338.71]

14) WELL TESTS: NA  
Type test  Pump  Bailor  Jetted  Estimated  
Yield: \_\_\_\_\_ gpm with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.

11) WATER LEVEL:  
Static level: \_\_\_\_\_ ft. below land surface Date \_\_\_\_\_  
Artesian flow: \_\_\_\_\_ gpm. Date \_\_\_\_\_

15) WATER QUALITY:  
Did you knowingly penetrate any strata which contained undesirable constituents?  
 Yes  No If yes, submit "REPORT OF UNDESIRABLE WATER"  
Type of water? \_\_\_\_\_ Depth of strata \_\_\_\_\_  
Was a chemical analysis made?  Yes  No

12) PACKERS: NA Type \_\_\_\_\_ Depth \_\_\_\_\_

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME \_\_\_\_\_ (Type or print) WELL DRILLER'S LICENSE NO. TX 52694-M

ADDRESS \_\_\_\_\_ (City) (State) (Zip)

(Signed) [Signature] (Licensed Well Driller) (Signed) \_\_\_\_\_ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.

# AD-4

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

**State of Texas  
WELL REPORT**

Texas Water Well Drillers Advisory Council  
P.O. Box 13087  
Austin, TX 78711-3087  
512-239-0530

ATTENTION OWNER: Confidentiality  
Privilege Notice on Reverse Side

1) OWNER Southwestern Electric Power ADDRESS Rt. 4, Box 221 Pittsburg Tx 75686  
(Name) (Street or RFD) (City) (State) (Zip)

2) ADDRESS OF WELL: County Camp Rt. 4 Box 221 Pittsburg Tx 75686 GRID # 16-584  
(City) (State) (Zip)

3) TYPE OF WORK (Check):  
 New Well     Deepening  
 Reconditioning     Plugging

4) PROPOSED USE (Check):  Monitor     Environmental Soil Boring     Domestic  
 Industrial     Irrigation     Injection     Public Supply     De-watering     Testwell  
 If Public Supply well, were plans submitted to the TNRCC?  Yes     No

5) GPS  
 33° 02' 43" N  
 94° 50' 33" W

6) WELL LOG:  
 Date Drilling: \_\_\_\_\_  
 Started 4/26 <sup>19</sup> 2001  
 Completed 4/26 <sup>19</sup> 2001

DIAMETER OF HOLE		
Dia. (in.)	From (ft.)	To (ft.)
8 1/4	Surface	30

7) DRILLING METHOD (Check):  Driven  
 Air Rotary     Mud Rotary     Bored  
 Air Hammer     Cable Tool     Jetted  
 Other \_\_\_\_\_

8) Borehole Completion (Check):  Open Hole     Straight Wall  
 Underreamed     Gravel Packed     Other \_\_\_\_\_  
 If Gravel Packed give interval ... from 16 ft. to 30 ft.

From (ft.)	To (ft.)	Description and color of formation material	Setting (ft.)		Gage Casting Screen
			From	To	
0	5	red silty clay with gray streaks			
5	30	gray silty clay with red streaks			

9) CEMENTING DATA [Rule 338.44(1)]  
 Cemented from 16 ft. to 2 ft. No. of sacks used 8-50 #  
 Method used bentonite pellets  
 Cemented by \_\_\_\_\_  
 Distance to septic system field lines or other concentrated contamination \_\_\_\_\_ ft.  
 Method of verification of above distance \_\_\_\_\_

10) SURFACE COMPLETION  
 Specified Surface Slab Installed [Rule 338.44(2)(A)]  
 Specified Steel Sleeve Installed [Rule 338.44(3)(A)]  
 Pitless Adapter Used [Rule 338.44(3)(b)]  
 Approved Alternative Procedure Used [Rule 338.71]

11) WATER LEVEL:  
 Static level \_\_\_\_\_ ft. below land surface    Date \_\_\_\_\_  
 Artesian flow \_\_\_\_\_ gpm.    Date \_\_\_\_\_

12) PACKERS: NA    Type \_\_\_\_\_    Depth \_\_\_\_\_

13) TYPE PUMP:  
 Turbine     Jet     Submersible     Cylinder  
 Other NA  
 Depth to pump bowls, cylinder, jet, etc., \_\_\_\_\_ ft.

14) WELL TESTS: NA  
 Type test:  Pump     Bailer     Jetted     Estimated  
 Yield: \_\_\_\_\_ gpm with \_\_\_\_\_ ft. drawdown after \_\_\_\_\_ hrs.

15) WATER QUALITY:  
 Did you knowingly penetrate any strata which contained undesirable constituents?  
 Yes     No    If yes, submit "REPORT OF UNDESIRABLE WATER"  
 Type of water? \_\_\_\_\_    Depth of strata \_\_\_\_\_  
 Was a chemical analysis made?  Yes     No

I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.

COMPANY NAME \_\_\_\_\_ (Type or print)    WELL DRILLER'S LICENSE NO. TX 52694-M

ADDRESS \_\_\_\_\_ (City) \_\_\_\_\_ (State) \_\_\_\_\_ (Zip)

(Signed) Sally M. Davis (Licensed Well Driller)    (Signed) \_\_\_\_\_ (Registered Driller Trainee)

Please attach electric log, chemical analysis, and other pertinent information, if available.



# SOIL BORING LOG

BORING/WELL NO.: **AD-4A**  
 TOTAL DEPTH: **30'**  
 TOP OF CASING ELEV.: **342.85 ft. NGVD**  
 GROUND SURFACE ELEV.: **340.19 ft. NGVD**

CLIENT: **AEP**  
 PROJECT: **Ash Disposal Area**  
 SITE LOCATION: **Welsh Power Plant**  
 PROJECT NO.: **S-08-0109**  
 LOGGED BY: **James Meleton, Jr.**

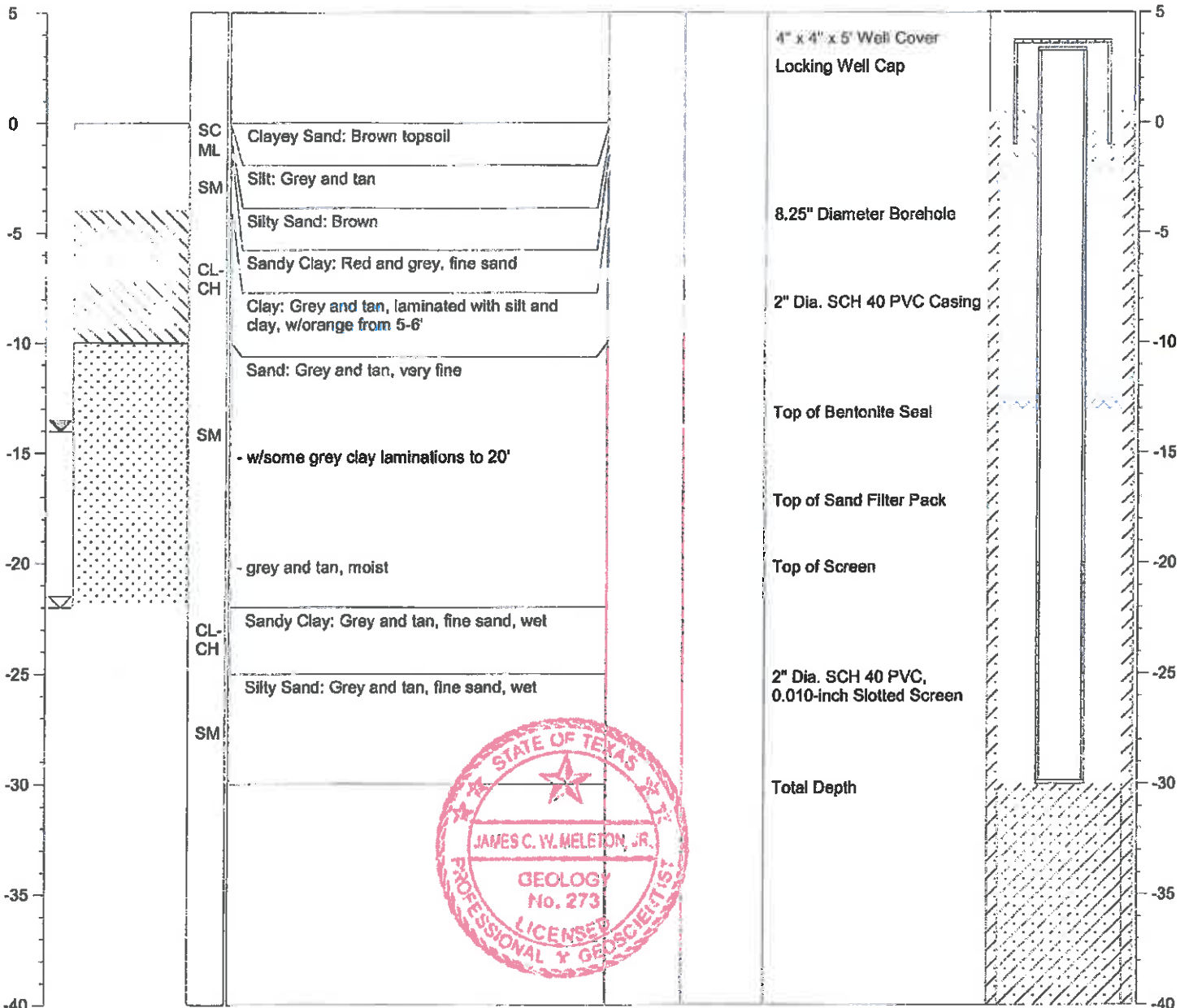
DRILLING CO.: **WEST Drilling**  
 DRILLER: **Tom McCullough**  
 METHOD OF DRILLING: **Hollow-stem Auger**  
 SAMPLING METHODS: **Split-spoon**  
 DATE DRILLED: **9/22/09**

NOTES: **Latitude: 33.04527**  
**Longitude: 94.84258**

≡ Water level during drilling  
 ≡ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-4B  
 TOTAL DEPTH: 15'  
 TOP OF CASING ELEV.: 333.23 ft. NGVD  
 GROUND SURFACE ELEV.: 329.55 ft. NGVD

CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

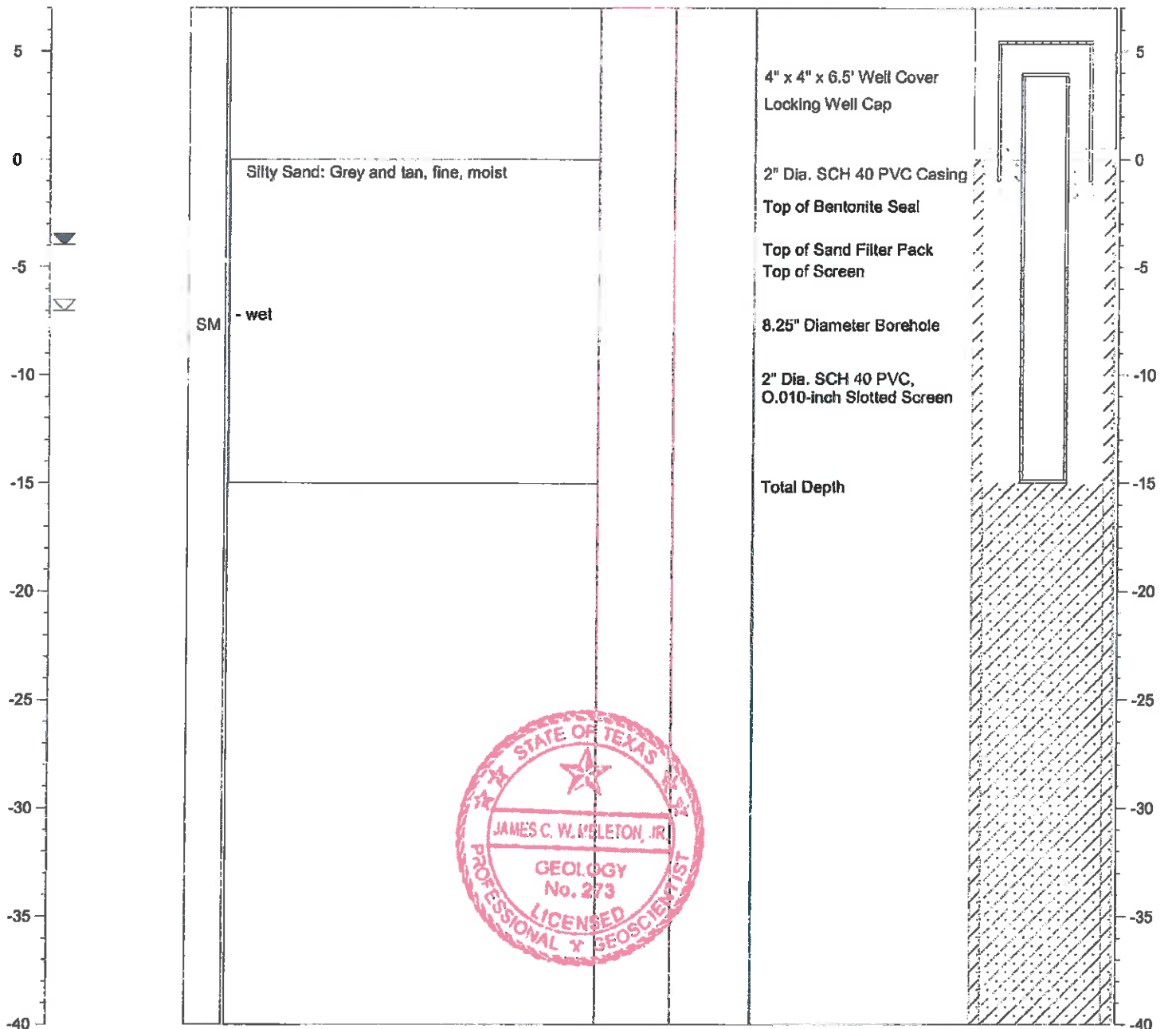
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/23/09

NOTES: Latitude: 33.04531  
 Longitude: 94.84230

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-4C  
 TOTAL DEPTH: 15'  
 TOP OF CASING ELEV.: 333.28 ft. NGVD  
 GROUND SURFACE ELEV.: 329.15 ft. NGVD

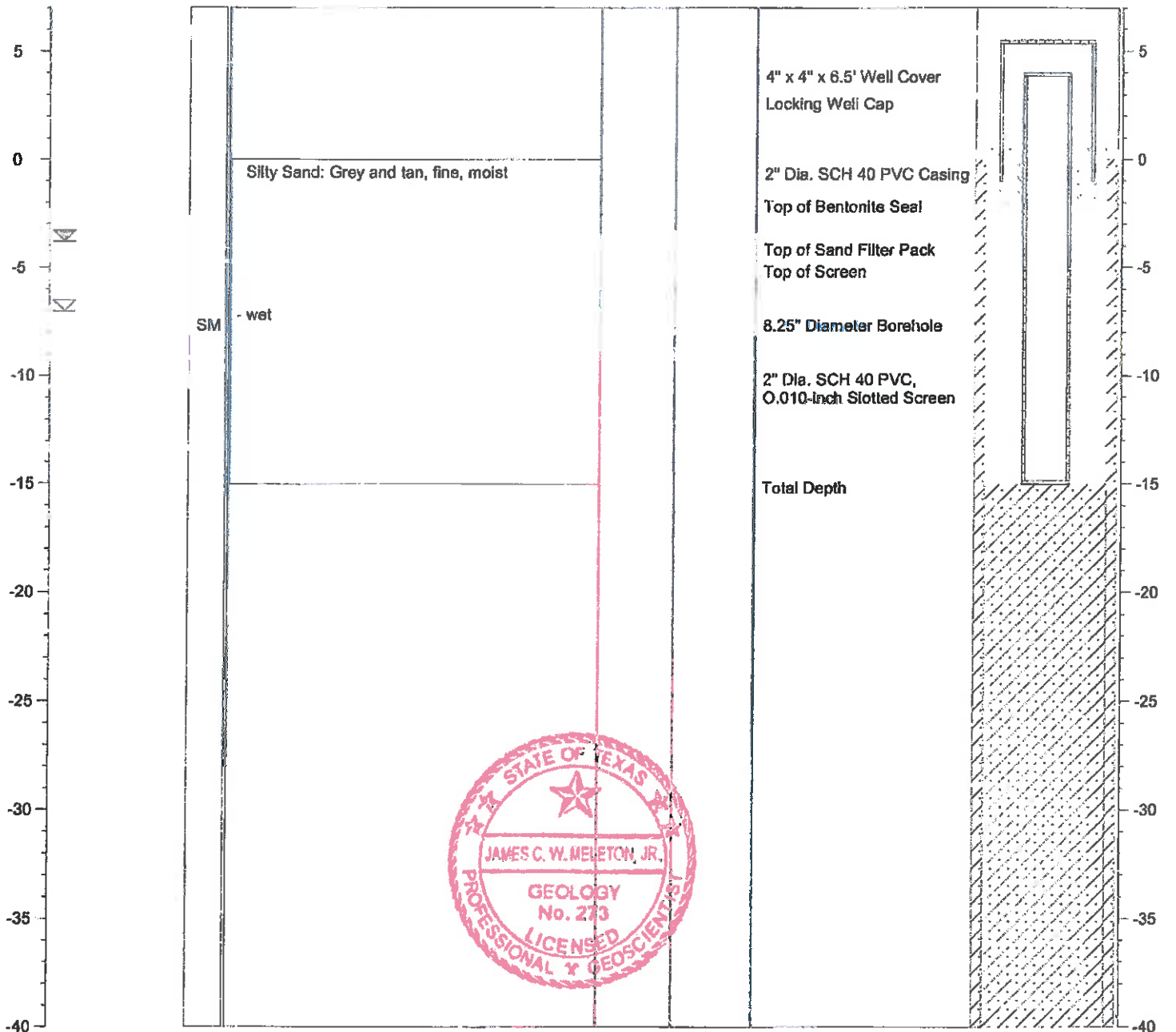
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/23/09

NOTES: Latitude: 33.04507  
 Longitude: 94.84244

≡ Water level during drilling  
 ≡ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# AD-5

Send original copy by certified mail to: TNRCC, P.O. Box 13087, Austin, TX 78711-3087

Please use black ink.

ATTENTION OWNER: Confidentiality Privilege Notice on Reverse Side		State of Texas <b>WELL REPORT</b>		Texas Water Well Drillers Advisory Council P.O. Box 13087 Austin, TX 78711-3087 512-239-0530																					
1) OWNER <u>Southwestern Electric Power</u> ADDRESS <u>Rt. 4, Box 221 Pittsburg Tx</u> <u>75686</u> <small>(Name) (Street or RFD) (City) (State) (Zip)</small>		2) ADDRESS OF WELL: County <u>Camp</u> <u>Titus</u> <u>Rt. 4, Box 221 Pittsburg Tx</u> <u>75686</u> GRID # <u>16-58-4</u> <small>(Street, RFD or other) (City) (State) (Zip)</small>																							
3) TYPE OF WORK (Check): <input checked="" type="checkbox"/> New Well <input type="checkbox"/> Deepening <input type="checkbox"/> Reconditioning <input type="checkbox"/> Plugging		4) PROPOSED USE (Check): <input checked="" type="checkbox"/> Monitor <input type="checkbox"/> Environmental Soil Boring <input type="checkbox"/> Domestic <input type="checkbox"/> Industrial <input type="checkbox"/> Irrigation <input type="checkbox"/> Injection <input type="checkbox"/> Public Supply <input type="checkbox"/> De-watering <input type="checkbox"/> Testwell If Public Supply well, were plans submitted to the TNRCC? <input type="checkbox"/> Yes <input type="checkbox"/> No		5) <u>33°03'13"N</u> <u>94°51'00"W</u> <div style="text-align: right;">↑</div>																					
6) WELL LOG: Date Drilling: Started <u>1-11-2001</u> Completed <u>1-11-2001</u>		DIAMETER OF HOLE <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Dis. (in.)</th> <th>From (ft.)</th> <th>To (ft.)</th> </tr> <tr> <td><u>8 1/4</u></td> <td>Surface</td> <td><u>30</u></td> </tr> </table>		Dis. (in.)	From (ft.)	To (ft.)	<u>8 1/4</u>	Surface	<u>30</u>	7) DRILLING METHOD (Check): <input type="checkbox"/> Driven <input type="checkbox"/> Air Rotary <input type="checkbox"/> Mud Rotary <input checked="" type="checkbox"/> Bored <input type="checkbox"/> Air Hammer <input type="checkbox"/> Cable Tool <input type="checkbox"/> Jetted <input type="checkbox"/> Other _____															
Dis. (in.)	From (ft.)	To (ft.)																							
<u>8 1/4</u>	Surface	<u>30</u>																							
From (ft.)    To (ft.)    Description and color of formation material <u>0 - 10</u> <u>red &amp; gray clay with orange streaks</u> <u>10 - 20</u> <u>gray/black clay with tan clay</u> <u>20 - 25</u> <u>stiff clay with lignite streak</u> <u>25 - 30</u> <u>fine gray sand</u>  <div style="text-align: center;"><u>AP-5</u></div>		8) Borehole Completion (Check): <input type="checkbox"/> Open Hole <input type="checkbox"/> Straight Wall <input type="checkbox"/> Underreamed <input checked="" type="checkbox"/> Gravel Packed <input type="checkbox"/> Other _____ If Gravel Packed give interval ... from <u>16</u> ft. to <u>30</u> ft.		CASING, BLANK PIPE, AND WELL SCREEN DATA: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Dia. (in.)</th> <th rowspan="2">New or Used</th> <th rowspan="2">Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial</th> <th colspan="2">Setting (ft.)</th> <th rowspan="2">Gage Casting Screen</th> </tr> <tr> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td><u>2</u></td> <td><u>N</u></td> <td><u>riser</u></td> <td><u>+2</u></td> <td><u>20</u></td> <td><u>sch 40</u></td> </tr> <tr> <td><u>2</u></td> <td><u>N</u></td> <td><u>#10 slot screen</u></td> <td><u>20</u></td> <td><u>30</u></td> <td><u>sch 40</u></td> </tr> </tbody> </table>		Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen	From	To	<u>2</u>	<u>N</u>	<u>riser</u>	<u>+2</u>	<u>20</u>	<u>sch 40</u>	<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>20</u>	<u>30</u>	<u>sch 40</u>
Dia. (in.)	New or Used	Steel, Plastic, etc. Perf., Slotted, etc. Screen Mfg., if commercial	Setting (ft.)		Gage Casting Screen																				
			From	To																					
<u>2</u>	<u>N</u>	<u>riser</u>	<u>+2</u>	<u>20</u>	<u>sch 40</u>																				
<u>2</u>	<u>N</u>	<u>#10 slot screen</u>	<u>20</u>	<u>30</u>	<u>sch 40</u>																				
13) TYPE PUMP: <input type="checkbox"/> Turbine <input type="checkbox"/> Jet <input type="checkbox"/> Submersible <input type="checkbox"/> Cylinder <input type="checkbox"/> Other _____ Depth to pump bowls, cylinder, jet, etc., _____ ft.		9) CEMENTING DATA [Rule 338.44(1)] Cemented from <u>16</u> ft. to <u>0</u> ft. No. of sacks used _____ _____ ft. to _____ ft. No. of sacks used _____ Method used <u>Dentonite</u> Cemented by _____ Distance to septic system field lines or other concentrated contamination _____ ft. Method of verification of above distance _____																							
14) WELL TESTS: Type test: <input type="checkbox"/> Pump <input type="checkbox"/> Bailor <input type="checkbox"/> Jetted <input type="checkbox"/> Estimated Yield: _____ gpm with _____ ft. drawdown after _____ hrs.		10) SURFACE COMPLETION <input checked="" type="checkbox"/> Specified Surface Slab Installed [Rule 338.44(2)(A)] <input checked="" type="checkbox"/> Specified Steel Sleeve Installed [Rule 338.44(3)(A)] <input type="checkbox"/> Pileless Adapter Used [Rule 338.44(3)(b)] <input type="checkbox"/> Approved Alternative Procedure Used [Rule 338.71]																							
15) WATER QUALITY: Did you knowingly penetrate any strata which contained undesirable constituents? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No    If yes, submit "REPORT OF UNDESIRABLE WATER" Type of water? _____ Depth of strata _____ Was a chemical analysis made? <input type="checkbox"/> Yes <input type="checkbox"/> No		11) WATER LEVEL: Static level <u>11'9"</u> ft. below land surface    Date <u>1-11-01</u> Artesian flow _____ gpm.    Date _____		12) PACKERS: <u>NA</u> Type _____    Depth _____																					
I hereby certify that this well was drilled by me (or under my supervision) and that each and all of the statements herein are true to the best of my knowledge and belief. I understand that failure to complete items 1 thru 15 will result in the log(s) being returned for completion and resubmittal.																									
COMPANY NAME _____ <small>(Type or print)</small>		WELL DRILLER'S LICENSE NO. <u>TX 52694-M</u>																							
ADDRESS _____ <small>(Street or RFD) (City) (State) (Zip)</small>																									
(Signed) <u>[Signature]</u> <small>(Licensed Well Driller)</small>		(Signed) _____ <small>(Registered Driller Trainee)</small>																							
Please attach electric log, chemical analysis, and other pertinent information, if available.																									





# SOIL BORING LOG

BORING/WELL NO.: AD-6  
 TOTAL DEPTH: 33'  
 TOP OF CASING ELEV.: 346.33 ft. NGVD  
 GROUND SURFACE ELEV.: 343.31 ft. NGVD

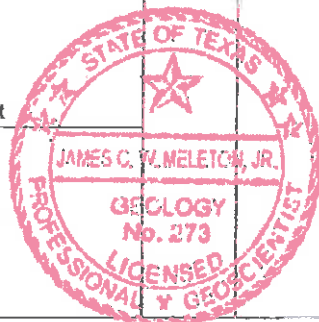
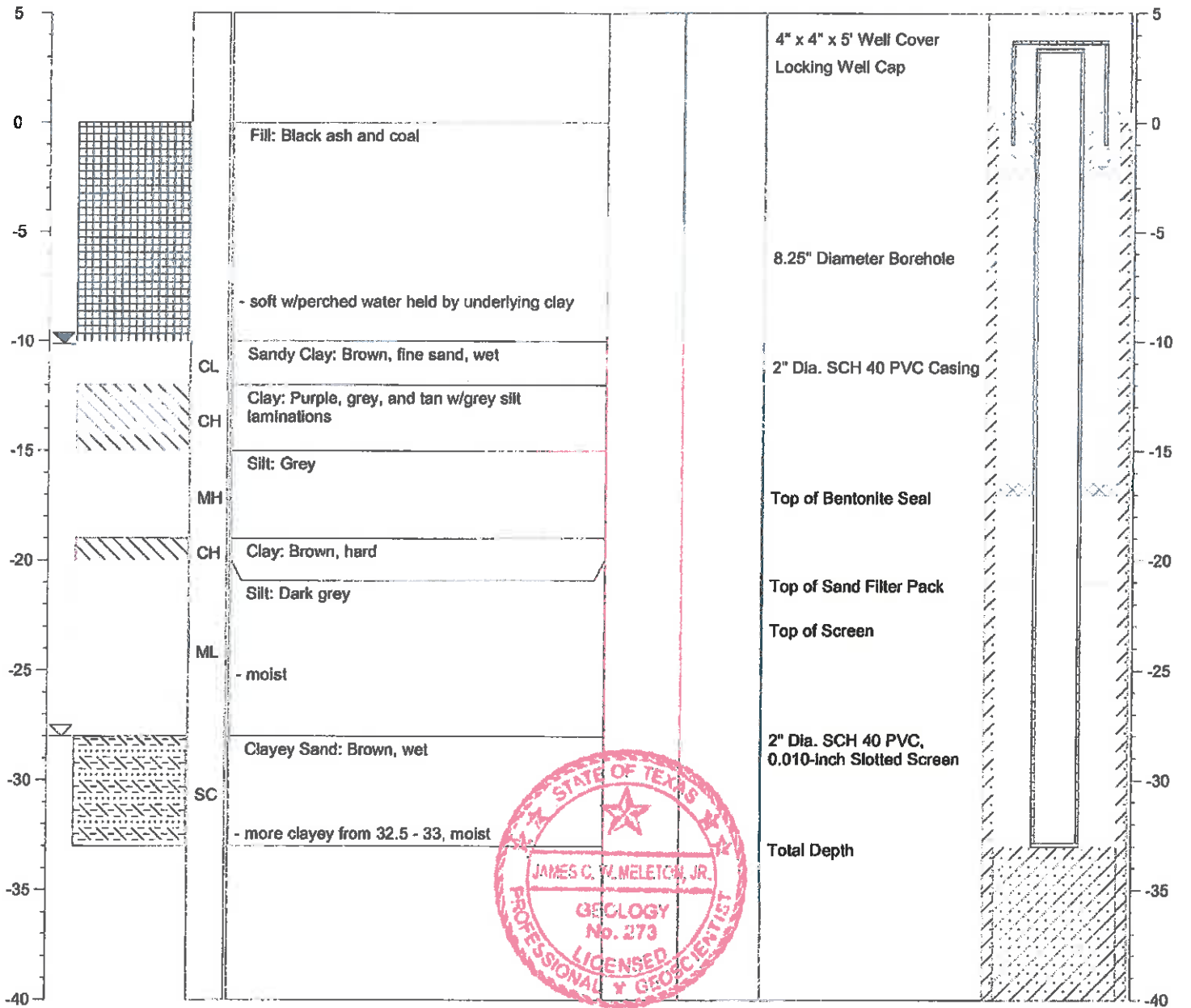
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/23/09

NOTES: Latitude: 33.05235  
 Longitude: 94.84757

☒ Water level during drilling  
 ☒ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: **AD-7**  
 TOTAL DEPTH: **38'**  
 TOP OF CASING ELEV.: **350.82 ft. NGVD**  
 GROUND SURFACE ELEV.: **347.86 ft. NGVD**

CLIENT: **AEP**  
 PROJECT: **Ash Disposal Area**  
 SITE LOCATION: **Welsh Power Plant**  
 PROJECT NO.: **S-08-0109**  
 LOGGED BY: **James Meleton, Jr.**

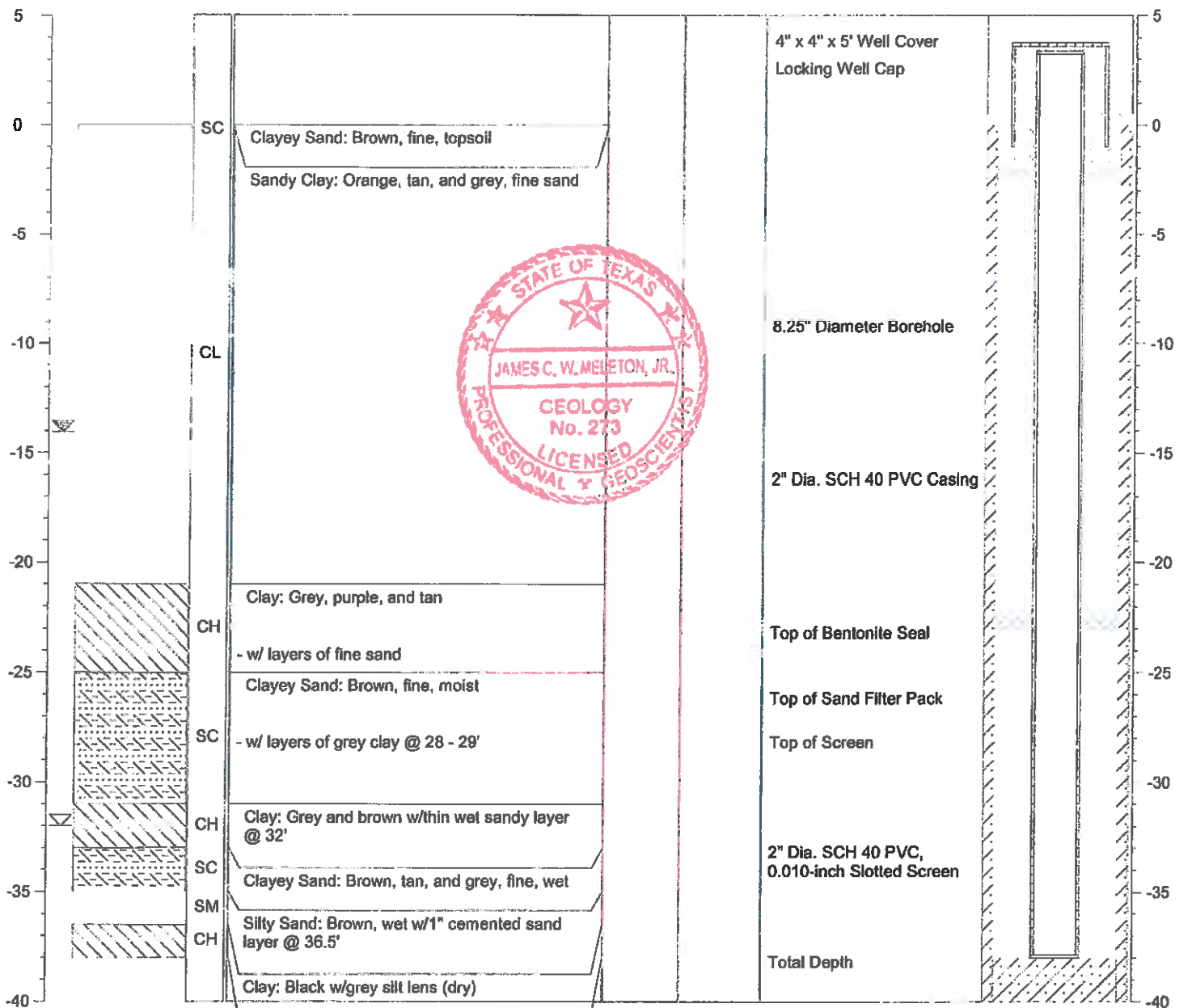
DRILLING CO.: **WEST Drilling**  
 DRILLER: **Tom McCullough**  
 METHOD OF DRILLING: **Hollow-stem Auger**  
 SAMPLING METHODS: **Split-spoon**  
 DATE DRILLED: **9/24/09**

NOTES: **Latitude: 33.05257**  
**Longitude: 94.84219**

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-8  
 TOTAL DEPTH: 29'  
 TOP OF CASING ELEV.: 340.01 ft. NGVD  
 GROUND SURFACE ELEV.: 337.53 ft. NGVD

CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

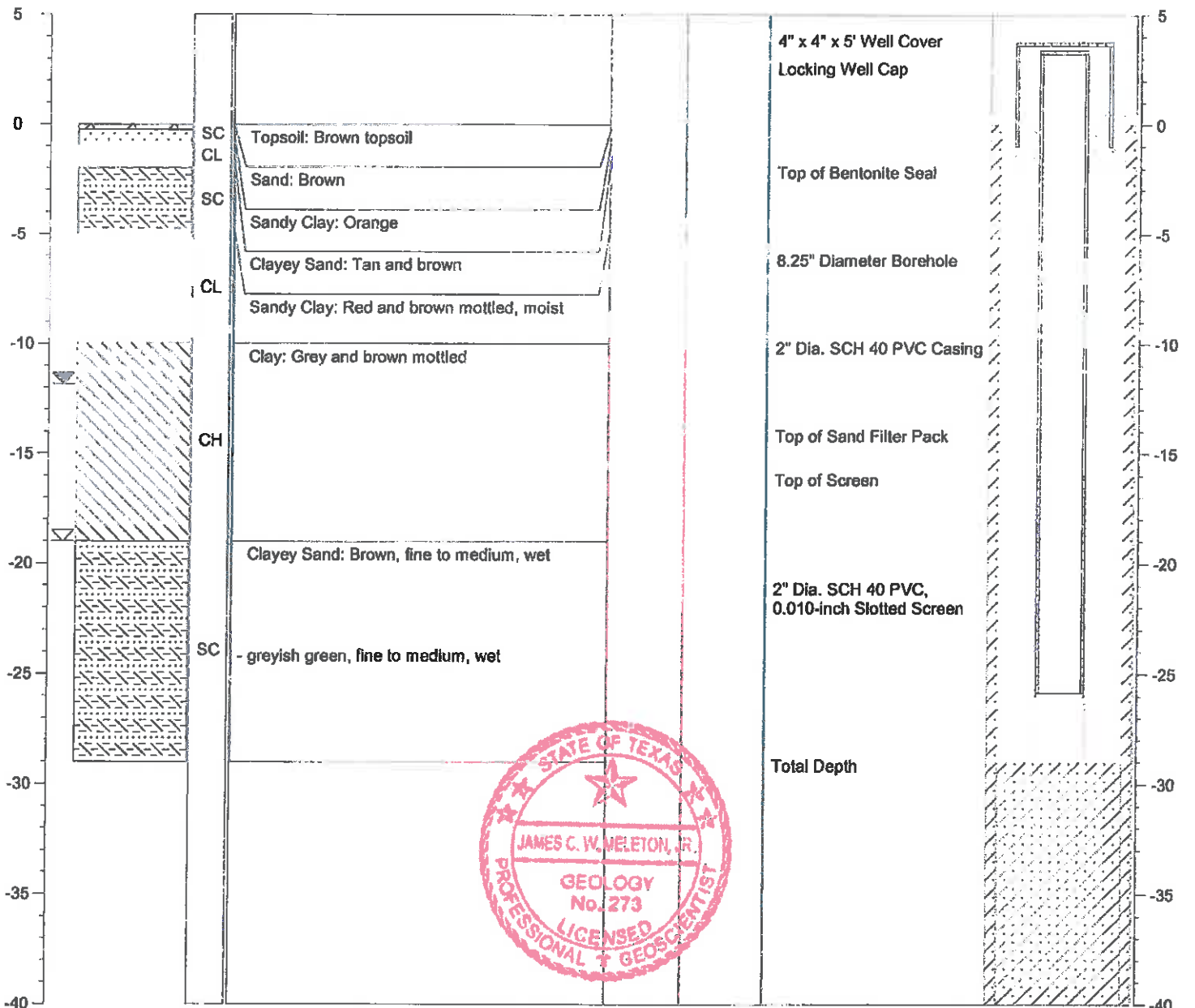
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/21/09

NOTES: Latitude: 33.05187  
 Longitude: 94.84026

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-9  
 TOTAL DEPTH: 35'  
 TOP OF CASING ELEV.: 343.09 ft. NGVD  
 GROUND SURFACE ELEV.: 340.32 ft. NGVD

CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

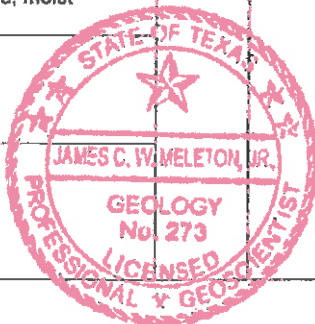
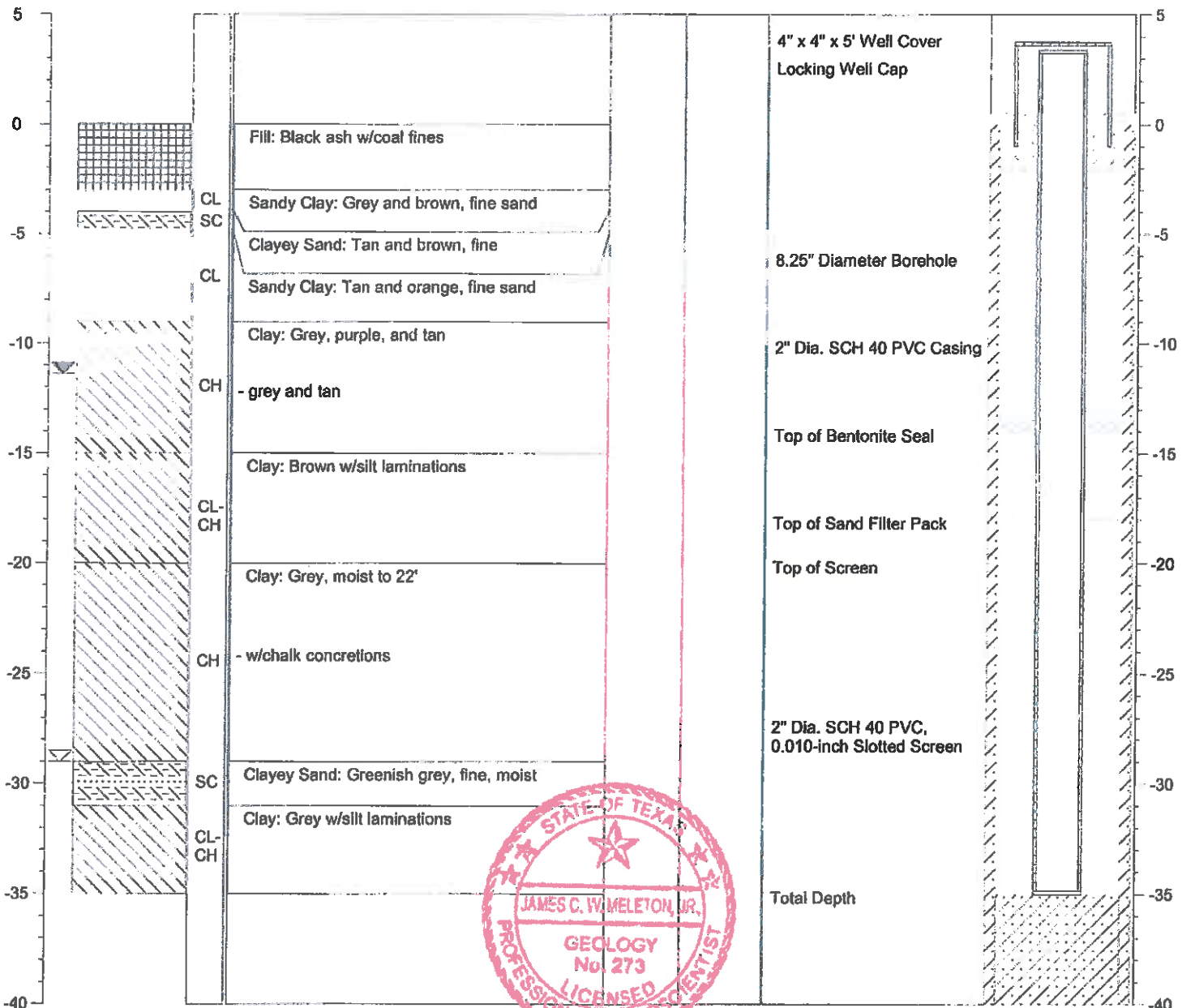
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/21/09

NOTES: Latitude: 33.04995  
 Longitude: 94.84196

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-10  
 TOTAL DEPTH: 35'  
 TOP OF CASING ELEV.: 343.01 ft. NGVD  
 GROUND SURFACE ELEV.: 340.23 ft. NGVD

CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

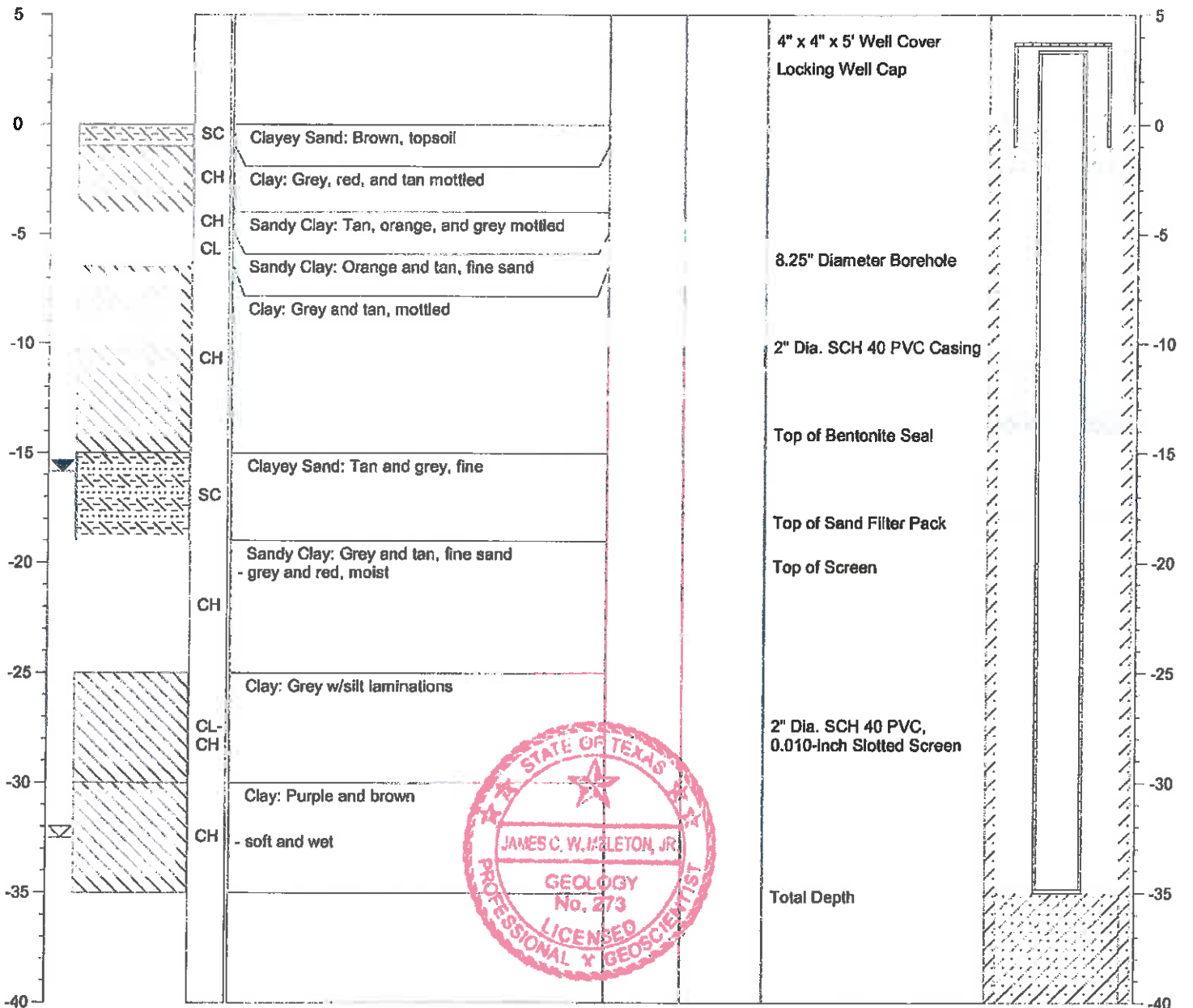
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04881  
 Longitude: 94.84047

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-11  
 TOTAL DEPTH: 20'  
 TOP OF CASING ELEV.: 342.18 ft. NGVD  
 GROUND SURFACE ELEV.: 339.61 ft. NGVD

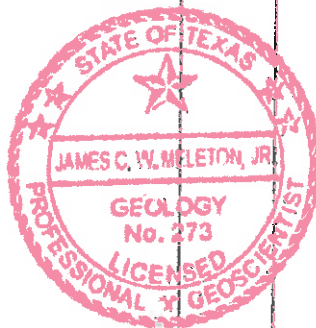
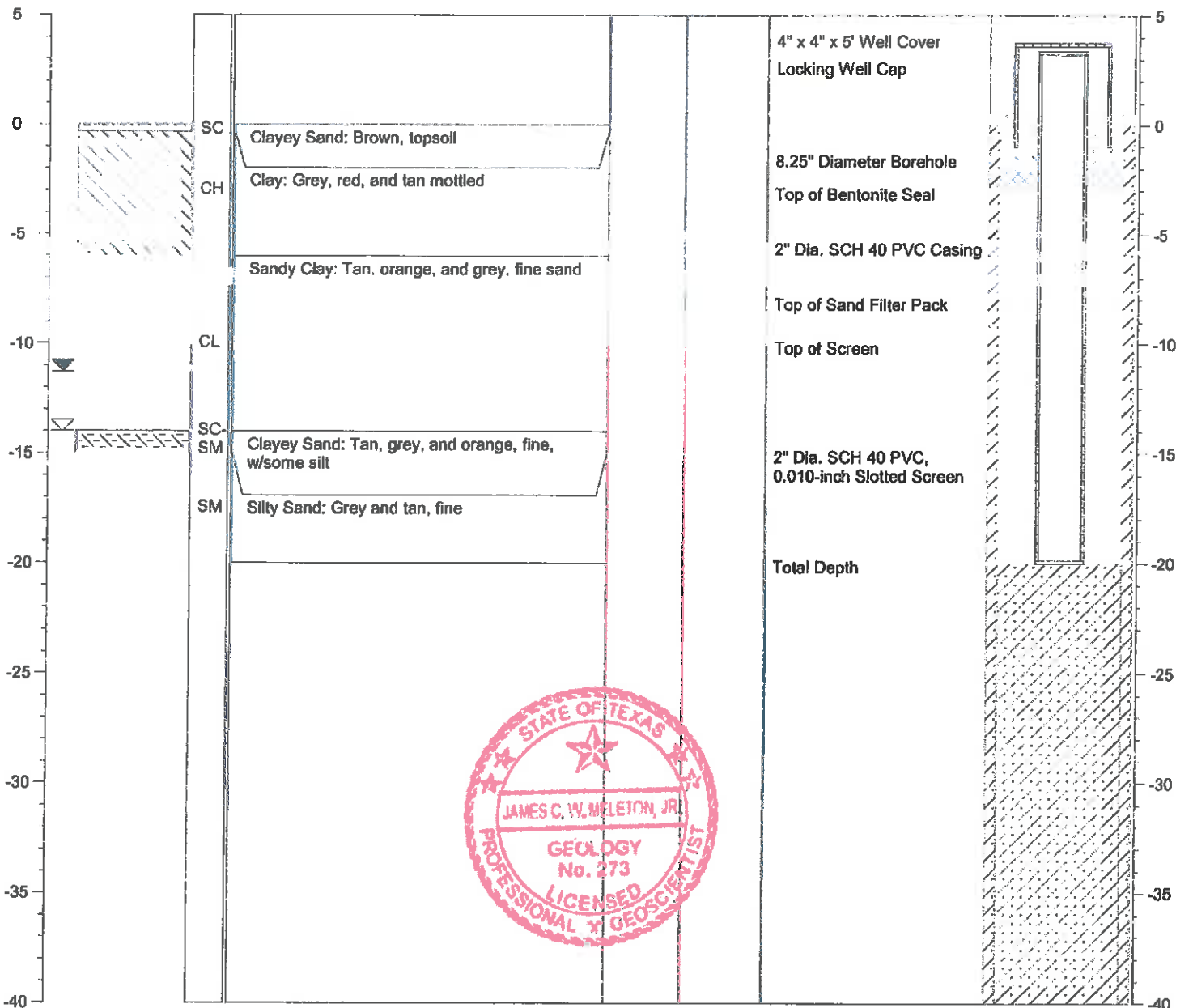
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04824  
 Longitude: 94.84177

☒ Water level during drilling  
 ☒ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-12  
 TOTAL DEPTH: 30'  
 TOP OF CASING ELEV.: 369.33 ft. NGVD  
 GROUND SURFACE ELEV.: 366.27 ft. NGVD

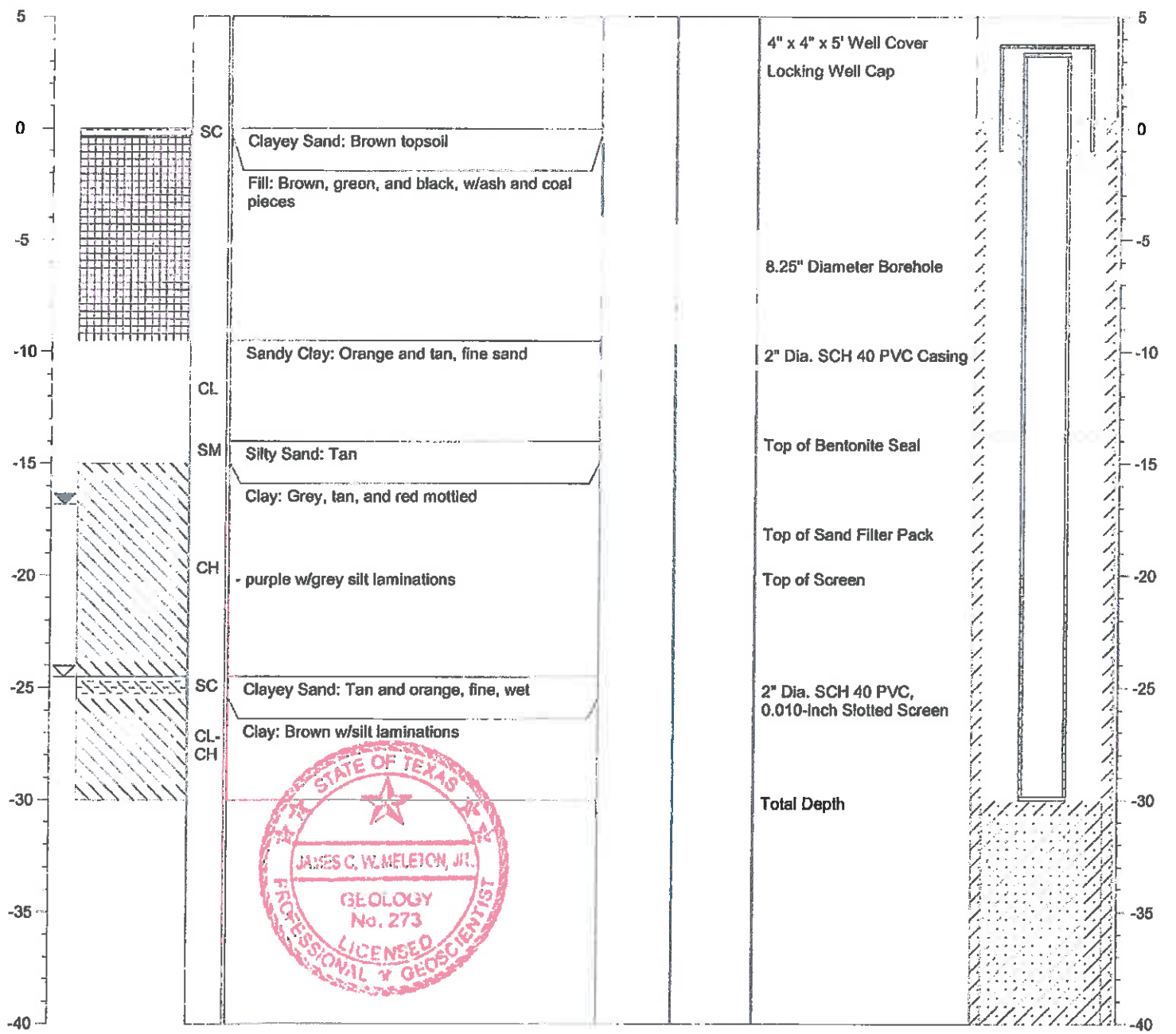
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/24/09

NOTES: Latitude: 33.04901  
 Longitude: 94.84977

☒ Water level during drilling  
 ☒ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-13  
 TOTAL DEPTH: 20'  
 TOP OF CASING ELEV.: 347.00 ft. NGVD  
 GROUND SURFACE ELEV.: 344.12 ft. NGVD

CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

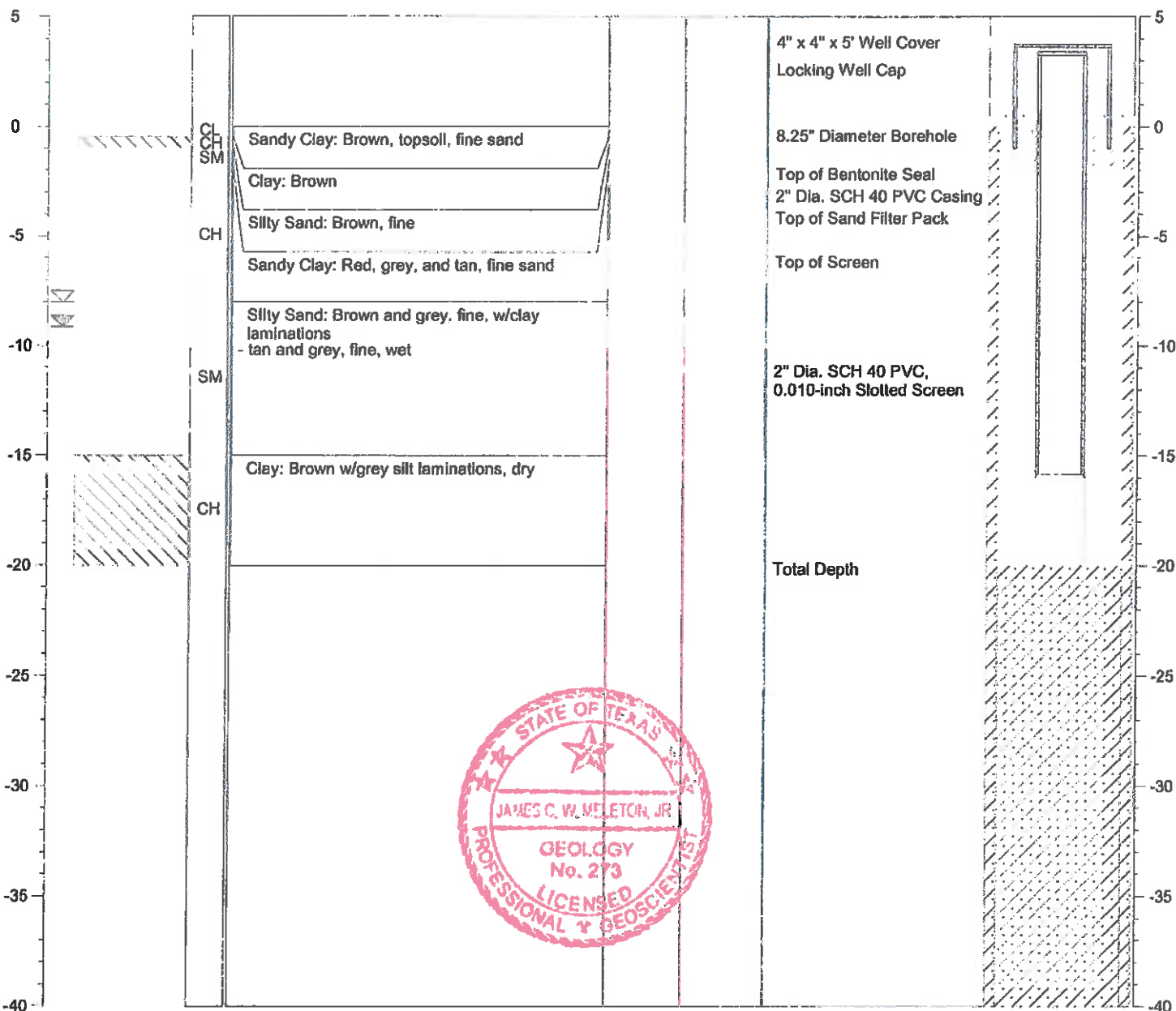
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04918  
 Longitude: 94.84275

☒ Water level during drilling  
 ☒ Water level in completed well

Page 1 of 1

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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# SOIL BORING LOG

BORING/WELL NO.: AD-14  
 TOTAL DEPTH: 18.5'  
 TOP OF CASING ELEV.: 345.43 ft. NGVD  
 GROUND SURFACE ELEV.: 342.32 ft. NGVD

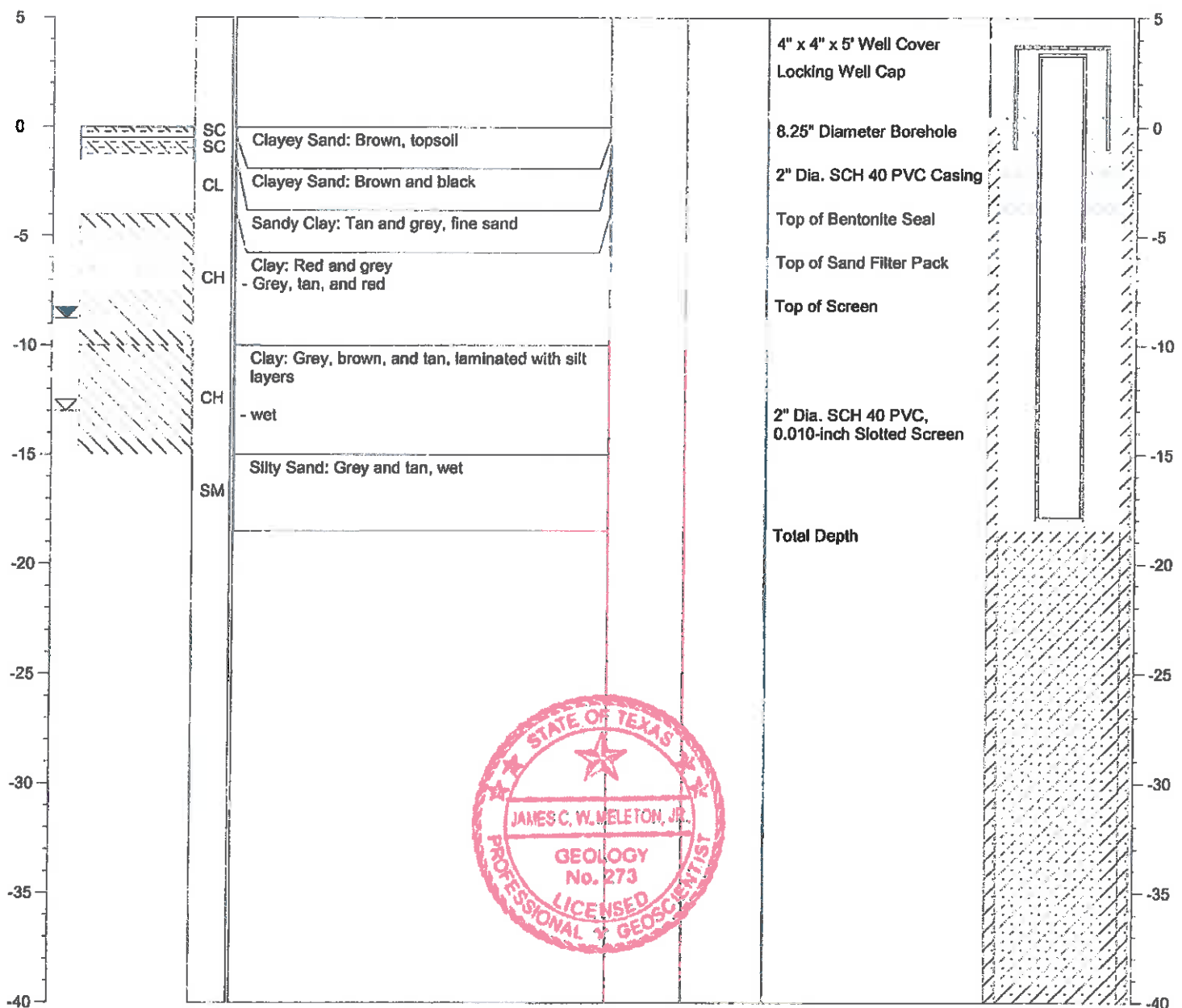
CLIENT: AEP  
 PROJECT: Ash Disposal Area  
 SITE LOCATION: Welsh Power Plant  
 PROJECT NO.: S-08-0109  
 LOGGED BY: James Meleton, Jr.

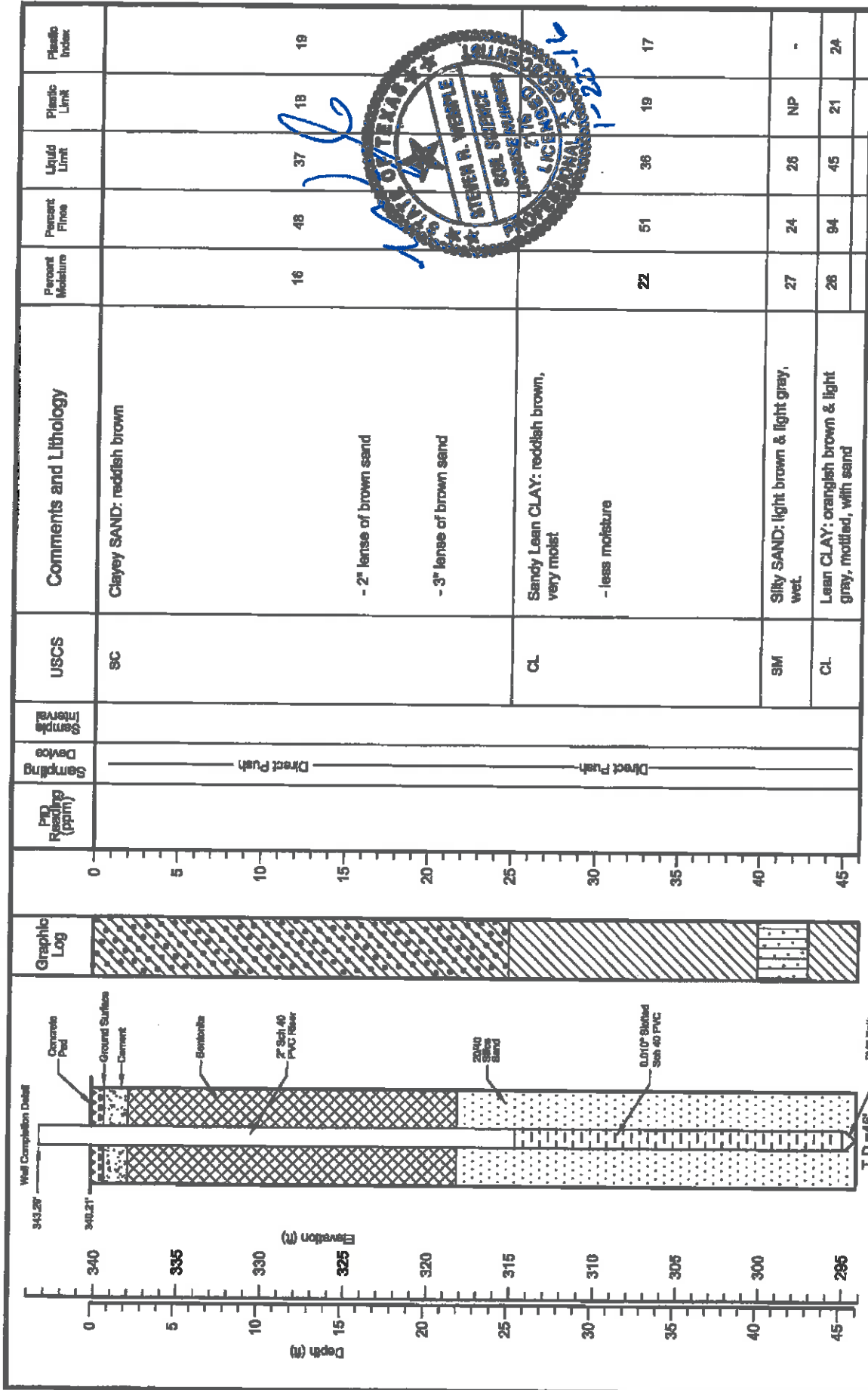
DRILLING CO.: WEST Drilling  
 DRILLER: Tom McCullough  
 METHOD OF DRILLING: Hollow-stem Auger  
 SAMPLING METHODS: Split-spoon  
 DATE DRILLED: 9/22/09

NOTES: Latitude: 33.04715  
 Longitude: 94.84256

☒ Water level during drilling  
 ☒ Water level in completed well

DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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WEST Drilling, Inc.  
101 Industrial Drive  
Waco, Texas 76715

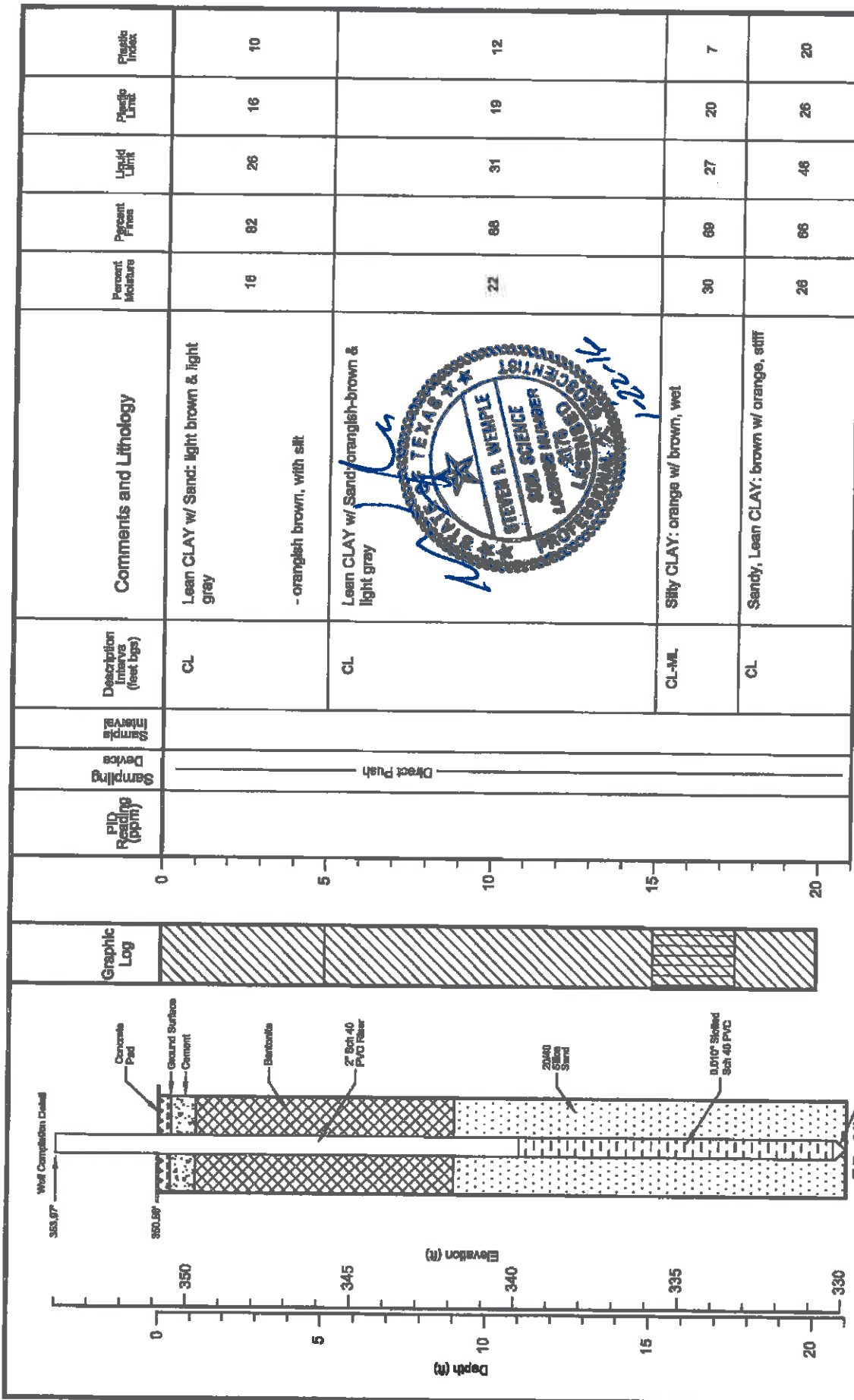
DATE: 12/12/15  
Drilling Method: H.S.A.  
Bt Diameter: 7.25"  
Depth to Water: -

Logged by: Robert Williams, PE  
Driller: Robert Williams  
Date Completed: 12/12/15  
Depth to Product: NA

Welsh Power Station  
Pittsburg, Texas

Log of Boring  
AD-15

PROJECT NO.: -  
SCALE: AS SHOWN  
FILE NAME: JR Welsh Power Plant LOGS.dwg



PID Reading (ppm)	Sampling Device	Sample Interval	Description Intervals (feet bgs)	Comments and Lithology	Percent Moisture	Percent Fine	Liquid Limit	Plastic Limit	Plastic Index
	Direct Push		CL	Lean CLAY w/ Sand: light brown & light gray - orangish brown, with silt	16	82	26	16	10
			CL	Lean CLAY w/ Sand: orangish-brown & light gray	22	68	31	19	12
			CL-ML	Silty CLAY: orange w/ brown, wet	30	69	27	20	7
			CL	Sandy, Lean CLAY: brown w/ orange, stiff	26	66	46	26	20

<b>west</b> DRILLING environmental & geotechnical WEST Drilling, Inc. 101 Industrial Drive Waco, Texas 76786		DATE: 12/10/15 Drilling Method: H.S.A. Bit Diameter: 7.25" Depth to Water: --	Logged by: Robert Williams, PE Driller: Robert Williams Date Completed: 12/10/15 Depth to Product: NA	Welsh Power Station Pittsburg, Texas DRAWN BY: HDS CHECKED BY: SRW	Log of Boring AD-16 PRODUCT NO. -- SCALE AS SHOWN FILE NAME: W Welsh Power Plant LOG.dwg
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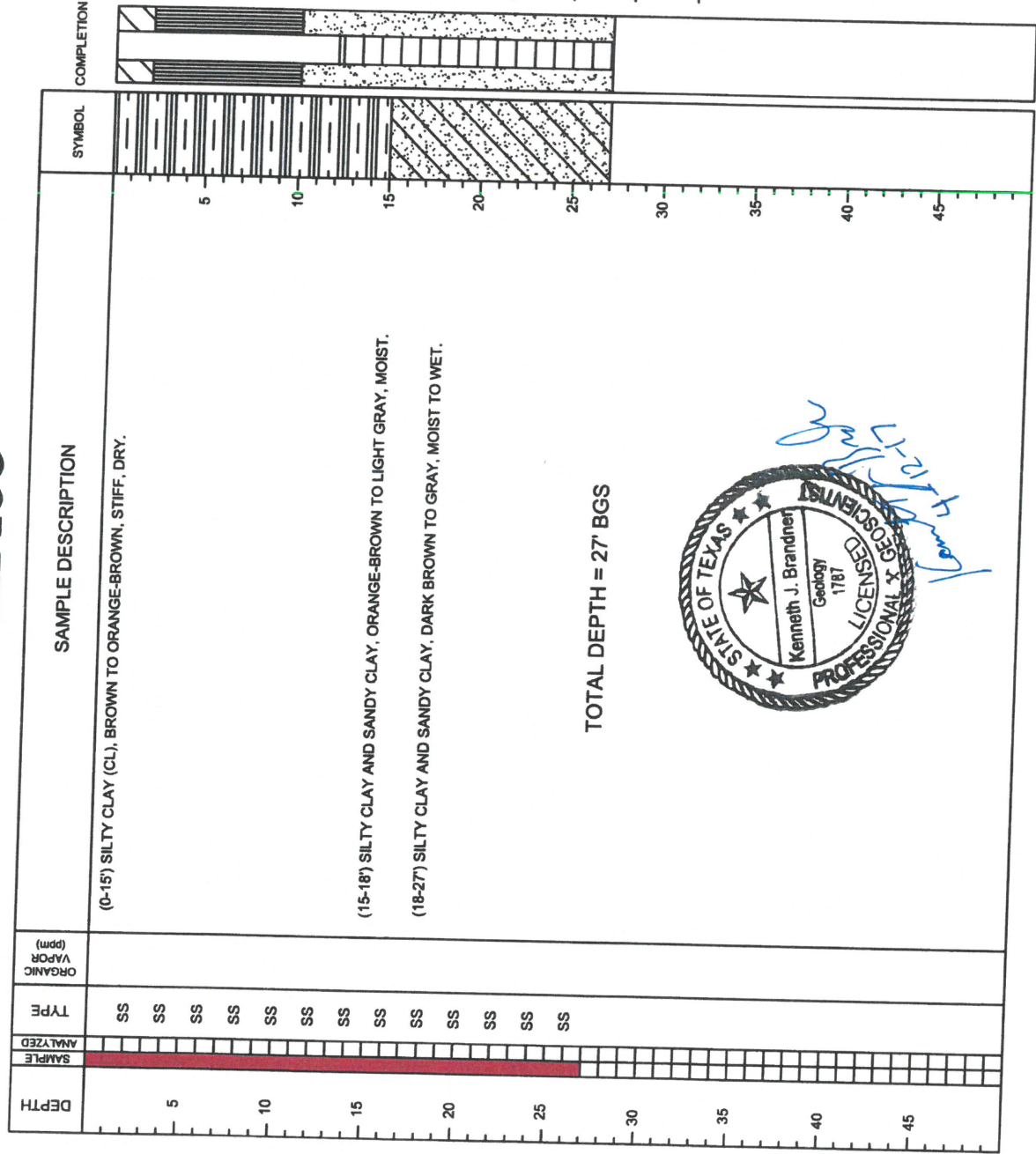


# WELL LOG

**WELL** AD-16R  
**AEP** \_\_\_\_\_  
**CLIENT** \_\_\_\_\_  
**PROJECT** BOTTOM ASH STORAGE POND  
**LOCATION** WELSH POWER PLANT  
**DATE** 4/12/17  
**HSA** \_\_\_\_\_  
**DRILLING METHOD** \_\_\_\_\_  
**CASING** 2" PVC, 2' AGL-12' BGL  
 2" PVC, 12'-27' BGS  
**SCREEN** \_\_\_\_\_  
**CEMENT** 0-2' BGS  
**BENTONITE** 2-10' BGS  
**SAND PACK** 10-27' BGS  
**GROUND ELEV. / TOP OF CASING ELEV.** 350.55' / 353.49'

**CT - CUTTINGS** ▽ **HC LEVEL**  
**SB - SPLIT BARREL(S)** ▾ **WATER LEVEL**  
**SS - SPLIT SPOON(Z)** \_\_\_\_\_  
**SAND** [Symbol] **FILL/CONCRETE** [Symbol]  
**SILT** [Symbol] **BENTONITE** [Symbol]  
**CLAY** [Symbol] **GRAVEL** [Symbol]

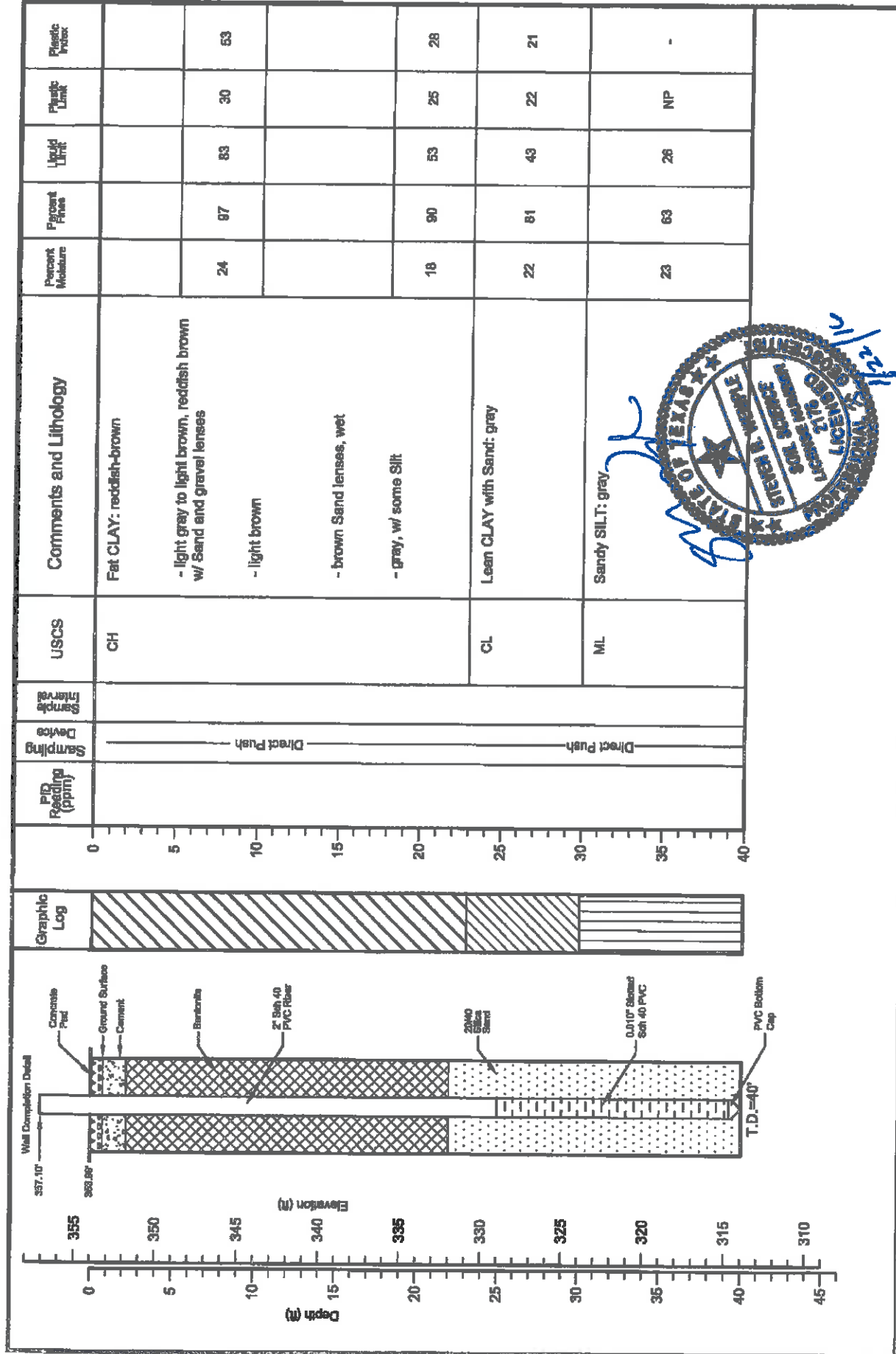
START: \_\_\_\_\_ FINISH: \_\_\_\_\_



TOTAL DEPTH = 27' BGS



**ARCADIS** Design & Consultancy for natural and built assets  
 711 N. CARANCAHUA, #1080  
 CORPUS CHRISTI, TEXAS 78401  
 TEL: (361) 883-1353 FAX: (361) 883-7565



Depth (m)	USCS	Comments and Lithology	Percent Moisture	Percent Plastic	Liquid Limit	Plastic Limit	Plastic Index
0 - 24	CH	Fat CLAY: reddish-brown - light gray to light brown, reddish brown w/ Sand and gravel lenses - light brown	24	97	83	30	53
24 - 28	CL	- brown Sand lenses, wet - gray, w/ some Silt	18	90	53	25	28
28 - 30	CL	Lean CLAY with Sand: gray	22	81	43	22	21
30 - 40	ML	Sandy SILT: gray	23	63	26	NP	-

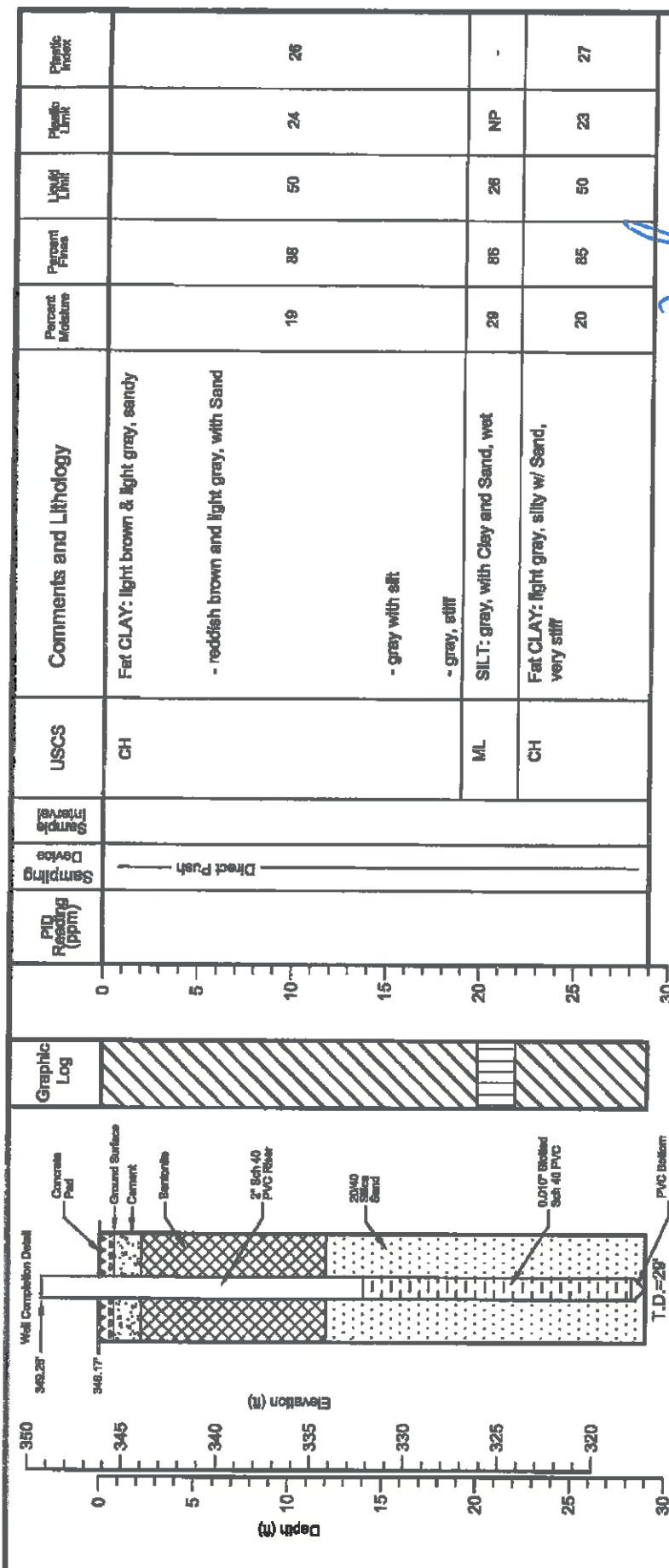


Logged by: Robert Williams, PE  
 Driller: Robert Williams  
 Date Completed: 12/11/15  
 Depth to Product: MA

DATE: 12/10/15  
 Drilling Method: H.S.A.  
 Bit Diameter: 7.25"  
 Depth to Water: -

**west**  
 DRILLING  
 environmental & geotechnical  
 WEST Drilling, Inc.  
 101 Industrial Drive  
 Westborough, Texas 75165

Log of Boring  
 AD-17  
 Welsh Power Station  
 Pittsburg, Texas  
 PROJECT NO.: ---  
 SCALE: AS SHOWN  
 DRAWN BY: HDS  
 CHECKED BY: SRW  
 FILE NAME: JF Welsh Power Plant LOGS.dwg



Depth (ft)	USCS	Comments and Lithology	Percent Moisture	Percent Finest	Liquid Limit	Plastic Limit	Plastic Index
0 - 19	CH	Fat CLAY: light brown & light gray, sandy - reddish brown and light gray, with Sand	19	88	50	24	26
19 - 20		- gray with silt					
20 - 23	ML	SILT: gray, with Clay and Sand, wet - gray, stiff	29	86	28	NP	-
23 - 27	CH	Fat CLAY: light gray, silty w/ Sand, very stiff	20	85	50	23	27



<b>west</b> DRILLING Environmental & Geotechnical WEST Drilling, Inc. 101 Industrial Drive Waco, Texas 76766		DATE: 12/11/15 Drilling Method: H.S.A. Bit Diameter: 7.25" Depth to Water: -	Logged by: Robert Williams, PE Driller: Robert Williams Date Completed: 12/11/15 Depth to Product: NA	Welsh Power Station Pittsburg, Texas	Log of Boring AD-18	
		DRAWN BY: HDS CHECKED BY: SRW	PROJECT NO. - SCALE: AS SHOWN			
		FILE NAME: JR Welsh Power Plant LOGS.dwg				

**Project: AEP Welsh Power Plant**  
**Project Location: Cason, TX**  
**Project Number: TXL0064**

**Log of Boring GB-1**  
**Sheet 1 of 2**

Date(s) Drilled: <b>July 23, 2009</b>	Logged By: <b>Kush S. Chohan</b>	Checked By:
Drilling Method: <b>Hollow Stem Auger</b>	Drill Bit Size/Type:	Total Depth of Borehole: <b>37 feet bgs</b>
Drill Rig Type: <b>Mobil B61</b>	Drilling Contractor: <b>Total Support Services</b>	Approximate Surface Elevation: <b>367 feet MSL</b>
Groundwater Level and Date Measured:	Sampling Method(s): <b>SPT, Tube</b>	Hammer Data: <b>140 lb, 30 in drop, Auto-hammer</b>
Borehole Backfill: <b>Bentonite Chips</b>	Location: <b>On the Northern edge of proposed chemical pond along the screening berm.</b>	

Printed with a trial version of BorinGS - visit www.gookinsoftware.com for purchase information: P:\Projects\AEP Welsh Plant\2009 Pond Design\Hydrogeo Investigation\Boring Log\Boring\_CS\_files\GB-1\_logs [KSC AEP].log

Elevation, feet	Depth, feet	Sample Type	Sample Description, Resistance, Blow/foot, Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
367	0	ST		Other		Black COAL, a few fine roots and organics.						Shelby tube pulled black COAL
		SS	10									SPT 4, 5, 5, 5, 24" recovered
362	5	SS	11	Soft to Firm	SC	Reddish Brown fine SAND, little clay, trace silt, Dry. Natural Ground.						SPT 4, 5, 6, 7, 24" recovered
		SS	11	Soft	SM	Reddish brown fine SAND with silt, trace clay. Vertical sand seams in sample, Dry.						SPT 3, 5, 6, 8, 24" recovered.
357	10	ST					23.6	22	48.9	5.4E-07		Shelby tube sample, 18" recovered.
		SS	12	Soft	SC	Reddish brown well graded fine SAND, trace silt and clay. Damp.						SPT 5, 6, 8, 9, 24" recovered
		SS	13	Firm	CL	Greyish red CLAY, little sand, horizontal sand seams, Dry.						SPT 7, 6, 7, 9, 24" recovered.
		SS	13	Soft	SC	Brownish red fine SAND, little clay, Damp.						SPT 6, 9, 9, 9, 24" recovered.
352	15	SS	16	Firm	SC-CL	Four-inch CLAY seam, little fine sand.						SPT 8, 9, 9, 9, 24" recovered.
		SS	16	Firm	CL	Reddish grey CLAY, little sand, oxidized iron ore. Dry	17.74	14	40.1			SPT 9, 8, 9, 11, 24 inches recovered.
		SS	17	Soft	SM	Brownish red fine SAND, trace clay, thin clay seams. Moist.						SPT 5, 7, 8, 50/2, 21" recovered
347	20	ST		Other	SC	Iron oxidized material	16.25	NP	28.9	3.6E-05		SPT 50/3"
		SS	15	Soft	SC	Brownish red fine SAND, little clay. Moist.						SPT 11, 13, 14, 16, 24" recovered.
		SS	18	Soft	CL	Dark grey CLAY, little fine sand, Wet.						SPT 11, 16, 30, 14, 24" recovered.
342	25	SS	20	Soft Very Hard	SP	Dark grey-black cemented SAND, little clay. Wet. Driller comments that cemented sand terminates at 25.5 feet.						SPT 11, 15, 22, 25, 24" recovered.
		SS	27	Soft to Firm	SC	Dark grey fine SAND, little clay. Moist. Soft sand with lenses of firm clay.						
		SS	46	Hard	CL	Dark grey CLAY, little sand, Dry.						
		SS	37	Hard	SC	Dark grey-black fine SAND, little clay, Wet. Encountered water but water rose to 19 feet after 15 min break.						
337	30	SS	37	Hard	CL							

Figure



Project: AEP Welsh Power Plant  
 Project Location: Cason, TX  
 Project Number: TXL0064

Log of Boring GB-1  
 Sheet 2 of 2

Elevation, feet	Depth, feet	Sample Type	Sample Number	Soil Resistance, lb/sq. in.	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
337	30	SS	37		Hard	CL		Dark gray CLAY, little fine sand, occasional horizontal sand seams. Wet. (cont.)						SPT 11, 15, 22, 25. 24" recovered. SPT 6, 11, 18, 24. 24 recovered.
		SS	29		Soft	ML		Dark grey-black fine SAND, with clay, frequent hard clay lenses (1-3"). Wet.	26.37	NP	57.5			
		SS	34		Hard	CL		Black CLAY, trace to little fine sand, trace silt. Dry						
332	35							Bottom of Boring at 37 feet bgs						SPT 9, 16, 18, 23. 24" recovered.
327	40													
322	45													
317	50													
312	55													
307	60													
302	65													

Figure

Printed with a trial version of BorlogSS - visit www.gocoinsoftware.com for purchase information. P:\Projects\AEP Welsh Plant\2009 Pond Design\Hydrogeo Investigation\Boring Log\Boring\_GS\_files\GB-1\_bgs JKSC\_AEP.mpl

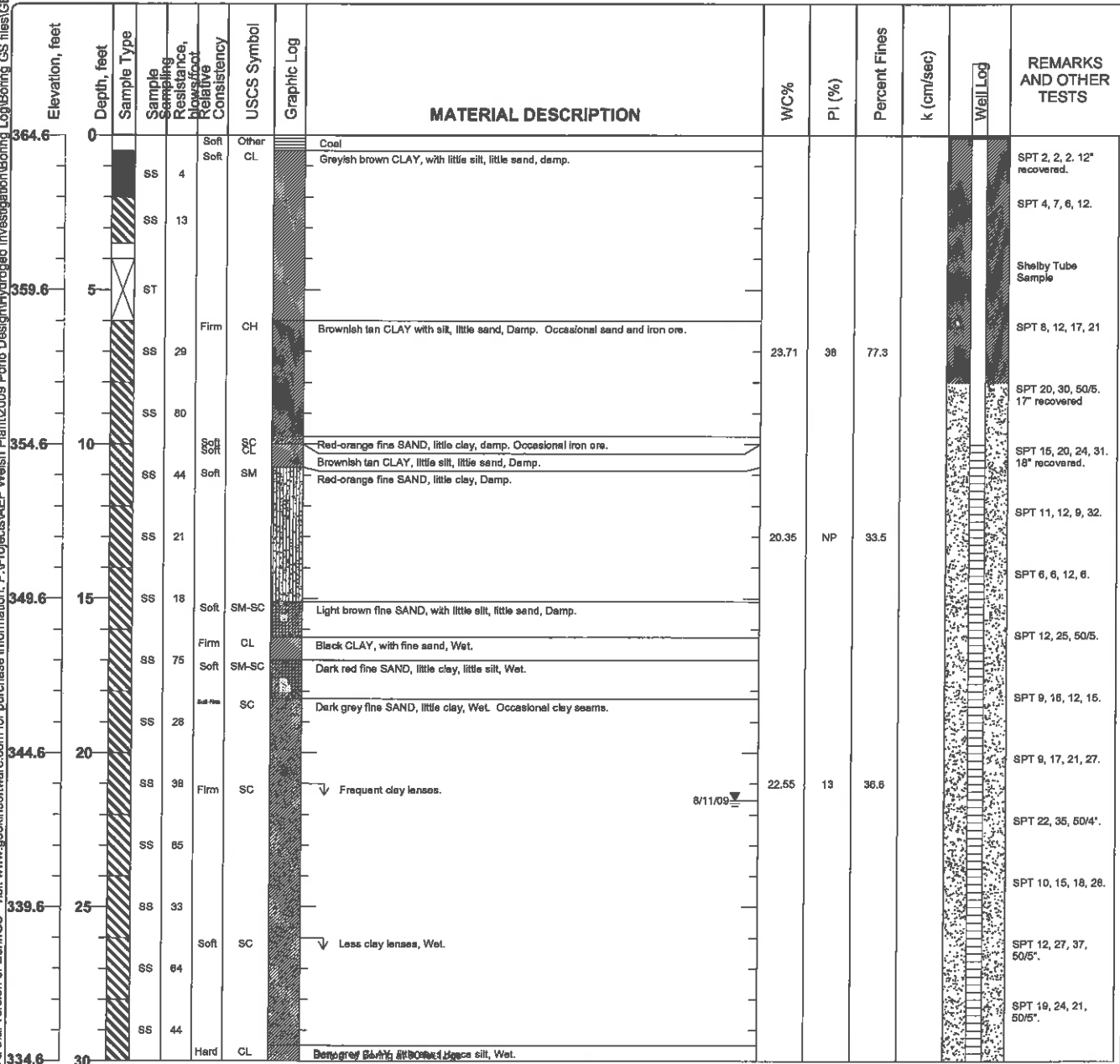
Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

## Log of Boring GB-02

Sheet 1 of 1

Date(s) Drilled <b>August 14, 2009</b>	Logged By <b>Kush S. Chohan</b>	Checked By
Drilling Method <b>Hollow Stem Auger</b>	Drill Bit Size/Type	Total Depth of Borehole <b>30 feet bgs</b>
Drill Rig Type <b>Mobil B61</b>	Drilling Contractor <b>Total Support Services</b>	Approximate Surface Elevation <b>364.56 feet MSL</b>
Groundwater Level and Date Measured <b>21.53 feet measured on 8/11/09</b>	Sampling Method(s) <b>SPT, Tube</b>	Hammer Data <b>140 lb, 30 in drop, rope &amp; cathead</b>
Borehole Backfill <b>Well Completion</b>	Location <b>Western edge of proposed chemical pond near perimeter fence.</b>	

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Figure

**WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)**



JOB NAME: AEP Welsh Power Plant

JOB NO.: TXL0064

DATE/TIME: 8/7/2009

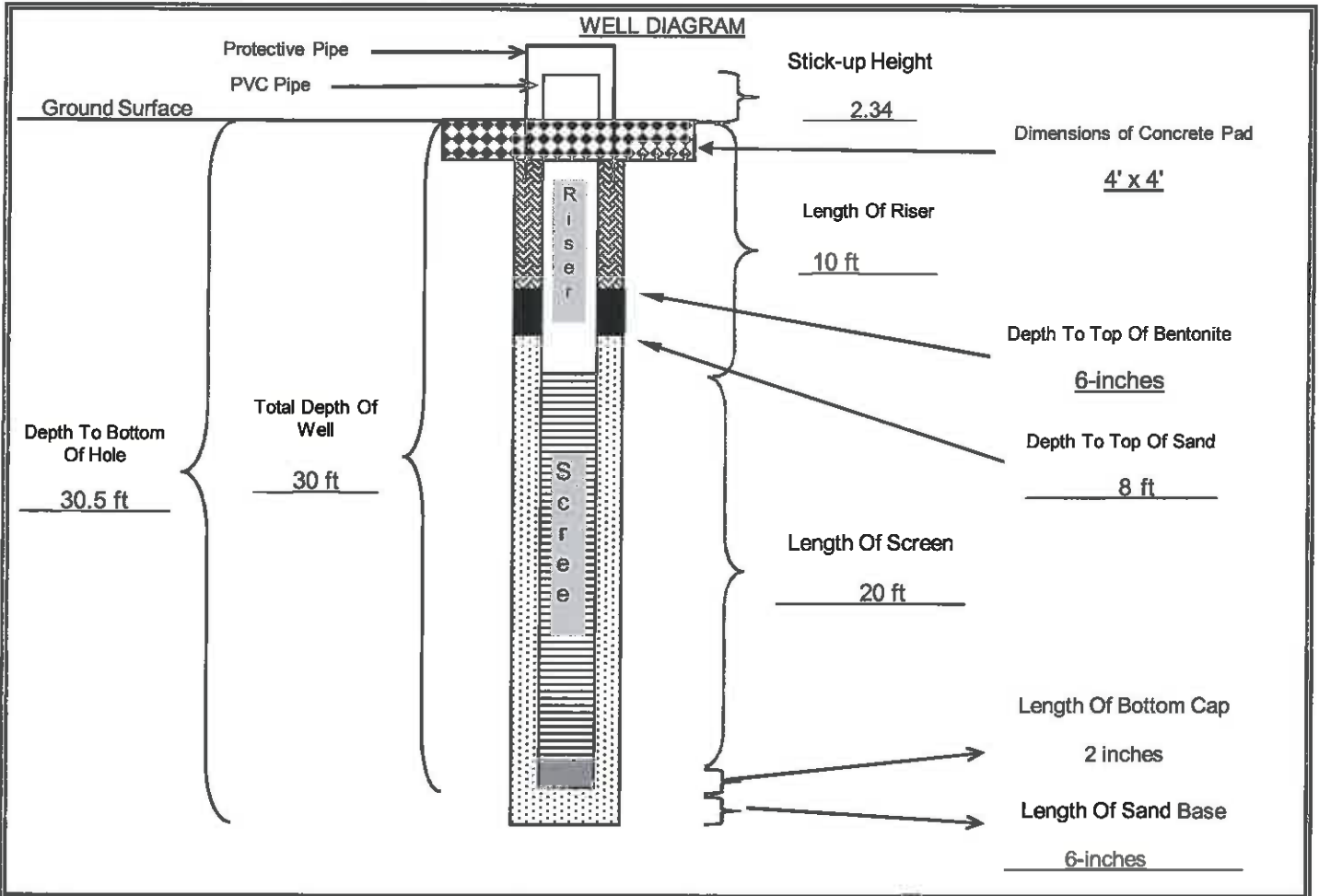
WELL LOCATION: \_\_\_\_\_

WELL NO.: \_\_\_\_\_

FIELD REP: Kush Chohan

**GB-02**

GROUND SURFACE ELEVATION:	<u>364.56</u>	(ft, msl)	BENTONITE TYPE:	<u>Western Bentonite</u>
TOP OF SCREEN ELEVATION:	<u>354.56</u>	(ft, msl)	MANUFACTURER:	<u>PDS</u>
BOTTOM OF WELL ELEVATION:	<u>334.06</u>	(ft, msl)	CEMENT TYPE:	<u>Not used-sealed with bentonite chips</u>
NORTHING:	<u>747.0223</u>	EASTING:	<u>-2442.888</u>	CEMENT MANUFACTURER: _____
SCREEN MATERIAL:	<u>PVC</u>	SAND PACK TYPE AND SIZE:	<u>Silica 20/40</u>	
SCREEN MANUFACTURER:	_____	SAND MANUFACTURER:	<u>Uninum</u>	
RISER MATERIAL:	<u>PVC</u>	DRILLING CONTRACTOR:	<u>Total Support Services</u>	
RISER MANUFACTURER:	_____	AMOUNT BENTONITE USED:	<u>4</u>	bags lbs
RISER DIAMETER:	<u>2</u>	(in) Length:	<u>10</u>	(ft) AMOUNT CEMENT USED: _____ bags lbs
SCREEN DIAMETER:	<u>2</u>	(in) Length:	<u>20</u>	(ft) AMOUNT SAND USED: <u>13</u> bags lbs
BOREHOLE DIAMETER:	<u>8</u>	(in) STATIC WATER:	<u>21.53</u>	depth from TOC
DRILLING TECHNIQUE:	<u>Hollow stem</u>	Size:	_____	(in) ENCOUNTERED WATER: _____ depth from ground



	<b>Cement/Bentonite Grout</b>		<b>Sand Pack</b>		<b>Neat Concrete</b>		<b>Bentonite</b>		<b>Bottom Cap</b>
QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush Chohan</u>							
	DATE: <u>August 7th, 2009</u>	CHECKED BY: _____	DATE: _____						

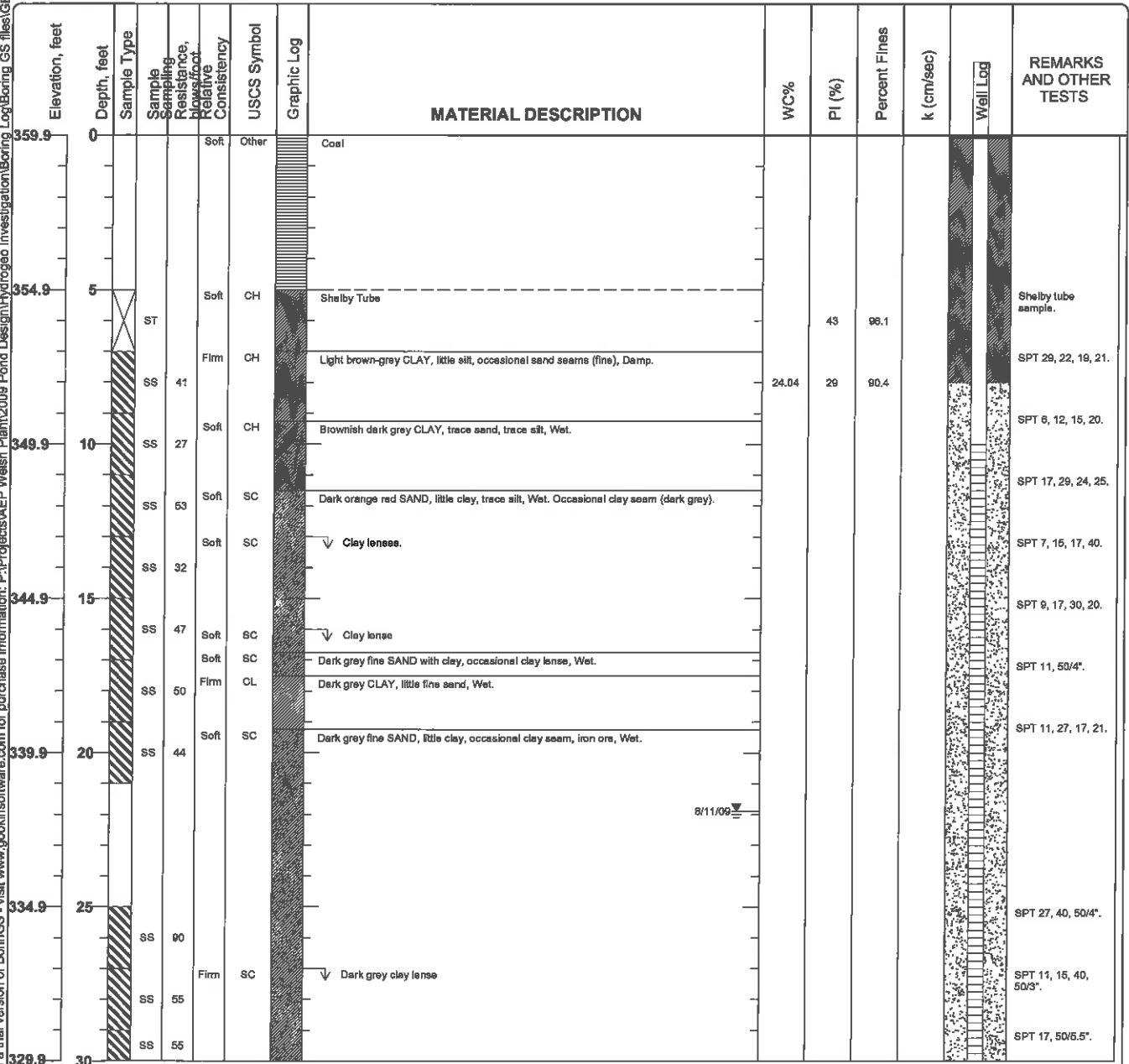
Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

## Log of Boring GB-03

Sheet 1 of 2

Date(s) Drilled: <b>August 7, 2009</b>	Logged By: <b>Kush S. Chohan</b>	Checked By:
Drilling Method: <b>Hollow Stem Auger</b>	Drill Bit Size/Type:	Total Depth of Borehole: <b>31 feet bgs</b>
Drill Rig Type: <b>Mobil B61</b>	Drilling Contractor: <b>Total Support Services</b>	Approximate Surface Elevation: <b>359.91 feet MSL</b>
Groundwater Level and Date Measured: <b>21.89 feet measured on 8/11/09</b>	Sampling Method(s): <b>SPT, Tube</b>	Hammer Data: <b>140 lb, 30 in drop, rope &amp; cathead</b>
Borehole Backfill: <b>Well Completion</b>	Location: <b>Southwest corner of proposed chemical pond near screening pile.</b>	

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Figure



Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

Log of Boring GB-03  
 Sheet 2 of 2

Elevation, feet	Depth, feet	Sample Type	Sample Description	Resistance, lb/sq ft	Moisture Content, %	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
329.9	30	SS	65	Hard	CL			Dark grey CLAY, trace silt, trace fine sand.						SPT 17, 50/6.5".	
								Bottom of Boring at 31 feet bgs							
324.9	35														
319.9	40														
314.9	45														
309.9	50														
304.9	55														
299.9	60														
294.9	65														

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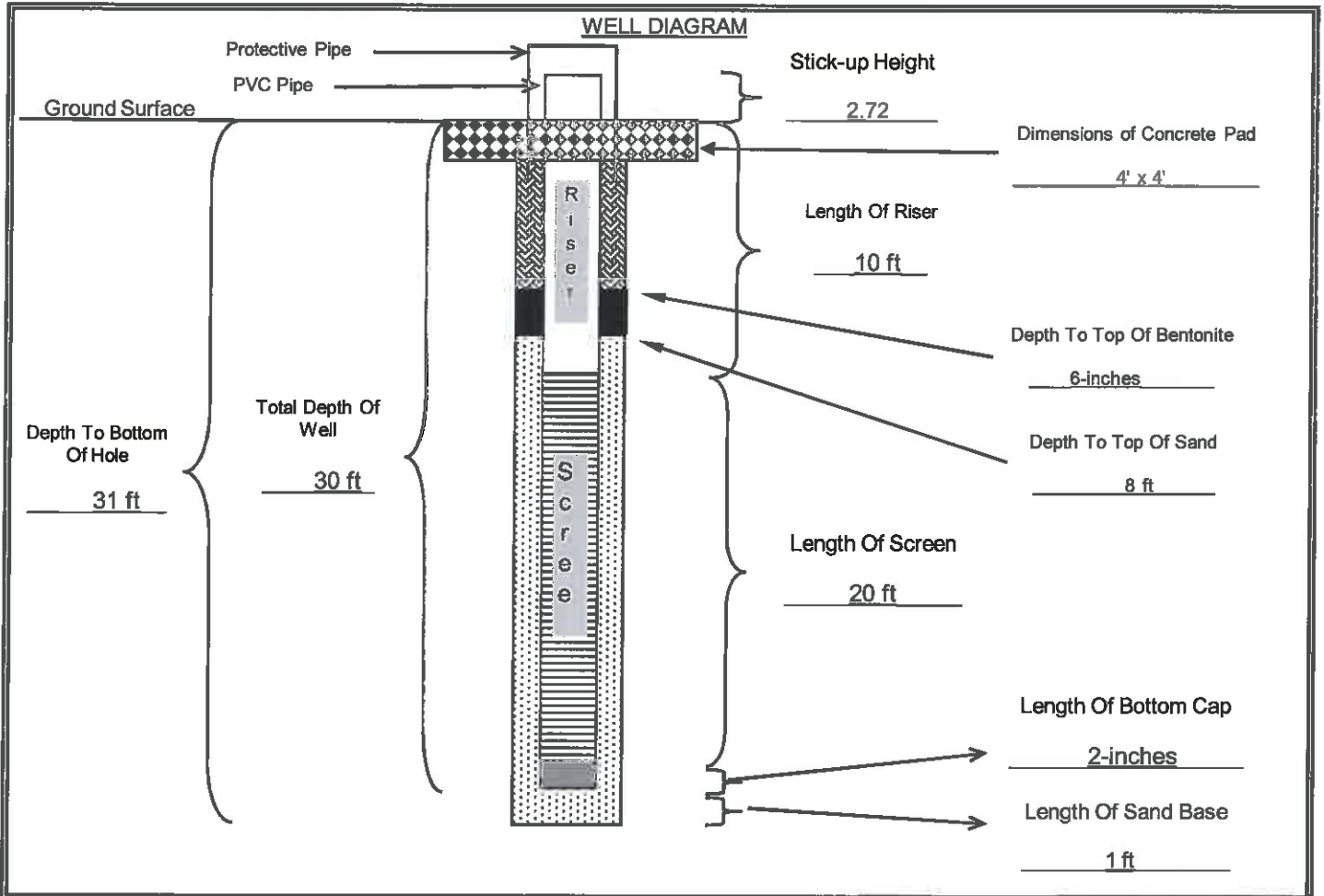
Figure

## WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)



JOB NAME: <u>AEP Welsh Power Plant</u>	GB-03
JOB NO.: <u>TXL0064</u>	
DATE/TIME: <u>8/7/2009</u>	WELL NO.:
WELL LOCATION:	FIELD REP: <u>Kush Chohan</u>

GROUND SURFACE ELEVATION:	<u>359.57</u>	(ft, msl)	BENTONITE TYPE:	<u>Western Bentonite</u>
TOP OF SCREEN ELEVATION:	<u>349.57</u>	(ft, msl)	MANUFACTURER:	<u>PDS</u>
BOTTOM OF WELL ELEVATION:	<u>328.57</u>	(ft, msl)	CEMENT TYPE:	<u>None used-sealed with bentonite chips</u>
NORTHING:	<u>460.5803</u>	EASTING:	<u>-2507.6332</u>	CEMENT MANUFACTURER:
SCREEN MATERIAL:	<u>PVC</u>		SAND PACK TYPE AND SIZE:	<u>Silica 20/40</u>
SCREEN MANUFACTURER:			SAND MANUFACTURER:	<u>Uninum</u>
RISER MATERIAL:	<u>PVC</u>		DRILLING CONTRACTOR:	<u>Total Support Services</u>
RISER MANUFACTURER:			AMOUNT BENTONITE USED:	<u>4</u> bags lbs
RISER DIAMETER:	<u>2</u>	(in)	Length:	<u>10</u>
			(ft)	AMOUNT CEMENT USED:
SCREEN DIAMETER:	<u>2</u>	(in)	Length:	<u>20</u>
			(ft)	AMOUNT SAND USED:
BOREHOLE DIAMETER:	<u>8</u>		(in)	STATIC WATER:
				<u>21.89</u>
				depth from TOC
DRILLING TECHNIQUE:	<u>Hollow Stem</u>		Size:	<u>8</u>
			(in)	ENCOUNTERED WATER:
				<u>                    </u>
				depth from ground



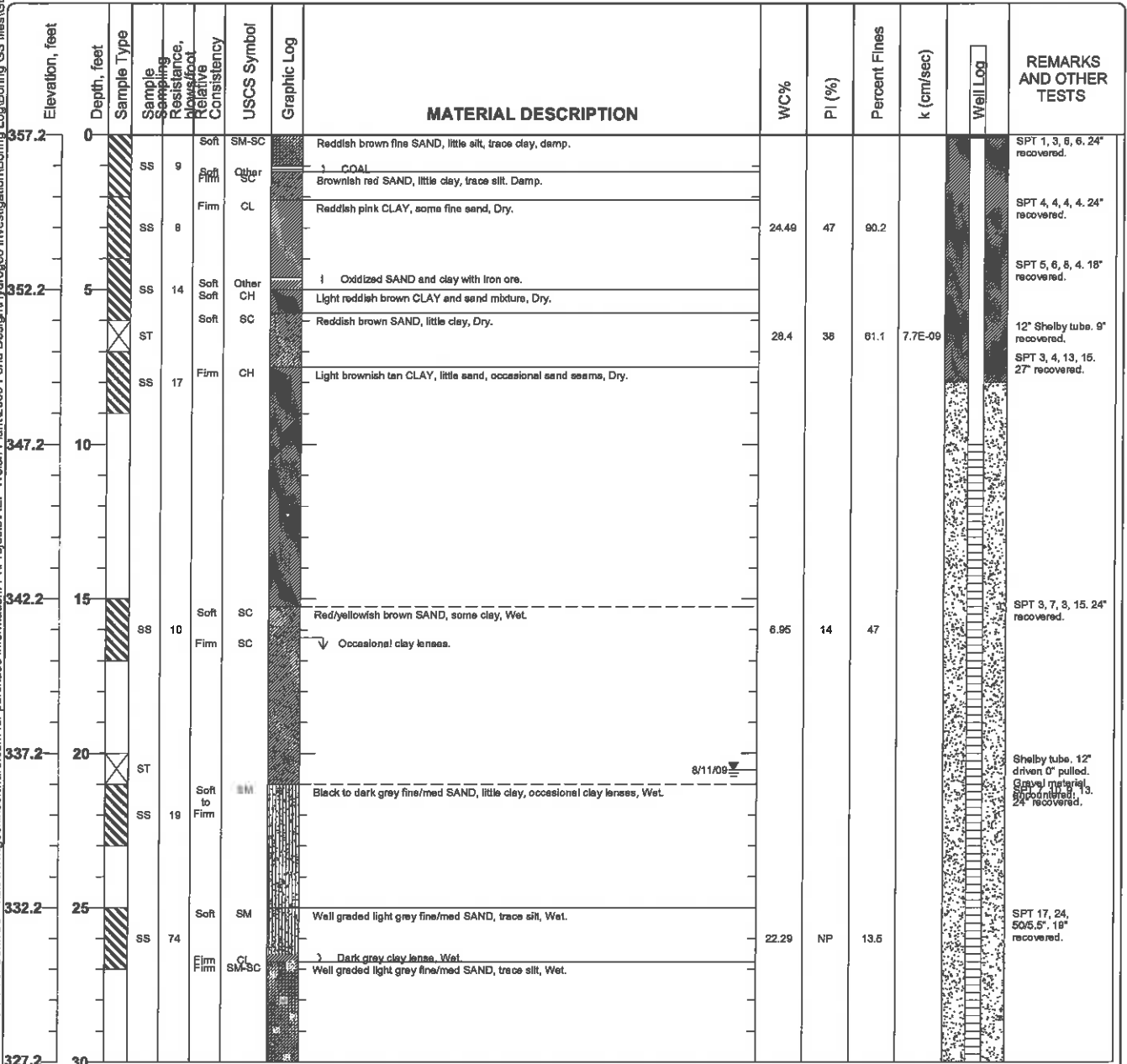
	Cement/Bentonite Grout	Sand Pack	Neat Concrete	Bentonite	Bottom Cap
QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush S. Chohan</u>			
	DATE: <u>7-Aug-09</u>	CHECKED BY: <u>                    </u>	DATE: <u>                    </u>		

Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

Log of Boring GB-04  
 Sheet 1 of 2

Date(s) Drilled	July 24, 2009	Logged By	Kush S. Chohan	Checked By	
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type		Total Depth of Borehole	34 feet bgs
Drill Rig Type	Mobil B61	Drilling Contractor	Total Support Services	Approximate Surface Elevation	357.22 feet MSL
Groundwater Level and Date Measured	20.54 feet measured on 8/11/09	Sampling Method(s)	SPT, Tube	Hammer Data	140 lb, 30 in drop, Auto-hammer
Borehole Backfill	Well Completion	Location	Southeast corner of proposed chemical evaporation pond. Located in a grassy field.		

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Figure

Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

Log of Boring GB-04  
 Sheet 2 of 2

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Elevation, feet	Depth, feet	Sample Type	Sample Description	Resistance, Blows/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
327.2	30	ST		Hard		ML		Dark grey CLAY, little sand, Wet.						12" Shelby tube. Bent shelly tube.
		ST							21.3	NP	84.2	2.0E-08		12" Shelby tube.
		SS	38	Hard		CL		Dark grey CLAY, trace sand, Wet.	25.44	18	92.5			SPT 15, 19, 19, 25, 24" recovered.
								Bottom of Boring at 34 feet bgs						
322.2	35													
317.2	40													
312.2	45													
307.2	50													
302.2	55													
297.2	60													
292.2	65													

Figure



**WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)**



JOB NAME: AEP Welsh Power Plant

JOB NO.: TXL0064

DATE/TIME: 24-Jul-09

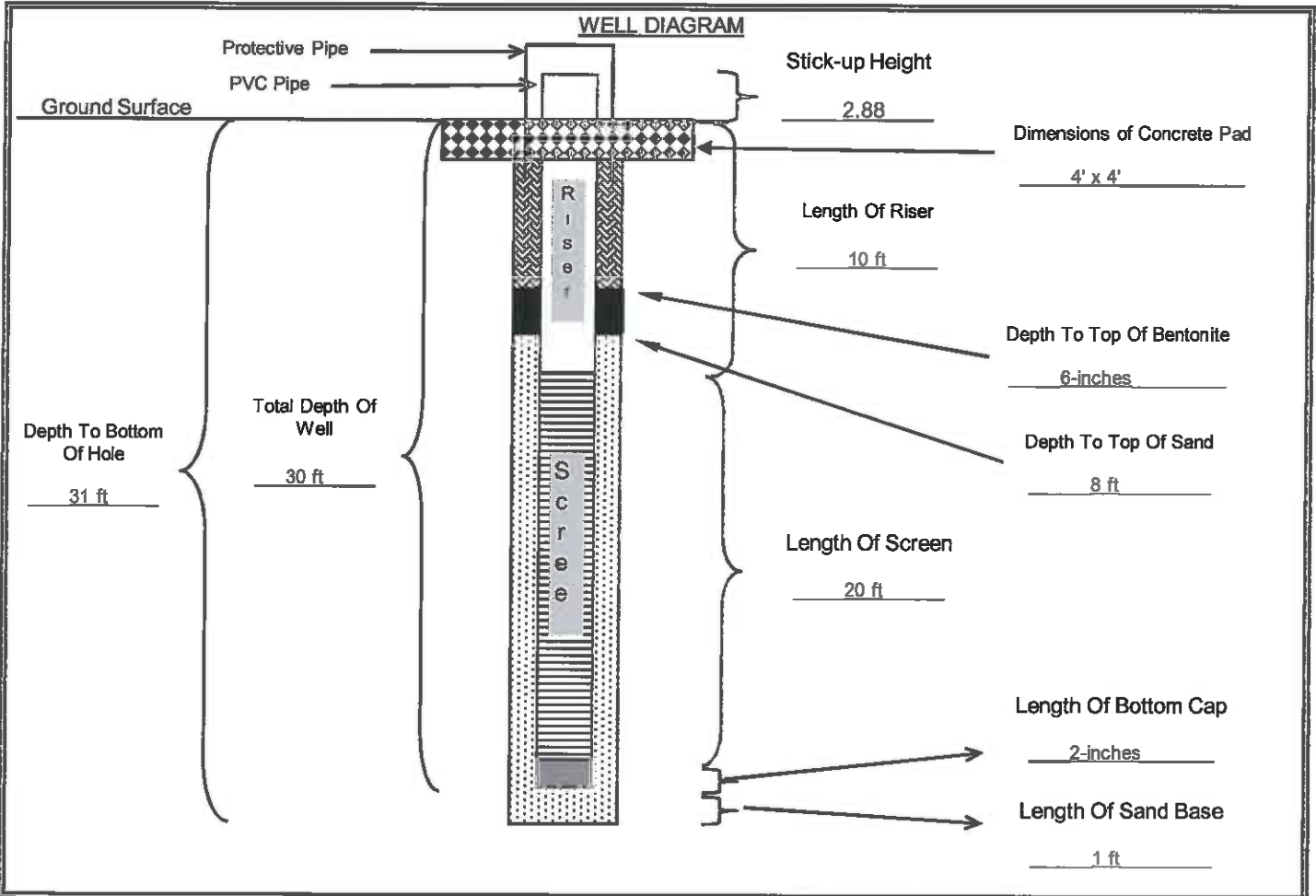
WELL LOCATION: \_\_\_\_\_

WELL NO.: \_\_\_\_\_

FIELD REP: Kush Chohan

**GB-04**

GROUND SURFACE ELEVATION:	<u>357.22</u>	(ft, msl)	BENTONITE TYPE:	<u>Western Bentonite</u>
TOP OF SCREEN ELEVATION:	<u>347.22</u>	(ft, msl)	MANUFACTURER:	<u>PDS</u>
BOTTOM OF WELL ELEVATION:	<u>326.22</u>	(ft, msl)	CEMENT TYPE:	_____
NORTHING:	<u>-384.9666</u>	EASTING:	<u>-2353.7375</u>	CEMENT MANUFACTURER: _____
SCREEN MATERIAL:	<u>PVC</u>	SAND PACK TYPE AND SIZE:	<u>Silica 20/40</u>	
SCREEN MANUFACTURER:	_____	SAND MANUFACTURER:	<u>Uninum</u>	
RISER MATERIAL:	<u>PVC</u>	DRILLING CONTRACTOR:	<u>Total Support Services</u>	
RISER MANUFACTURER:	_____	AMOUNT BENTONITE USED:	<u>3</u>	bags lbs
RISER DIAMETER:	<u>2</u>	(in) Length:	<u>10</u>	(ft) AMOUNT CEMENT USED: _____ bags lbs
SCREEN DIAMETER:	<u>2</u>	(in) Length:	<u>20</u>	(ft) AMOUNT SAND USED: <u>7</u> bags lbs
BOREHOLE DIAMETER:	<u>6.75</u>	(in) STATIC WATER:	<u>20.54</u>	depth from TOC
DRILLING TECHNIQUE:	<u>Hollow Stem</u>	Size:	<u>6.75</u>	(in) ENCOUNTERED WATER: _____ depth from ground



	Cement/Bentonite Grout	Sand Pack	Neat Concrete	Bentonite	Bottom Cap
QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush S. Chohan</u>			
	DATE: <u>24-Jul-09</u>	CHECKED BY: _____	DATE: _____		

**Project: AEP Welsh Power Plant**  
**Project Location: Cason, Texas**  
**Project Number: TXL0064**

**Log of Boring GB-05**  
**Sheet 1 of 2**

Date(s) Drilled <b>July 24, 2009</b>	Logged By <b>Kush S. Chohan</b>	Checked By
Drilling Method <b>Hollow Stem Auger</b>	Drill Bit Size/Type	Total Depth of Borehole <b>30.5 feet bgs</b>
Drill Rig Type <b>Mobil B61</b>	Drilling Contractor <b>Total Support Services</b>	Approximate Surface Elevation <b>357.49 feet MSL</b>
Groundwater Level and Date Measured <b>15.3 feet measured on 8-11-09</b>	Sampling Method(s) <b>SPT, Tube</b>	Hammer Data <b>140 lb, 30 in drop, Auto-hammer</b>
Borehole Backfill <b>Well Completion</b>	Location <b>Eastern edge of proposed chemical evaporation pond.</b>	

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Elevation, feet	Depth, feet	Sample Type	Sample Resistance, blow/foot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
357.5	0	SS	7	Firm	CH	•••••	Dark fine SAND with brown organic material and roots.						SPT 2, 2, 5, 5, 24" recovered
		SS			CH	•••••	Dark red/grey CLAY, trace silt. Dry.	23.37	44	68.8			SPT 4, 4, 7, 9, 24" recovered.
		SS	11								7E-07		SPT 5, 6, 8, 13, 24" recovered
352.5	5	SS	14		CH	•••••	Trace of sand						SPT 5, 6, 8, 13, 24" recovered
		ST		Soft	CH	•••••	Dark red fine SAND, trace clay, Damp.	16.5	41	73.8	3.2E-08		Shelby tube. Pushed 12" recovered at SPT 5, 7, 11, 11, 24" recovered.
		SS	18	Firm Soft Firm	CH	•••••	Light tan CLAY, trace sand, Dry.						SPT 6, 7, 11, 14, 24" recovered.
		SC			SC	•••••	Dark red SAND, trace of CLAY, Damp.						SPT 6, 7, 11, 14, 24" recovered.
		SC			SC	•••••	Light tan CLAY, trace fine sand, Dry.						SPT 6, 7, 11, 14, 24" recovered.
347.5	10	SS	18	Soft	SC	•••••	Dark red SAND, little clay, frequent clay seams, Damp						SPT 6, 7, 11, 14, 24" recovered.
		SC			SC	•••••	Frequent clay seams						SPT 11, 22, 13, 14, 24" recovered.
		SS	35	Soft	SC	•••••	Red/orange fine SAND, trace clay, trace coarse sand, poorly sorted, Moist.						SPT 17, 27, 50/5", 17" recovered.
		SS	77	Firm Soft	CL	•••••	Brownish grey CLAY, trace sand, Moist.						SPT 11, 22, 13, 14, 24" recovered.
342.5	15	ST			SC	•••••	Tanish grey fine SAND, some clay, Wet.	19.9	13	35.7	8.6E-07		Shelby tube. Pushed 12" recovered at SPT 11, 13, 10, 14, 24" recovered.
		SS	23	Soft	SM	•••••	Dark grey coarse SAND/GRAVEL mix, some fine sand, trace clay, Wet.	27.08	NP	32.3			SPT 7, 8, 11, 13, 24" recovered.
		SS	19	Soft	SM-SC	•••••	Red fine SAND, trace clay, Moist. cemented. Moist.						SPT 7, 8, 11, 13, 24" recovered.
337.5	20	SS		Firm	SC	•••••	Black fine SAND, occasional clay, Wet.						SPT 8, 10, 12, 15, 24" recovered.
		CL		Firm	CL	•••••	Dark grey CLAY, little sand, Wet.						SPT 8, 10, 12, 15, 24" recovered.
		SS	22	Firm	SM	•••••	Black fine SAND, some medium sand, some clay, Wet.	32.23	NP	35.5			SPT 6, 11, 17, 21, 24" recovered.
		CL		Firm	CL	•••••	Dark grey CLAY, little sand, Wet.						SPT 6, 11, 17, 21, 24" recovered.
		SM		Firm	SM	•••••	Black fine SAND, some medium sand, some clay, Wet.						SPT 6, 11, 17, 21, 24" recovered.
		SS	28	Firm	SM	•••••	Frequent clay seams						SPT 6, 11, 17, 21, 24" recovered.
		SM		Firm	SM	•••••	Frequent clay seams.						SPT 6, 11, 17, 21, 24" recovered.
332.5	25	ST			CL	•••••	Dark grey CLAY, trace of sand, Dry.						Shelby tube. 12" driven 0" recovered.
		SS	40	Hard	CL	•••••	Dark grey CLAY, trace of sand, Dry.						SPT 15, 19, 21, 27, 24" recovered.
		SS	22										SPT 10, 11, 11, 50/5", 23" recovered.
327.5	30	ST		Very Hard	CL	•••••	Dark grey CLAY, frequent iron stone/ore. Rig chatter driller comments	24.9	15	75.0	1.0E-07		Shelby tube. 12" driven 9" recovered.

Figure

Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

Log of Boring GB-05  
 Sheet 2 of 2

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Elevation, feet	Depth, feet	Sample Type	Sample Description	Resistance, Blowfoot	Relative Consistency	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	WC%	PI (%)	Percent Fines	k (cm/sec)	Well Log	REMARKS AND OTHER TESTS
327.5	30	ST		Hard		CL		Dark gray CLAY, trace of sand, Dry. (cont.) Bottom of Boring at 30.5 feet bgs	24.0	15	75.0	1.0E-07		Shelby tube, 12' driven 9' recovered.
322.5	35													
317.5	40													
312.5	45													
307.5	50													
302.5	55													
297.5	60													
292.5	65													

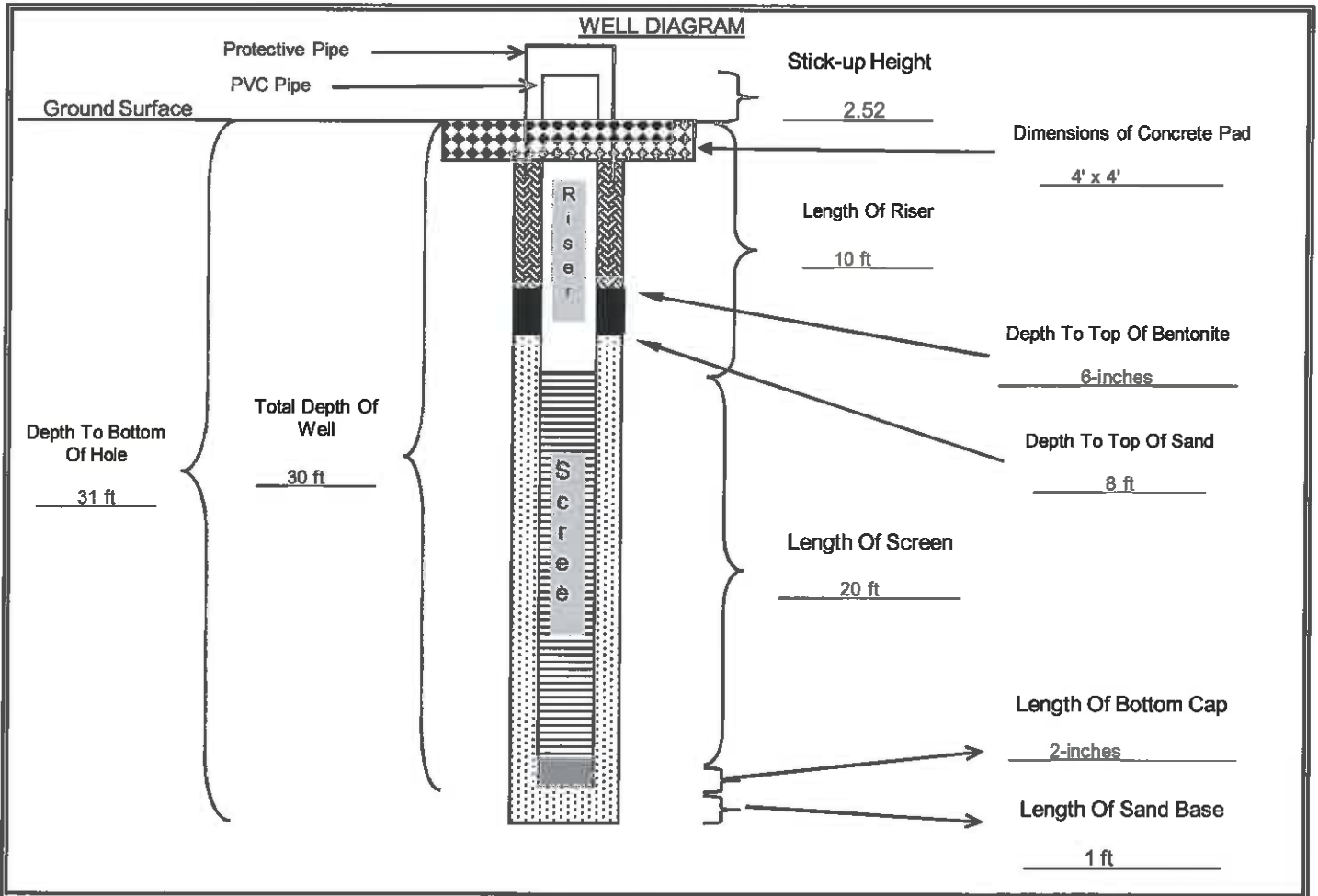
Figure

**WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)**



JOB NAME:	AEP Welsh Power Plant	<b>GB-05</b>	
JOB NO.:	TXL0064		
DATE/TIME:	August 6 2009	WELL NO.:	
WELL LOCATION:		FIELD REP:	Kush Chohan

GROUND SURFACE ELEVATION:	357.49	(ft, msl)	BENTONITE TYPE:	Western Bentonite		
TOP OF SCREEN ELEVATION:	347.49	(ft, msl)	MANUFACTURER:	PDS		
BOTTOM OF WELL ELEVATION:	326.49	(ft, msl)	CEMENT TYPE:			
NORTHING:	529.1865	EASTING:	-2243.9973	CEMENT MANUFACTURER:		
SCREEN MATERIAL:	PVC	SAND PACK TYPE AND SIZE:	Silica 20/40			
SCREEN MANUFACTURER:		SAND MANUFACTURER:	Uninum			
RISER MATERIAL:	PVC	DRILLING CONTRACTOR:	Total Support Services			
RISER MANUFACTURER:		AMOUNT BENTONITE USED:	3	bags lbs		
RISER DIAMETER:	2	(in) Length:	10	(ft) AMOUNT CEMENT USED:		
SCREEN DIAMETER:	2	(in) Length:	20	(ft) AMOUNT SAND USED:	7	bags lbs
BOREHOLE DIAMETER:		8	(in) STATIC WATER:	17.33	depth from TOC	
DRILLING TECHNIQUE:	Hollow Stem	Size:	8	(in) ENCOUNTERED WATER:	depth from ground	



QA/QC	INSTALLED BY:	Total Support Services	OBSERVED BY:	Kush Chohan
	DATE:	6-Aug-09	CHECKED BY:	
				DATE:



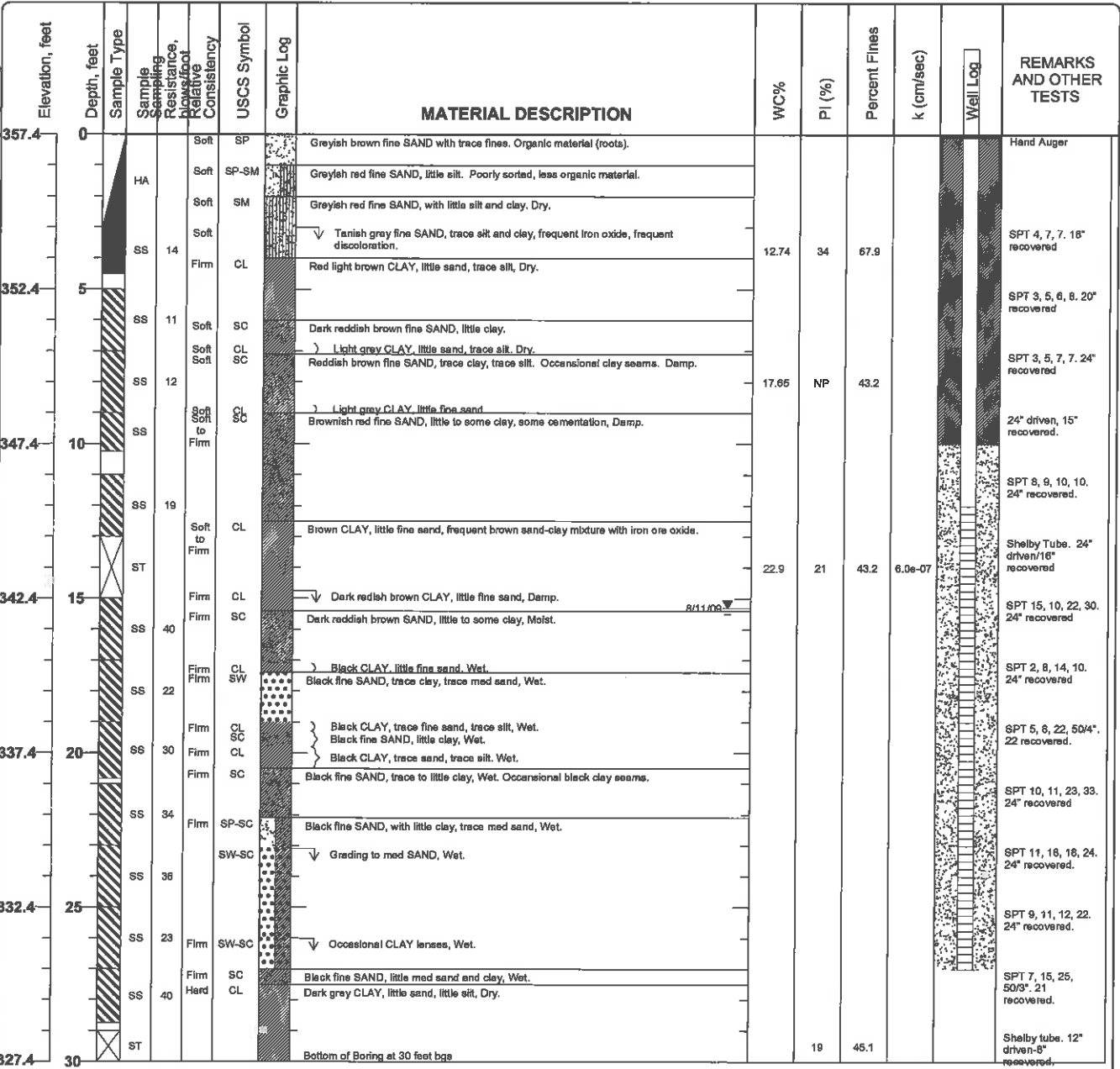
Project: AEP Welsh Power Plant  
 Project Location: Cason, Texas  
 Project Number: TXL0064

# Log of Boring GB-06

Sheet 1 of 1

Date(s) Drilled <b>7/23/2009</b>	Logged By <b>Kush S. Chohan</b>	Checked By
Drilling Method <b>Hollow Stem Auger</b>	Drill Bit Size/Type	Total Depth of Borehole <b>30 feet bgs</b>
Drill Rig Type <b>Mobil B61</b>	Drilling Contractor <b>Total Support Services</b>	Approximate Surface Elevation <b>357.41 feet MSL</b>
Groundwater Level and Date Measured <b>15.3 feet measured on 8/11/09</b>	Sampling Method(s) <b>SPT, Tube, Other</b>	Hammer Data <b>140 lb, 30 in drop, auto hammer</b>
Borehole Backfill <b>Well Completion</b>	Location <b>Northeast corner of proposed chemical pond in the middle of open grass field.</b>	

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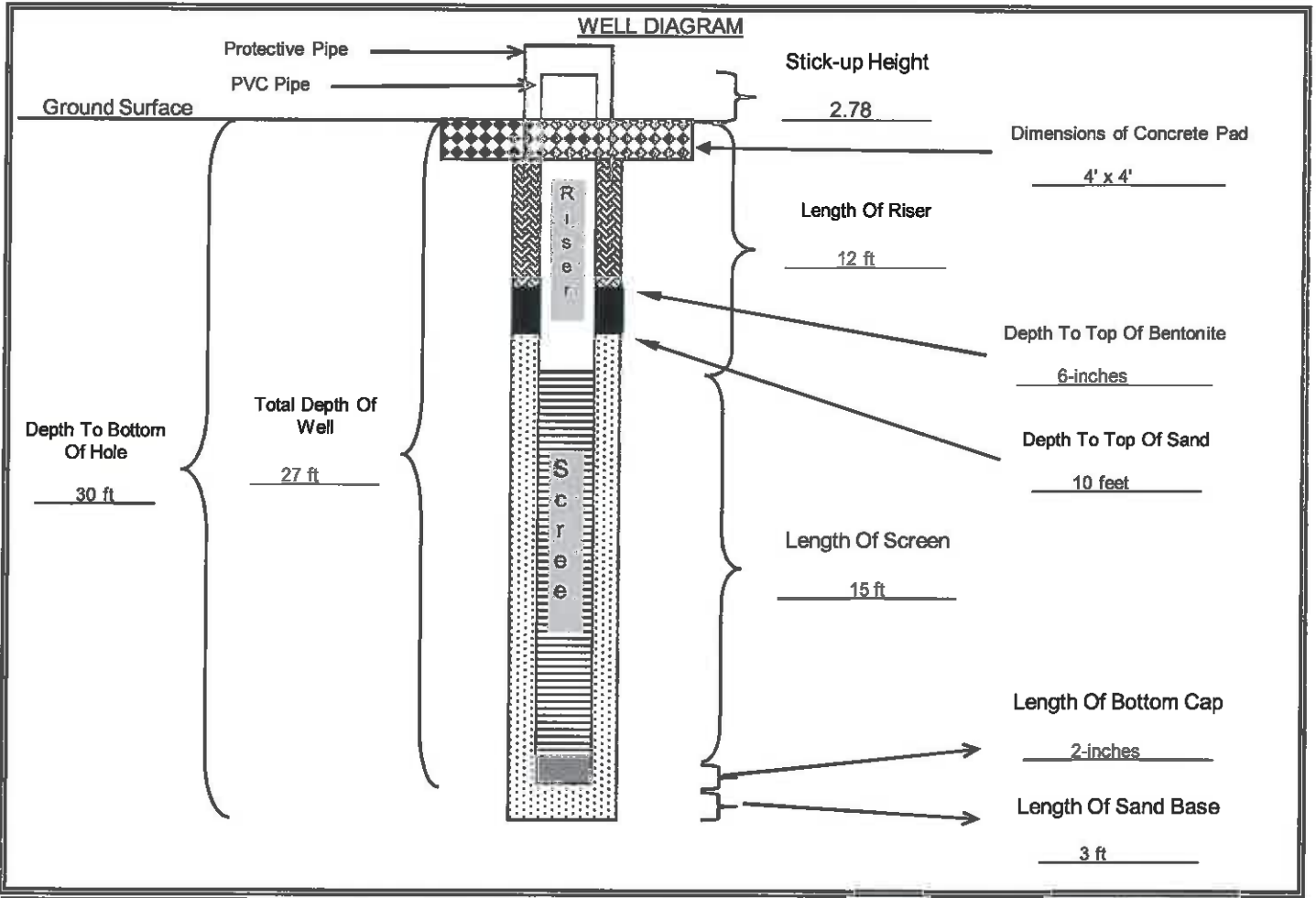
Figure

**WELL CONSTRUCTION DIAGRAM - EPA TYPE II WELL (STICK-UP)**



JOB NAME: <u>AEP Welsh Power Plant</u>	<b>GB-06</b>
JOB NO.: <u>TXL0064</u>	
DATE/TIME: <u>23-Jul-09</u>	WELL NO.:
WELL LOCATION:	FIELD REP: <u>Kush Chohan</u>

GROUND SURFACE ELEVATION: <u>357.41</u> (ft, msl)	BENTONITE TYPE: <u>Western Bentonite</u>
TOP OF SCREEN ELEVATION: <u>345.41</u> (ft, msl)	MANUFACTURER: <u>PDS</u>
BOTTOM OF WELL ELEVATION: <u>327.41</u> (ft, msl)	CEMENT TYPE: _____
NORTHING: <u>740.4893</u> EASTING: <u>-2166.134</u>	CEMENT MANUFACTURER: _____
SCREEN MATERIAL: <u>PVC</u>	SAND PACK TYPE AND SIZE: <u>Silica 20/40</u>
SCREEN MANUFACTURER: _____	SAND MANUFACTURER: <u>Uninum</u>
RISER MATERIAL: <u>PVC</u>	DRILLING CONTRACTOR: <u>Total Support Services</u>
RISER MANUFACTURER: _____	AMOUNT BENTONITE USED: <u>2.5</u> bags lbs
RISER DIAMETER: <u>2</u> (in) Length: <u>12</u> (ft)	AMOUNT CEMENT USED: _____ bags lbs
SCREEN DIAMETER: <u>2</u> (in) Length: <u>15</u> (ft)	AMOUNT SAND USED: <u>7</u> bags lbs
BOREHOLE DIAMETER: _____ (in)	STATIC WATER: <u>15.3</u> depth from TOC
DRILLING TECHNIQUE: <u>Hollow Stem</u> Size: <u>6.75</u> (in)	ENCOUNTERED WATER: _____ depth from ground



QA/QC	INSTALLED BY: <u>Total Support Services</u>	OBSERVED BY: <u>Kush Chohan</u>		
	DATE: <u>23-Jul-09</u>	CHECKED BY: _____	DATE: _____	



# SOIL BORING LOG

BORING/WELL NO.: **GB-07/MW-7**  
 TOTAL DEPTH: **34'**  
 TOP OF CASING ELEV.: **362.75 ft. NGVD**  
 GROUND SURFACE ELEV.: **360.20 ft. NGVD**

CLIENT: **AEP**  
 PROJECT: **Metal Cleaning Waste Pond**  
 SITE LOCATION: **Welsh Power Plant**  
 PROJECT NO.: **S-08-0120**  
 LOGGED BY: **James Meleton, Jr.**

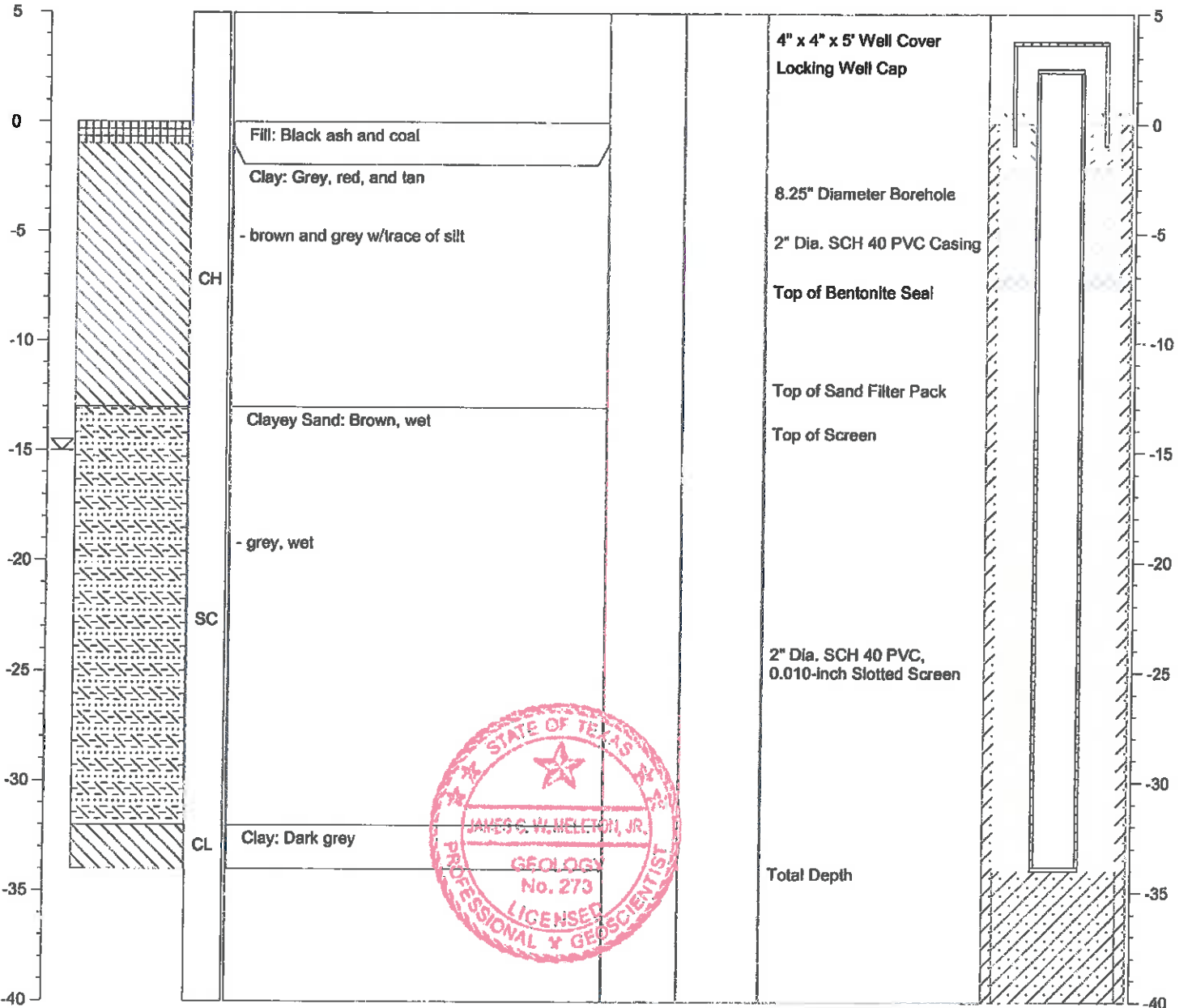
DRILLING CO.: **WEST Drilling**  
 DRILLER: **Tom McCullough**  
 METHOD OF DRILLING: **Hollow-stem Auger**  
 SAMPLING METHODS: **Split-spoon**  
 DATE DRILLED: **12/1/09**

NOTES: **Latitude: 33.05455**  
**Longitude: 94.84674**

≡ Water level during drilling  
 ≡ Water level in completed well

Page 1 of 1

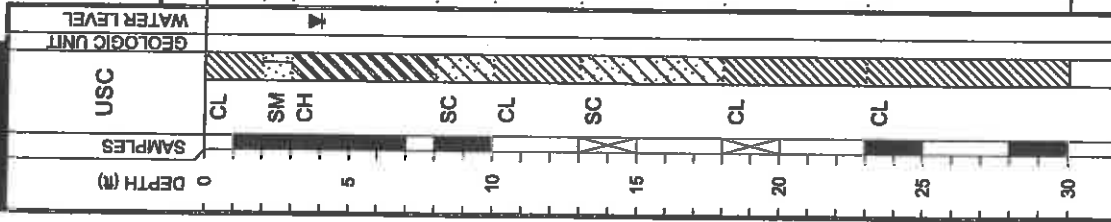
DEPTH	SOIL SYMBOLS	USCS	SOIL DESCRIPTION	CORE RECOVERY (Percent)	PID (ppm)	WELL DESCRIPTION	WELL CONSTRUCTION
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**LOG OF BORING B-1**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas  
PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE: 10/27/09

SURFACE ELEVATION  
324.1

FIELD STRENGTH DATA	BLOW COUNT ● 20 40 60 80 ▲ Cu (tsf) ▲ 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT (PL) PLASTIC LIMIT (PI) PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Liquid Limit				
P=4.0 SF N=7	● 20 40 60 80 ▲ Cu (tsf) ▲ 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) 1.0 2.0 3.0 4.0					20	54	16	38	63	+40 Sieve=10% +4 Sieve=1%
P=1.5						19	34	17	17	32	+40 Sieve=7% +4 Sieve=3%
P=1.75						22	24	15	9	19	+40 Sieve=35% +4 Sieve=22%
N=15						21	41	21	20	75	+40 Sieve=2% +4 Sieve=0%
N=35						15	33	17	16	52	+40 Sieve=1% +4 Sieve=0%
P=4.5+											
P=4.5+											

Key to Abbreviations:  
N - SPT Data (Blows/Ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

Notes:  
GPS Coordinates: N 33°03.090', W 94°50.417'

Water Level:  Measured:  Perched:   
Water Observations:  
Seepage @ 5' while drilling. Water level @ 4' and open to 30' upon completion.



Piezo Bender B-2



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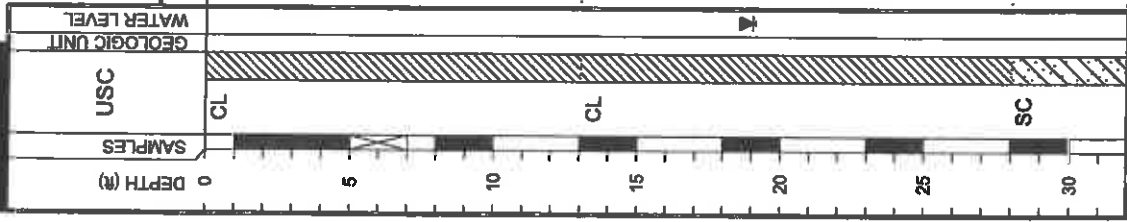
**MATERIAL DESCRIPTION**

SANDY LEAN CLAY (CL) hard; red and tan  
 --very stiff  
 --stiff  
 --very stiff; reddish brown

SANDY LEAN CLAY (CL) hard; red and tan

--very stiff

CLAYEY SAND (SC) medium dense; tan, red, and gray



Water Level  
 Est.:  Measured:  Perched:   
 Water Observations: Water level @ 19' and open to 24' upon completion.

DATE		SURFACE ELEVATION		BORING TYPE: Flight Auger		PROJECT: Welsh Power Plant Pittsburgh, Texas		PROJECT NO.: G3242-09		GPS Coordinates: N 33°03.078', W 94°50.449'	
10/28/09		339.7		OTHER TESTS PERFORMED (Page Ref. #)		MOISTURE CONTENT (%)		FIELD STRENGTH DATA		Notes:	
MINUS #200 SIEVE (%)		ATTERBERG LIMITS (%)		COMPRESSION		FAILURE STRAIN (%)		DRY DENSITY (pcf)		Key to Abbreviations:	
LIQUID LIMIT (LL)		PLASTIC LIMIT (PL)		CONFINING PRESSURE (psf)		COMPRESSION STRENGTH (tsf)		BLOW COUNT		N - SPT Data (Blows/Ft)	
PLASTICITY INDEX (PI)		PLASTICITY INDEX (PI)		FAILURE STRAIN (%)		COMPRESSION STRENGTH (tsf)		Qu (tsf)		P - Pocket Penetrometer (tsf)	
OTHER TESTS PERFORMED (Page Ref. #)		OTHER TESTS PERFORMED (Page Ref. #)		FAILURE STRAIN (%)		COMPRESSION STRENGTH (tsf)		PPR (tsf)		T - Torvane (tsf)	
OTHER TESTS PERFORMED (Page Ref. #)		OTHER TESTS PERFORMED (Page Ref. #)		FAILURE STRAIN (%)		COMPRESSION STRENGTH (tsf)		Torvane (tsf)		L - Lab Vane Shear (tsf)	
61	14	14	14								
65	16	24	16								
58	14	16	16								
54	15	19	19								
47	16	21	21								

Notes:  
 GPS Coordinates: N 33°03.078', W 94°50.449'



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**MATERIAL DESCRIPTION**

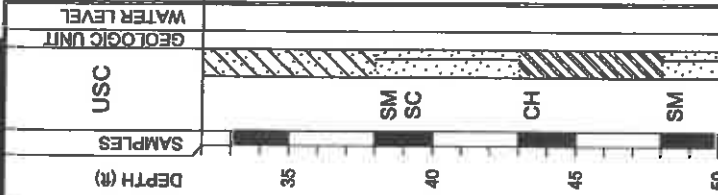
-red and tan

SILTY CLAYEY SAND(SM-SC) red, tan, and gray; saturated

FAT CLAY(CH) hard; brown, tan, and gray; with ferric joints; with lignite and sand seams

SILTY SAND(SM) black and gray

Bottom of Boring @ 50'



**LOG OF BORING B-2**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE: 10/28/09

SURFACE ELEVATION: 339.7

MOISTURE CONTENT (%)	ATTERBERG LIMITS(%)			OTHER TESTS PERFORMED (Page Ref. #)
	LIQUID LIMIT	PLASTIC LIMIT	PL	
12	22	15	7	
				MINUS #200 SIEVE (%)
				48
				+40 Sieve=0%, +4 Sieve=0%

FIELD STRENGTH DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits
	1 2 3 4					Plastic Limit Moisture Content Liquid Limit
P=2.5	1.0 2.0 3.0 4.0					20 40 60 80
SF						
P=4.5+						
SF						

Key to Abbreviations:  
N - SPT Data (Blows/Ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

Notes:

GPS Coordinates: N 33°03.078', W 94°50.449'

Water Level:  Measured:  Perched:   
Water level @ 19' and open to 24' upon completion.

# Piezometer B-2

ENVIRONMENTAL LOG			Well No. B-2		Location Pittsburg, Texas		Page 1 of 2	
Client: Welsh Power Plant		Phase	Task	Surface Elev.				
Project No: G3242-095								
Depth Feet	Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details	
							T.O.C. Elev.	
0		Ground Surface				0		
5		SANDY LEAN CLAY(CL) hard; red and tan -very stiff				5		
10		-stiff -very stiff; reddish brown				10		
15		SANDY LEAN CLAY(CL) hard; red and tan				15		
20		-very stiff				20		
25						25		

Continued Next Page

Driller <u>Doug Hinds</u>	Drilling Method <u>Solid Stem Auger</u>	Bentonite Seal <u>2-8' &amp; 20-50'</u>
Logged By <u>James Griffith</u>	Borehole Diameter <u>6.5"</u>	Filter Pack Qty. <u>8-20'</u>
Drilling Started <u>10/28/09</u>	Well Casing <u>2.0" Dia. 0.0' to 10.0'</u>	Filter Pack Type <u>20/40 Sand</u>
Drilling Completed <u>10/28/09</u>	Casing Type <u>PVC</u>	Static Water Level _____
Construction Completed _____	Well Screen <u>2.0" Dia. 10.0' to 20.0'</u>	Notes: _____
Development Completed _____	Screen Type <u>Slotted</u>	_____
Type of Well _____	Slot Size <u>0.010"</u>	_____
	Grout Type <u>Bentonite</u>	_____



**ENVIRONMENTAL LOG**

Client: Welsh Power Plant

Well No. B-2

Location Pittsburg, Texas




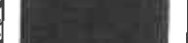

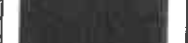



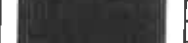
Project No: G3242-095

Phase

Task

Surface Elev.

Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
Continued from previous page						
30	CLAYEY SAND(SC) medium dense; tan, red, and gray				30	
35	--red and tan				35	
40	SILTY CLAYEY SAND(SM-SC) red, tan, and gray; saturated				40	
45	FAT CLAY(CH) hard; brown, tan, and gray; with ferric joints; with lignite and sand seams				45	
50	SILTY SAND(SM) black and gray				50	
	Bottom of Boring @ 50'					
55						
60						







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**LOG OF BORING B-3**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE

10/27/09

SURFACE ELEVATION

339.6

DEPTH (ft)	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD STRENGTH DATA	BLOW COUNT ● 20 40 60 80 ▲ Qu (tsf) 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits			MOISTURE CONTENT (%)	ATTERBERG LIMITS(%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
										Plastic Limit	Moisture Content	Liquid Limit		L	PL	PI		
0	SC			N=11	●						23	52	18	34	87	+40 Sieve=3%, +4 Sieve=0%		
5	CH			P=1.0	■						21	51	19	32	86	+40 Sieve=3%, +4 Sieve=0%		
10				P=3.5	■						21	54	20	34	85	+40 Sieve=10%, +4 Sieve=1%		
15	CH			P=3.75	■						23	61	24	37	81	+40 Sieve=11%, +4 Sieve=0%		
20				P=2.5	■						22	42	22	20	35	+40 Sieve=1%, +4 Sieve=0%		
25	CH			P=4.5+	■													
30	SC			N=56	●													

**MATERIAL DESCRIPTION**

CLAYEY SAND(SC) medium dense; gray and red

EAT CLAY(CH) stiff; red and tan; with sand seams

-very stiff

EAT CLAY WITH SAND(CH) very stiff; brown; with ferric joints

-red and tan; layered; with ferric seams

EAT CLAY(CH) hard; gray; with sand seams

CLAYEY SAND(SC) very dense; gray; with sand seams

Key to Abbreviations:  
N - SPT Data (Blow/Ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

Notes:  
GPS Coordinates: N 33°02.998', W 94°50.514'

Est.:  Measured:  Perched:   
Water Observations:  
Seepage @ 13' while drilling. Water level @ 19' and open to 24' upon completion.



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**MATERIAL DESCRIPTION**

FAT CLAY(CH) hard; brown; layered and with sand seams

--gray and green

SANDY LEAN CLAY(CL) very silty; gray and dark green; layered; with sand seams

FAT CLAY(CH) hard; gray and dark green; layered; with silt seams

Bottom of Boring @ 50'

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
35		CH		
40				
45		CL		
50		CH		

Water Level  
Elev.  Measured:  Perched:   
Water Observations:  
Seepage @ 13' while drilling. Water level @ 19' and open to 24' upon completion.

**LOG OF BORING B-3**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE: 10/27/09

SURFACE ELEVATION  
339.6

MOISTURE CONTENT (%)	21		
ATTERBERG LIMITS(%)	LIQUID LIMIT	TL	60
	PLASTIC LIMIT	PL	24
	PLASTICITY INDEX	PI	36
MINUS #200 SIEVE (%)	95		
OTHER TESTS	PERFORMED (Page Ref. #) +40 Sieve=1%, +4 Sieve=0%		

FIELD STRENGTH DATA	BLOW COUNT	CONFINING PRESSURE (psi)	FAILURE STRAIN (%)	COMPRESSIVE STRENGTH (tsf)	DRY DENSITY (pcf)	Natural Moisture Content and Atterberg Limits	
						Plastic Limit	Liquid Limit
P=4.5+	● 20 40 60 80 ▲ Ou (tsf) 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) 1.0 2.0 3.0 4.0					20	80
P=4.5+							
P=3.5							
P=4.5+							

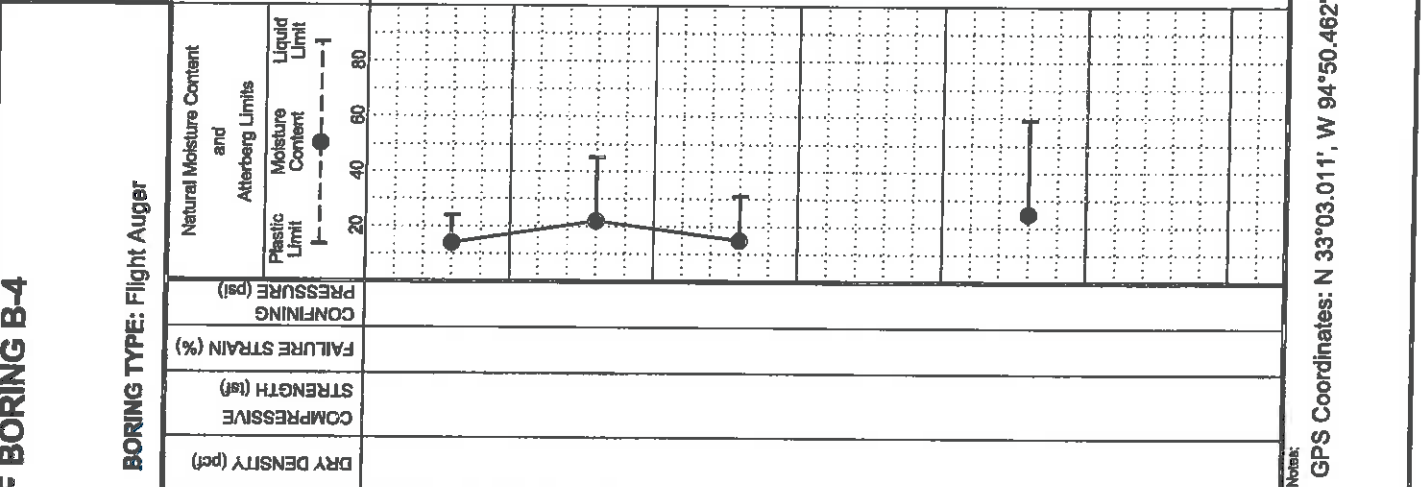
Key to Abbreviations:  
N - SPT Data (Blows/ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

Notes:

GPS Coordinates: N 33°02.998', W 94°50.514'

Pipe 200m dia B-4

**DATE** 10/27/09  
**SURFACE ELEVATION** 340.6  
**PROJECT:** Welsh Power Plant  
 Pittsburgh, Texas  
**PROJECT NO.:** G3242-08  
**BORING TYPE:** Flight Auger  
**OTHER TESTS PERFORMED** (Page Ref. #)  
 MINUS #200 SIEVE (%)  
 ATTERBERG LIMITS(%)  
 LIQUID LIMIT (LL) PLASTICITY INDEX (PI)  
 MOISTURE CONTENT (%)



FIELD STRENGTH DATA	BLOW COUNT	COMPRESSION STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	MOISTURE CONTENT (%)	OTHER TESTS PERFORMED
N=19	1				14	+40 Sieve=1%, +4 Sieve=0%
SF	2				22	+40 Sieve=2%, +4 Sieve=0%
P=4.5	3				15	+40 Sieve=1%, +4 Sieve=0%
P=3.25	4				25	+40 Sieve=4%, +4 Sieve=0%
P=3.25						
N=9						
P=4.0						
P=2.75						

DEPTH (ft)	USC SAMPLES	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	BLOW COUNT	COMPRESSION STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits
0										
1.5	SM			SILTY SAND(SM) medium dense; tan; with gravel	N=19	1				24, 15, 9
3.25	CL			SANDY LEAN CLAY(CL) dark brown -tannish orange -hard; orangish tan	SF	2				45, 21, 24
3.75				-very stiff; white	P=4.5	3				31, 15, 16
27.5	CH			FAT CLAY(CH) very stiff, orangish tan, with ferric seams -tannish brown; with iron ore seams	P=4.0	4				59, 24, 35

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**Notes:**  
 GPS Coordinates: N 33°03.011', W 94°50.462'  
 Key to Abbreviations:  
 N - SPT Data (Blows/Ft)  
 P - Pocket Penetrometer (tsf)  
 T - Torvane (tsf)  
 L - Lab Vane Shear (tsf)

Water Level @ 18' and open to 48' upon completion.



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**MATERIAL DESCRIPTION**

-hard; light gray; layered and with silt seams

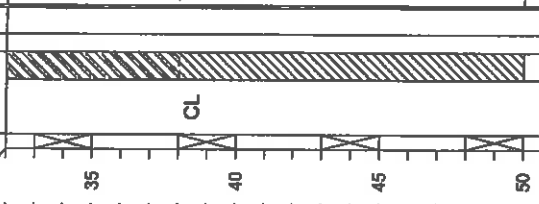
LEAN CLAY(CL) hard; light gray; layered and with silt seams

-light gray

-layered and with sand seams; with lignite

Bottom of Boring @ 50'

DEPTH (ft)	
SAMPLES	
USC	
GEOLOGIC UNIT	
WATER LEVEL	



**LOG OF BORING B-4**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE

10/27/09

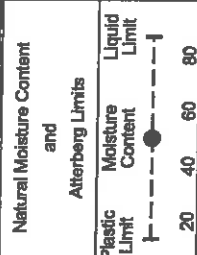
SURFACE ELEVATION  
340.6

ATTERBERG  
LIMITS(%)

LIQUID LIMIT	TL	44	21
PLASTIC LIMIT	PL	25	19
PLASTICITY INDEX	PI	19	83
MINUS #200 SIEVE (%)			

OTHER TESTS  
PERFORMED  
(Page Ref. #)

+40 Sieve=1%  
+4 Sieve=0%



MOISTURE CONTENT (%)	
PLASTIC LIMIT	25
LIQUID LIMIT	44
PLASTICITY INDEX	19
MINUS #200 SIEVE (%)	

FIELD STRENGTH DATA	
N=30	
N=50/5.75"	
N=41	
N=43	

BLOW COUNT	
20 40 60 80	
▲ Cu (tsf)	
1 2 3 4	
■ PPR (tsf)	
1.0 2.0 3.0 4.0	
◆ Torvane (tsf)	
1.0 2.0 3.0 4.0	

DRY DENSITY (pcf)	
COMPRESSIVE STRENGTH (tsf)	
FAILURE STRAIN (%)	
CONFINING PRESSURE (psi)	

COMPRESSION	
STRENGTH (tsf)	
FAILURE STRAIN (%)	
CONFINING PRESSURE (psi)	

NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS	
PLASTIC LIMIT	
LIQUID LIMIT	

Key to Abbreviations:  
N - SPT Data (Blow/Ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

Ed.:  Measured:  Perched:   
Water level @ 18' and open to 48' upon completion.

Water Level  
Water Observations:  
completion.

Notes:  
GPS Coordinates: N 33°03.011', W 94°50.462'



# Piezometer B-4

ENVIRONMENTAL LOG			Well No. B-4		Location Pittsburg, Texas		Page 1 of 2	
Client: Welsh Power Plant		Phase	Task	Surface Elev.				
Project No: G3242-095								
Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details		
0	<b>Ground Surface</b>				0	T.O.C. Elev.		
5	<b>SILTY SAND(SM)</b> medium dense; tan; with gravel <b>SANDY LEAN CLAY(CL)</b> dark brown -fannish orange -hard; orangish tan				5			
10	-very stiff; white				10			
15	<b>CLAYEY SAND(SC)</b> medium dense; tan -orangish gray; with sand seams				15			
20	<b>SANDY LEAN CLAY(CL)</b> stiff; orangish tan				20			
25	<b>FAT CLAY(CH)</b> very stiff; orangish tan; with ferric seams				25			

Continued Next Page

Driller <u>Doug Hinds</u>	Drilling Method <u>Soild Stem Auger</u>	Bentonite Seal <u>2-8' &amp; 18-50'</u>
Logged By <u>James Griffith</u>	Borehole Diameter <u>6.5"</u>	Filter Pack Qty. <u>6-18'</u>
Drilling Started <u>10/27/09</u>	Well Casing <u>2.0" Dia. 0.0' to 8.0'</u>	Filter Pack Type <u>20/40 Sand</u>
Drilling Completed <u>10/27/09</u>	Casing Type <u>PVC</u>	Static Water Level _____
Construction Completed _____	Well Screen <u>2.0" Dia. 8.0' to 18.0'</u>	Notes: _____
Development Completed _____	Screen Type <u>Slotted</u>	
Type of Well _____	Slot Size <u>0.010"</u>	
	Grout Type <u>Bentonite</u>	



**ENVIRONMENTAL LOG**

Client: Welsh Power Plant

Project No: G3242-095

Phase



Task

Well No. B-4

Location Pittsburg, Texas

Surface Elev.

Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
Continued from previous page						
30	-tannish brown; with iron ore seams				30	
35	-hard; light gray; layered and with silt seams				35	
40	<u>LEAN CLAY (CL)</u> hard; light gray; layered and with silt seams				40	
45	-light gray				45	
50	-layered and with sand seams; with lignite				50	
	Bottom of Boring @ 50'					
55						
60						



P.E. Zouker B-5

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**LOG OF BORING B-5**  
 PROJECT: Weish Power Plant  
 Pittsburgh, Texas  
 PROJECT NO.: G3242-09  
 BORING TYPE: Flight Auger

DATE: 10/27/09  
 SURFACE ELEVATION: 340.0

DEPTH (ft)	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION	FIELD STRENGTH DATA	BLOW COUNT				DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits			MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						BLOW COUNT	Cu (tsf)	PPR (tsf)	Torvane (tsf)					PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX						
0																						
0-5	CL			LEAN CLAY WITH SAND(CL) stiff; red and tan	P=2.0	1	2	3	4						22	47	19	28	81	+40 Sieve=9%, +4 Sieve=3%		
5-10	CL			LEAN CLAY(CL) hard; red and tan -very stiff	P=4,5+										21	46	18	28	94	+40 Sieve=3%, +4 Sieve=0%		
10-15	CH			FAT CLAY(CL) very stiff; brown and tan	P=3.0										22	52	24	28	88	+40 Sieve=3%, +4 Sieve=0%		
15-20	CH			FAT CLAY WITH SAND(CH) hard; red and tan	P=4,5+																	
20-25	CL			SANDY LEAN CLAY(CL) very stiff; red and gray; with sand seams	P=3.0																	
25-30	SC			CLAYEY SAND(SC) very loose; tan, red, and gray	P=0.5										19	33	17	16	44	+40 Sieve=1%, +4 Sieve=0%		
30-35	CH			FAT CLAY WITH SAND(CH) stiff; red and gray	P=2.0										25	61	19	42	83	+40 Sieve=5%, +4 Sieve=3%		

Notes:  
 GPS Coordinates: N 33°02.964', W 94°50.428'

Key to Abbreviations:  
 N - SPT Data (Blows/Ft)  
 P - Pocket Penetrometer (tsf)  
 T - Torvane (tsf)  
 L - Lab Vane Shear (tsf)

Water Level: Est.  Measured:  Perched:   
 Water Observations: Seepage @ 35' while drilling. Water level @ 31' and open to 35' upon completion and after 30 minutes.



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**MATERIAL DESCRIPTION**

SILTY CLAYEY SAND(SC) gray and red;  
saturated

FAT CLAY(CH) hard; red and gray; with sand  
seams

-gray, tan, and red; with sand seams

SILTY SAND(SM-SC) red and gray

Bottom of Boring @ 50'

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
35		SC		
40		CH		
45				
50		SM SC		

**LOG OF BORING B-5**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas

PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE

10/27/09

SURFACE ELEVATION

340.0

FIELD STRENGTH DATA	BLOW COUNT ● 20 40 60 80 ▲ Qu (tsf) ▲ 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (ks)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)			OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Liquid Limit	TT	PL	PI	
SF						25	51	31	20	87	+40 Sieve=6% +4 Sieve=0%
P=4.5+											
P=4.5+											
SF											

Key to Abbreviations:

- N - SPT Data (Blow/ft)
- P - Pocket Penetrometer (tsf)
- T - Torvane (tsf)
- L - Lab Vane Shear (tsf)

Notes:

GPS Coordinates: N 33°02.964', W 94°50.428'


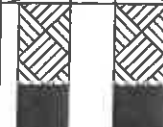

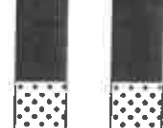
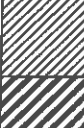
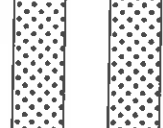

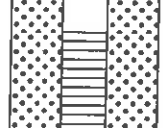

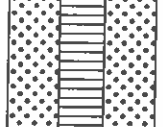

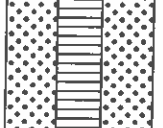
Water Level

Water Observations:

@ 31' and open to 35' upon completion and after 30 minutes.

Perched:  Measured:  Ekt:

Appendix P-5

ENVIRONMENTAL LOG			Well No. B-5			
Client: Welsh Power Plant			Location Pittsburg, Texas			
Project No: G3242-095	Phase	Task	Surface Elev.	Page 1 of 2		
Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
0	Ground Surface				0	T.O.C. Elev.
5	LEAN CLAY WITH SAND(CL) stiff; red and tan				5	
10	LEAN CLAY(CL) hard; red and tan -very stiff				10	
15	FAT CLAY(CL) very stiff; brown and tan				15	
20	FAT CLAY WITH SAND(CH) hard; red and tan				20	
25	SANDY LEAN CLAY(CL) very stiff; red and gray; with sand seams				25	
	CLAYEY SAND(SC) very loose; tan, red, and gray					

Continued Next Page

<b>Driller</b> <u>Doug Hinds</u> <b>Logged By</b> <u>James Griffith</u> <b>Drilling Started</b> <u>10/27/09</u> <b>Drilling Completed</b> <u>10/27/09</u> <b>Construction Completed</b> _____ <b>Development Completed</b> _____ <b>Type of Well</b> _____	<b>Drilling Method</b> <u>Soild Stem Auger</u> <b>Borehole Diameter</b> <u>6.5"</u> <b>Well Casing</b> <u>2.0" Dia. 0.0' to 10.0'</u> <b>Casing Type</b> <u>PVC</u> <b>Well Screen</b> <u>2.0" Dia. 10.0' to 20.0'</u> <b>Screen Type</b> <u>Slotted</u> <b>Slot Size</b> <u>0.010"</u> <b>Grout Type</b> <u>Bentonite</u>	<b>Bentonite Seal</b> <u>2-5' &amp; 20-50'</u> <b>Filter Pack Qty.</b> <u>5-20'</u> <b>Filter Pack Type</b> <u>20/40 Sand</u> <b>Static Water Level</b> _____ <b>Notes:</b> _____ _____ _____
--	---	---





**ENVIRONMENTAL LOG**

Client: Welsh Power Plant

Well No. B-5

Location Pittsburg, Texas











Project No: G3242-095

Phase

Task

Surface Elev.

Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
	Continued from previous page					
30	FAT CLAY WITH SAND(CH) stiff; red and gray				30	
35	SILTY CLAYEY SAND(SC) gray and red; saturated				35	
40	FAT CLAY(CH) hard; red and gray; with sand seams				40	
45	-gray, tan, and red; with sand seams				45	
50	SILTY SAND(SM-SC) red and gray				50	
	Bottom of Boring @ 50'					
55						
60						



Pic 7000 in B-6

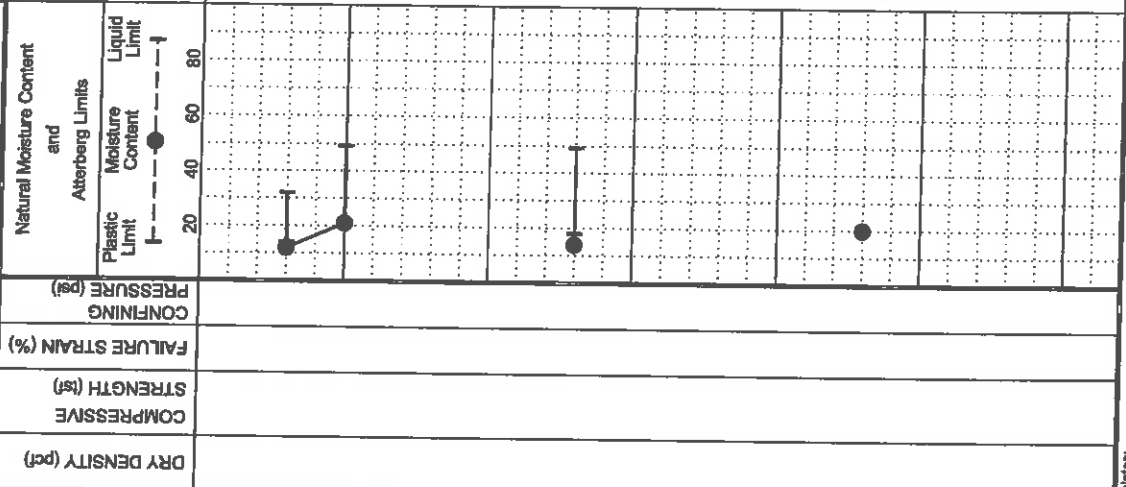
**LOG OF BORING B-6**

**DATE** 10/27/09  
**SURFACE ELEVATION** 340.1

**PROJECT:** Welsh Power Plant  
 Pittsburgh, Texas  
**PROJECT NO.:** G3242-09

**BORING TYPE:** Flight Auger

MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)		MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
	LIQUID LIMIT	PLASTIC LIMIT		
12	32	14	18	+40 Sieve=0%, +4 Sieve=0%
21	49	20	29	+40 Sieve=2%, +4 Sieve=0%
14	49	18	31	+40 Sieve=0%, +4 Sieve=0%
20			18	+40 Sieve=0%, +4 Sieve=0%



FIELD STRENGTH DATA	DRY DENSITY (pcf)	COMPRESSIONIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)
P=4.0				
P=4.5+				
P=3.0				
P=3.0				
P=4.0				
P=3.0				
N=50/5.25"				
SF				

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	MATERIAL DESCRIPTION
0					
5		CH			FAT CLAY(CH) very stiff; red and gray; with ferric seams
5		CL			SANDY LEAN CLAY(CL) hard; red and tan
10					-very stiff; red, gray, and brown; with gravel -with sand seams
15					
15		SM			SILTY SAND(SM) gray; saturated
20					
25					-very dense; gray and red
30					

**Key to Abbreviations:**  
 N - SPT Data (Blows/Ft)  
 P - Pocket Penetrometer (tsf)  
 T - Torvans (tsf)  
 L - Lab Vane Shear (tsf)

**Notes:**  
 GPS Coordinates: N 33°02.912', W 94°50.462'

**Water Observations:**  
 Seepage @ 17' while drilling. Water level @ 13' and open to 15' upon completion and after 30 minutes.

**Water Level:** Measured:  Perched:

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Pipe 2000 B-6

ENVIRONMENTAL LOG			Well No. B-6		
Client: Welsh Power Plant			Location Pittsburg, Texas		
Project No: G3242-095		Phase	Task	Surface Elev.	
Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet
					T.O.C. Elev.
0	Ground Surface				0
	FAT CLAY(CH) very stiff; red and gray; with ferric seams				
	SANDY LEAN CLAY(CL) hard; red and tan				
5					5
	-very stiff; red, gray, and brown; with gravel				
	-with sand seams				
10					10
15					15
	SILTY SAND(SM) gray; saturated				
20					20
	-very dense; gray and red				
25					25

Continued Next Page

Driller <u>Doug Hinds</u>	Drilling Method <u>Solid Stem Auger</u>	Bentonite Seal <u>1.5-4' &amp; 22-50'</u>
Logged By <u>James Griffith</u>	Borehole Diameter <u>6.5"</u>	Filter Pack Qty. <u>4-22'</u>
Drilling Started <u>10/28/09</u>	Well Casing <u>2.0" Dia. 0.0' to 12.0'</u>	Filter Pack Type <u>20/40 Sand</u>
Drilling Completed <u>10/28/09</u>	Casing Type <u>PVC</u>	Static Water Level _____
Construction Completed _____	Well Screen <u>2.0" Dia. 12.0' to 22.0'</u>	Notes: _____
Development Completed _____	Screen Type <u>Slotted</u>	_____
Type of Well _____	Slot Size <u>0.010"</u>	_____
	Grout Type <u>Bentonite</u>	



**ENVIRONMENTAL LOG**

Client: Welsh Power Plant

Project No: G3242-095

Phase

Task

Well No. B-6

Location Pittsburg, Texas

Surface Elev.

Page 2 of 2

Depth Feet Sampler	Overburden/Lithologic Description	Field Strength Data	Graphic Log	Well Construction Graphics	Depth Feet	Well Construction Details
	Continued from previous page					
30					30	
	FAT CLAY(CH) hard; brown; with sand seams					
35					35	
	-dark green					
45					45	
	LEAN CLAY(CL) hard; dark green; laminated with lignite					
50					50	
	Bottom of Boring @ 50'					
55						
60						







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**MATERIAL DESCRIPTION**

SM  
SILTY SAND(SM) dense; tan

-gray; saturated

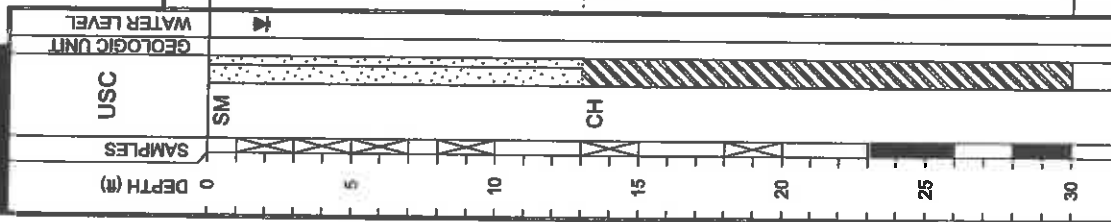
-very dense

CH  
EAT CLAY(CH) very stiff; dark gray; with silt and ferric seams

-hard; gray and black; with trace of lignite

-gray

Bottom of Boring @ 30'



Ent:  Measured:  Punched:   
Water Observations:  
Seepage @ 4' while drilling. Water level @ 2' and open to 7' upon completion.

**LOG OF BORING B-7**

PROJECT: Welsh Power Plant  
Pittsburgh, Texas  
PROJECT NO.: G3242-09

BORING TYPE: Flight Auger

DATE: 10/27/09

SURFACE ELEVATION  
340.4

FIELD STRENGTH DATA	BLOW COUNT ● 20 40 60 80 ▲ Ou (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits			MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT (L) PLASTIC LIMIT (PL) PLASTICITY INDEX (ID)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Moisture Content	Liquid Limit				
N=31	● 20 40 60 80 ▲ Ou (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0					21	21	21	21	21	21	+40 Sieve=0%, +4 Sieve=0%
N=36	● 20 40 60 80 ▲ Ou (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0					23	23	23	23	23	15	+40 Sieve=0%, +4 Sieve=0%
N=38	● 20 40 60 80 ▲ Ou (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0											
N=59	● 20 40 60 80 ▲ Ou (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0											
N=26	● 20 40 60 80 ▲ Ou (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0					14	14	14	14	14	98	+40 Sieve=0%, +4 Sieve=0%
P=4.5+	■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0											
P=4.5+	■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆ 1.0 2.0 3.0 4.0											

Notes:  
GPS Coordinates: N 33°02.898', W 94°50.519'

Key to Abbreviations:  
N - SPT Data (Blow/Ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

# Landfill Boring B-2

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**CONSULTANTS**

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**MATERIAL DESCRIPTION**

ASH (SILT WITH GRAVEL (ML)) medium dense; light grayish brown; with coarse-grained sand and lightly cemented gravel pieces; dry

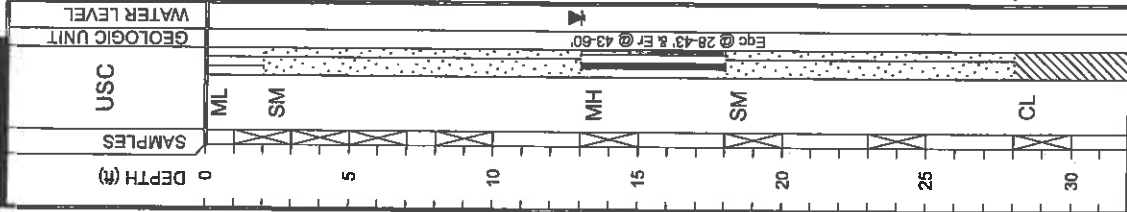
ASH (SILTY SAND (SM)) medium dense; dark brown and light brown; with coarse-grained sand and lightly cemented gravel pieces  
 --loose; moist

ASH (ELASTIC SILT (MH)) very loose; black; with fine-grained sand and lightly cemented gravel pieces; saturated

ASH (SILTY SAND (SM)) very loose; dark brown; with coarse-grained sand and lightly cemented gravel pieces; moist

--loose; dark brown and light brown; with coarse-grained sand and lightly cemented gravel pieces; moist

SANDY LEAN CLAY (CL) medium stiff; dark brown and black; with fine-grained sand and cemented gravel pieces; saturated



**LOG OF BORING B-2**

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest  
 Welsh Power Station - Cason, Texas  
 DRILL RIG: B-61 HDX  
 PROJECT NO.: G4207-146  
 BORING TYPE: Rotary Wash/Rig Auger

DATE  
 10/8/14

SURFACE ELEVATION  
 373.8

FIELD STRENGTH DATA	BLOW COUNT ● 20 40 60 80 ▲ Qu (tsf) ▲ 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Tonvane (tsf) 1.0 2.0 3.0 4.0	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%) LIQUID LIMIT (LL) PLASTIC LIMIT (PL) PLASTICITY INDEX (PI)	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
						Plastic Limit	Liquid Limit				
N=13	● 20 40 60 80 ▲ Qu (tsf) ▲ 1 2 3 4 ■ PPR (tsf) 1.0 2.0 3.0 4.0 ◆ Tonvane (tsf) 1.0 2.0 3.0 4.0					46	59				+40 Sieve=27% +4 Sieve=16%
N=29						40	40				+40 Sieve=19% +4 Sieve=2%
N=18											+40 Sieve=0% +4 Sieve=0%
N=9											
N=0											
N=1											
N=7											
N=6											

Notes:

Key to Abbreviations:  
 N - SPT Data (Blows/Ft)  
 P - Pocket Penetrometer (tsf)  
 T - Tonvane (tsf)  
 L - Lab Vane Shear (tsf)

GPS Coordinates:  
 N33.04890°, W94.84451°

Driller:  
 Tommy Cook

Logger:  
 B.Hobbs/O.Sanderson



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**MATERIAL DESCRIPTION**

**CLAYEY SAND(SC)** dense; light brown, light gray and reddish brown; moist; with fine-grained sand; mottled

**SILTY SAND(SM)** very dense; light brown, yellowish brown and light gray; moist; mottled; with fine-grained sand

**EAT CLAY(CH)** very stiff; dark brown and light brown; moist; with sand seams; laminated

-dark brown with light gray; moist; with silt seams

-hard; dark brown; moist

Bottom of Boring @ 60'

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
35		SC		
40		SM		
45		CH		
50				
55				
60				

Water Level  
Water Observations:  
Est.:  Measured:  Perched:   
Water level @ 13'

**LOG OF BORING B-2 (cont.)**

**PROJECT:** Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.  
Welsh Power Station - Cason, Texas  
**DRILL RIG:** B-61 HDX  
**BORING TYPE:** Rotary Wash/Flight Auger

**PROJECT NO.:** G4207-146

**DATE** 10/8/14

**SURFACE ELEVATION**  
373.8

FIELD STRENGTH DATA	BLOW COUNT				DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)
	20	40	60	80					PLASTIC LIMIT	LIQUID LIMIT		PLASTICITY INDEX			
P=3.5 P=2.75	1	2	3	4	110	1.39	4.3	21	20	30	18	15	15	+40 Sieve=0% +4 Sieve=0%	
N=78											16			+40 Sieve=0% +4 Sieve=0%	
N=27											21			+40 Sieve=0% +4 Sieve=0%	
P=4.0					98						25	26	36	+40 Sieve=2% +4 Sieve=0%	
N=37											24				

Notes:

Key to Abbreviations:

- N - SPT Data (Blows/Ft)
- P - Pocket Penetrometer (tsf)
- T - Torvane (tsf)
- L - Lab Vane Shear (tsf)

GPS Coordinates:  
N33,04890°, W94,84451°

Driller:  
Tommy Cook

Logger:  
B.Hobbs/O.Sanderson

# Landfill Boring B-10



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## LOG OF BORING B-10

**PROJECT:** Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.  
Welsh Power Station - Cason, Texas  
**DRILL RIG:** B-61 HDX  
**BORING TYPE:** Rotary Wash/Flight Auger

**PROJECT NO.:** G4207-146

**DATE:** 10/8/14

**SURFACE ELEVATION:** 373.2

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL	FIELD STRENGTH DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		ATTERBERG LIMITS (%)			MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
											Moisture Content	Plastic Limit	Liquid Limit	LL	PL		
0																	
5		SC			N=7	1					24	31	19	12	41	+40 Sieve=21% +4 Sieve=11%	
10		MH			N=3	2											
15					N=0	3											
20		SM			N=50/1"	4					56				14	+40 Sieve=71% +4 Sieve=28%	
25					N=50/4"												
30		CL			N=4						19	23	14	9	57	+40 Sieve=1% +4 Sieve=0%	

**Key to Abbreviations:**  
 N - SPT Data (Blows/Ft)  
 P - Pocket Penetrometer (tsf)  
 T - Torvane (tsf)  
 L - Lab Vane Shear (tsf)

**Notes:**  
 Seepage @ 13' while drilling.

**GPS Coordinates:** N33.04895°, W94.84390°  
**Driller:** Tommy Cook  
**Logger:** B. Hobbs/O. Sanderson



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DEPTH (ft)	35	40	45	50	55	60
SAMPLES		SC	CH			
USC						
GEOLOGIC UNIT						
WATER LEVEL						

**MATERIAL DESCRIPTION**

CLAYEY SAND(SC) medium dense; reddish brown and grayish brown; moist; mottled

EAT CLAY(CH) very stiff; dark brown with light gray; with silt seams; moist

--hard

Bottom of Boring @ 60'

Water Level  
Water Observations:  
Est.  Measured:  Perched:   
Seepage @ 13' while drilling.

**LOG OF BORING B-10 (cont.)**

PROJECT: Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.  
Welsh Power Station - Cason, Texas  
PROJECT NO.: G4207-146  
BORING TYPE: Rotary Wash/Flight Auger

FIELD STRENGTH DATA	P=1.25 P=1.0	N=23	N=18	P=4.5+	P=4.5+
BLOW COUNT	20 40 60 80				
Qu (tsf)	1 2 3 4				
PPR (tsf)	1.0 2.0 3.0 4.0				
Torvane (tsf)	1.0 2.0 3.0 4.0				
DRY DENSITY (pcf)	107	2.10	6.1	21	
COMPRESSIONIVE STRENGTH (tsf)					
FAILURE STRAIN (%)					
CONFINING PRESSURE (psi)					
Natural Moisture Content and Atterberg Limits					
Plastic Limit	20	40	60	80	
Moisture Content					
Liquid Limit					

Key to Abbreviations:  
N - SPT Data (Blows/ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

Notes:

GPS Coordinates:  
N33.04895°, W94.84390°

Diller: Tommy Cook  
Logger: B. Hobbs/O. Sanderson

DATE: 10/8/14  
SURFACE ELEVATION: 373.2

MOISTURE CONTENT (%)	22	22	25	22
LIQUID LIMIT (LL)	25	64	24	40
PLASTIC LIMIT (PL)	17	8	27	
PLASTICITY INDEX (PI)				
MINUS #200 SIEVE (%)				
OTHER TESTS PERFORMED (Page Ref. #)		+40 Sieve=3% +4 Sieve=0%	+40 Sieve=7% +4 Sieve=0%	



# Landfill Boring B-12



**ETTL  
ENGINEERS &  
CONSULTANTS**

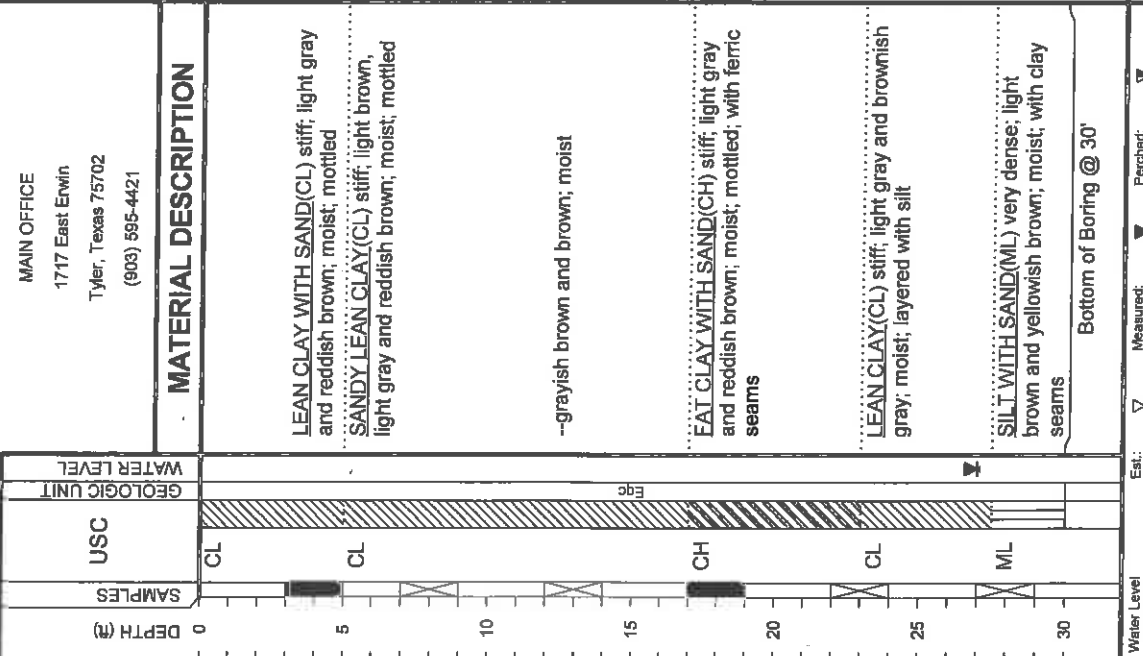
MAIN OFFICE  
1717 East Erwin  
Tyler, Texas 75702  
(903) 595-4421

## LOG OF BORING B-12

**PROJECT:** Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.  
Welsh Power Station - Cason, Texas  
**DRILL RIG:** BORING TYPE: Flight Auger  
**PROJECT NO.:** G4207-146

**DATE:** 10/15/14  
**SURFACE ELEVATION:** 361.7

FIELD STRENGTH DATA	BLOW COUNT 20 40 60 80 ▲ Qu (tsf) ▲ 1 2 3 4 ■ PPR (tsf) ■ 1.0 2.0 3.0 4.0 ◆ Torvane (tsf) ◆	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits		MOISTURE CONTENT (%)	ATTERBERG LIMITS (%)			OTHER TESTS PERFORMED (Page Ref. #)	
						Plastic Limit	Moisture Content		Liquid Limit	LIQUID LIMIT LL	PLASTIC LIMIT PL		PLASTICITY INDEX PI
P=3.75													
N=15								16	33	19	14	58	+40 Sieve=1% +4 Sieve=0%
N=11													
P=3.75													
N=14								24	39	19	20	93	+40 Sieve=1% +4 Sieve=0%
N=53													



**Water Level**  
Water Observations: Water level @ 27' and open upon completion.

**Notes:**

Key to Abbreviations:  
N - SPT Data (Blows/Ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

GPS Coordinates: N33.04713° W94.84486°  
Driller: Lewis Drilling, Inc.  
Logger: O. Sanderson

# Landfill Boring B-13

## LOG OF BORING B-13

**ETTL ENGINEERS & CONSULTANTS**

MAIN OFFICE  
1717 East Erwin  
Tyler, Texas 75702  
(903) 595-4421

**PROJECT:** Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.  
Welsh Power Station - Cason, Texas  
**DRILL RIG:** BORING TYPE: Flight Auger

**PROJECT NO.:** G4207-146

**DATE:** 10/15/14  
**SURFACE ELEVATION:** 361.4

**MOISTURE CONTENT (%):**  
**LIQUID LIMIT (TL):**  
**PLASTIC LIMIT (PL):**  
**PLASTICITY INDEX (PI):**  
**MINUS #200 SIEVE (%):**  
**OTHER TESTS PERFORMED (Page Ref. #):**

**DRY DENSITY (pcf):**  
**COMPRESSION STRENGTH (tsf):**  
**FAILURE STRAIN (%):**  
**CONFINING PRESSURE (psi):**

**FIELD STRENGTH DATA:**  
● BLOW COUNT  
▲ Gu (tsf)  
■ PPR (tsf)  
◆ Torvane (tsf)

**MATERIAL DESCRIPTION**

LEAN CLAY WITH SAND (CL) medium stiff; reddish brown with light gray; moist

SANDY LEAN CLAY (CL) very stiff; light brown, gray and reddish brown; moist; mottled

CLAYEY SAND (SC) medium dense; grayish brown; moist

FAT CLAY WITH SAND (CH) medium stiff; reddish brown and light gray; moist; mottled

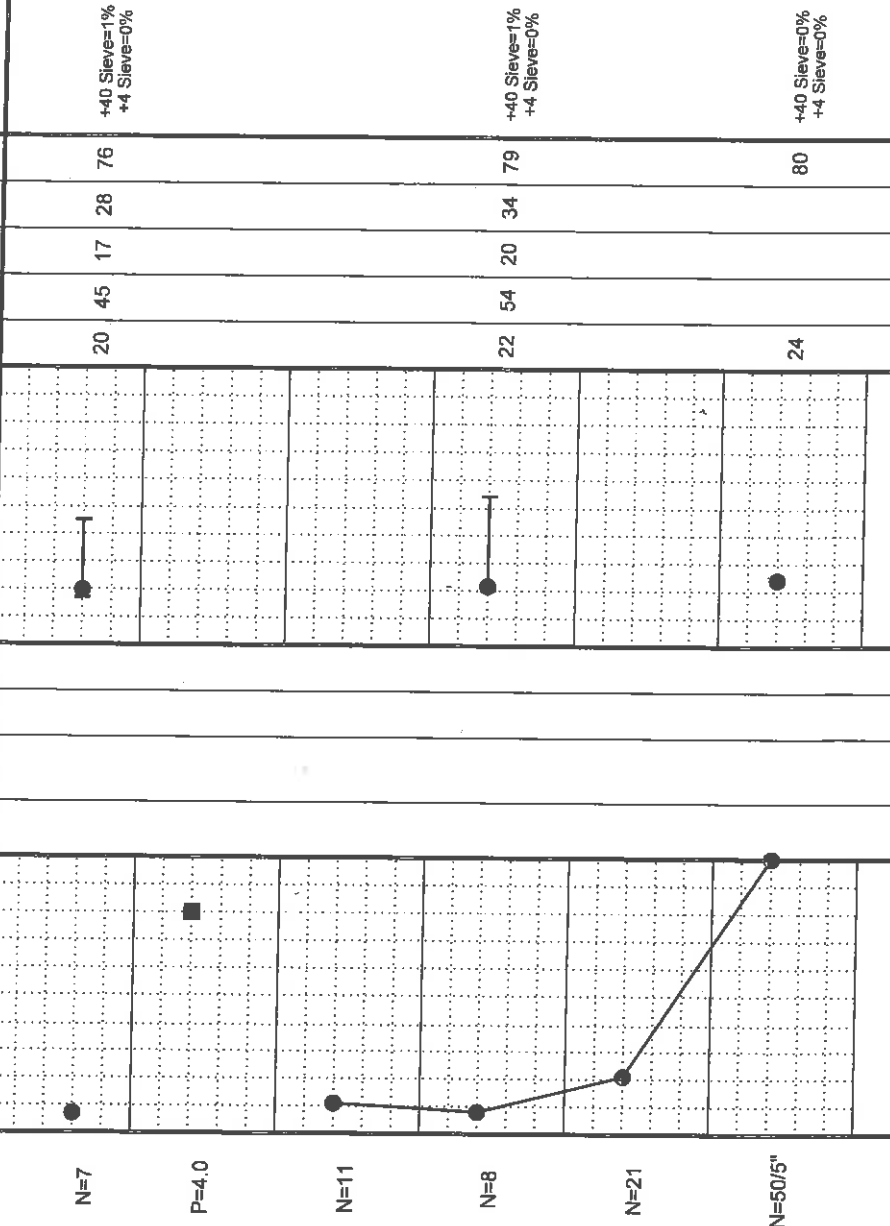
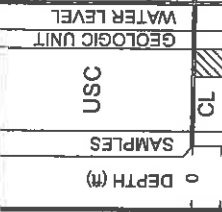
LEAN CLAY (CL) very stiff; light gray and grayish brown; moist; layered with silt

SILT WITH SAND (ML) very dense; light gray and yellowish brown; wet; with clay seams

Bottom of Boring @ 30'

**USC**  
**SAMPLES**  
**DEPTH (ft)**

**WATER LEVEL**  
**GEOLOGIC UNIT**



**Notes:**

Key to Abbreviations:  
N - SPT Data (Blows/FT)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

Est.:  Measured;  Perched;  Water level @ 28' and open upon completion.

Water Observations:

GPS Coordinates: N33.047160°, W94.84384°  
Driller: Lewis Drilling, Inc.  
Logger: O. Sanderson

# Landfill Boring B-14

## LOG OF BORING B-14

**ETTL ENGINEERS & CONSULTANTS**

MAIN OFFICE  
1717 East Erwin  
Tyler, Texas 75702  
(903) 595-4421

**PROJECT:** Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.  
Welsh Power Station - Cason, Texas  
**DRILL RIG:**  
**BORING TYPE:** Flight Auger

**PROJECT NO.:** G4207-146

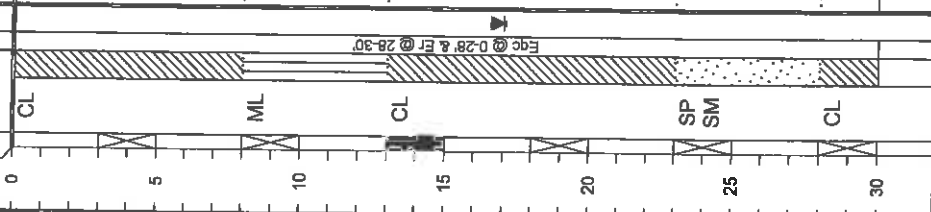
**DATE**

10/14/14

**SURFACE ELEVATION**  
347.2

**OTHER TESTS PERFORMED**  
(Page Ref. #)

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
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### MATERIAL DESCRIPTION

**SANDY LEAN CLAY (CL)** medium stiff; yellowish brown with reddish brown, dry, with clay seams

**SANDY SILT (ML)** medium dense; grayish brown; moist; with clay seams

**SANDY LEAN CLAY (CL)** very stiff; light gray and gray; moist

—light gray and grayish brown; moist; layered with silt

**POORLY GRADED SAND WITH SILT (SP-SM)** medium dense; yellowish brown, light gray and reddish brown; wet

**LEAN CLAY (CL)** very stiff; dark brown; moist; with silt partings

Bottom of Boring @ 30'

FIELD STRENGTH	DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits
N=9		1.0, 2.0, 3.0, 4.0					Plastic Limit, Liquid Limit
N=11		1.0, 2.0, 3.0, 4.0					Plastic Limit, Liquid Limit
P=4.0		1.0, 2.0, 3.0, 4.0					Plastic Limit, Liquid Limit
N=34		1.0, 2.0, 3.0, 4.0					Plastic Limit, Liquid Limit
N=27		1.0, 2.0, 3.0, 4.0					Plastic Limit, Liquid Limit
N=26		1.0, 2.0, 3.0, 4.0					Plastic Limit, Liquid Limit

MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	MINUS #200 SIEVE (%)
108	17	17	NP	68
26	40	16	24	67
25				10

**Key to Abbreviations:**  
N - SPT Data (Blows/Ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

**Notes:**

**GPS Coordinates:** N33.04774°, W94.84290°  
**Driller:** Lewis Drilling, Inc.  
**Logger:** O. Sanderson

**Water Level**  
Water Observations: completion.  
Est.: Measured: Perched: Water level @ 17' and caved to 23' upon completion.

# Landfill Boring B-15

## LOG OF BORING B-15

**ETTL ENGINEERS & CONSULTANTS**

MAIN OFFICE  
1717 East Erwin  
Tyler, Texas 75702  
(903) 595-4421

**PROJECT:** Phase 1 Fly Ash Storage Area Embankment Seepage & Vertical Expansion Invest.  
Welsh Power Station - Cason, Texas  
**DRILL RIG:** BORING TYPE: Flight Auger

**PROJECT NO.:** G4207-146

**DATE** 10/14/14

**SURFACE ELEVATION**  
348.2

**OTHER TESTS PERFORMED**  
(Page Ref. #)

DEPTH (ft)	SAMPLES	USC	GEOLOGIC UNIT	WATER LEVEL
0				
5				
10				
15				
20				
25				
30				

**MATERIAL DESCRIPTION**

FAT CLAY(CH) stiff; reddish brown and light gray; moist; mottled

--very stiff, light gray, grayish brown and reddish brown; moist; layered

SILTY SAND(SM) very dense; light brown; dry

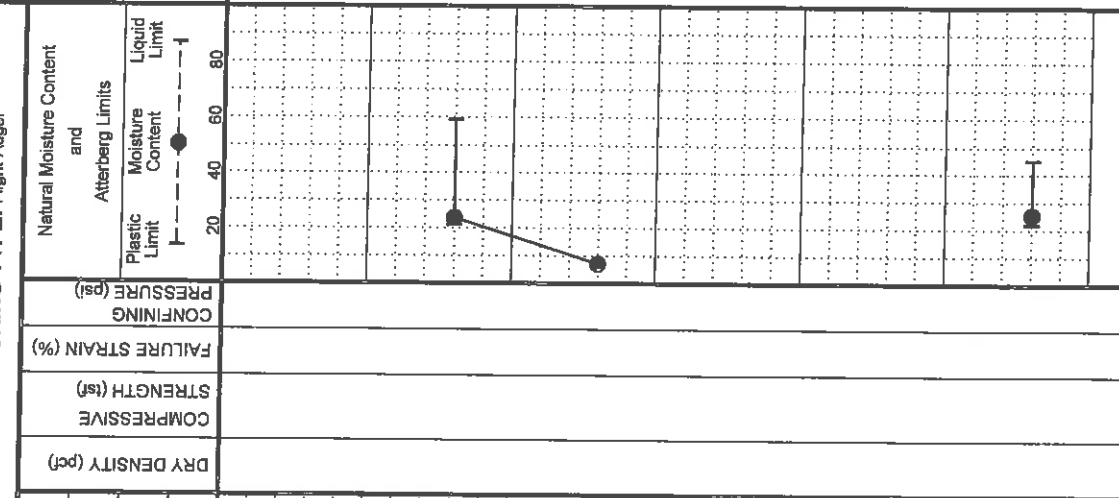
--medium dense; wet

--very dense

LEAN CLAY(CL) hard; dark brown; moist; with silt partings

Bottom of Boring @ 30'

FIELD STRENGTH DATA	BLOW COUNT	DRY DENSITY (pcf)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	Natural Moisture Content and Atterberg Limits
	● BLOW COUNT ▲ Cu (tsf) ■ PPR (tsf) ◆ Torvane (tsf)					Plastic Limit Moisture Content Liquid Limit
N=10	20	1.0				20 40 60 80
P=3.75	40	2.0				
N=59	60	3.0				
N=21	80	4.0				
N=56						
P=4.5						



MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	MINUS #200 SIEVE (%)	OTHER TESTS PERFORMED (Page Ref. #)
24	59	21	38	85	
7				12	+40 Sieve=0% +4 Sieve=0%
25	45	22	23	92	+40 Sieve=0% +4 Sieve=0%

**Key to Abbreviations:**  
N - SPT Data (Blows/Ft)  
P - Pocket Penetrometer (tsf)  
T - Torvane (tsf)  
L - Lab Vane Shear (tsf)

**Water Level**  
Water Observations: completion.  
Est. Measured:  Perched:   
Water level @ 17' and caved to 19' upon completion.

Notes:

GPS Coordinates:  
N33.04857°, W94.84286°

Driller:  
Lewis Drilling, Inc.

Logger:  
O. Sanderson



## **Appendix B**

### **Photographic Log**



**Project Name:**

AEP – J. ROBERT WELSH POWER PLANT

**Location:**

PITTSBURG, TITUS COUNTY, TEXAS

**Project No.**

OK001625.0001

**Photo No.**

1

**Date:**

8/20/2015

**Direction Photo Taken:**

North

**Description:**

Staging area west of landfill.

P8200493


**Project Name:**

AEP – J. ROBERT WELSH POWER PLANT

**Location:**

PITTSBURG, TITUS COUNTY, TEXAS

**Project No.**

OK001625.0001

**Photo No.**

2

**Date:**

8/20/2015

**Direction Photo Taken:**


South Southeast



**Description:**

Potential wetland on the top (west) end of the Primary Ash Pond.


P8200495






<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 3	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> West Northwest			
<b>Description:</b> Ditch between road and railway west of landfill, this ditch would be non-jurisdictional.			
P8200497			


 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 4	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> Northeast			
<b>Description:</b> Ground Water Monitoring Well AD-12 near northwest end of landfill.			
P8200501			






<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 5	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> East Northeast			
<b>Description:</b> View of plant from top of landfill. Primary ash pond is within the wooded area on left.			
P8200506			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 6	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> East Northeast			
<b>Description:</b> Drainage canal that drains from primary ash pond to clear water pond.			
P8200510			


<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 7	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> West Northwest			
<b>Description:</b> Vegetated strip between landfill and road. This would be isolated due to lack of connectivity.  P8200521			



<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> 8	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> North			
<b>Description:</b> Dike between landfill and primary ash pond. Facility in the background.  P8200522			

<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>9</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> West			
<b>Description:</b> Vegetated strip between landfill and road. This area would be isolated due to lack of connectivity.  P8200527			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>10</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> North Northeast			
<b>Description:</b> Road east of landfill running toward facility and clear water pond.  P8200530			



<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>11</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> South			
<b>Description:</b> Top of landfill.  P8200534			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>12</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> Southeast			
<b>Description:</b> View of lined bottom ash storage pond.  P8200538			

**Project Name:**  
AEP – J. ROBERT WELSH POWER PLANT

**Location:**  
PITTSBURG, TITUS COUNTY, TEXAS

**Project No.**  
OK001625.0001

**Photo No.**  
**13**

**Date:**  
8/20/2015

**Direction Photo Taken:**  
Southeast

**Description:**  
Lined bottom ash storage pond.

P8200545



**Project Name:**  
AEP – J. ROBERT WELSH POWER PLANT

**Location:**  
PITTSBURG, TITUS COUNTY, TEXAS

**Project No.**  
OK001625.0001

**Photo No.**  
**14**


**Date:**  
8/20/2015



**Direction Photo Taken:**  
South


**Description:**  
Southside of lined bottom ash storage pond.



P8200547



<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>15</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> West			
<b>Description:</b> East side of lined bottom ash storage pond.			
P8200560			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>16</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> North			
<b>Description:</b> Upland with pine and ground water monitoring well AD-2 south of lined bottom ash storage pond.			
P8200563			

<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>17</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b>			
<b>Description:</b> Outflow of water from plant into the northeast portion of the Primary Ash Pond.  P8200577			

 <b>ARCADIS</b>		<b>PHOTOGRAPHIC LOG</b>	
<b>Project Name:</b> AEP – J. ROBERT WELSH POWER PLANT		<b>Location:</b> PITTSBURG, TITUS COUNTY, TEXAS	<b>Project No.</b> OK001625.0001
<b>Photo No.</b> <b>18</b>	<b>Date:</b> 8/20/2015		
<b>Direction Photo Taken:</b> South Southwest			
<b>Description:</b> Northeast portion of primary ash pond, view facing south-southwest.  P8200578			