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October 12, 2018
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Revision 0

Tennessee Valley Authority (TVA)
1101 Market Street
Chattanooga, Tennessee 37402

**RE: Placement Above the Uppermost Aquifer Demonstration
Stilling Pond (including Retention Pond)
EPA Final Coal Combustion Residuals (CCR) Rule
TVA Cumberland Fossil Plant
Cumberland City, Tennessee**

1.0 PURPOSE

As described in 40 CFR § 257.60(a), an owner or operator of an existing CCR surface impoundment is required to demonstrate that the unit is located no less than five feet above the upper limit of the uppermost aquifer. This letter documents Stantec's certification that the Stilling Pond (including Retention Pond) at the TVA Cumberland Fossil Plant (CUF) complies with the location restrictions for aquifer separation in the EPA Final CCR Rule at 40 CFR § 257.60(a)

2.0 SUMMARY OF FINDINGS

The attached demonstration documents that the Stilling Pond (including Retention Pond) meets the requirements set forth in 40 CFR § 257.60(a).

3.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stephen H. Bickel, being a Professional Engineer in good standing in the State of Tennessee, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;
2. that the information contained herein is accurate as of the date of my signature below; and
3. that the TVA Cumberland Stilling Pond (including Retention Pond) meets the requirements specified in 40 CFR 257.60(a).



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Stilling Pond (including Retention Pond)
EPA Final Coal Combustion Residuals (CCR) Rule
TVA Cumberland Fossil Plant
Cumberland City, Tennessee**

SIGNATURE 

DATE 10/12/2018

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ATTACHMENTS: Aquifer Location Demonstration Report



**Placement Above the
Uppermost Aquifer
Demonstration**

Stilling Pond
(Including Retention Pond)
Cumberland Fossil Plant
Stewart County, Tennessee



Prepared for:
Tennessee Valley Authority

Prepared by:
Stantec Consulting Services Inc.
Lexington, Kentucky

October 12, 2018
Revision 0

PLACEMENT ABOVE THE UPPERMOST AQUIFER DEMONSTRATION - CUF STILLING POND (INCLUDING RETENTION POND)

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Introduction
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1.0 INTRODUCTION

On April 17, 2015, the "Disposal of Coal Combustion Residuals (CCR) from Electric Utilities" (final rule) was published in the Federal Register. Stantec Consulting Services Inc. (Stantec) was tasked by the Tennessee Valley Authority (TVA) to determine whether the requirements for Placement Above the Uppermost Aquifer (UMA) Location Restriction for the Stilling Pond (including the retention pond) CCR unit (the Unit) at the Cumberland Fossil Plant (CUF) are met as required by the final rule § 257.60.

1.1 OBJECTIVE

As required by §257.60 of the final rule, an owner or operator of new CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units is required by October 17, 2018 to demonstrate whether the Unit is located no less than five feet above the upper limit of the UMA. Relevant sections of the final rule are cited below to provide context and additional detail regarding the objective (EPA, 2015).

The final rule § 257.53 provides definitions of CCR and CCR surface impoundments.

"Coal combustion residuals (CCR) means fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." (257.53)

"CCR surface impoundment means a natural topographic depression, manmade excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the unit treats, stores, or disposes of CCR." (257.53)

The final rule § 257.60 (a) requires that the CCR unit is constructed:

"...with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table)." (257.60 (a))

TVA must demonstrate that the requirements of paragraph (a) of section 257.60 are met, and the demonstration must be certified to meet the requirements by a qualified professional engineer (P.E.) (§ 257.60 (b)). The demonstration and certification must be completed no later than October 17, 2018 (§ 257.60 (c)(1)).

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1.2 UNIT DESCRIPTION

CUF is a coal-fired, electric-generating plant. The plant is located in Stewart County, Tennessee along the south shore of the Cumberland River, and upstream from Lake Barkley (**Figure 1**).

The Unit is located north of the Dry Fly Ash Stack, east of Wells Creek and south of the Cumberland River. The Unit includes an internal divider dike which separates the Retention Pond to the south and the Stilling Pond to the north (**Figure 2**). The Unit is considered an active CCR surface impoundment and is used for detention of stormwater, CCRs, and process water. Effluent from the Unit discharges to the Cumberland River (Stantec, 2016A). The Unit meets the EPA definition of a CCR surface impoundment because it is a manmade area designed to hold an accumulation of CCR and liquids and is used to treat, store or dispose of CCR.

The Stilling Pond, previously referred to as the Ash Disposal Area, was constructed in 1969. During its construction Wells Creek was relocated, resulting in portions of the Unit being built over the original location of Wells Creek. In 1977, TVA constructed the interior divider dike separating the Stilling Pond and the Retention Pond. The perimeter dike around the entire Stilling Pond area (including the Retention Pond) was raised to Elevation 395 feet with clay in 1979. In 1986, approximately 300 feet of the west portion of the divider dike between the Stilling Pond and the Dry Ash Stack was constructed. Then the exterior divider dike between the Stilling Pond and the Dry Ash Stack was constructed in 1995 and 1996. Review of the historical drawings, historical air photos and the history of construction (Stantec, 2016A) indicates that within the extent of the Unit, ash was sluiced onto the existing (unlined) ground surface. The Unit is considered an unlined surface impoundment (Stantec, 2016B).

1.3 GEOLOGY AND HYDROGEOLOGY

CUF is located within Wells Creek Basin, which is the result of a meteor impact that occurred approximately 200 million years ago. Bedrock was uplifted 2,500 feet in the center of the impact, tilting the mostly horizontal limestone and shale strata outward from the central uplift. Over time, the area affected by the meteor crater has been more susceptible to weathering, due to the orientation of the bedding planes and faults, resulting in the Wells Creek Basin. Circular faults surround the basin, with grabens (valleys) and horsts (ridges). The bedrock elevation in the basin ranges from 360 ft-msl to 449 ft-msl, with the highest elevation located on the central hill, which is located approximately 1,800 feet south of the Unit (TVA, 1998).

The Unit overlies eight mapped bedrock formations ranging from the Ordovician Hermitage Formation to the Mississippian Fort Payne Formation. **Figure 3** is a geologic map of the Wells Creek Basin that was adapted from Wilson and Sterns (1968) to indicate the approximate boundaries of CCR units at CUF. This figure includes a detailed geologic map of the Wells Creek Basin and cross-sections for certain areas. This map shows the variability of strikes and dips for the bedrock across the Basin. Most notably, the bedrock formations along the northern side of the Unit strike generally to the east with steeply dipping beds to the south (Cross-section C-C' in Wilson and Sterns, 1968).

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Major bedrock formations in this area include: the Wayne Group, the Brownsport Group, the Devonian Harriman and Camden Formations, the Devonian Chattanooga Shale, and the Mississippian Fort Payne Formation.

The regional overburden geologic units consist of Quaternary-aged flood plain deposits of the Cumberland River and larger creeks (including Wells Creek) as well as the Late Cretaceous Tuscaloosa Formation (Wilson and Sterns, 1968). Flood plain deposits consist of alluvial lenticular beds of clays and silts grading to coarser grained sands and gravels with depth (TVA, 2010).

Prior to the construction of CUF in 1968, the channel for Wells Creek was located beneath the Unit. The Creek's channel was relocated and placed along the southwestern edge of the Unit (adjacent to the perimeter dike) during the construction of the plant. The overburden geology at CUF consists of the Quaternary-aged flood plain deposits of the Cumberland River (Wilson and Sterns, 1968) and the former Wells Creek. The flood plain deposits consist of alluvial lenticular beds of clays and silts overlaying coarser-grained sand and gravel (TVA, 2010). These deposits are located within the historic floodplain found below elevation 360 ft-msl. The alluvial deposits within the larger tributaries are highly variable in thickness (Wilson and Sterns, 1968) and are not consistently present beneath the Unit. **Figure 3** includes pre-construction ground surface contours and the approximate extent of alluvial deposits at CUF. Alluvial deposits are not present at higher pre-construction elevations, including along the eastern edge of the Unit.

At CUF, the alluvium is generally saturated and the coarse-grained alluvial deposits are confined beneath the finer grained alluvial deposits. These coarse-grained alluvial deposits are discontinuous at CUF and pinch out with distance away from the former Wells Creek channel along the eastern and northeastern edge of the Unit.

Hydraulic conductivity data describing geologic deposits at CUF have been characterized by analysis of Shelby tube samples and slug, pumping and packer tests performed at CUF (Law, 1992; Stantec, 2018; Stantec, 2009; Stantec, 2010; Stantec, 2015; TVA, 1998). Generally, the upper alluvial (clay) deposits tend to have a low permeability and the underlying, thin coarse sand and gravel have a higher permeability. Based on hydraulic conductivity data obtained at CUF, the sand and gravel deposits tend to be more permeable than underlying bedrock as well. Bedrock beneath CUF has varying permeability depending on the formation.

1.4 APPROACH AND METHODS

The approach for demonstration of placement above the UMA utilized a desktop review of separation as determined at borings and wells. Because of the hydrogeological complexity (including discontinuous formations), the UMA beneath the Unit cannot be represented by a simple surface. Borings and well logs were available from a representative range of settings within and around the Unit. Demonstration relied on review of these logs. The evaluation focused on demonstrating that the material within five feet of the Unit is not the UMA.

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Introduction

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The following factors have been considered (specifically for the Unit) to determine whether the Unit meets the requirements for placement above the UMA:

- Evaluation of bottom of the CCR;
- Identification of the UMA materials; and
- Evaluation of the material within five feet of the bottom of the Unit.

A search of historical documents yielded 66 boring and well logs within 300 feet of the Unit. These boring logs completed by others have been furnished to Stantec by TVA which Stantec has used, as furnished, in preparing this demonstration report. The distribution of these wells and borings covers a range of pre-construction settings along the perimeter of the Unit and (to a lesser extent due to access constraints) within the Unit. Borings and well logs were available from a representative range of settings within and around the Unit and were included in the desktop review of separation.

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Affected Boundary (Base of CCR Unit)
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2.0 AFFECTED BOUNDARY (BASE OF CCR UNIT)

To determine if the Unit meets the requirement for placement above the UMA, the affected boundary (base elevation of the CCR material) must be identified. Because the Unit is an unlined pond, the pre-construction ground surface is considered generally representative of the base of the CCR within the Unit (several expectations are discussed below). For each boring included in the desktop review of separation, the base of the Unit was determined using the following method:

1. The boring logs were reviewed for field indications of ash, fill and native materials. The elevation of the pre-construction ground surface was estimated for borings based on these indications. The locations included in this review are shown on **Figure 4** and summarized in **Table 1**.
2. Stantec developed a raster surface representing the estimated affected boundary (**Figure 4**). The surface was created by digitizing pre-construction ground surface contour lines from TVA drawing 10N212-R11 (TVA, 1969; **Appendix B**). The value of the raster at the location of each boring was determined.
3. In general, the minimum elevation determined from the boring logs and pre-construction ground surface was used to represent the base of the Unit in the desktop review of separation (**Table 1** and **Section 4**). Several exceptions are discussed below.

TVA drawing 10N227 (1979) indicates that a cutoff trench was installed under the eastern raised dike along approximately 1,565 feet of the southeastern perimeter of the Unit (**Appendix B**). Borings completed through the dike in this area encountered fill to elevations that were below what was indicated based on the pre-construction ground surface (**Figure 4**). These borings are shown in gray on **Figure 4** and labeled with the abbreviation C.T. for cutoff trench.

Boring HBA8 was completed along the western edge of the Unit through the outer edge of the perimeter dike to a depth of 60 feet below grade. Ash was not encountered in the boring. The pre-construction ground surface elevation at HBA8 (based on TVA drawing 10N212-R11) was estimated to be 350.5 feet msl (29 feet below grade). Field descriptions of decayed organics (including wood and roots) and mottling indicate that the actual pre-construction ground surface may have been 357 feet (22.5 feet below grade). Based on the field descriptions, an elevation of 357 feet was used as representative of the bottom of the Unit in the desktop review of separation.

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Uppermost Aquifer (UMA)
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3.0 UPPERMOST AQUIFER (UMA)

3.1 DEFINITION

The final rule § 257.53 provides the following definitions of aquifer and uppermost aquifer (UMA):

“Aquifer means a geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of groundwater to wells or springs.”

“Uppermost aquifer means 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 ground surface to which the aquifer rises during the wet season”

3.2 IDENTIFICATION

Groundwater Monitoring System Certification

AECOM prepared a letter regarding the Unit dated October 16, 2017 (AECOM, 2017) including a qualified professional engineer certification which stated that:

“Based upon review of the available information, the groundwater monitoring system at the Stilling Pond (including Retention Pond) meets the performance standard specified in 40 CFR § 257.91, based on the following criteria... The wells provide samples from the uppermost aquifer (257.91(a) and 257.53)” (AECOM, 2017).

The groundwater monitoring system referenced in this letter includes six monitoring wells: CUF-201, CUF-202, CUF-205, CUF-206, CUF-207, and CUF-208. The letter indicates that the screened formation for these monitoring wells is Alluvial Deposits. A copy of this certification is available on the TVA Cumberland Coal Combustion Residuals website.

Alluvium UMA

The alluvium beneath the Unit may be differentiated between alluvial sands and gravels and alluvial silts and clays. Generally, in the vicinity of the Unit, the shallow alluvium is silt and clay with minor intervals of silty sand. Coarse grained alluvium is generally present beneath the fine-grained alluvium in the vicinity of the Unit. Where present, this coarse-grained alluvium is the UMA beneath the Unit.

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Uppermost Aquifer (UMA)
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Extent of Alluvium

As was discussed in **Section 1.3**, the geologic map of Wells Creek Basin (Wilson and Sterns, 1968) indicates that prior to construction of CUF, alluvial deposits of Wells Creek were present beneath approximately the western two thirds of the Unit (**Figure 3**). The alluvium did not extend to the current eastern edge of the Unit where the pre-construction ground surface was above the flood plain. Along the eastern edge of the Unit, residuum was present at the surface overlying bedrock ranging in age from Ordovician to Mississippian (TVA, 1998).

The location of borings and wells completed near the Unit are shown in **Figure 4**. **Table 1** includes a summary of key elevations identified at the borings and wells and **Attachment A** includes copies of the boring logs. Borings completed along the eastern edge of the Unit confirm the lack of alluvium in this area. For example, alluvium was not encountered in borings for D-19, STN-CUF-SB-1, and STN-CUF-SB-2.

Bedrock UMA

The review of boring and well logs identified locations where coarse grained alluvium is not present. In areas where coarse grained alluvium is not present beneath the Unit, the UMA is within the bedrock.

3.3 UPPER LIMIT

According to the final rule, the upper limit of the UMA is measured “at a point nearest to the natural ground surface to which the aquifer rises during the wet season” (EPA, 2015). For a confined aquifer the top of the UMA would be defined based on the structure of the top of the aquifer (base of the confining layer). This demonstration conservatively assumed that the UMA is confined and that the top of the UMA is defined based on the structure of the top of the aquifer materials and not at depth within the aquifer materials. For the demonstration of placement above the UMA, if coarse-grained alluvium or bedrock are not encountered within five feet of the bottom of the Unit then the required separation is met.

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Review of Separation
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4.0 REVIEW OF SEPARATION

For each boring included in the desktop review of separation, the material within five feet of the affected boundary (**Section 2.0**) was compared to the UMA (**Section 3**). The results of this review are summarized in **Table 1** and the boring and well locations included are shown on **Figure 4**. Neither coarse-grained alluvial materials defined as the UMA nor bedrock were encountered within five feet of the estimated bottom of the Unit at these locations.

The borings and wells included in the desktop review were distributed around the perimeter of and within the Unit. This demonstration relied on field descriptions of soil at wells and borings with available logs that were completed to sufficient depth in representative locations. They are representative of the range of conditions expected to be encountered beneath the Unit and include borings completed in the alluvium associated with the former Wells Creek Flood plain, the former Wells Creek channel and residuum present above bedrock where the alluvium is absent. Identification of separation distance beneath the entire Unit relied on the representativeness of the data set.

Bedrock Outcrop

In 2018, during excavation activities completed along the eastern edge of the Unit, bedrock was encountered at a shallow depth. Test trenches were dug along the edge of the bedrock and logged by a senior Stantec engineering technician. In each of the six test trenches there was at least five feet of clay found surrounding the bedrock separating it from CCR material within the Unit.

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Summary
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5.0 SUMMARY

The following factors were considered to determine whether the Unit meets the requirements for placement above the UMA. These factors are specific to the extent of the Unit.

- Elevation of the base of the CCR.
 - The elevation of the bottom of the CCR unit was estimated based on interpretation of pre-construction ground surface contours and review of boring logs (**Section 2; Figure 4; Table 1**).
- Identification of the UMA.
 - The UMA is coarse-grained alluvium where present and bedrock where coarse-grained alluvium is not present (**Section 3.2**).
- Identification of the upper limit of the UMA.
 - This demonstration conservatively assumed that the UMA is confined and the top of the UMA is defined based on the structure of the top of the aquifer materials (**Section 3.3**).
- Review of Separation
 - Boring and well logs from within 300 feet of the Unit were reviewed. The locations of these borings and wells are representative of the range of conditions expected to be encountered beneath the Unit (**Figure 4**).
 - Neither coarse-grained alluvial materials defined as the UMA nor bedrock were encountered within five feet of the estimated bottom of the Unit.

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Conclusions
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6.0 CONCLUSIONS

Based on this assessment of the UMA and the Unit, the requirements of §257.60 of the final rule for placement above the UMA at the Stilling Pond (including retention pond) at CUF have been met.

PLACEMENT ABOVE THE UPPERMOST AQUIFER DEMONSTRATION - CUF STILLING POND (INCLUDING RETENTION POND)

References
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7.0 REFERENCES

- AECOM. (2017). Groundwater Monitoring System Stilling Pond (including Retention Pond) TVA Cumberland Fossil Plant Cumberland City, Tennessee.
- Environmental Protection Agency (EPA) (2015). Federal Register, Vol. 80, No. 74, Part II. 40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule.
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- Stantec Consulting Services Inc. (2010). Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.
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- TVA. 2010. Groundwater Detection Monitoring Plan. Tennessee Valley Authority, Cumberland Fossil Plant, Dry Fly Ash and Gypsum Disposal Areas (IDL 81-102-0086). February 27, 2010.
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- Tennessee Valley Authority. (1969). Main Plant Ash Disposal Areas Sheet No. 1. 10N212-R11.
- Wilson, Jr., C. W. and R. G. Sterns. 1968. Geology of the Wells Creek Structure, Tennessee. Tennessee Division of Geology, Bulletin 68. 1968.

TABLE 1
SUMMARY OF DESKTOP REVIEW OF
BORING AND WELL LOGS

Summary of Desktop Review of Boring and Well Logs

Boring ID	Current ground surface	Bottom of boring	Estimated bottom of Unit	Source for estimated bottom of Unit	Generalized description of material within 5 feet of estimated bottom of Unit	Determination of separation
	(ft msl)	(ft msl)	(ft msl)			
93-4	394.6	360.1	C.T.	NA	Fill	C.T.
B-1	394.6	318.1	343.6	Log	Clay	> 5 feet
B-2	394.5	343.0	353.0	Log	Clay	> 5 feet
B-212	392.7	306.7	340.2	Log	Clay with Sand	> 5 feet
B-222	392.5	291.5	347.5	Log	Clay	> 5 feet
B-232	393.1	272.1	340.1	Log	Clay and Silty Sand	> 5 feet ¹
B-242	393.0	293.0	344.3	Log	Clay	> 5 feet
B-3	394.4	317.9	348.1	Log	Clay	> 5 feet
B-4	394.2	342.7	366.2	Log	Clay	> 5 feet
CUF-205	380.8	355.6	378.8	Log	Silt and Clay	> 5 feet
CUF-206	394.9	303.4	352.8	PCC	Clay	> 5 feet
CUF-207	394.4	310.1	352.2	PCC	Gravelly Clay and Clay	> 5 feet
CUF-208	394.6	334.6	360.6	PCC	Gravelly Silt	> 5 feet
D-18	382.3	331.3	357.3	Log	Silty Clay	> 5 feet
D-19	382.8	345.3	371.3	Log	Silty clay and silt	> 5 feet
D-20	383.3	296.3	345.3	Log	Clayey silt	> 5 feet
GCCUF-P-2A	395.2	347.5	354.7	Log	Clay	> 5 feet
GCCUF-P-2B	394.7	367.2	362.4	PCC	NA	T.S
GCCUF-P-2C	395.0	341.2	357.5	Log	Clay	> 5 feet
GCCUF-R-2A	395.2	307.3	349.7	Log	Clay	> 5 feet
GCCUF-R-2B	395.0	306.0	344.0	Log	Clay	> 5 feet
GCCUF-S-2A	394.7	292.1	350.4	PCC	Clay	> 5 feet
GCCUF-T-2A	395.1	318.0	351.6	Log	Clay	> 5 feet
HBA10	394.8	319.8	357.9	PCC	Clay and silty clay	> 5 feet
HBA11	378.3	318.3	351.8	PCC	Sandy clay and silty clay	> 5 feet
HBA12	378.9	321.9	352.6	PCC	Sandy clay	> 5 feet
HBA13	379.4	319.4	344.9	PCC	Sandy silty clay	> 5 feet
HBA14	378.6	338.6	348.3	PCC	Silty clay and sandy silty clay	> 5 feet
HBA7	380.0	324.0	361.0	Log	Silty clay and sandy clay	> 5 feet

Summary of Desktop Review of Boring and Well Logs

Boring ID	Current ground surface	Bottom of boring	Estimated bottom of Unit	Source for estimated bottom of Unit	Generalized description of material within 5 feet of estimated bottom of Unit	Determination of separation
	(ft msl)	(ft msl)	(ft msl)			
HBA8	379.5	319.5	357.0	Log ¹	Silty clay	> 5 feet
HBA9	379.8	314.8	352.5	PCC	Sandy clay	> 5 feet
LawB-101	387.8	355.8	365.3	Log	Sandy clay with chert	> 5 feet
LawB-102	395.0	338.0	348.0	Log	Sandy silty clay	> 5 feet
LawB-103	394.4	357.4	342.8	PCC	NA	T.S
LawB-2	394.7	354.7	364.5	PCC	Clay	> 5 feet
LawB-3	395.5	368.5	C.T.	NA	Fill	C.T.
LawB-4	395.4	350.4	359.4	Log	Silty clay	> 5 feet
LawB-5	395.4	356.1	351.2	PCC	NA	T.S
LawB-6	396.4	372.9	351.1	PCC	NA	T.S
STN-1	392.6	362.6	349.3	PCC	NA	T.S
STN-100	395.0	316.4	360.0	Log	Clay	> 5 feet
STN-101	395.1	341.8	363.0	PCC	Clay	> 5 feet
STN-102	395.0	348.5	360.0	Log	Clay	> 5 feet
STN-3	394.8	322.8	356.7	PCC	Clay	> 5 feet
STN-4	393.9	314.6	351.4	Log	Silty Clay	> 5 feet
STN-47	380.0	339.5	361.0	Log	Clay	> 5 feet
STN-48	395.0	340.0	362.7	PCC	Clayey Gravel with Sand	> 5 feet ²
STN-49	379.2	315.1	346.2	PCC	Clay	> 5 feet
STN-50A	394.5	303.5	343.6	PCC	Clay	> 5 feet
STN-51	378.8	312.3	350.0	PCC	Clay	> 5 feet
STN-52	394.9	310.9	353.4	PCC	Clay, Silty Clay	> 5 feet
STN-53A	376.0	280.0	345.0	Log	Clay	> 5 feet
STN-54	395.0	294.7	347.2	PCC	Clay	> 5 feet
STN-55	379.5	304.5	367.3	PCC	Clay with Sand	> 5 feet
STN-56	395.0	318.8	373.0	PCC	Clay	> 5 feet
STN-57	381.5	324.5	354.0	Log	Clay with Sand	> 5 feet
STN-57B	381.5	315.0	354.0	Log	Clay with Sand	> 5 feet
STN-58	395.0	332.1	379.3	PCC	Sandy Clay and Clay	> 5 feet

Boring ID	Current ground surface	Bottom of boring	Estimated bottom of Unit	Source for estimated bottom of Unit	Generalized description of material within 5 feet of estimated bottom of Unit	Determination of separation
	(ft msl)	(ft msl)	(ft msl)			
STN-59B	383.0	336.7	C.T.	NA	Fill	C.T.
STN-60	395.1	351.5	C.T.	NA	Fill	C.T.
STN-61	387.2	364.7	364.7	Log	NA	T.S
STN-62	394.8	362.8	C.T.	NA	Fill	C.T.
STN-CUF-SB-1	387.4	340.1	369.9	Log	Clay	> 5 feet
STN-CUF-SB-1A	387.5	330.4	370.0	Log	Clay	> 5 feet
STN-CUF-SB-2	386.8	336.3	369.3	Log	Clay	> 5 feet
STN-CUF-SB-3	387.2	366.2	371.5	Log	Clay	> 5 feet

Notes

1. Grain size analysis indicated that the silty sand layer encountered at B-232 was between 7.5 and 9.7 feet thick and included up to 27.7% fines and would not be capable of acting as the UMA at this location. The silty sand layer is underlain by gravel that is consistent with the UMA.

2. Based on the results of follow up drilling and evaluation, the field classification of GC at STN-48 may have been in error or the extent of the coarse-grained alluvium is expected to be limited and isolated.

C.T.: Cutoff Trench - TVA drawing 10N227 (1979) indicates that a cutoff trench was installed under the eastern raised dike along the southeastern perimeter of the Unit (Appendix B). Borings completed through the dike in this area encountered fill to elevations that were below what was indicated based on the pre-construction ground surface. The utility of these borings for the desktop review of separation is limited because of the non-ccr fill used to replace native sediments within the cutoff trench. However, these borings consistently indicate more than five feet of separation between the pre-construction ground surface and the top of the bedrock.

T.S.: Too Shallow - bottom of boring less than 5 feet below the estimated bottom of the Unit.

ft msl: Feet above mean sea level

Unit: Stilling Pond (including the retention pond)

PCC: Pre-construction ground surface contour (TVA drawing 10N212-R11)

Log: Boring log indication of bottom of fill

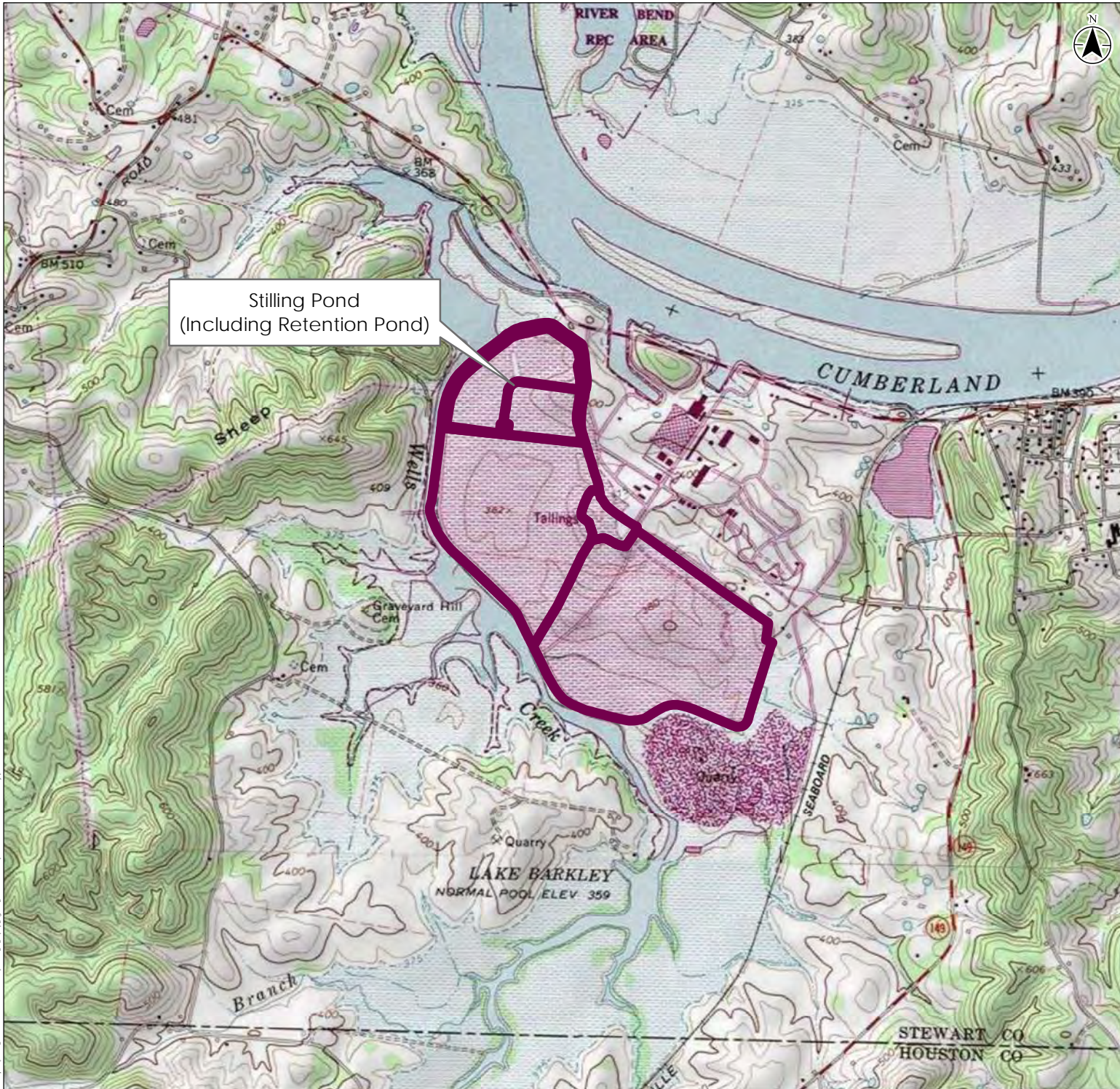
Estimated bottom of Unit: Lower elevation of PCC and Log based elevation unless otherwise noted.

CL: USCS code for lean clay (USB, 1998)

CH: USCS code for fat clay (USB, 1998)

GC: USCS code for clayey gravel (USB, 1998)

FIGURE 1
SITE LOCATION MAP



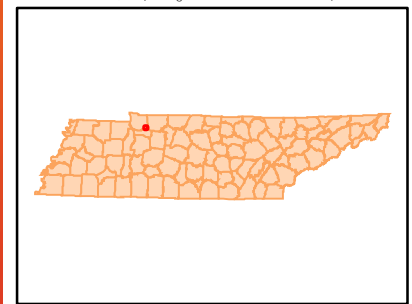
Stilling Pond
(Including Retention Pond)

Legend

CCR Unit Area (Approximate)

Notes
 1. Coordinate System: NAD 1983 StatePlane Kentucky FIPS 1600 Feet
 2. Service Layer Credits: Copyright: © 2013 National Geographic Society, i-cubed

0 400
 Feet
 1:24,000 (At Original document size of 8.5x11)



Project Location:
 Stewart County, TN Prepared by PRB on 5/31/2018

Client/Project
 Client: Tennessee Valley Authority
 Stantec No: 175577013

Figure No:
 1

Title
 Site Location Map
 Cumberland Fossil Plant

C:\Work\TVA_CCR\GIS\SP\Documents\CRP_357_Archie.fgprst_2\LocationMap.mxd Review: 2018.06.30 11:51 AM

**FIGURE 2
SITE MAP**

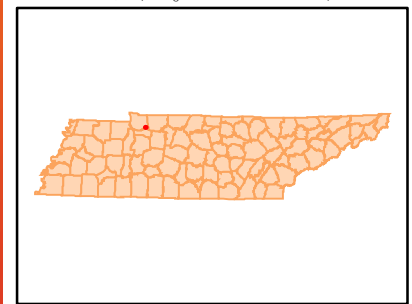


Legend

 CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Kentucky FIPS 1600 Feet
2. Aerial Imagery: Imagery Provided by Tuck Mapping (c. 2017)



Project Location:
Stewart County, TN Prepared by PRB on 5/31/2018

Client/Project
Client: Tennessee Valley Authority
Stantec No: 175577013

Figure No:
2

Title
**Site Map
Cumberland Fossil Plant**

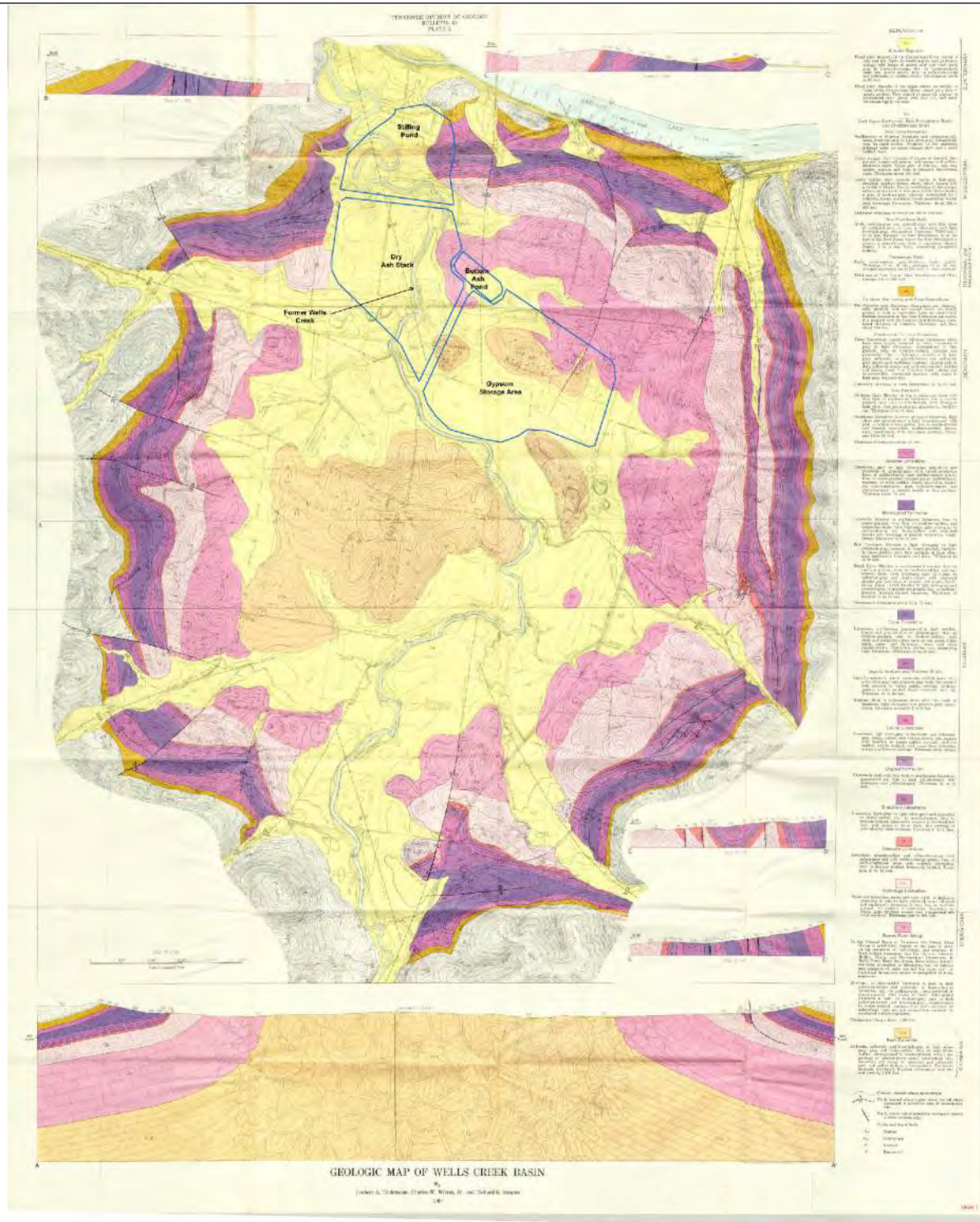
C:\Users\TVA\OneDrive\Documents\175577013\175577013_02_SiteMap.mxd - Revised: 2018/05/31/18y - jrb

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

FIGURE 3
GEOLOGIC MAP OF WELLS CREEK BASIN
(WILSON AND STERNS, 1968)

Legend

Notes
 1. Adapted from Wilson and Sterns, 1968



C:\Users\jva\OneDrive\Documents\1007_307_A\Map_Figures\geologicmap.mxd Revised: 2/18/2018 2:25 by pavel

Project Location: Stewart County, TN	Prepared by: PRB on 9/25/2018
Client/Project: Client: Tennessee Valley Authority Stantec No: 175577013	
Figure No: 3	
Title Geologic Map of Wells Creek Basin (Wilson and Sterns, 1968)	

FIGURE 4
**BORINGS, WELLS AND PRE-
CONSTRUCTION GROUND SURFACE**

**ATTACHMENT A
BORING AND WELL LOGS**

PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 380.04'

DATE 8/1/86

WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 23.8' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 21.9' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
			0.0						
1	3.5	5.0			Brown & gray clayey silt w/ traces of sand, organics & small gravel	30	17		
2	8.5	10.0			Brown & gray sandy clay w/ traces of gravel - Moist	9	25		
3	13.0	14.5			Brown clay w/traces of sand & decayed organics - Moist	22	26		
4	15.0	16.5			Brown & red clay to brown sandy clay w/gray mottling & small gravel seams	14	28		
5	17.0	18.5			Brown silty clay to brown & gray mottled sandy clay w/ small gravel - Moist	14	23		
6	19.0	20.5			Brown & gray sandy clay to gray silty clay w/traces of roots, gravel & organics - Moist	11	24		
7	21.0	22.5			Gray clay to gray silty clay w/traces of small gravel, organics & sand - Very Moist	8	24		
					"CONTINUED"				

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

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TEST BORING RECORD

BORING NO. 7 JOB NO. 86-07102



PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 380.04' DATE 8/1/86 WEATHER

WATER LEVEL AT FIELD ENGINEER John O. Gordon

WATER LEVEL 23.8' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 21.9' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
					"CONTINUED"				
8	23.0	24.5			Brown & gray mottled sandy clay to light brown silty clay - Moist	11	22		
9	25.0	26.5			Brown & gray mottled sandy clay w/decayed organics - Moist	18	49		
10	27.0	28.5			Brown & gray silty clay w/sand traces & decayed organics - Moist	23	20		
11	29.0	30.5			Brown & gray silty clay w/sand traces & decayed organics - Moist	22	20		
12	31.0	32.5			Brown & gray sandy clay w/decayed mottled organics - Moist	24	21		
13	33.5	35.0			Brown clayey sand & gravel Moist	28			
14	38.5	40.0			Brown & red mottled silty clay w/traces of coarse sand & organics	24	29		
					"CONTINUED"				

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BORING NO. 7 JOB NO. 86-07102



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PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 379.52'

DATE 7/31/86

WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 21.8' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 21.4' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
			0.0						
1	3.5	5.0				25	16		
2	8.5	10.0			Brown to gray mottled clayey silt w/traces of pea gravel - Moist	36	17		
3	12.5	14.0			Brown silty clay w/seams of shale, traces of wood & sand Moist	26	21		
4	14.5	16.0			Gray silty clay to brown & red sandy clay w/traces of organics & small gravel	15	27		
5	16.5	18.0			Brown silty clay w/traces of coarse sand & small sub-angular gravel - Moist	13	24		
6	18.5	20.0			Brown & gray sandy clay w/traces of small gravel - Moist	11	24		
7	20.5	22.0			Red to gray silty clay w/traces of sand, small gravel & small amounts of mottling	9	29		
					"CONTINUED"				

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JOB NO. 86-07102



HALL, BLAKE AND ASSOCIATES, INC.

PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 379.52' DATE 7/31/86 WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 21.8' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 21.4' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
					"CONTINUED"				
8	22.5	24.0			Gray sandy silty clay w/ decayed organics & roots - Moist	9	23		
9	24.5	26.0			Gray silty clay w/traces of wood, sand & roots - Moist	7	24		
10	26.5	28.0			Gray silty clay w/decayed organics & traces of coarse sand & small gravel - Moist	5	24		
11	28.5	30.0			Gray silty clay to brown clayey sand w/decayed organics & small gravel - Very Moist	4	26		
12	30.5	32.0			Brown & gray clayey coarse sand & gravel - Very Moist	11	21		
13	33.5	35.0			Red to brown clayey coarse sand & sub-angular gravels-V. Moist	52	16		
14	38.5	40.0			Brown silty coarse sand w/small sub-angular gravel & traces of clays - Moist	32	17		
15	43.5	45.0			Brown clayey sand & gravel Very Moist	32	19		
					"CONTINUED"				

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PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 379.76'

DATE 7/28/86

WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 21.4' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 22.6' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
			0.0						
1	3.5	5.0			Brown & gray mottled silty clay w/traces of sand	18	18		
2	8.5	10.0			Brown & gray mottled sandy clay w/traces of pea gravel & organics	20	20		
3	13.0	14.5			Reddish gravel changing to brown sandy clay w/coarse sands & gravel - Moist	32	19		
4	15.0	16.5			Brown coarse sandy clay w/ small to large angular gravel Moist	17	22		
5	17.0	18.5			Brown to red sandy clay w/ small to large angular gravel Moist	14	23		
6	19.0	20.5			Brown to red clay w/traces of medium to coarse sand & gravel	15	22		
7	21.0	22.5			Brown to red sandy clay w/ medium rounded to sub-angular gravel	14	28		
					"CONTINUED"				

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PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 379.76' DATE 7/28/86 WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 21.4' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 22.6' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
					"CONTINUED"				
8	23.0	24.5			Light brown to reddish brown mottled sandy clay w/ small gravel - Moist	11	29		
9	25.0	26.5			Brown medium to coarse sandy clay w/traces of small to large gravel	16	29		
10	27.0	28.5			Brown sandy clay w/gravel - Moist	11	31		
11	29.0	30.5			Brown sandy clay w/traces of small gravel - Moist	9	34		
12	31.0	32.5			Brown sandy clay to gray sandy clay w/traces of small gravel & organics	12	30		
13	33.5	35.0			Brown to gray silty clay w/ traces of sand & organics (large rock in shoe of spoon)	35	22		
14	38.5	40.0			Clayey sand & small angular gravel changing to red sandy clay w/gravel - Moist	19	32		
15	43.5	45.0			Red to brown sandy clay w/ trace samll gravel & decayed organics	32	30		

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PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 394.76' DATE 7/16/86 WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 27.9' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL _____ AT 24 HOURS _____

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
			0.0						
1	3.5	5.0			Red sandy clay w/sub-angular gravel, stiff - Moist	18	22		
2	8.5	10.0			Red sandy clay w/sub-angular gravel, very stiff - Moist	15'	25		
3	13.5	15.0			Brown silty clay w/coarse sand & small gravel - Moist	18	24		
4	18.5	20.0			Brown & gray silty clay w/ angular to sub-angular gravel Damp	16	15		
5	23.5	25.0			Brown to gray clayey sand & gravel, Moist	5	19		
6	28.0	29.5			Brown clayey sand w/angular to sub-angular gravel - Moist	19	16		
7	30.0	31.5			Sub-angular to angular gravel to clayey sand & gravel, brown, Moist	9	12		
8	32.0	33.5			Brown sandy clay w/small gravel, trace of organics - Moist	6	14		
					"CONTINUED"				

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BORING NO. 10 JOB NO. 86-07102



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PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 394.76'

DATE 7/16/86

WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 27.9' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL _____ AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
					"CONTINUED"				
9	34.0	35.5			Brown sandy clay w/gravel, traces of organics, small wood stems - Moist	9	24		
10	36.0	37.5			Green to gray clay w/traces of sand, organics, roots - Moist	9	23		
11	38.0	39.5			Brown & gray mottled silty clay w/traces of sand, organics & roots - Moist	16	23		
12	40.0	41.5			Brown & gray mottled silty clay w/traces of sand & small gravel-Moist	22	20		
13	42.0	43.5			Brown & gray mottled silty clay w/traces of sand & organics - Moist	27	20		
14	44.0	45.5			Brown & gray silty clay w/ traces of small gravel & organics, mottled - Moist	31	20		
15	46.0	47.5			Brown clayey sand & gravel Moist	30	19		
					"CONTINUED"				

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BORING NO. 10 JOB NO. 86-07102



HALL, BLAKE AND ASSOCIATES, INC.

PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 378.26'

DATE 7/25/86

WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 21.7' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 18.1' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
			0.0						
1	3.5	5.0			Red silty clay w/coarse sand & small gravel - Moist	17	25		
2	8.5	10.0			Red to brown silty clay w/ small gravel & sand - Moist	11	22		
3	11.0	12.5			Brown to red sandy clay w/ traces of gravel - Moist	8	26		
4	13.0	14.5			Red to gray sandy clay w/ traces of pea gravel - Moist	8	21		
5	15.0	16.5			Red sandy clay w/traces of coarse sand & pea gravel - Moist	7	24		
6	17.0	18.5			Red to brown sandy clay w/ small gravel - Moist	8	24		
7	19.0	20.5			Brown to red coarse sandy clay w/sub-angular gravel traces	7	28		
8	21.0	22.5			Brown to red mottled sandy clay w/sub-angular gravel	10	23		
9	23.0	24.5			Brown & gray mottled clay w/ coarse sand & small gravel	8	27		

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BORING NO. 11 JOB NO. 86-07102



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PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 378.26' DATE 7/25/86 WEATHER

WATER LEVEL AT FIELD ENGINEER John O. Gordon

WATER LEVEL 21.7' AT 1 Hour DRILLER Joseph K. Hall

WATER LEVEL 18.1' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
					"CONTINUED"				
10	25.0	26.5			Brown sand to gray & brown sandy clay w/traces of gravel	7	27		
11	27.0	28.5			Brown to red sandy clay w/ traces of organics	5	26		
12	29.0	30.5			Gray silty clay - Moist	16	25		
13	33.5	35.0			Brown silty clay - Moist	18	23		
14	38.5	40.0			Brown sandy clay - Very Moist	7	25		
15	43.5	45.0			Brown to gray sand & gravel w/clayey sand seams - Very Moist	28	23		
16	48.5	50.0			Brown coarse sand & gravel w/dark gray silty clay seams & decayed organics	25	23		
17	53.5	55.0			Gray sandy clay w/trace of gravel to brown & gray coarse sand & gravel	31	22		
18	58.5	60.0			Brown coarse sand & gravel	37	16		
					Bottom of Hole 60.0'				

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BORING NO. 11 JOB NO. 86-07102



HALL, BLAKE AND ASSOCIATES, INC.

PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 378.92'

DATE 8/2/86

WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 19.0' AT 1 Hour DRILLER Joseph K. Hall

WATER LEVEL 16.8' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
			0.0						
1	3.5	5.0			Brown silty clay	56	18		
2	8.5	10.0			Brown to gray mottled silty clay w/traces of sand - Moist	15	20		
3	12.0	13.5			Green to gray silty clay w/ sand traces to gray clayey silt w/decayed organics - Moist	11	23		
4	14.0	15.5			Brown & gray mottled clay to gray & green silty clay w/decayed organics, roots - Moist	28	21		
5	16.0	17.5			Brown & gray mottled silty clay to gray silty clay	17	20		
6	18.0	19.5			Brown & gray mottled silt & clay w/organics	27	21		
7	20.0	21.5			Red to brown sandy clay w/ gravel to gray silty clay w/organics	22	22		
8	22.0	23.5			Gray silty clay, highly organic - Moist	15	23		
					"CONTINUED"				

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BORING NO. 12

JOB NO. 86-07102



HALL, BLAKE AND ASSOCIATES, INC.

PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 378.92'

DATE 8/2/86

WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 19.0' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 16.8' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
					"CONTINUED"				
9	24.0	25.5			Brown silty clay w/gray sandy clay mottling, roots - Moist	13	27		
10	26.0	27.5			Brown & gray mottled sandy clay, Very Moist	19	23		
11	28.0	29.5			Brown & gray mottled sandy clay w/traces of decayed organics - Moist	23	21		
12	30.0	31.5			Brown to gray sandy clay, mottled, w/trace of organics Moist	14	21		
13	33.5	35.0			Gray sandy clay w/brown sand & clay mottling & trace of organics - Moist	11	21		
14	38.5	40.0			Brown & gray mottled sandy clay	18	20		
15	43.5	45.0			Brown sandy clay w/ironstone modules changing to gray clayey sand	19	19		
16	48.5	50.0			Dark gray sandy clay	9	25		
					"CONTINUED"				

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PAGE 2 OF 3

TEST BORING RECORD

BORING NO. 12 JOB NO. 86-07102



HALL, BLAKE AND ASSOCIATES, INC.

PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 379.4' DATE 8/5/86 WEATHER

WATER LEVEL AT FIELD ENGINEER John O. Gordon

WATER LEVEL 20.8' AT hour DRILLER Joseph K. Hall

WATER LEVEL 20.0' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
			0.0						
1	3.5	5.0			Brown sandy clay w/traces of small sand	15	22		
2	8.5	10.0			Brown & gray mottled silty sandy clay w/traces of small gravel - Moist	13	27		
3	12.5	14.0			Brown sandy clay w/clay organics & traces of small gravel - Moist	14	26		
4	14.5	16.0			Brown & gray mottled silty clay w/traces of sand & organics - Moist	12	20		
5	16.5	18.0			Brown silty clay w/coarse sand & small gravel - Moist	16	30		
6	18.5	20.0			Brown & gray sandy clay w/ small gravel - Very Moist	4	30		
7	20.5	22.0			Brown silty clay changing to green/gray gravel	50=6"	28		
*8	22.5	24.0			Brown to red sandy clay w/ traces of gravel - Very Moist	50=6"	27		
					"CONTINUED"				

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: PAGE 1 OF 3

*Refusal at 24.5' - redrilled 5' to south

TEST BORING RECORD

BORING NO. 13 JOB NO. 86-07102



HALL, BLAKE AND ASSOCIATES, INC.

PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 379.4'

DATE 8/5/86

WEATHER

WATER LEVEL AT FIELD ENGINEER John O. Gordon

WATER LEVEL 20.8' AT 1 hr DRILLER Joseph K. Hall

WATER LEVEL 20.0' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
					"CONTINUED"				
9	24.5	26.0			Brown sandy clay w/traces of small gravel w/ brown silt seam - Moist	14	28		
10	26.5	28.0			Red to brown sandy silty clay Moist	7	42		
11	28.5	30.0			Reddish brown sandy silty clay w/mottling & trace of gravel Moist	7	25		
12	30.5	32.0			Reddish sandy silty clay w/ small gravel - Moist	5	28		
13	33.5	35.0			Reddish brown sandy silty clay w/traces of sand & gravel - Moist	50=6"	30		
14	38.5	40.0			Gray sandy silty clay w/ decayed organics - Moist	8	25		
15	43.5	45.0			Gray sandy silty clay w/ decayed organics to brown coarse sand & small gravel - Moist	10	24		
					"CONTINUED"				

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: PAGE 2 OF 3

TEST BORING RECORD

BORING NO. 13 JOB NO. 86-07102



PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 378.6' DATE 8/6/86 WEATHER _____

WATER LEVEL 19.8' AT Drilling FIELD ENGINEER J. Gordon

WATER LEVEL 18.3' AT Completion DRILLER J. Hall

WATER LEVEL _____ AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
			0.0						
1	3.5	5.0			Red & brown coarse sandy clay w/gravel / moist	42	17		
2	8.5	10.0			Brown & gray mottled silty clay w/traces of sand and occasional gravel / moist	13	18		
3	11.5	13.0			Brown & gray mottled silty clay, moist trace of sand & gravel, to brown & gray mottled sandy clay	12	20		
4	13.5	15.0			Brown & gray mottled silty sandy clay, moist	14	24		
5	15.5	17.0			Brown & gray mottled silty sandy clay, w/gray silty clay seam, moist	16	23		
6	17.5	19.0			Brown & gray silty clay w/trace of sand, moist	19	21		
7	19.5	21.0			Brown & gray silty clay (mottled) traces of sand & small gravel decayed organics, seam	13	25		
8	21.5	23.0			Brown silty clay, gray to green sandy, silty clay, moist	8	23		

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: _____ Page 1 of 3

TEST BORING RECORD

BORING NO. 14 JOB NO. 86-07102



HALL, BLAKE AND ASSOCIATES, INC.

PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 378.78' DATE 7/22/86 WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER J. Gordon

WATER LEVEL 20.9' AT 1 hour DRILLER J. Hall

WATER LEVEL 20.0' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Qu	PPR
	From	To	From	To					
9	23.5	25.0			Gray sandy silty clay w/ large amount of decayed organics, roots etc., moist	9	25		
10	25.5	27.0			Green to gray silty clay w/ coarse sand & decayed organics moist	14	23		
11	27.5	29.0			Gray silty clay w/traces of sand, roots & decayed roots moist	14	24		
12	29.5	31.0			Gray to green silty clay moist	11	27		
13	31.5	33.0			Brown to gray silty clay w/ traces of sand, moist	14	27		
14	33.5	35.0			Brown to gray mottled sand, silty clay, very moist	9	27		
15	38.5	40.0			Brown sandy clay to brown clayey sand, moist	8	26		

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

REMARKS: _____ Page 2 of 3

TEST BORING RECORD

BORING NO. 14 JOB NO. 86-07102



PROJECT Cumberland Fossil Project - Ash Pond Dike and Borrow Investigation

FOR TENNESSEE VALLEY AUTHORITY

Ash Pond Dike

ELEVATION 378.6' DATE 8/6/86 WEATHER _____

WATER LEVEL _____ AT _____ FIELD ENGINEER John O. Gordon

WATER LEVEL 19.8' AT 1 hour DRILLER Joseph K. Hall

WATER LEVEL 18.3' AT 24 HOURS

Sample No.	Sample Depth Feet		Stratum Depth Feet		Soil Classification	N	W	Q _u	PPR
	From	To	From	To					
					"CONTINUED"				
16	43.5	45.0			Brown coarse sand & gravel w/black gravel seam to orange coarse sand & gravel	25	30		
17	48.5	50.0			Brown medium sand followed by 3" gray sandy clay seam to brown coarse sand & gravel	17	33		
18	53.5	55.0			Brown coarse sand & gravel changing to a gray silty clay - Moist	18	29		
19	58.5	60.0			Brown coarse sand & gravel w/clayey sand & gravel seam	20	24		
					Bottom of Hole				
					60.0'				

ALL SYMBOLS AND ABBREVIATIONS USED ARE DESCRIBED IN THE STANDARD LEGEND SHEET

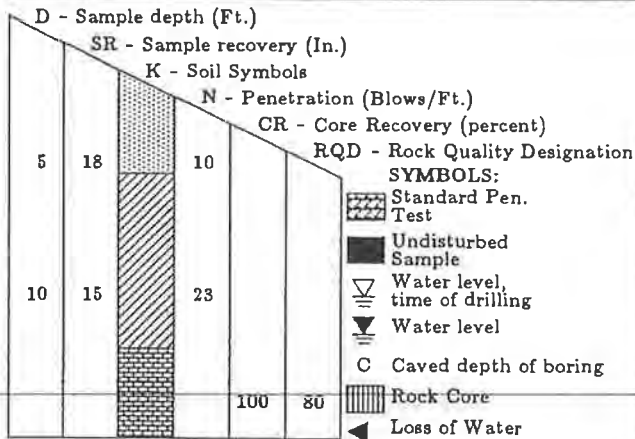
REMARKS: _____ PAGE 3 OF 3


TEST BORING RECORD

BORING NO. 14 JOB NO. 86-07102

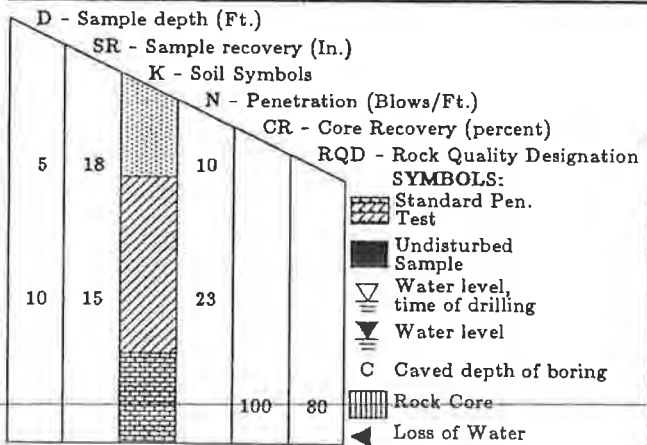


STRATUM ELEV. DEPTH	VISUAL SOIL DESCRIPTION	D	SR	K	N	CR	RQD	REMARKS
0.0								
0.3	Crushed Limestone Gravel							Surface Materials: Crushed Limestone Gravel
	Stiff to very stiff, red FAT CLAY, CH, with chert (FILL)	2.5	8		20			
		4.5	12		18			
		7.0	14		13			
		9.5	12		9			
		14.5	6		11			Drilled by: B. Grissom J. Thomas Drilling Method: HSA Logged by ALF/MLB
		19.5	8		16			
		24.5	18		21			▽ Water level - 22.4 feet at 3:49 PM, 12/17/91
27.0	Stiff, gray LEAN CLAY, CL, with fine organics (ALLUVIUM)							
		29.5	18		11			
32.0	Stiff, gray and tan, FAT CLAY, CH (RESIDUAL)							Piezometer - Set 40.5 feet of one-inch PVC pipe; hand-slotted lower 20 feet
		34.5	14		16			
37.0	Stiff, tan and brown FAT CLAY, CH, moist (RESIDUAL)							
		39.5	18		11			
40.0	BORING TERMINATED AT 40.0 FEET							



TEST BORING RECORD	
BORING NUMBER B-2	
DATE DRILLED	December 10, 1991
PROJECT NUMBER	417.91199.05
PROJECT	TVA Cumberland Ash Pond
PAGE 1 OF 1	
 LAW ENGINEERING	

STRATUM ELEV. DEPTH	VISUAL SOIL DESCRIPTION	D	SR	K	N	CR	RQD	REMARKS
0.0								
0.3	Crushed limestone gravel Firm to very stiff, red, FAT CLAY, CH, with chert (FILL)	2.5	9		19			Surface Materials: Crushed Limestone Gravel
		4.5	13		7			
		7.5	18		14			
		9.5	12		11			
		14.5	15		10			Drilled by: B. Grissom J. Thomas Drilling Method: HSA Logged by: MLB
17.0	Stiff, tan and gray, SILTY CLAY, with trace of chert and limestone gravel (FILL)	19.5	18		11			
24.5	Firm, tan and brown, FAT CLAY, CH (RESIDUUM)	24.5	13		8			
27.0	AUGER/SAMPLER REFUSAL AT 27.0 FEET; BORING TERMINATED	27.0	1		*			*50/0",-,- Borehole dry at 3:42 p.m., 12/17/91 Piezometer - Set 27.3 feet of one-inch PVC pipe; hand- slotted lower 10 feet



TEST BORING RECORD	
BORING NUMBER B-3	
DATE DRILLED	December 11, 1991
PROJECT NUMBER	417.91199.05
PROJECT	TVA Cumberland Ash Pond
PAGE 1 OF 1	
LAW ENGINEERING	

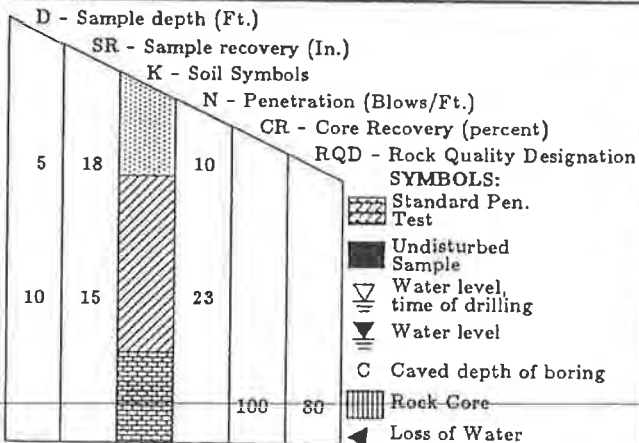
STRATUM
ELEV. DEPTH

VISUAL SOIL DESCRIPTION

D SR K N CR RQD

REMARKS

STRATUM ELEV. DEPTH	VISUAL SOIL DESCRIPTION	D	SR	K	N	CR	RQD	REMARKS
0.0								
0.5	Crushed limestone gravel							Surface Materials: Crushed Limestone Gravel
	Stiff to very stiff, red to reddish-brown, FAT CLAY, CH, with chert (FILL)	2.5	12		14			
	Moist samples at 8.5 to 10.0 feet and 13.5 to 15.0 feet	4.5	13		10			
		7.5	12		12			
	Firm sample at 13.5 to 15.0 feet	9.5	12		10			Drilled by: B. Grissom J. Thomas Drilling Method: HSA Logged by: MLB
		14.5	10		7			
		16.5	13					
18.5	Very stiff, tan and gray, SILTY CLAY, CL-ML, with trace of chert and limestone (FILL)	18.5	14		22			
		20.0	7		32			
		22.0	16		41			
		24.0	10		39			Water level - 24.3 feet at 3:35 p.m., 12/17/91
	Limestone content increased with depth	29.5	0		20			
32.0	Stiff, tan and brown FAT CLAY, CH, with oxide nodules, and a trace of chert and limestone (FILL)	34.0	14		12			
36.0	Stiff, gray SILTY CLAY, CL-ML (ALLUVIUM)							
		39.5	18		11			Piezometer - Set 45.4 feet of one-inch PVC pipe; hand-slotted lower 20 feet
42.0	Very stiff, tan and gray, FAT CLAY, CH, with oxide nodules (RESIDUUM)	44.5	18		26			
45.0	REFUSAL NOT ENCOUNTERED; BORING TERMINATED AT 45.0 FEET							



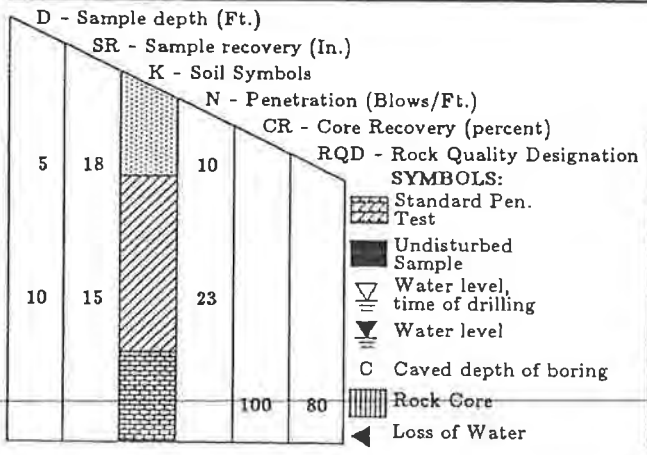
TEST BORING RECORD

BORING NUMBER B-4
 DATE DRILLED December 11, 1991
 PROJECT NUMBER 417.91199.05
 PROJECT TVA Cumberland Ash Pond
 PAGE 1 OF 1

LAW ENGINEERING

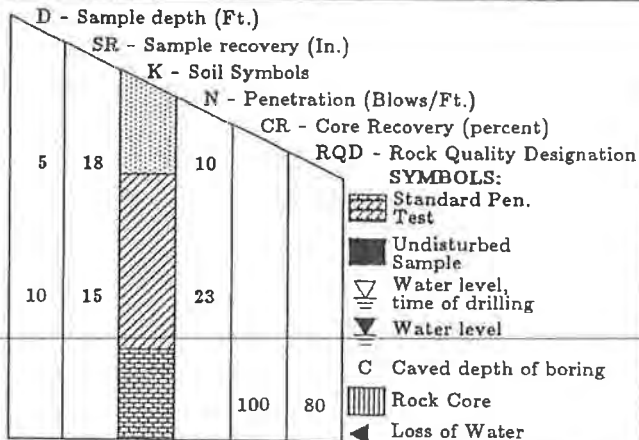
STRATUM ELEV. DEPTH	VISUAL SOIL DESCRIPTION	D	SR	K	N	CR	RQD	REMARKS
0.0								
0.5	Crushed limestone gravel							Surface Materials: Crushed Limestone Gravel
	Firm to very stiff, red FAT CLAY, CH, with chert (FILL)	2.5	10				12	
	Trace of cinders in first sample							
	Limestone pieces in sample at 8.5 to 10.0 feet	4.5	18				12	
		7.5	7				7	
		9.5	8				7	
		12.0	8					Drilled by: B. Grissom J. Thomas Drilling Method: HSA Logged by: MLB
		14.0	7				12	
		19.5	8				17	
22.0	Firm, red FAT CLAY, CH, and tan LEAN CLAY, CL, with chert and limestone fragments (FILL)	24.5	6				8	Water level - 24.8 feet at 3:29 p.m., 12/17/91
27.0	Firm, reddish-brown and tan, LEAN CLAY, CL, with chert and limestone fragments (FILL)	29.5	12				5	
33.5								
34.5	Very stiff, gray, SILTY CLAY, CL-ML, with trace organic material. Limestone fragments in upper portion of sample (ALLUVIUM)	34.5	15				23	Piezometer - Set 39.6 feet of one-inch PVC pipe; hand-slotted lower 20 feet
	Firm to stiff, tan and gray LEAN CLAY, CL (ALLUVIUM). Limestone fragments at bottom of sample.							
39.3	SAMPLER REFUSAL AT 39.3 FEET; BORING TERMINATED	39.0	10				*	*6.50/4",-

Boring drilled over two-day period 12/11/91 to 12/12/91



TEST BORING RECORD	
BORING NUMBER	B-5
DATE DRILLED	December 11, 1991
PROJECT NUMBER	417.91199.05
PROJECT	TVA Cumberland Ash Pond
PAGE 1 OF 1	
LAW ENGINEERING	

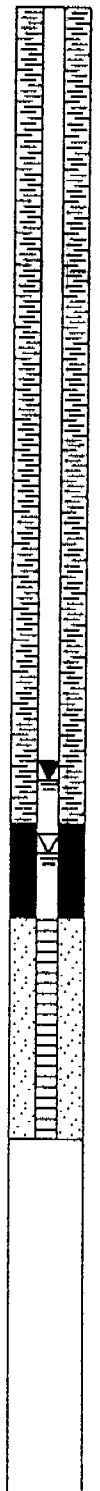
STRATUM ELEV. DEPTH	VISUAL SOIL DESCRIPTION	D	SR	K	N	CR	RQD	REMARKS
0.0								
0.5	Crushed limestone gravel							Surface Materials: Crushed Limestone Gravel
	Stiff to very stiff, red FAT CLAY, CH, with chert and trace zones of tan LEAN CLAY (FILL)	2.5	15		11			
		4.5	15		12			
		7.5	18		14			
		9.5	18		20			
		14.5	15		17			Drilled by: B. Grissom J. Thomas Drilling Method: HSA Logged by: MLB
16.0	Dense, LIMESTONE FRAGMENTS, with brown, LEAN CLAY to FAT CLAY, CL/CH, and trace of red FAT CLAY, CH (FILL). Sample over 50 percent limestone fragments.	18.5	14		49			
23.5	BORING TERMINATED AT 23.5 FEET*	23.0	12		45			Water level - 22.6 feet at 3:19 p.m, 12/17/91
	*Augered with difficult drilling to 23.5 feet. Inserted sampler and drilling rods in hole to attempt a sample; rods could not be maintained in a vertical position due to rock in hole.							Piezometer - Set 23.5 feet of one-inch PVC pipe; hand-slotted lower 10 feet



TEST BORING RECORD	
BORING NUMBER	B-6
DATE DRILLED	December 12, 1991
PROJECT NUMBER	417.91199.05
PROJECT	TVA Cumberland Ash Pond
PAGE 1 OF 1	
LAW ENGINEERING	

IDL 811020086

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT										
			0	10	20	30	40	60	80	100			
0.0	FILL - STIFF TO VERY STIFF RED SANDY CLAY WITH CHERT FRAGMENTS (DAMP AT 10.0 FEET)	387.8											
		382.8											
		377.8											
		372.8											
		367.8											
22.5	FIRM TO STIFF TAN SANDY CLAY WITH CHERT FRAGMENTS - RESIDUAL UNDISTURBED SAMPLE ATTEMPTED FROM 26.5 TO 28 FEET (NO RECOVERY)	362.8											
		357.8											
32.0	AUGER REFUSAL												
		352.8											



REMARKS:
 INSTALLED TWO INCH DIAMETER PVC TYPE II PIEZOMETER. STABILIZED GROUNDWATER MEASURED AT 20.85 FEET ON MAY 1, 1992.

SOIL TEST BORING RECORD	
BORING NUMBER	B-101
DATE DRILLED	April 9, 1992
PROJECT NUMBER	57401442.04
PROJECT	TVA - CUMBERLAND
PAGE 1 OF 1	
▲ LAW ENGINEERING	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

DEPTH
(FT.)

DESCRIPTION

ELEVATION
(FT.)

● PENETRATION - BLOWS/FOOT

0.0

394.9 0

10 20 30 40 60 80 100

BOTTOM ASH, VERY DENSE CINDERS AND
SLAG

389.9

384.9

379.9

374.9

369.9

30.1

30.3

BROWN CLAY LENSE

BOTTOM ASH - LOOSE TO FIRM CINDERS
AND SLAG

364.9

359.9

REMARKS:

SOIL TEST BORING RECORD

BORING NUMBER B-102
DATE DRILLED April 23, 1992
PROJECT NUMBER 57401442.04
PROJECT TVA - CUMBERLAND
PAGE 1 OF 2

SEE KEY SHEET FOR EXPLANATION OF
SYMBOLS AND ABBREVIATIONS USED ABOVE

▲ LAW ENGINEERING

DEPTH
(FT.)

DESCRIPTION

ELEVATION
(FT.)

● PENETRATION - BLOWS/FOOT

0 10 20 30 40 60 80 100

47.0

STIFF DARK GRAY SLIGHTLY SANDY SILTY
CLAY - ALLUVIUM
UNDISTURBED SAMPLES ATTEMPTED FROM
50.5 TO 53.5 FEET AND FROM 55.0 TO 57.0
FEET (NO RECOVERY)

349.9

344.9

339.9

57.0

BORING TERMINATED

334.9

329.9

324.9

319.9

REMARKS:

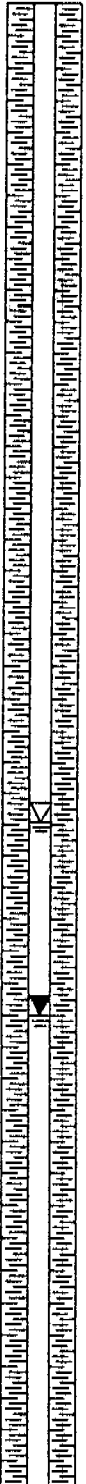
SOIL TEST BORING RECORD

BORING NUMBER B-102
DATE DRILLED April 23, 1992
PROJECT NUMBER 57401442.04
PROJECT TVA - CUMBERLAND
PAGE 2 OF 2

SEE KEY SHEET FOR EXPLANATION OF
SYMBOLS AND ABBREVIATIONS USED ABOVE

▲ LAW ENGINEERING

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT									
			0	10	20	30	40	60	80	100		
0.0	STIFF TO VERY STIFF RED SANDY CLAY WITH CHERT FRAGMENTS - FILL	394.4										
		389.4			●							
	STIFF BROWN SLIGHTLY SANDY CLAY WITH CHERT FRAGMENTS - FILL	384.4			●							
14.0		379.4			●							
19.0	FIRM GRAY AND BROWN SLIGHTLY CLAYEY SAND WITH CRUSHED STONE - FILL	374.4					●					
24.0	VERY STIFF RED AND BROWN SLIGHTLY SANDY CLAY WITH CHERT AND LIMESTONE FRAGMENTS - FILL UNDISTURBED SAMPLE OBTAINED FROM 29.0 TO 31.0 FEET	369.4			●							
		364.4						●				
	AUGER REFUSAL AT 37.0 FEET ROCK TYPE - RED AND WHITE ARGILLACEOUS LIMESTONE, PROBABLE DIXON FORMATION, HIGHLY	359.4						●				
37.0												



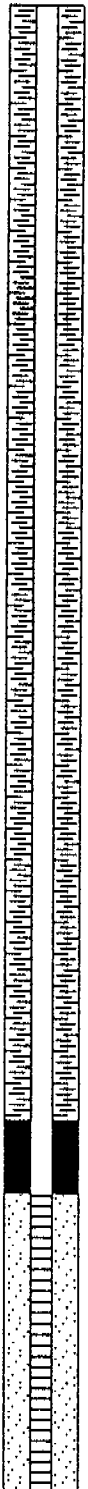
REMARKS:

INSTALLED TWO INCH DIAMETER PVC TYPE II PIEZOMETER, STABILIZED GROUNDWATER MEASURED AT 27.3 FEET ON MAY 1, 1992.

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

SOIL TEST BORING RECORD	
BORING NUMBER	B-103
DATE DRILLED	April 7, 1992
PROJECT NUMBER	57401442.04
PROJECT	TVA - CUMBERLAND
PAGE 1 OF 3	
▲ LAW ENGINEERING	

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	● PENETRATION - BLOWS/FOOT																	
			0	10	20	30	40	60	80	100										
45.0	WEATHERED/SOLUTIONED CORE RUN #1 - FROM 37.0' TO 42.0' CAVITIES FROM 40.0 TO 45.5' PARTIALLY MUD FILLED REC. = 30.4% ROD. = 7.1% SET NW CASING TO 45.0 FEET	349.4																		
52.0	CORE RUN #2 - FROM 45.5' TO 52.5' CAVITIES FROM 55.5' TO 63.5' PARTIALLY MUD FILLED WITH SOME ORGANIC FIBERS	344.4																		
62.0	CORE RUN #3 - FROM 52.5' TO 62.5' CAVITIES FROM 55.5' TO 63.5' PARTIALLY MUD FILLED WITH SOME ORGANIC FIBERS REC. = 35% ROD. = 35%	339.4																		
68.5	CORE RUN #4 - FROM 62.5' TO 68.5' INTERMITTENT THIN ROCK LENSES AND MUD FROM 62.5' TO 68.5' REC. = 8.3% ROD. = 0%	329.4																		
	BEGIN SOIL TEST BORING AT 68.5 FEET	324.4																		
		319.4																		



REMARKS:
 INSTALLED TWO INCH DIAMETER PVC
 TYPE II PIEZOMETER, STABILIZED
 GROUNDWATER MEASURED AT 27.3 FEET
 ON MAY 1, 1992.

SOIL TEST BORING RECORD	
BORING NUMBER	B-103
DATE DRILLED	April 7, 1992
PROJECT NUMBER	57401442.04
PROJECT	TVA - CUMBERLAND
PAGE 2 OF 3	
▲ LAW ENGINEERING	

SEE KEY SHEET FOR EXPLANATION OF
 SYMBOLS AND ABBREVIATIONS USED ABOVE

DEPTH
(FT.)

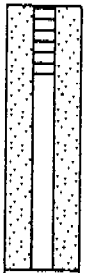
DESCRIPTION

ELEVATION
(FT.)

● PENETRATION - BLOWS/FOOT

0 10 20 30 40 60 80 100

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	0	10	20	30	40	60	80	100
85.0	WASH BORING - 68.5' TO 85.0' VERY STIFF TAN AND RED CLAY WITH CHERT AND LIMESTONE FRAGMENTS - RESIDUAL				●					
87.0	STIFF WHITE TO LIGHT GRAY CLAY - RESIDUAL	309.4		●						
	BORING TERMINATED AT 87.0 FEET	304.4								
		299.4								
		294.4								
		289.4								
		284.4								
		279.4								



REMARKS:

INSTALLED TWO INCH DIAMETER PVC
TYPE II PIEZOMETER, STABILIZED
GROUNDWATER MEASURED AT 27.3 FEET
ON MAY 1, 1992.

SOIL TEST BORING RECORD

BORING NUMBER B-103
DATE DRILLED April 7, 1992
PROJECT NUMBER 57401442.04
PROJECT TVA - CUMBERLAND
PAGE 3 OF 3

SEE KEY SHEET FOR EXPLANATION OF
SYMBOLS AND ABBREVIATIONS USED ABOVE

 **LAW ENGINEERING**

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-18
CLIENT: CUMBERLAND STEAM PLANT	START: 04-14-93	SPOON SIZE: 2" OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-14-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 382.3 FT.	G.W. DEPTH/EL.: NA*
DRILL RIG: CME, MODEL M-75	N. COOR.: 7,992.4 FT.	G.W. DATE: NA*
GEOLOGIST: R.D. BECKER	E. COOR.: 7,686.4 FT.	

ELEV (FT.)	DEPTH (FT.)	SAMPLE TYPE No.	PENETRATION RESIST			RECOVERY (%)			COLUMN SYMBOL	SOIL/ROCK DESCRIPTION	
			BLOWS/6 in.	N	TSF	R	RQD	VOID		SAMPLE	SEQUENCE
	5.00	S-SP 1	4-14-11-12	25		16"					
										Black, medium dense BOTTOM ASH, sandy- gravel-size (Interior Dike Material)	
	10.00	S-SP 2	6-6-4-3	10		14"					
	15.00	S-SP 3	4-3-1-3	4		16"				Lower Half: FLY ASH, f.-m. sand-size with silt-size grains	
										15.0	
	20.00	S-SP 4	1-1-1-1	2		24"				FLY ASH, silty, very soft	
										Gray, very soft FLY ASH, f.-m. sand-size to silt-size (Pond- Settled Material)	
	25.00	S-SP 5	1-1-2-4	3		13"				Lower Half: Br. & gr. SILTY CLAY to CLAYEY SILT moist to wet, soft to med. stiff, trace round pebbles	
										25.0	

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 6-1/2" D. flights) which were advanced through and between the sampled intervals.
 * Pond level at the time of the drilling was at El. 385.5 FT.

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-18
CLIENT: CUMBERLAND STEAM PLANT	START: 04-14-93	SPOON SIZE: 2" OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-14-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 382.3 FT.	G.W. DEPTH/EL.: NA*
DRILL RIG: CME, MODEL M-75	N. COOR.: 7,992.4 FT.	G.W. DATE: NA*
GEOLOGIST: R.D. BECKER	E. COOR.: 7,686.4 FT.	

ELEV. DEPTH (FT.)	SAMPLE TYPE No.	PENETRATION RESIST.			RECOVERY (%)			COLUMN SYMBOL	SOIL/ROCK DESCRIPTION		
		BLOWS/6 in.	N	TSP	R	RQD	VOID		SAMPLE	SEQUENCE	
	S-SP 5	1-1-2-4	3		13"				See Previous Sheet	Brown and gray, stiff to very stiff SILTY CLAY (Colluvial Deposit)	
30.00	S-SP 8	8-8-9-11	17		4.5"				Light to dark brown SILTY CLAY, stiff, moist, black stained		
35.00	S-SP 7	8-8-8-12	18		12"				Light to dark brown SILTY CLAY, stiff, moist, black stained		
40.00	S-SP 8	10-7-7-10	14		7"				Br. & gray CLAY, trace silt, moist, with roots & organic material		
42.5											
45.00	S-SP 9	4-3-4-4	7		24"				Red & olive SILTY CLAY, stiff plastic, predominantly red, residual soil		Red & olive, medium stiff SILTY CLAY, trace sand & pebbles to some rock fragments at or near the contact with bedrock (Residual Soil)
50.00	S-SP 10	30-50/2'	80/8"		7"				RED SILTY CLAY		

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 6-1/2" D. flights) which were advanced through and between the sampled intervals.
 * Pond level at the time of the drilling was at El. 385.5 FT.

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-18
CLIENT: CUMBERLAND STEAM PLANT	START: 04-14-93	SPOON SIZE: 2" OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-14-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 382.3 FT.	G.W. DEPTH/EL.: NA*
DRILL RIG: CME, MODEL M-75	N. COOR.: 7,992.4 FT.	G.W. DATE: NA*
GEOLOGIST: R.D. BECKER	E. COOR.: 7,686.4 FT.	

ELEV/DEPTH (FT.)	SAMPLE TYPE No.	PENETRATION RESIST		RECOVERY (%)		COLUMN SYMBOL	SOIL/ROCK DESCRIPTION		
		BLOWS/6 in.	N	TSF	R		RQD	VOID	SAMPLE
								Auger brought red shaley limestone fragments	T.O.R. (SHALEY LIMESTONE)
		REFUSAL OF AUGER							51.0 End of Boring
55.00									
60.00									
65.00									
70.00									
75.00									

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 6-1/2" D. flights) which were advanced through and between the sampled intervals.
 * Pond level at the time of the drilling was at El. 385.5 FT.

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-19
CLIENT: CUMBERLAND STEAM PLANT	START: 04-09-93	SPOON SIZE: 2" OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-09-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 382.8 FT.	G.W. DEPTH/EL.: 7.5/375.3 FT
DRILL RIG: CME, MODEL M-75	N. COOR.: 9,188.6 FT.	G.W. DATE: 04-12-93
GEOLOGIST: N.S. DRAKULICH	E. COOR.: 9,091.9 FT.	

ELEV. (FT.)	DEPTH (FT.)	SAMPLE TYPE No.	PENETRATION		RESISTANCE		RECOVERY (%)		COLUMN SYMBOL	SOIL/ROCK DESCRIPTION	
			BLOWS/6 in.	N	TSF	R	RQD	VOID		SAMPLE	SEQUENCE
	5.00									A recent, leveled SPOIL PILE. Auger brought up material - a mixture of CRUSHED STONE & SILTY CLAY	Gray loose CRUSHED STONE and brownish yellow soft SILTY CLAY FILL (Surficial Fill)
	10.00									Older FILL. Auger brought material - red silty CLAY FILL, occasional pebbles	Red, medium stiff SILTY CLAY FILL, occasional pebbles (Compacted Structural Fill - Exterior Dike)
		S-SP 1	4-2-3-6	5		23"				Top 6": Red GRAVELLY SILTY CLAY FILL Mid 12": Gr. CLAYEY SILT FILL, Bott 5": Br. & gray SILTY CLAY trace pebbles	Br. & gr. medium stiff SILTY CLAY, trace pebbles (Residual Soil)
	15.00									Brown (slightly greenish in places), SILT trace sand, with angle joints preserved (SAPROLITE)	
	20.00	S-SP 2	6-13-12-12	25		17"					Brown very stiff to hard SILT, completely decomposed calcareous siltstone (Saprolite)
		S-SP 3	15-16-23-50/1"	39		16"				Brown SILT to CLAYEY SILT (SAPROLITE). Water in hole	
	25.00	S-SP -	50/0"	50/0"		0				High resistance to augering started at 24.0'	

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 6-1/2" D. flights) which were advanced through and between the sampled intervals, whereas rock was cored.

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-19
CLIENT: CUMBERLAND STEAM PLANT	START: 04-09-93	SPOON SIZE: 2" OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-09-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 382.8 FT.	G.W. DEPTH/EL.: 7.5/375.3 FT
DRILL RIG: CME, MODEL M-75	N. COOR.: 9,188.6 FT.	G.W. DATE: 04-12-93
GEOLOGIST: N.S. DRAKULICH	E. COOR.: 9,091.9 FT.	

ELEV (FT.)	DEPTH	SAMPLE TYPE No.	PENETRATION RESIST			RECOVERY (%)			COLUMN SYMBOL	SOIL/ROCK DESCRIPTION	
			BLOWS/6 in.	N	TSF	R	RQ	VOID		SAMPLE	SEQUENCE
30.00		S-SF 4	50/5"	50/5"	5"				Dark Brown SILT (SAPROLITE)	Brown very stiff to hard SILT, completely decomposed calcareous siltstone (Saprolite)	
			AUGER REFUSAL								
35.00		Run 1				36"	12"		Top 18": Gr. to brownish gray CALCILUTITE: One piece 6", the rest 2"-3" Bott 18": Dk. bluish gray, vertically bedded, highly decomposed CALCAREOUS SILTSTONE	Gray, vertically interbedded fresh & sound CALCILUTITE and highly decomposed CALCAREOUS SILTSTONE (Bedrock)	
										37.5 End of Boring	
40.00											
45.00											
50.00											

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 6-1/2" D. flights) which were advanced through and between the sampled intervals, whereas rock was cored.

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-20
CLIENT: CUMBERLAND STEAM PLANT	START: 04-13-93	SPOON SIZE: 2' OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-13-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 383.3 FT.	G.W. DEPTH/EL.: NA*
DRILL RIG: CME, MODEL M-75	N. COOR.: 8,246.3 FT.	G.W. DATE: NA*
GEOLOGIST: N.S. DRAKULICH	E. COOR.: 7,983.2 FT.	

ELEV (FT.)	DEPTH (FT.)	SAMPLE TYPE No.	PENETRATION BLOWS/6 in.	RESIST N	RECOVERY (%) TSF R	COLUMN SYMBOL	SOIL/ROCK DESCRIPTION	
							SAMPLE	SEQUENCE
	5.00	S-SP 1	7-9-9-7	18	14"	[Soil Column Diagram]	BOTTOM ASH	Black, medium dense BOTTOM ASH, sandy- gravel-size (Interior Dike Material)
	10.00	S-SP 2	5-5-5-7	10	17"		BOTTOM ASH	
	15.00	S-SP 3	6-8-5-4	11	16"		BOTTOM ASH	
								18.0
	20.00	S-SP 4	6-2-2-1	4	10.5"	BOTTOM ASH	Black, loose to very loose BOTTOM ASH, sandy-gravel- size (Interior Dike Material)	
	25.00	S-SP 5	3-8-6-5	**	24"	BOTTOM ASH		

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 6-1/2" D. (lights) which were advanced through and between the sampled intervals, whereas rock was cored. Drilling through bottom ash and sand & pebbles was assisted by maintaining water level in augers above the pond water level.

* Pond level at the time of drilling was at El. 385.5'

** Spoon was full before reaching 23.5'

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-20
CLIENT: CUMBERLAND STEAM PLANT	START: 04-13-93	SPOON SIZE: 2" OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-13-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 383.3 FT.	G.W. DEPTH/EL.: NA*
DRILL RIG: CME, MODEL M-75	N. COOR.: 8,246.3 FT.	G.W. DATE: NA*
GEOLOGIST: N.S. DRAKULICH	E. COOR.: 7,983.2 FT.	

ELEV/DEPTH (FT.)	SAMPLE TYPE No.	PENETRATION BLOWS/6 in.	RESIST			RECOVERY (%)			COLUMN SYMBOL	SOIL/ROCK DESCRIPTION	
			N	TSF	R	RQD	VOID	SAMPLE		SEQUENCE	
	S-SP 5	3-8-8-5	**			24"				BOTTOM ASH	
30.00											Black, loose to very loose BOTTOM ASH, sandy-gravel- size (Interior Dike Material)
	S-SP 6	1-1-1-1	2			24"				Top 6": BOTTOM ASH Bott 18": FLY ASH	30.0
35.00											Gray, very soft FLY ASH, silt-size (Pond-Settled Material)
	S-SP 7	1-1-1-1 (1/10"-1/8"-1/8")	2			24"				Top 18": FLY ASH Bott 6": Dark gray CLAYEY SILT	38.0
40.00	S-SP 8	1-1-1-1	2			24"				Dark gray organic CLAYEY SILT with roots, tree branches	
											Dark gray soft organic CLAYEY SILT (Lacustrine Deposit)
45.00	S-SP 9	1-2-4-7	6			24"				Top 15": Dk. gray organic CLAYEY SILT Mid 1": Dk. gray f-m SAND Bott 8": Brown silty CLAY, some dk. org. pigments	45.5
											Brown and gray stiff SILTY CLAY, trace roots and dark organic pigments (Colluvial Deposit)
50.00	S-ST 1	Pushed 24"	NA			24"				Bott: Gray & brown SILTY CLAY, trace roots, no sand & pebbles	

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 6-1/2" D. flights) which were advanced through and between the sampled intervals, whereas rock was cored. Drilling through bottom ash and sand & pebbles was assisted by maintaining water level in augers above the pond water level.

- * Pond level at the time of drilling was at El. 385.5'
- ** Spoon was full before reaching 23.5'

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-20
CLIENT: CUMBERLAND STEAM PLANT	START: 04-13-93	SPOON SIZE: 2" OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-13-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 383.3 FT.	G.W. DEPTH/EL.: NA*
DRILL RIG: CME, MODEL M-75	N. COOR.: 8,246.3 FT.	G.W. DATE: NA*
GEOLOGIST: N.S. DRAKULICH	E. COOR.: 7,983.2 FT.	

ELEV (FT.)	DEPTH (FT.)	SAMPLE TYPE No.	PENETRATION RESIST			RECOVERY (%)			COLUMN SYMBOL	SOIL/ROCK DESCRIPTION	
			BLOWS/6 in.	N	TSF	R	RQD	VOID		SAMPLE	SEQUENCE
		S-ST 1	Pushed 24"	NA		24"				Bott: Gray & brown SILTY CLAY, trace roots, no sand & pebbles	Brown and gray stiff SILTY CLAY, trace roots and dark organic pigments (Colluvial Deposit)
											53.0
	55.00	S-SP 10	WOR/12"- -2-8-5	0 8		24"				Top 6": Dk. gr. clayey SILT-silty CLAY Next 4": Dk. gr. f.-c. SAND, some clay Next 8": SAND & GRAVEL Next 4": Dk. gr. silty CLAY-clayey SILT Bott 4": Dk. gray gravelly silty CLAY CLAY to clayey GRAVEL	Dark gray thinly interbedded soft CLAYEY SILT and medium dense SAND & GRAVEL (Alluvial Deposits)
											58.0
	60.00	S-SP 11	5-10-8-8	18		8"				Gray gravelly f.-c. SAND, some silt; all grains are angular	
	65.00	S-SP 12	8-9-9-11	18		8"				Gray gravelly f.-c. SAND, some silt; most grains are angular, some are rounded	
											Gray, medium dense SAND and GRAVEL (Alluvial Deposits)
	70.00	S-SP 13	7-7-5-5	12		8"				Gray sandy (f.-c.) GRAVEL, some silt; most grains are angular	
	75.00	S-SP 14	12-7-5-6	12		2"				Gray f.-m. GRAVEL, some sand	

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 8-1/2" D. flights) which were advanced through and between the sampled intervals, whereas rock was cored. Drilling through bottom ash and sand & pebbles was assisted by maintaining water level in augers above the pond water level.

* Pond level at the time of drilling was at El. 385.5'

** Spoon was full before reaching 23.5'

JOB No.: 6314.009	PROJECT: DACP	BORING No.: D-20
CLIENT: CUMBERLAND STEAM PLANT	START: 04-13-93	SPOON SIZE: 2" OD, 2' LONG
LOCATION: CUMBERLAND CITY, TENN.	END: 04-13-93	CORE SIZE: NX
CONTRACTOR: PSI INC.	ELEVATION: 383.3 FT.	G.W. DEPTH/EL.: NA*
DRILL RIG: CME, MODEL M-75	N. COOR.: 8,246.3 FT.	G.W. DATE: NA*
GEOLOGIST: N.S. DRAKULICH	E. COOR.: 7,983.2 FT.	

ELEV/DEPTH (FT.)	SAMPLE TYPE No.	PENETRATION BLOWS/6 in.	RESIST. N	TSF	RECOVERY (%)		COLUMN SYMBOL	SOIL/ROCK DESCRIPTION	
					R	RQD/VOID		SAMPLE	SEQUENCE
	S-SP 14	12-7-5-6	12		2'			Gray f.-m. GRAVEL, some sand	
80.00									Gray, medium dense SAND and GRAVEL (Alluvial Deposits)
		Auger encountered a very high resistance at 82.5'							82.5 T.O.R.
85.00		AUGER REFUSAL							Rose coarse crystalline LIMESTONE (Bedrock)
	Run 1				12" 50%	12" 50%		Rose coarsely crystallized LIMESTONE	87.0 End of Boring
90.00									
95.00									
100.00									

NOTES: Borehole was drilled in soil by plugged hollow-stem augers (3-1/4" ID, 6-1/2" D. flights) which were advanced through and between the sampled intervals, whereas rock was cored. Drilling through bottom ash and sand & pebbles was assisted by maintaining water level in augers above the pond water level.

* Pond level at the time of drilling was at El. 385.5'

** Spoon was full before reaching 23.5'



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-47	Total Depth	40.5 ft
County	Stewart, TN	Surface Elevation	380.0 ft		
Project Type	HSA 4.25	Date Started	7/21/09	Completed	7/21/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	26.0 ft
Logged By	Anthony Aloti	Depth to Water	23.0 ft	Date/Time	7/21/09

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
380.0	0.0	Top of Hole							
		Lean Clay, with a trace gravel, gray to brown & red, moist, fill (CL)		SPT-1	0.0 - 1.5	1.5	3-3-3	20	
			SPT-2	1.5 - 3.0	1.5	6-6-7	15		
			SPT-3	3.0 - 4.5	1.3	8-9-11	17		
			SPT-4	4.5 - 6.0	0.3	4-5-5	18		
			SPT-5	6.0 - 7.5	1.3	1-3-6	19		
			SPT-6	7.5 - 9.0	1.3	4-5-5	21		
			SPT-7	9.0 - 10.5	1.5	2-3-3	23		
			SPT-8	10.5 - 12.0	1.3	2-3-4	29		
			SPT-9	12.0 - 13.5	1.3	2-2-3	28		
			SPT-10	13.5 - 15.0	1.3	1-1-4	24		
			SPT-11	15.0 - 16.5	1.2	1-1-2	25		
			SPT-12	16.5 - 18.0	1.3	1-3-5	21		
361.0	19.0		Lean Clay, with a trace gravel, gray & brown, moist to wet (CL)		SPT-13	18.0 - 19.5	1.3	2-1-2	26
		SPT-14		19.5 - 21.0	1.2	1-1-4	22		
		SPT-15		21.0 - 22.5	1.3	2-2-1	25		
		SPT-16		22.5 - 24.0	0.9	1-2-2	23		
		SPT-17		24.0 - 25.5	1.3	3-2-5	22		
		SPT-18		25.5 - 27.0	1.5	7-7-7	26		
		SPT-19		27.0 - 28.5	1.5	2-4-7	31		
		SPT-20		28.5 - 30.0	0.3	4-6-8	28		
		SPT-21		31.0 - 32.5	1.3	6-17-11	29		
		SPT-22		33.5 - 35.0	1.5	9-11-8	37		

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-47 Total Depth <u>40.5 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
339.5	40.5	Lean Clay, with a trace gravel, gray & brown, moist to wet (CL) <i>(Continued)</i>		SPT-23	36.0 - 37.5	1.5	2-3-2	33	Cobbles
				SPT-24	38.5 - 40.0	0.7	1-6-5	34	
				SPT-25	40.4 - 40.5	0.1	50+/-0.1	3	

Auger Refusal /
Bottom of Hole

Top of Rock = 40.5
Elevation (339.5)

STANTEC\FMSM_LEGACY_175539016-CUF.GPJ_FMSM_GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016		Location		Cumberland Fossil				
Project Name		Ash Ponds		Boring No.		B-48		Total Depth		55.0 ft
County		Stewart, TN		Surface Elevation		395.0 ft				
Project Type		HSA 4.25		Date Started		7/25/09		Completed		7/25/09
Supervisor		D. Rogers		Driller		Jerry Huntoon		Depth to Water		14.1 ft
Date/Time								Date/Time		7/25/09
Logged By		D. Chapman		Depth to Water		N/A		Date/Time		N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
395.0	0.0	Top of Hole							
394.4	0.6	Crushed stone (road bed)		SPT-1	0.0 - 1.5	1.0	13-5-5	12	
		Sandy Lean Clay, red brown, trace sand to fine gravel, moist, stiff to very stiff (CL/CH)		SPT-2	1.5 - 3.0	1.0	12-8-9	21	
			SPT-3	3.0 - 4.5	0.7	6-5-4	24		
			SPT-4	4.5 - 6.0	0.8	4-5-7	19		
			SPT-5	6.0 - 7.5	0.7	2-6-8	18		Organic matter at top of spoon
			SPT-6	7.5 - 9.0	0.1	5-6-6	16		Pushed a rock with spoon
			SPT-7	9.0 - 10.5	1.1	6-7-12	20		
			SPT-8	10.5 - 12.0	1.5	3-5-6	24		
			SPT-9	12.0 - 13.5	1.3	3-6-7	20		Spoon contains organic matter
			SPT-10	13.5 - 15.0	1.2	4-4-5	22		
			SPT-11	15.0 - 16.5	1.5	3-4-9	25		Mottles
			SPT-12	16.5 - 18.0	0.7	5-8-8	19		No organic matter, some fine gravel
377.0	18.0		Clayey Gravel With Sand, some silt, red brown to olive yellow, wet, loose to dense (GC)		SPT-13	18.0 - 19.5	0.1	3-6-8	22
		SPT-14		19.5 - 21.0	0.6	1-5-5	24		Alternately rough and smooth
		SPT-15		21.0 - 22.5	0.4	12-13-8	10		drilling below 18'
		SPT-16		22.5 - 24.0	0.5	6-17-15	23		
		SPT-17		24.0 - 25.5	0.7	21-28-14	18		
		SPT-18		25.5 - 27.0	0.3	4-5-7	22		Grinding on cobbles
		SPT-19		27.0 - 27.9	0.4	7-50+/0.4	18		
		SPT-20		28.5 - 28.8	0.0	50+/0.3	--		
		SPT-21		31.0 - 32.5	0.3	3-6-3	21		
		SPT-22		33.5 - 33.7	0.3	50+/0.2	35		
359.0	36.0								

STANTEC/FNSM_LEGACY_175539016-CLF-GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
347.0	48.0	Sand With Gravel, some silt and clay to silty clay, red brown to olive gray, moist to wet, medium dense (GC) <i>(Continued)</i>		SPT-23	36.0 - 37.5	1.0	5-8-10	25	Mottles	
				SPT-24	38.5 - 40.0	1.5	1-12-13	27		
				SPT-25	41.0 - 42.5	1.5	5-6-6	28		
				SPT-26	43.5 - 45.0	1.5	4-5-7	24		
				SPT-27	46.0 - 47.5	1.5	5-8-9	29		
				SPT-28	48.5 - 49.9	0.4	8-11-50+/-0.4	20		Grinding on cobbles
				SPT-29	51.0 - 52.5	1.0	5-7-7	27		2" diameter spoon/140# autohammer
340.0	55.0	Cobbles with sand and gravel		SPT-30	53.5 - 54.8	1.4	8-11-50+/-0.3	26	Crushed rock in tip of spoon	
			Auger Refusal / Bottom of Hole							Backfill Full depth with Cement
			Top of Rock = 54.8 Elevation (340.2)							-Bentonite Grout



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil	
Project Name	Ash Ponds	Boring No.	B-48 A	Total Depth 15.0 ft
County	Stewart, TN	Surface Elevation	395.0 ft	
Project Type	HSA 4.25	Date Started	8/7/09	Completed 8/7/09
Supervisor	D. Rogers	Driller	J. Felts	Depth to Water Dry Date/Time 8/7/09
Logged By	Z. Massey	Depth to Water	N/A	Date/Time N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
395.0	0.0	Top of Hole							
394.4	0.6	Crushed stone (road bed)							
		Sandy Lean Clay, red brown, trace sand to fine gravel, moist, stiff to very stiff (CL/CH)							
				BAG-1	5.0 - 15.0			--	
380.0	15.0								

No Refusal /
Bottom of Hole

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-49	Total Depth	64.1 ft
County	Stewart, TN	Surface Elevation	379.2 ft		
Project Type	HSA 4.25	Date Started	7/21/09	Completed	7/22/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	44.0 ft
Logged By	Anthony Aloti	Depth to Water	30.5 ft	Date/Time	7/22/09

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
379.2	0.0	Top of Hole							
		Lean Clay, red brown to brown, trace sand and gravel, moist, stiff to medium stiff (CL)		SPT-1	0.0 - 1.5	0.9	5-5-6	24	PZ installed, Screen 47-57 gravel block shoe
			SPT-2	1.5 - 3.0	0.9	4-5-5	28		
			SPT-3	3.0 - 4.5	1.0	5-7-7	22		
			SPT-4	4.5 - 6.0	0.7	5-4-4	20		
			SPT-5	6.0 - 7.5	0.3	3-6-6	20		
			SPT-6	7.5 - 9.0	1.4	3-4-5	23		
			SPT-7	9.0 - 10.5	1.3	3-5-5	22		
			SPT-8	10.5 - 12.0	1.2	3-5-5	27		
			SPT-9	12.0 - 13.5	1.0	2-3-3	27		
			SPT-10	13.5 - 15.0	1.2	2-3-3	24		
364.2	15.0	Lean Clay, gray, trace sand, moist, medium stiff to soft (CL)		SPT-11	15.0 - 16.5	1.5	2-2-3	31	Organic rich zone 20.0-21.2
			SPT-12	16.5 - 18.0	1.5	1-1-2	31		
			SPT-13	18.0 - 19.5	0.9	1-2-2	29		
359.5	19.7	Lean Clay, gray with brown mottles, trace sand and gravel, moist, soft, with cobble zones (CL)		SPT-14	19.5 - 21.0	1.1	2-1-1	31	cobble zone 23.2-25.0
			SPT-15	21.0 - 22.5	0.9	1-1-2	29		
			SPT-16	22.5 - 24.0	0.9	1-2-3	32		
			SPT-17	24.0 - 25.5	0.7	2-2-4	33		
			SPT-18	26.0 - 27.5	1.5	2-2-3	31		
			SPT-19	28.5 - 30.0	1.5	1-2-1	32		
			SPT-20	31.0 - 32.5	1.5	2-2-3	32		
			SPT-21	33.5 - 35.0	1.5	2-2-3	32		

STANTEC/FNSM_LEGACY_175539016-CLF-GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-49	Total Depth		64.1 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
333.2	46.0	Lean Clay, gray with brown mottles, trace sand and gravel, moist, soft, with cobble zones (CL) <i>(Continued)</i>		SPT-22	36.0 - 37.5	1.5	2-2-2	28	water encountered, rise to 30.5	
				SPT-23	38.5 - 40.0	1.5	2-1-2	32		
				SPT-24	41.0 - 42.5	1.5	1-1-1	25		
				SPT-25	43.5 - 45.0	0.9	0-1-1	27		
325.2	54.0	Silty Sand, grayish brown, wet, loose to medium dense, medium to fine grained (SM)		SPT-26	46.0 - 47.5	1.3	2-2-4	37		
				SPT-27	48.5 - 50.0	0.9	7-11-13	27		
				SPT-28	51.0 - 52.5	0.7	5-4-5	36		
317.7	61.5	Lean Clay, gray, wet, little sand and gravel, very stiff, some weathered rock fragments (CL)		SPT-29	53.5 - 55.0	1.5	5-7-5	28		
				SPT-30	56.0 - 57.5	1.5	5-8-21	26		
				SPT-31	58.5 - 60.0	1.3	8-11-19	21		
315.1	64.1	Weathered limestone		SPT-32	61.0 - 62.5	1.0	12-13-8	20	some weathered rock fragments	
				SPT-33	63.5 - 64.1	0.3	42-	11		
		Auger Refusal / Bottom of Hole				50+/-0.1				
		Top of Rock = 61.5 Elevation (317.7)								

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM_GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-50	Total Depth	38.0 ft
County	Stewart, TN	Surface Elevation	394.5 ft		
Project Type	HSA 4.25	Date Started	7/26/09	Completed	7/26/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	14.5 ft
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
394.5	0.0	Top of Hole							
393.9	0.6	Crushed stone (road bed)		SPT-1	0.0 - 1.5	1.0	3-5-6	17	
		Sandy Lean Clay, trace small gravel, red brown, moist, medium stiff to very stiff (CL)		SPT-2	1.5 - 3.0	0.8	8-7-11	15	
			SPT-3	3.0 - 4.5	1.5	8-5-15	24		
			SPT-4	4.5 - 6.0	1.3	5-7-4	22		
			SPT-5	6.0 - 7.5	1.0	2-3-4	24		
			SPT-6	7.5 - 9.0	0.5	3-3-5	24		
			SPT-7	9.0 - 10.5	1.5	2-5-4	25		
			SPT-8	10.5 - 12.0	1.6	5-4-6	20		
			SPT-9	12.0 - 13.5	1.0	5-6-8	21		
			SPT-10	13.5 - 15.0	0.9	2-8-9	23		
			SPT-11	15.0 - 16.5	0.8	2-3-6	22		
			SPT-12	16.5 - 18.0	0.3	5-6-10	20	Rock in tip of spoon	
375.0	19.5		SPT-13	18.0 - 19.5	0.7	3-7-9	19	Rocks in top of spoon	
		Clayey Gravel With Sand, very dark gray to olive brown, wet, loose to medium dense (GC)		SPT-14	19.5 - 21.0	0.0	4-9-21	20	Very dark gray
			SPT-15	21.0 - 22.5	0.7	12-9-8	9		
			SPT-16	22.5 - 24.0	0.3	3-5-5	20		
			SPT-17	24.0 - 25.5	0.5	6-12-8	21		
			SPT-18	25.5 - 27.0	0.7	3-3-3	31	Silty clay layer	
			SPT-19	27.0 - 28.5	0.8	2-3-3	28	26.5 - 28.5	
			SPT-20	28.5 - 30.0	0.3	2-2-4	40	Olive brown	
			SPT-21	31.0 - 32.5	0.9	1-1-12	39	Silty clay layer	
			SPT-22	33.5 - 35.0	0.0	5-8-12	--	31 - 33.5	
									Began grinding on cobbles

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ FNSM-GRAPHIC.LOG.GDT 1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-50 Total Depth <u>38.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
356.5	38.0	Auger Refusal / Bottom of Hole		SPT-23	36.0 - 37.3	0.0	2-3- 50+/-0.3	--	Auger refusal and bottom of boring. No piezometer installed. Grouted to ground surface.

STANTEC\FMSM_LEGACY_175539016-CUF.GPJ_FMSM_GRAPHIC.LOG.GDT 1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-50 A	Total Depth	91.0 ft
County	Stewart, TN	Surface Elevation	394.5 ft		
Project Type	HSA 4.25	Date Started	7/27/09	Completed	7/27/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	Dry
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
394.5	0.0	Top of Hole							
		Augered (Refer to STN-50)							Augered 0 - 33.5. For soil description, see log for B-50.
361.0	33.5	Cobbles and boulders interbedded with silty clay		SPT-1	33.5 - 35.0	0.7	3-3-3	33	
				SPT-2	36.0 - 36.0	0.0	50+0	--	Drilling through

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-50 A	Total Depth		91.0 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
346.0	48.5	Cobbles and boulders interbedded with silty clay (Continued)		SPT-3	43.5 - 45.0	0.2	15-21-24	--	cobbles Auger refusal at 37". Drilled with 4 1/8" rotary bit 0 - 42". Drilled with 4 1/4" inside diameter augers 42 - 43.5. 3" outside diameter spoon. Rock in tip.	
				SPT-4	46.0 - 47.3	0.4	14-34-50+/-0.3	20	Sand and gravel layer with some silt and clay 46 - 48.5	
		Lean Clay, red brown to very dark gray, moist to wet, soft to very stiff (CL)		SPT-5	48.5 - 50.0	0.9	3-7-7	32	Strong brown	
				SPT-6	51.0 - 52.5	1.1	6-2-3	36	Dark reddish brown	
				SPT-7	54.0 - 55.5	0.0	2-3-3	--		
				SPT-8	56.0 - 57.5	0.5	2-2-1	29	Olive	
				SPT-9	58.5 - 60.0	1.5	1-2-2	28	Dark olive	
				SPT-10	61.0 - 62.5	1.3	3-5-8	32	Layer of sand with little fine gravel 62 - 63	
				SPT-11	63.5 - 65.0	1.5	1-1-2	26		
				SPT-12	66.0 - 67.5	1.1	1-1-2	27	Very dark gray	
				SPT-13	68.5 - 70.0	1.3	1-1-1	29		
				SPT-14	71.0 - 72.5	1.2	16-21-18	32	Layer of sand with little fine gravel 72 - 73	
				SPT-15	73.5 - 75.0	0.8	9-16-20	19		
				SPT-16	76.0 - 77.5	0.8	2-1-3	34		

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-50 A	Total Depth	91.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
303.5	91.0	Lean Clay, red brown to very dark gray, moist to wet, soft to very stiff (CL) <i>(Continued)</i>		SPT-17	78.5 - 80.0	1.3	2-4-6	27	
				SPT-18	81.0 - 82.5	1.4	1-3-5	36	
				SPT-19	83.5 - 85.0	1.5	1-1-6	30	
				SPT-20	86.0 - 87.5	1.2	6-7-12	29	
				SPT-21	88.5 - 90.0	1.0	3-4-15	26	Sample contains some fine sand

Auger Refusal /
Bottom of Hole

Top of Rock = 91.0
Elevation (303.5)

Bottom of boring at auger refusal. Installed a Slope Inclinator to 85'.



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-50 B	Total Depth	39.0 ft
County	Stewart, TN	Surface Elevation	394.5 ft		
Project Type	HSA 4.25	Date Started	7/28/09	Completed	7/28/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	Dry
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
394.5	0.0	Top of Hole							
393.9	0.6	Crushed stone (road bed)							
		Sandy Lean Clay, trace small gravel, red brown, moist, medium stiff to very stiff (CL)							
				ST-1	8.0 - 10.0	0.0		--	Tube Crushed
				ST-2	15.0 - 17.0	1.5		--	
375.0	19.5	Clayey Gravel With Sand, very dark gray to olive brown, wet, loose to medium dense (GC)							
				ST-3	23.0 - 25.0	0.0		--	Tube Crushed
				ST-4	27.0 - 29.0	0.0		--	Tube Crushed
				ST-5	31.0 - 33.0	0.0		--	Tube Crushed

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-50 B Total Depth <u>39.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
356.5	38.0								
355.5	39.0	Cobbles (Augered)							

No Refusal /
Bottom of Hole

STANTEC\FMSM_LEGACY_175539016-CUF.GPJ_FMSM_GRAPHIC.LOG.GDT 1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-51	Total Depth	66.5 ft
County	Stewart, TN	Surface Elevation	378.8 ft		
Project Type	HSA 4.25	Date Started	7/22/09	Completed	7/22/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	49.5 ft
Logged By	Anthony Aloti	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
378.8	0.0	Top of Hole							
		Lean Clay, red brown to brown, trace sand and gravel, moist, stiff to medium stiff (CL)		SPT-1	0.0 - 1.5	1.3	4-5-7	20	
			SPT-2	1.5 - 3.0	1.3	7-8-8	12		
			SPT-3	3.0 - 4.5	0.9	6-7-11	20		
			SPT-4	4.5 - 6.0	1.3	8-16-11	19		
			SPT-5	6.0 - 7.5	1.5	4-4-5	20		
			SPT-6	7.5 - 9.0	1.4	4-5-11	17		
			SPT-7	9.0 - 10.5	1.5	2-5-7	19		
			SPT-8	10.5 - 12.0	1.5	2-2-4	21		
			SPT-9	12.0 - 13.5	1.5	2-3-5	20		
			SPT-10	13.5 - 15.0	1.3	4-3-5	20		
			SPT-11	15.0 - 16.5	1.3	2-3-5	19		
			SPT-12	16.5 - 18.0	1.5	3-6-8	20		
			SPT-13	18.0 - 19.5	1.3	3-4-4	20		
358.8	20.0	Lean Clay, brown with few gray mottles, trace sand and gravel, moist, medium stiff to very stiff (CL)		SPT-14	19.5 - 21.0	1.4	3-3-3	21	
			SPT-15	21.0 - 22.5	0.5	4-7-11	21		
			SPT-16	23.5 - 25.0	1.3	1-5-5	20		
		SPT-17	26.0 - 27.5	1.1	8-10-11	25			
349.8	29.0	Lean Clay, red brown to gray, some gravel, moist, stiff to medium stiff, some cobble zones (CL)		SPT-18	28.5 - 30.0	1.3	1-3-3	27	
			SPT-19	31.0 - 31.3	0.2	50+/0.3	24		
			SPT-20	33.5 - 35.0	1.5	14-5-4	27		

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-51	Total Depth		66.5 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
327.8	51.0	Lean Clay, red brown to gray, some gravel, moist, stiff to medium stiff, some cobble zones (CL) <i>(Continued)</i>		SPT-21	36.0 - 37.5	1.5	12-5-4	29		
				SPT-22	38.5 - 40.0	1.5	2-2-2	29		
				SPT-23	41.0 - 42.5	1.3	7-4-10	26		
				SPT-24	43.5 - 45.0	1.3	3-1-1	27		
				SPT-25	46.0 - 47.5	1.3	2-1-1	26		
				SPT-26	48.5 - 50.0	1.3	5-1-1	32		
314.6	64.2	Silty Sand, brown to grayish brown, wet, loose to medium dense, medium to fine grained, grading gravelly (SM)		SPT-27	51.0 - 52.5	0.4	4-3-2	26		
				SPT-28	53.5 - 55.0	1.1	3-12-13	25		
				SPT-29	56.0 - 57.5	1.5	12-11-13	21		
				SPT-30	58.5 - 60.0	1.3	8-10-13	22		
				SPT-31	61.0 - 62.5	0.9	6-16-20	19		
312.3	66.5	Shale, completely to highly weathered 64.2-66.0		SPT-32	63.5 - 65.0	1.4	15-12-10	20		
				SPT-33	66.0 - 66.4	0.3	50+/-0.4	15		
		<p style="margin: 0;">Auger Refusal / Bottom of Hole</p> <p style="margin: 0;">Top of Rock = 64.2 Elevation (314.6)</p>								

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ.FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-52	Total Depth	84.0 ft
County	Stewart, TN	Surface Elevation	394.9 ft		
Project Type	HSA 4.25	Date Started	7/28/09	Completed	7/29/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	Dry
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
394.9	0.0	Top of Hole							
394.4	0.5	Crushed stone		SPT-1	0.0 - 1.5	1.5	7-8-4	17	
		Sandy Lean Clay, little gravel, red-brown to brown, moist medium stiff to very stiff (CL)		SPT-2	1.5 - 3.0	0.5	5-3-3	23	
			SPT-3	3.0 - 4.5	0.9	3-5-6	27		
			SPT-4	4.5 - 6.0	1.3	3-7-3	23		
			SPT-5	6.0 - 7.5	1.0	1-3-4	21		
			SPT-6	7.5 - 9.0	0.9	2-2-2	22		
			SPT-7	9.0 - 10.5	1.0	7-9-9	27		
			SPT-8	10.5 - 12.0	1.1	3-6-4	21		
			SPT-9	12.0 - 13.5	0.9	3-2-10	24		
			SPT-10	13.5 - 15.0	0.8	2-4-5	20		
			SPT-11	15.0 - 16.5	1.0	2-2-4	23		
			SPT-12	16.5 - 18.0	0.9	2-5-7	16		
375.9	19.0				SPT-13	18.0 - 18.9	0.7	7-50+0.4	18
		Lean Clay, Silty clay, some to no sand and gravel, wet, soft to very stiff, brown to gray (CL)		SPT-14	19.5 - 21.0	0.8	9-24-31	8	Stone blocked spoon
			SPT-15	21.0 - 22.5	0.5	5-9-6	18		
			SPT-16	22.5 - 24.0	0.0	4-3-2	29		
			SPT-17	24.0 - 25.5	0.0	2-4-10	34		
			SPT-18	25.5 - 27.0	1.2	4-5-5	21		
			SPT-19	27.0 - 28.5	0.4	1-1-2	24		
			SPT-20	28.5 - 30.0	0.2	2-1-3	11		
			SPT-21	31.0 - 32.5	0.8	2-4-2	24		
			SPT-22	33.5 - 35.0	0.7	9-7-9	23		

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-52	Total Depth		84.0 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
		Lean Clay, Silty clay, some to no sand and gravel, wet, soft to very stiff, brown to gray (CL) <i>(Continued)</i>		SPT-23	36.0 - 37.5	0.1	1-3-10	14	no sand and gravel	
			SPT-24	38.5 - 40.0	0.4	7-16-12	20			
			SPT-25	41.0 - 42.5	1.0	5-4-6	29			
			SPT-26	43.5 - 45.0	0.9	3-5-7	26			
			SPT-27	46.0 - 47.5	1.2	2-3-6	25			
			SPT-28	48.5 - 50.0	1.5	3-4-5	25			
			SPT-29	51.0 - 52.5	1.3	1-2-2	27			
			SPT-30	53.5 - 55.0	1.5	1-1-2	28			
			SPT-31	56.0 - 57.5	1.3	3-3-3	29			
			SPT-32	58.5 - 60.0	1.4	2-1-1	28			
			SPT-33	61.0 - 62.5	1.3	1-1-1	27			
			SPT-34	63.5 - 65.0	0.4	1-2-2	36			
			SPT-35	66.0 - 67.5	1.0	10-12-11	27			
326.4	68.5		Gravel With Silt And Sand, poorly graded, some gravel and silt, wet, medium dense to dense (GP-GM)		SPT-36	68.5 - 70.0	0.6	7-8-9		26
				SPT-37	71.0 - 72.5	0.7	6-9-12	18		
		SPT-38		73.5 - 75.0	0.5	5-10-13	25			
		SPT-39		76.0 - 77.5	0.4	8-8-6	22			

STANTEC/FNSM_LEGACY_175539016-CUF-GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-52 Total Depth <u>84.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Gravel With Silt And Sand, poorly graded, some gravel and silt, wet, medium dense to dense (GP-GM) <i>(Continued)</i>		SPT-40	78.5 - 80.0	0.8	7-8-8	16	
				SPT-41	81.0 - 81.8	0.7	5-50+/0.3	15	
311.2	83.7			SPT-42	83.5 - 83.7	0.2	50+/0.2	11	
310.9	84.0	Limestone and shale fragments							
		Auger Refusal / Bottom of Hole							
		Top of Rock = 83.7 Elevation (311.2)							

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-52 A	Total Depth	10.0 ft
County	Stewart, TN	Surface Elevation	394.9 ft		
Project Type	HSA 4.25	Date Started	8/7/09	Completed	8/7/09
Supervisor	D. Rogers	Driller	J. Felts	Depth to Water	Dry
Logged By	Z. Massey	Depth to Water	N/A	Date/Time	8/7/09
		Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
394.9	0.0	Top of Hole							
394.4	0.5	Crushed stone							
		Sandy Lean Clay, little gravel, red-brown to brown, moist medium stiff to very stiff (CL)		BAG-1	5.0 - 10.0			--	
384.9	10.0								

No Refusal /
Bottom of Hole

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-53	Total Depth	27.0 ft
County	Stewart, TN	Surface Elevation	376.0 ft		
Project Type	HSA 4.25	Date Started	7/23/09	Completed	7/23/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	Dry
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
376.0	0.0	Top of Hole							
		Lean Clay, with trace sand to fine gravel, red brown to mottled light greenish gray and olive brown, moist, soft to very stiff (CL)		SPT-1	0.0 - 1.5	0.7	2-5-5	22	
			SPT-2	1.5 - 3.0	0.8	4-3-4	18		
			SPT-3	3.0 - 4.5	0.7	4-5-8	27		
			SPT-4	4.5 - 6.0	1.3	3-8-7	27		
			SPT-5	6.0 - 7.5	0.7	2-2-2	17		
			SPT-6	7.5 - 9.0	0.7	1-1-2	23		
			SPT-7	9.0 - 10.5	0.3	1-1-1	27		
			SPT-8	10.5 - 12.0	0.2	1-2-30	21		
			SPT-9	12.0 - 13.5	0.5	4-5-5	22		
			SPT-10	13.5 - 15.0	0.7	5-8-10	22		
			SPT-11	15.0 - 16.5	1.3	4-3-5	20		
			SPT-12	16.5 - 18.0	0.2	11-21-25	23		
			SPT-13	18.0 - 19.5	1.3	7-11-9	19		
			SPT-14	19.5 - 21.0	1.1	7-12-13	18		
			SPT-15	21.0 - 22.5	1.5	7-8-8	27		
			SPT-16	22.5 - 24.0	0.5	4-3-5	28		
			SPT-17	24.0 - 25.5	0.5	7-8-8	26		
349.0	27.0		SPT-18	26.0 - 26.0	0.0	50+/0	--		

Auger Refusal /
Bottom of Hole

Bottom of boring at 27' at auger refusal on a boulder. No piezometer was installed. The boring was grouted to ground surface. Moved 6' west and drilled B-53A.

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ_FNSM_GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-53 A	Total Depth	96.0 ft
County	Stewart, TN	Surface Elevation	376.0 ft		
Project Type	HSA 4.25	Date Started	7/23/09	Completed	7/24/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	12.0 ft
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
376.0	0.0	Top of Hole							
		Lean Clay, trace sand to fine gravel, red brown to mottled light greenish gray and olive brown, moist, soft to very stiff (CL)		ST-1	8.0 - 10.0	1.5		--	See log B-53 for descriptions of SPT samples from 0 - 27' below ground surface Shelby tube 8'-10'
				ST-2	22.5 - 24.5	0.0		--	Shelby tube attempted 22.5' - 24.5'. No recovery.
				ST-3	24.5 - 26.5	0.0		--	Shelby tube attempted 24.5' - 26.5'. No recovery.
				SPT-1	29.5 - 31.0	1.5	5-8-7	26	
				SPT-2	31.0 - 32.5	1.5	3-8-2	22	
				SPT-3	33.5 - 35.0	1.5	2-1-2	28	
345.0	31.0	Lean Clay, dark olive to dark gray, moist, soft to stiff (CL)							

STANTEC/FNSM_LEGACY_175539016-CLIF.GPJ FNSM-GRAPHIC.LOG.GDT 1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-53 A	Total Depth		96.0 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
		Silty Sand, Silty sand, some fine gravel, dark olive to olive yellow, wet, very loose to dense (SM) <i>(Continued)</i>		SPT-19	78.5 - 80.0	0.7	1-1-7	35		
				SPT-20	81.0 - 82.5	0.7	1-1-2	29		
				SPT-21	83.5 - 85.0	1.0	0-0-0	36		
				SPT-23	88.5 - 80.0	1.5		44		
				SPT-22	86.0 - 87.5	1.5	0-0-0	44		
				SPT-24	91.0 - 92.5	1.5	0-8-3	43		
				SPT-25	93.5 - 95.0	1.5	0-0-0	55		
280.0	96.0									
		Auger Refusal / Bottom of Hole							Bottom of boring at 96' at auger refusal on apparent limestone bedrock. Installed a piezometer screened from 55' - 65' below ground surface	
		Top of Rock = 96.0 Elevation (280.0)								

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM_GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-53 B	Total Depth	43.0 ft
County	Stewart, TN	Surface Elevation	376.0 ft		
Project Type	HSA 4.25	Date Started	7/24/09	Completed	7/24/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	Dry
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
376.0	0.0	Top of Hole							
		Lean Clay, trace sand to fine gravel, red brown to mottled light greenish gray and olive brown, moist, soft to very stiff (CL)							
345.0	31.0	Lean Clay, dark olive to dark gray, moist, soft to stiff (CL)							

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-53 B Total Depth <u>43.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
333.0	43.0	Lean Clay, dark olive to dark gray, moist, soft to stiff (CL) <i>(Continued)</i>							
		No Refusal / Bottom of Hole							Bottom of boring at 43'. No refusal. Installed a piezometer screened from 33' - 43' below ground surface.

STANTEC\FMSM_LEGACY_175539016-CUF.GPJ_FMSM_GRAPHIC.LOG.GDT 1/27/10

Project Number		175539016		Location		Cumberland Fossil				
Project Name		Ash Ponds		Boring No.		B-54		Total Depth		100.3 ft
County		Stewart, TN		Surface Elevation		395.0 ft				
Project Type		HSA 4.25		Date Started		7/26/09		Completed		7/27/09
Supervisor		D. Rogers		Driller		J. Felts		Depth to Water		30.0 ft
Logged By		James Felts		Date/Time		7/26/09		Depth to Water		14.0 ft
Date/Time		7/27/09								

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
395.0	0.0	Top of Hole							
394.1	0.9	Crushed stone		SPT-1	0.0 - 1.5	1.0	2-5-5	22	
		Fat Clay, dark red-brown, with sand and chert gravel, damp to moist, stiff (CH)		SPT-2	1.5 - 3.0	0.8	2-4-5	20	
			SPT-3	3.0 - 4.5	1.2	2-3-4	28		
			SPT-4	4.5 - 6.0	1.2	2-4-4	26		
			SPT-5	6.0 - 7.5	0.9	2-2-6	21		
			SPT-6	7.5 - 9.0	1.2	2-3-3	22		
			SPT-7	9.0 - 10.5	0.5	3-3-4	22		
			SPT-8	10.5 - 12.0	0.9	4-5-5	23		
			SPT-9	12.0 - 13.5	1.2	2-5-6	19		
			SPT-10	13.5 - 15.0	1.0	4-3-4	21		
			SPT-11	15.0 - 16.5	0.9	2-2-3	25		
377.0	18.0		SPT-12	16.5 - 18.0	1.4	9-10-13	24		
374.5	20.5		Lean Clay, Silty clay, brown with gray lenses, very stiff, damp, trace flyash 18-18.3 (CL)		SPT-13	18.0 - 19.5	1.2	3-10-14	14
		SPT-14	19.5 - 21.0	1.2	5-9-10	18			
		Lean Clay, Silty clay, brown-gray mottled, trace gravel, moist to wet, stiff to very stiff (CL)		SPT-15	21.0 - 22.5	1.3	4-6-9	19	
			SPT-16	22.5 - 24.0	1.2	1-5-8	18		
			SPT-17	24.0 - 25.5	1.3	4-9-12	16		
			SPT-18	25.5 - 27.0	0.1	5-6-8	13		
			SPT-19	27.0 - 28.5	1.3	3-5-7	18		
			SPT-20	28.5 - 30.0	1.3	3-6-9	21	Organics @ 29.0	
			SPT-21	30.0 - 31.5	0.9	2-5-8	20		
			SPT-22	31.5 - 33.0	1.5	2-2-3	23		
			SPT-23	33.0 - 34.5	1.4	0-2-4	22	Organics @ 33.0-34.5	
359.0	36.0		SPT-24	34.5 - 36.0	1.0	0-4-7	20		

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-54	Total Depth		100.3 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
		Lean Clay, dark gray, damp to wet, very stiff to very soft, zones of sand and gravel (CL) (Continued)		SPT-25	36.0 - 37.5	1.2	2-5-11	22		
			SPT-26	37.5 - 39.0	1.2	3-7-13	21			
			SPT-27	39.0 - 40.5	1.5	3-6-9	21			
			SPT-28	40.5 - 42.0	0.9	3-6-8	22			
			SPT-29	42.0 - 43.5	1.0	3-6-8	20			
			SPT-30	43.5 - 45.0	1.2	4-6-7	22			
			SPT-31	45.0 - 46.5	1.3	2-4-4	24			
			SPT-32	47.5 - 49.0	1.2	1-3-4	25			
			SPT-33	50.0 - 51.5	1.0	0-1-3	24			
			SPT-34	52.5 - 54.0	1.4	0-3-4	26			
			SPT-35	55.0 - 56.5	1.5	0-1-2	28			
			SPT-36	57.5 - 59.0	1.5	0-1-3	37			
			SPT-37	60.0 - 61.5	1.2	0-0-1	29			
			SPT-38	62.5 - 64.0	1.5	0-0-0	25			
		SPT-39	65.0 - 66.5	1.5	0-0-0	27				
327.0	68.0	Silty Gravel, with cobbles, gray, wet, medium dense (GM)		SPT-40	67.5 - 69.0	0.6	1-3-5	32		
			SPT-41	70.0 - 71.5	0.6	2-10-14	25			
322.5	72.5	Clayey Sand, with gravel, brown-gray, wet, dense (SC)		SPT-42	72.5 - 74.0	0.5	5-3-6	28		
			SPT-43	75.0 - 76.5	0.9	1-6-2	24			
317.5	77.5									

STANTEC/FNSM_LEGACY_175539016_CUF.GPJ_FNSM_GRAPHIC.LOG.GDT_1/27/10

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
312.5	82.5	Silty Gravel, with cobbles, gray, wet, medium dense (GM) (Continued)		SPT-44	77.5 - 79.0	0.8	10-14-10	19	Began Core
				SPT-45	80.0 - 81.5	0.7	7-9-14	16	
310.0	85.0	Lean Clay, gray, wet, medium stiff, trace sand (CL)		SPT-46	82.5 - 84.0	0.9	12-3-3	22	
304.9	90.1	Silty Sand With Gravel, coarse, wet, gray, dense (SM)		SPT-47	85.0 - 86.5	1.1	18-20-15	16	
				SPT-48	87.5 - 89.0	0.7	15-20-22	16	
				SPT-49	90.0 - 90.1	0.0	50+/0.1	--	
301.7	93.3	(rollered hard)							
294.7	100.3	Limestone(80%) with zone highly weathered shale(20%)							
		Limestone is hard, gray, fractured, water stained							
		Shale is highly weathered, fissile, brown, eroded		21	7.0	4.6	66	100.3	
Bottom of Hole									
Top of Rock = 90.1 Elevation (304.9)									

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-54 A	Total Depth	52.5 ft
County	Stewart, TN	Surface Elevation	395.0 ft		
Project Type	HSA 4.25	Date Started	7/28/09	Completed	7/29/09
Supervisor	D. Rogers	Driller	J. Felts	Depth to Water	Dry
Logged By	James Felts	Depth to Water	N/A	Date/Time	7/29/09
		Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
395.0	0.0	Top of Hole							
394.1	0.9	Crushed stone							
		Fat Clay, dark red-brown, with sand and chert gravel, damp to moist, stiff (CH)							
				ST-2	8.0 - 9.4	0.5		--	
377.0	18.0								
374.5	20.5	Lean Clay, Silty clay, brown with gray lenses, very stiff, damp, trace flyash 18-18.3 (CL)							
		Lean Clay, Silty clay, brown-gray mottled, trace gravel, moist to wet, stiff to very stiff (CL)							
				ST-3	22.0 - 24.0	1.4		--	
				ST-4	30.0 - 32.0	1.8		--	
359.0	36.0								

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT 1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. <u>B-54 A</u> Total Depth <u>52.5 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
342.5	52.5	Lean Clay, dark gray, damp to wet, very stiff to very soft, zones of sand and gravel (CL) <i>(Continued)</i>		ST-5	45.0 - 47.0	2.0		--	

No Refusal /
Bottom of Hole

STANTEC\FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-55	Total Depth	75.0 ft
County	Stewart, TN	Surface Elevation	379.5 ft		
Project Type	HSA 4.25	Date Started	7/24/09	Completed	7/25/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	18.0 ft
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core							RQD
379.5	0.0	Top of Hole								
372.0	7.5	Fat Clay, trace sand and fine gravel, red brown, moist, soft to stiff (CH)(FILL)		SPT-1	0.0 - 1.5	0.7	5-4-6	21	Trace brick	
				SPT-2	1.5 - 3.0	0.8	4-5-6	14		
				SPT-3	3.0 - 4.5	1.2	5-6-6	20		
				SPT-4	4.5 - 6.0	1.2	2-1-3	22		
				SPT-5	6.0 - 7.5	1.5	2-2-4	23		
358.5	21.0	Lean Clay With Sand, red brown, moist, medium stiff to very stiff (CL)		SPT-6	7.5 - 9.0	1.5	1-2-4	23	Trace roots and organics	
				SPT-7	9.0 - 10.5	1.5	2-3-3	20		
				SPT-8	10.5 - 12.0	1.5	2-3-2	22		
				SPT-9	12.0 - 13.5	1.5	4-6-8	24		
				SPT-10	13.5 - 15.0	1.3	2-24-19	21		
				SPT-11	15.0 - 16.5	0.7	6-16-5	20		Drilled through cobbles from 15' - 16'
				SPT-12	16.5 - 18.0	1.3	2-4-6	24		
				SPT-13	18.0 - 19.5	1.5	3-3-5	22		
				SPT-14	19.5 - 21.0	1.3	2-3-5	24		
					Clayey Gravel With Sand, little to some silt, olive brown to olive yellow, very loose to dense (GC)		SPT-15	21.0 - 22.5		1.0
	SPT-16	22.5 - 24.0				1.2	16-23-21	19		
	SPT-17	24.0 - 25.5				1.3	4-8-25	18		
	SPT-18	25.5 - 27.0				1.5	3-9-11	26		
	SPT-19	28.5 - 30.0				1.3	8-13-22	34		
	SPT-20	31.0 - 32.5				0.3	4-19-12	24	Olive yellow	
	SPT-21	33.5 - 35.0				1.3	29-21-7	23		

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-55	Total Depth		75.0 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
304.5	75.0	Clayey Gravel With Sand, little to some silt, olive brown to olive yellow, very loose to dense (GC) <i>(Continued)</i>		SPT-22	36.0 - 37.5	0.8	11-15-31	--	Silt-rich zone 43.5' - 47.5'	
				SPT-23	38.5 - 40.0	0.5	6-26-16	25		
				SPT-24	41.0 - 42.5	1.3	8-10-11	28		
				SPT-25	43.5 - 45.0	1.5	2-3-3	64		
				SPT-26	46.0 - 47.5	1.3	7-5-10	30		
				SPT-27	48.5 - 50.0	1.3	13-26-10	27		
				SPT-28	51.0 - 52.5	1.2	5-12-27	16		
				SPT-29	53.5 - 55.0	1.5	11-7-4	38		
				SPT-30	56.0 - 57.5	1.3	8-17-4	41		
				SPT-31	58.5 - 60.0	0.8	1-3-5	42		
				SPT-32	61.0 - 62.5	0.8	8-25-7	40		
				SPT-33	63.5 - 65.0	0.8	8-1-1	63		
				SPT-34	66.0 - 67.5	1.5	1-1-1	63		
				SPT-35	68.5 - 70.0	1.0	8-46-6	39		
				SPT-36	71.0 - 72.5	1.0	0-0-0	74		
				SPT-37	73.5 - 75.0	0.4	8-8-	37		
				SPT-38	75.0 - 75.1	0.1	50+/-0.5	22		
					Auger Refusal / Bottom of Hole					

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-56	Total Depth	76.2 ft
County	Stewart, TN	Surface Elevation	395.0 ft		
Project Type	HSA 4.25	Date Started	8/3/09	Completed	8/4/09
Supervisor	D. Rogers	Driller	J. Felts	Depth to Water	29.0 ft
Logged By	Z. Massey	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
395.0	0.0	Top of Hole							
		Fat Clay, red brown to brown, damp to moist, medium stiff to very stiff, with chert and other rock fragments (CH)		SPT-1	0.0 - 1.5	0.7	11-10-8	13	
			SPT-2	1.5 - 3.0	0.9	4-5-6	19		
			SPT-3	3.0 - 4.5	1.5	6-7-9	23		
			SPT-4	4.5 - 6.0	1.5	6-3-5	22		
			SPT-5	6.0 - 7.5	1.0	2-3-6	23		
			SPT-6	7.5 - 9.0	1.3	2-3-4	27		
			SPT-7	9.0 - 10.5	1.3	4-7-6	23		
			SPT-8	10.5 - 12.0	1.5	4-6-6	21		
			SPT-9	12.0 - 13.5	0.7	3-2-3	23		
			SPT-10	13.5 - 15.0	0.8	13-4-5	24		
			SPT-11	15.0 - 16.5	1.1	4-5-6	23		
			SPT-12	16.5 - 18.0	1.0	4-5-7	23		
			SPT-13	18.0 - 19.5	0.1	2-3-6	22		
			SPT-14	19.5 - 21.0	0.3	2-3-2	22		
			SPT-15	21.0 - 22.5	0.5	5-9-14	26		
371.2	23.8		SPT-16	22.5 - 24.0	1.5	5-8-14	18		
		Lean Clay, gray to brown, moist to wet, medium stiff to very stiff, mottled, with rock fragments, occasional organics (CL)		SPT-17	24.0 - 25.5	0.8	4-8-10	18	
			SPT-18	25.5 - 27.0	1.4	4-8-9	18		
			SPT-19	27.0 - 28.5	0.9	6-4-4	19		
			SPT-20	28.5 - 30.0	1.0	3-6-9	32		
			SPT-21	30.0 - 31.5	1.2	3-9-19	26		
			SPT-22	31.5 - 33.0	1.2	7-27-15	16		
361.0	34.0	SPT-23	33.0 - 34.5	1.3	14-6-45	41			
		Silty Gravel With Sand, tan to brown, wet, medium stiff to very stiff (GM)		SPT-24	34.5 - 36.0	1.2	6-2-20	47	

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
356.0	39.0	Lean Clay, red brown to brown, moist to wet, very soft to very stiff, with chert and other rock fragments (CL)		SPT-25	36.0 - 37.5	0.4	3-3-4	26	
				SPT-26	37.5 - 39.0	1.4	3-10-9	34	
				SPT-27	39.0 - 40.5	0.8	13-9-10	28	
				SPT-28	40.5 - 42.0	0.8	3-3-11	29	
				SPT-29	42.0 - 43.5	1.3	4-15-13	30	
				SPT-30	43.5 - 45.0	0.5	1-1-1	54	
				SPT-31	45.0 - 46.5	0.5	1-1-1	58	
				SPT-32	46.5 - 48.0	0.5	1-1-16	34	
				SPT-33	48.0 - 49.5	0.8	20-3-3	48	
				SPT-34	49.5 - 51.0	1.0	1-4-3	65	
				SPT-35	52.5 - 54.0	1.4	1-1-9	26	
				SPT-36	55.0 - 56.5	1.3	2-3-3	61	
				SPT-37	57.5 - 59.0	1.0	1-1-10	47	
				SPT-38	60.0 - 61.5	1.3	1-1-8	36	
				SPT-39	62.5 - 64.0	1.1	8-2-4	28	
				SPT-40	65.0 - 66.5	1.2	10-18-10	25	
				SPT-41	67.5 - 69.0	1.5	2-4-4	44	
				SPT-42	70.0 - 71.5	1.3	10-44-30	32	
				SPT-43	72.5 - 74.0	1.0	15-11-1	29	
319.6	75.4			SPT-44	75.0 - 75.7	0.4	2-50+0.2	4	
318.8	76.2	Augered Hard							
		Auger Refusal /							

STANTEC\FNSM\LEGACY_175539016-CUF.GPJ_FNSM\GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-56 A	Total Depth	10.0 ft
County	Stewart, TN	Surface Elevation	395.0 ft		
Project Type	HSA 4.25	Date Started	8/4/09	Completed	8/4/09
Supervisor	D. Rogers	Driller	J. Felts	Depth to Water	Dry
Logged By	Z. Massey	Depth to Water	N/A	Date/Time	8/4/09
		Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
395.0	0.0	Top of Hole							
		Fat Clay, red brown to brown, damp to moist, medium stiff to very stiff, with chert and other rock fragments (CH)							
			BAG-1	6.0 - 10.0				--	
385.0	10.0								

No Refusal /
Bottom of Hole

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-57	Total Depth	56.5 ft
County	Stewart, TN	Surface Elevation	381.5 ft		
Project Type	HSA 3.25	Date Started	8/5/09	Completed	8/5/09
Supervisor	D. Rogers	Driller	Mark Martin	Depth to Water	19.0 ft
Logged By	Z. Massey	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
381.5	0.0	Top of Hole							
381.0	0.5	Crushed stone		SPT-1	0.0 - 1.5	1.0	16-9-6	8	
		Lean Clay, with gravel, damp to moist, gray to brown, very stiff (CL) (FILL)		SPT-2	1.5 - 2.3	0.8	19-50+/0.3	10	
378.0	3.5			SPT-3	3.0 - 4.5	1.2	5-10-17	19	
		Sandy Lean Clay, gray to brown, moist, very stiff (CL)		SPT-4	4.5 - 6.0	1.5	8-9-13	25	
				SPT-5	6.0 - 7.5	1.2	12-18-21	28	
				SPT-6	7.5 - 9.0	1.5	6-11-18	29	
				SPT-7	9.0 - 10.5	1.2	16-21-24	25	
				SPT-8	10.5 - 12.0	1.2	16-21-20	24	
				SPT-9	12.0 - 13.5	1.3	11-13-15	24	
				SPT-10	13.5 - 15.0	1.5	7-11-15	28	
				SPT-11	15.0 - 16.5	1.5	10-10-15	25	
				SPT-12	16.5 - 18.0	1.3	9-12-12	25	
				SPT-13	18.0 - 19.5	1.1	2-3-4	45	
				SPT-14	19.5 - 21.0	1.5	6-12-18	25	
				SPT-15	21.0 - 22.5	1.5	14-15-15	26	
				SPT-16	22.5 - 24.0	1.5	11-14-16	35	
				SPT-17	24.0 - 25.5	1.5	6-12-13	26	
				SPT-18	25.5 - 27.0	1.5	9-11-18	32	
354.0	27.5	Lean Clay, with sand, red brown to gray, moist, stiff to very stiff, with rock fragments (CL)		SPT-19	27.0 - 28.5	1.5	9-13-8	53	
				SPT-20	28.5 - 30.0	1.5	8-17-23	30	
				SPT-21	30.0 - 30.7	0.7	12-50+/0.2	26	
				SPT-22	32.5 - 34.0	1.5	9-8-12	34	
				SPT-23	35.0 - 36.5	1.5	8-4-9	49	

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-57	Total Depth		56.5 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
325.0	56.5	Lean Clay, with sand, red brown to gray, moist, stiff to very stiff, with rock fragments (CL) <i>(Continued)</i>		SPT-24	37.5 - 39.0	1.2	11-19-10	19		
				SPT-25	40.0 - 41.5	1.1	5-3-16	32		
				SPT-26	42.5 - 44.0	1.4	6-25-20	51		
				SPT-27	45.0 - 46.5	1.5	15-16-33	28		
				SPT-28	47.5 - 49.0	1.5	10-5-6	59		
				SPT-29	50.0 - 50.9	0.9	20-50+/-0.4	33	Boulders below 50 feet.	
				SPT-30	52.5 - 54.0	0.9	5-14-16	50		
				SPT-31	55.0 - 56.5	1.5	3-16-23	54		
		No Refusal / Bottom of Hole							Augers broke at 57 feet. Offset 3ft for B-57B	

STANTEC\FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-57 A	Total Depth	21.0 ft
County	Stewart, TN	Surface Elevation	381.5 ft		
Project Type	HSA 3.25	Date Started	8/6/09	Completed	8/6/09
Supervisor	D. Rogers	Driller	Mark Martin	Depth to Water	Dry
Logged By	Z. Massey	Depth to Water	N/A	Date/Time	8/6/09
		Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
381.5	0.0	Top of Hole							
381.0	0.5	Crushed stone							
378.0	3.5	Lean Clay, with gravel, damp to moist, gray to brown, very stiff (CL)							
		Sandy Lean Clay, gray to brown, moist, very stiff (CL)		ST-1	5.0 - 7.0	2.0		--	PZ Installed Screen 10'-20'
				ST-2	10.0 - 12.0	2.0		--	
360.5	21.0	No Refusal / Bottom of Hole							

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-57 B	Total Depth	66.5 ft
County	Stewart, TN	Surface Elevation	381.5 ft		
Project Type	HSA 3.25	Date Started	8/6/09	Completed	8/6/09
Supervisor	D. Rogers	Driller	Mark Martin	Depth to Water	Dry
Logged By	Z. Massey	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
381.5	0.0	Top of Hole							
381.0	0.5	Crushed stone							
378.0	3.5	Lean Clay, with gravel, damp to moist, gray to brown, very stiff (CL) (FILL)							
		Sandy Lean Clay, gray to brown, moist, very stiff (CL)							
354.0	27.5	Lean Clay, with sand, red brown to gray, moist, stiff to very stiff, with rock fragments (CL)							

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil	
Project Name	Ash Ponds	Boring No.	B-57 B	Total Depth 66.5 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Lean Clay, with sand, red brown to gray, moist, stiff to very stiff, with rock fragments (CL) <i>(Continued)</i>							
				SPT-32	57.5 - 59.0	1.4	43-38-27	38	
				SPT-33	60.0 - 61.5	1.5	4-3-4	41	
				SPT-34	62.5 - 64.0	0.9	20-29-16	36	
315.0	66.5			SPT-35	65.0 - 66.5	0.2	1-1-1	44	Broke augers again. Pull augers and grout

No Refusal /
Bottom of Hole

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM_GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016		Location	Cumberland Fossil			
Project Name	Ash Ponds		Boring No.	B-58	Total Depth	62.9 ft	
County	Stewart, TN		Surface Elevation	395.0 ft			
Project Type	HSA 4.25		Date Started	7/26/09	Completed	7/27/09	
Supervisor	D. Rogers	Driller	Mark Martin	Depth to Water	35.9 ft	Date/Time	7/27/09
Logged By	D. Rogers		Depth to Water	N/A	Date/Time	N/A	

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
395.0	0.0	Top of Hole							
394.8	0.2	Crushed Stone		SPT-1	0.0 - 1.5	0.4	6-7-9	16	SI installed to 61.5 gravel block spoon
		Sandy Fat Clay, red brown, damp to moist, very stiff, with coarse sand, little gravel (CH)		SPT-2	1.5 - 3.0	0.8	6-7-8	21	
			SPT-3	3.0 - 4.5	0.4	3-6-5	22		
			SPT-4	4.5 - 6.0	1.5	3-5-10	24		
			SPT-5	6.0 - 7.5	0.6	8-10-9	26		
			SPT-6	7.5 - 9.0	0.3	5-6-9	16		
			SPT-7	9.0 - 10.5	0.8	3-4-6	30		
			SPT-8	10.5 - 12.0	0.4	4-6-7	16		
			SPT-9	12.0 - 13.5	0.3	7-8-8	16		
			SPT-10	13.5 - 15.0	1.5	5-7-11	23		
			BAG-1	10.0 - 20.0	--				
379.0	16.0			SPT-11	15.0 - 16.5	1.5	5-10-10	20	
		Lean Clay, brown gray, damp to moist, very stiff, with coarse sand, trace gravel, mottled (CL)		SPT-12	16.5 - 18.0	1.5	12-15-19	20	brown sandy lens 28-29
			SPT-13	18.0 - 19.5	1.5	7-14-11	20		
			SPT-14	19.5 - 21.0	1.5	3-6-9	29		
			SPT-15	21.0 - 22.5	1.5	10-15-20	30		
			SPT-16	22.5 - 24.0	1.5	7-9-15	28		
			SPT-17	24.0 - 25.5	1.5	7-10-15	26		
			SPT-18	25.5 - 27.0	1.5	5-12-12	21		
			SPT-19	27.0 - 28.5	1.5	12-19-17	33		
			SPT-20	28.5 - 30.0	1.5	5-5-8	41		
363.9	31.1				SPT-21	30.0 - 31.5	1.5	5-6-21	
		Silty Sand With Gravel, brown, wet, medium dense, (SM)		SPT-22	32.5 - 34.0	13.0	3-11-10	43	
			SPT-23	35.0 - 36.5	1.2	3-4-8	49		

STANTEC/FNSM_LEGACY_175539016_CUF.GPJ_FNSM_GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016			Location		Cumberland Fossil			
Project Name		Ash Ponds			Boring No.		B-58	Total Depth		62.9 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
355.0	40.0	Silty Sand With Gravel, brown, wet, medium dense, (SM) <i>(Continued)</i>		SPT-24	37.5 - 39.0	1.3	35-13-16	20	occasional black mottling	
				SPT-25	40.0 - 41.5	1.5	7-5-11	49	gravelly zone 41-41.4	
334.1	60.9	Clayey Sand With Gravel, dark gray brown to gray brown, wet, medium dense, mottled (SC)		SPT-26	42.5 - 44.0	1.5	6-8-10	35		
				SPT-27	45.0 - 46.5	1.5	5-4-4	34		
				SPT-28	47.5 - 49.0	1.2	5-4-3	36	lighter by 48	
				SPT-29	50.0 - 51.5	0.8	22-23-5	17	51-51.2 weathered rock	
				SPT-30	52.5 - 54.0	1.0	0-6-8	41		
				SPT-31	55.0 - 56.5	0.6	6-11-12	14		
				SPT-32	57.5 - 58.1	0.5	36-50+	13		
332.1	62.9	No Core		SPT-33	60.0 - 60.2	0.2	50+	7		
		<p>Auger Refusal / Bottom of Hole</p> <p>Top of Rock = 57.5 Elevation (337.5)</p>								

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM_GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-58 A	Total Depth	47.0 ft
County	Stewart, TN	Surface Elevation	394.8 ft		
Project Type	HSA 3.25	Date Started	8/3/09	Completed	8/4/09
Supervisor	D. Rogers	Driller	Mark Martin	Depth to Water	34.0 ft
Logged By	Z. Massey	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
394.8	0.0	Top of Hole							
394.6	0.2	Crushed Stone							
		Sandy Fat Clay, red brown, damp to moist, very stiff, with coarse sand, little gravel (CH)		ST-1	5.0 - 7.0	1.0		--	PZ installed Screen 35.5'-45.5'
378.8	16.0	Lean Clay, brown gray, damp to moist, very stiff, with coarse sand, trace gravel, mottled (CL)		ST-2	15.0 - 17.0	1.0		--	
				ST-3	25.0 - 27.0	1.7		--	
363.7	31.1	Silty Sand With Gravel, brown, wet, medium dense, (SM)		ST-4	35.0 - 37.0	1.7		--	

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM_GRAPHIC.LOG.GDT_1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. <u>B-58 A</u> Total Depth <u>47.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
354.8	40.0	Silty Sand With Gravel, brown, wet, medium dense, (SM) <i>(Continued)</i>							
347.8	47.0	Clayey Sand With Gravel, dark gray brown to gray brown, wet, medium dense, mottled (SC)		ST-5	45.0 - 47.0	1.2		--	

No Refusal /
Bottom of Hole



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-59	Total Depth	35.0 ft
County	Stewart, TN	Surface Elevation	383.0 ft		
Project Type	HSA 4.25	Date Started	7/25/09	Completed	7/25/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	Dry
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
383.0	0.0	Top of Hole							
		Fat Clay, trace to little sand and fine gravel, red brown, moist, soft to very stiff (CH)		SPT-1	0.0 - 1.5	1.3	5-5-7	16	
			SPT-2	1.5 - 3.0	1.0	5-10-8	37		
			SPT-3	3.0 - 4.5	1.3	6-6-8	43		
			SPT-4	4.5 - 6.0	1.2	5-7-9	45		
			SPT-5	6.0 - 7.5	1.3	15-8-9	33		
			SPT-6	7.5 - 9.0	1.5	15-9-9	30		
			SPT-7	9.0 - 10.5	1.3	5-8-8	36		
			SPT-8	10.5 - 12.0	0.8	8-15-22	37		
			SPT-9	12.0 - 13.5	1.5	7-4-3	52		
			SPT-10	13.5 - 15.0	1.3	1-1-3	52		
			SPT-11	15.0 - 16.5	1.3	1-3-5	46		
			SPT-12	16.5 - 18.0	1.5	2-2-3	61		
			SPT-13	18.0 - 19.5	0.5	3-2-3	45		
			SPT-14	19.5 - 21.0	1.3	1-2-2	51		
			SPT-15	21.0 - 22.5	1.1	3-2-4	49		
			SPT-16	23.5 - 25.0	1.4	1-1-2	31		
			SPT-17	26.0 - 27.5	1.3	3-2-2	32		
			SPT-18	28.5 - 30.0	0.7	3-3-6	30		
350.0	33.0				SPT-19	31.0 - 32.5	1.3	2-3-2	28
348.0	35.0	Augered (rock)		SPT-20	33.5 - 35.0	0.0	50+/-0.0	--	
		Auger Refusal / Bottom of Hole							Bottom of boring. Auger refusal in limestone

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-59 Total Depth <u>35.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Top of Rock = 33.0 Elevation (350.0)							bedrock.

STANTEC\FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-59 A	Total Depth	38.0 ft
County	Stewart, TN	Surface Elevation	383.0 ft		
Project Type	HSA 4.25	Date Started	7/24/09	Completed	7/25/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	Dry
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
383.0	0.0	Top of Hole							
		Fat Clay, trace to little sand and fine gravel, red brown, moist, soft to very stiff (CH)							Drilled 0 - 35' with 4 1/4" inside diameter hollow stem augers. Drilled from 0 - 36' with a 4 1/8" diameter roller cone. Cored 36' - 38' with a 3" OD barrel. Broke trough into soil or weathered shale seam. Recovered 0.5' of limestone.
350.0	33.0								
		Augered (Rock)							
347.0	36.0								Began Core

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-59 A Total Depth <u>38.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
345.0	38.0	Limestone, light gray, hard, with clay seams <i>(Continued)</i> Bottom of Hole Top of Rock = 33.0 Elevation (350.0)		25 SPT-1	2.0 38.0 - 38.0	0.5 0.0	25 50-70"	38.0	Spoon refusal/bottom of boring. No piezometer installed.

STANTEC\FMSM_LEGACY_175539016-CLF.GPJ_FMSM_GRAPHIC.LOG.GDT 1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-59 B Total Depth <u>46.3 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Limestone, gray, hard, fractured and water stained, few clay seams <i>(Continued)</i>		30	3.0	1.1	37	37.0	
				0	3.6	2.6	72	40.6	
				67	0.6	0.6	100	41.2	
336.7	46.3			41	5.1	4.9	96	46.3	

Bottom of Hole

Top of Rock = 33.7
Elevation (349.3)

STANTEC\FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT 1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-60	Total Depth	43.6 ft
County	Stewart, TN	Surface Elevation	395.1 ft		
Project Type	HSA 3.25	Date Started	7/26/09	Completed	7/26/09
Supervisor	D. Rogers	Driller	Mark Martin	Depth to Water	Dry
Logged By	D. Rogers	Depth to Water	N/A	Date/Time	7/26/09
		Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
395.1	0.0	Top of Hole							
394.6	0.5	Crushed Stone		SPT-1	0.0 - 1.5	0.4	13-10-14	17	
		Sandy Fat Clay, red brown, damp to moist, very stiff, some gravel, some sand (CH)		SPT-2	1.5 - 3.0		10-10-10	13	
			SPT-3	3.0 - 4.5	0.6	5-5-5	22		
			SPT-4	4.5 - 6.0	1.1	7-5-8	22		
			SPT-5	6.0 - 7.5	1.4	4-6-9	26		
			SPT-6	7.5 - 9.0	1.3	5-4-11	25		
			SPT-7	9.0 - 10.5	1.5	8-9-8	26		
			SPT-8	10.5 - 12.0	1.0	3-4-7	24		
			SPT-9	12.0 - 13.5	1.2	2-5-10	22		
			SPT-10	13.5 - 15.0	1.2	4-8-11	24		
			SPT-11	15.0 - 16.5	1.1	3-3-25	31		
378.6	16.5	Fat Clay, red brown with gray, damp to moist, very stiff, trace gravel, trace sand, mottled (CH)		SPT-12	16.5 - 18.0	1.5	16-16-17	36	
			SPT-13	18.0 - 19.5	1.5	6-11-13	33		
			SPT-14	19.5 - 21.0	1.5	6-7-11	28		
			SPT-15	21.0 - 22.5	1.5	6-15-25	32		
			SPT-16	22.5 - 24.0	1.5	8-11-13	42		
			SPT-17	24.0 - 25.5	1.5	8-12-13	38	few sandy lenses	
			SPT-18	25.5 - 27.0	1.4	5-8-12	40		
			SPT-19	27.0 - 28.5	1.5	7-11-14	41		
			SPT-20	28.5 - 30.0	1.5	8-9-10	40		
			SPT-21	30.0 - 31.5	1.5	4-7-9	33		
			SPT-22	31.5 - 33.0	1.5	8-14-10	39		
362.1	33.0		Fat Clay, brown with gray, damp to moist, very stiff, trace gravel, little sand, mottled (CH)		SPT-23	33.0 - 34.5	1.5	5-8-9	41
		SPT-24		34.5 - 36.0	0.6	4-8-11	34	more sand and gravel 33-35	

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number <u>175539016</u>	Location <u>Cumberland Fossil</u>
Project Name <u>Ash Ponds</u>	Boring No. B-60 Total Depth <u>43.6 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Fat Clay, brown with gray, damp to moist, very stiff, trace gravel, little sand, mottled (CH) <i>(Continued)</i>		SPT-25	36.0 - 37.5	1.5	13-18-19	24	
			SPT-26	37.5 - 39.0	1.5	7-10-12	23		
			SPT-27	39.0 - 40.5	1.5	5-8-12	30		
			SPT-28	40.5 - 42.0	1.5	5-7-10	26		
351.6	43.5		SPT-29	42.0 - 43.5	1.5	14-14-17	28		
351.5	43.6		SPT-30	43.5 - 43.6	0.1	50+	3		43-43.1 wet sand lens
		Limestone, light gray							
		Auger Refusal / Bottom of Hole							
		Top of Rock = 43.5 Elevation (351.6)							

STANTEC/FNSM_LEGACY_175539016-CUF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number	175539016	Location	Cumberland Fossil		
Project Name	Ash Ponds	Boring No.	B-61	Total Depth	22.5 ft
County	Stewart, TN	Surface Elevation	387.2 ft		
Project Type	HSA 4.25	Date Started	7/26/09	Completed	7/26/09
Supervisor	D. Rogers	Driller	Jerry Huntoon	Depth to Water	Dry
Logged By	D. Chapman	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
387.2	0.0	Top of Hole							
		Crushed stone (road bed)							
383.2	4.0	Fat Clay, red brown, moist, medium stiff to very stiff (CH)							
			SPT-1	4.5 - 6.0	0.3	37-7-8	2		Little sand to fine gravel
			SPT-2	6.0 - 7.5	0.7	4-4-5	23		
			SPT-3	7.5 - 9.0	0.0	4-6-6	--		Trace sand to fine gravel
			SPT-4	9.0 - 10.5	1.5	3-6-9	24		
			SPT-5	10.5 - 12.0	0.3	3-5-11	24		
			SPT-6	12.0 - 13.5	1.1	2-3-8	23		
			SPT-7	13.5 - 15.0	0.8	1-3-6	38		
			SPT-8	15.0 - 16.5	1.0	2-4-6	23		
			SPT-9	16.5 - 18.0	1.3	2-2-8	27		
			SPT-10	18.0 - 19.5	1.5	1-3-3	34		
			SPT-11	19.5 - 21.0	1.3	1-2-3	34		
		SPT-12	21.0 - 22.5	1.2	2-3-	23			
364.7	22.5	SPT-13	22.5 - 22.5	0.0	50+/-0.2	32			
		Auger Refusal / Bottom of Hole				50+/-0		Crushed limestone in spoon tip Bottom of boring Auger refusal on apparent limestone bedrock. No piezometer installed.	
		Top of Rock = 22.5 Elevation (364.7)							

STANTEC/FNSM_LEGACY_175539016-CLF-GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10

Project Number		175539016		Location		Cumberland Fossil				
Project Name		Ash Ponds		Boring No.		B-62		Total Depth		32.0 ft
County		Stewart, TN		Surface Elevation		394.8 ft				
Project Type		HSA 3.25		Date Started		7/25/09		Completed		7/25/09
Supervisor		D. Rogers		Driller		Mark Martin		Depth to Water		Dry
Logged By		D. Rogers		Date/Time		7/25/09		Depth to Water		N/A
Date/Time		N/A		Date/Time		N/A		Date/Time		N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
394.8	0.0	Top of Hole								
394.4	0.4	Crushed Stone		SPT-1	0.0 - 1.5	0.9	7-5-7	21		
		Fat Clay, red brown, damp to moist, very stiff, some coarse sand, some gravel (CH)		SPT-2	1.5 - 3.0	1.1	7-7-9	17		
			SPT-3	3.0 - 4.5	0.9	3-3-5	21			
			SPT-4	4.5 - 6.0	1.5	3-4-11	19			
			SPT-5	6.0 - 7.5	1.5	12-10-9	22		sand lens 7.2-7.3	
			SPT-6	7.5 - 9.0	0.1	5-5-7	24			
			SPT-7	9.0 - 10.5	1.5	2-5-8	22			
			SPT-8	10.5 - 12.0	0.8	3-6-5	18			
			SPT-9	12.0 - 13.5	0.0	4-9-15	--		stone block spoon	
			SPT-10	13.5 - 15.0	0.3	7-9-16	25			
			SPT-11	15.0 - 16.5	0.9	4-9-13	25			
			SPT-12	16.5 - 18.0	0.6	12-14-10	18		gravelly 16-18	
			SPT-13	18.0 - 19.5	1.0	4-11-40	15			
			SPT-14	19.5 - 19.9	0.3	50+	11		boulder 19-22	
			SPT-15	21.0 - 21.4	0.3	50+	14			
371.3	23.5				SPT-16	22.5 - 23.8	1.5	33-35-50+	42	Began Core
		Limestone, gray, hard, close fracture spacing, zones water stained			2.4	0.0	0	26.0		
362.8	32.0					6.0	6.0	100	32.0	
Bottom of Hole										
Top of Rock = 23.5 Elevation (371.3)										

STANTEC/FNSM_LEGACY_175539016-CLF.GPJ_FNSM-GRAPHIC.LOG.GDT_1/27/10



SUBSURFACE LOG

Project Number	175539016	Location	Cumberland Fossil	
Project Name	Ash Ponds	Boring No.	B-62 A	Total Depth 10.0 ft
County	Stewart, TN	Surface Elevation	394.8 ft	
Project Type	HSA 4.25	Date Started	8/7/09	Completed 8/7/09
Supervisor	D. Rogers	Driller	J. Felts	Depth to Water Dry Date/Time 8/7/09
Logged By	Z. Massey	Depth to Water	N/A	Date/Time N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
394.8	0.0	Top of Hole							
394.4	0.4	Crushed Stone							
		Fat Clay, red brown, damp to moist, very stiff, some coarse sand, some gravel (CH)		BAG-1	5.0 - 10.0			--	
384.8	10.0								

No Refusal /
Bottom of Hole

STANTEC\FNSM_LEGACY_175539016-CLF.GPJ_FNSM.GRAPHIC.LOG.GDT_1/27/10

Project Number		175539009		Location		Cumberland Fossil				
Project Name		CUF		Boring No.		STN-1		Total Depth		30.0 ft
County		Stewart, TN		Surface Elevation		392.6 ft				
Project Type		HSA 4.25		Date Started		5/28/09		Completed		7/10/09
Supervisor		D. Rogers		Driller		Mark Martin		Depth to Water		9.2 ft
Logged By		D. Rogers		Date/Time		5/28/09		Depth to Water		N/A
Date/Time		N/A		Date/Time		N/A		Date/Time		N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks			
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth				
392.6	0.0	Top of Hole										
386.6	6.0	Bottom Ash, dark gray to black, damp, medium dense to very dense		SPT-1	0.0 - 1.5	1.1	5-7-11	11	Lost Auger at 21.0' back filled B-1A with cuttings.			
				SPT-2	1.5 - 3.0	1.4	16-17-19	9				
				SPT-3	3.0 - 4.5	1.5	17-17-17	9				
				SPT-4	4.5 - 6.0	1.4	9-11-50+/.4	11				
		362.6	30.0	Boulders, hard with silty clay, brown, very stiff, moist to wet		SPT-5	8.0 - 9.0	0.7		33-50+/.2	4	Moved 3 feet south along dike and bored B-1A to a depth of 8.0', encountered rock zone, back filled B-1A with cuttings, moved 3 feet south along dike from B-1A to B-1B, augered to a depth of 10.0' backfilled with cuttings.
						SPT-6	9.0 - 10.5	0.1		50+/.2	5	
						SPT-7	10.5 - 12.0	0.4		10-17-50+/.2	7	
						SPT-8	12.0 - 13.5	0.2		50+/.2	13	
						SPT-9	13.5 - 15.0	0.9		14-19-21	9	
						SPT-10	15.0 - 16.5	0.5		3-6-6	14	
						SPT-11	16.5 - 18.0	0.8		7-8-10	17	
						SPT-12	19.5 - 21.0	0.5		2-3-5	15	
						SPT-13	21.0 - 22.5	0.4		3-6-7	17	
	SPT-14				25.5 - 27.0	0.6	5-6-6	--				
	SPT-15	27.0 - 28.5	1.5	5-12-9	--							
	SPT-16	28.5 - 28.9	0.4	50+/.4	--							
		No Refusal / Bottom of Hole										

STANTEC\FNSM_LEGACY_175539009-CUF.GPJ_FNSM-GRAPHIC.LOG.GDT_11/12/09

Project Number	175539009	Location	Cumberland Fossil		
Project Name	CUF	Boring No.	STN-3	Total Depth	72.0 ft
County	Stewart, TN	Surface Elevation	394.8 ft		
Project Type	HSA 4.25	Date Started	7/13/09	Completed	7/14/09
Supervisor	D. Rogers	Driller	J. Felts	Depth to Water	14.6 ft
Logged By	D. Rogers	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks		
Elevation	Depth		Rock Core							RQD	Run
394.8	0.0	Top of Hole									
390.5	4.3	Bottom Ash, dark brown gray, damp, loose, some flyash intermixed		SPT-1	0.0 - 1.5	1.0	1-3-3	8	SI installed to 71.0'		
				SPT-2	1.5 - 3.0	1.1	1-2-2	9			
				SPT-3	3.0 - 4.5	1.2	1-2-2	12			
383.0	11.8	Fat Clay, dark brown, damp, medium stiff to stiff, (CH)		SPT-4	4.5 - 6.0	1.0	2-3-3	22			
				SPT-5	6.0 - 7.5	0.5	5-5-6	22			
				SPT-6	7.5 - 9.0	0.7	2-4-4	16			
				SPT-7	9.0 - 10.5	1.2	2-3-4	20			
				SPT-8	10.5 - 12.0	0.7	1-2-3	26			
372.9	21.9	Lean Clay, light brown, damp, soft to very stiff, (CL)		SPT-9	12.0 - 13.5	1.0	2-3-3	27			
				SPT-10	13.5 - 15.0	0.9	0-1-3	31			
				SPT-11	15.0 - 16.5	1.2	1-2-3	25			
				SPT-12	16.5 - 18.0	1.3	2-4-13	32			
				SPT-13	18.0 - 19.5	1.0	10-12-13	7			
				SPT-14	19.5 - 21.0	1.0	7-18-8	8			
				SPT-15	21.0 - 21.9	0.5	0-50+	22			
				SPT-16	22.5 - 22.5	0.0	50+	--			
360.9	33.9	Lean Clay, light brown, very soft to stiff, with rock fragments, some boulders (CL)		SPT-17	24.0 - 25.5	0.4	1-0-0	18		boulders 21.9-23.6 28-29	
				SPT-18	25.5 - 27.0	0.6	1-1-1	26			
				SPT-19	27.0 - 28.5	0.9	33-7-7	21			
				SPT-20	28.5 - 30.0	0.9	0-3-3	28			
				SPT-21	30.0 - 31.5	0.3	4-7-1	23			rock fragment blocked spoon
				SPT-22	31.5 - 33.0	0.2	4-8-8	18			
				SPT-23	33.0 - 34.5	1.3	7-14-3	35			
358.8	36.0	Lean Clay, red brown, wet, stiff, with coarse sand, some gravel (CL)		SPT-24	34.5 - 36.0	1.1	0-6-3	34			

STANTEC/FINSL_LEGACY_175539009_CUF.GPJ_FINSLM_GRAPHIC.LOG.GDT_11/12/09

Project Number		175539009			Location		Cumberland Fossil			
Project Name		CUF			Boring No.		STN-3	Total Depth		72.0 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
350.8	44.0	Lean Clay, gray with brown, moist, very stiff to stiff, (CL) <i>(Continued)</i>		SPT-25	36.0 - 37.5	1.5	6-2-5	23	siltier zone trace organics 36.0-42.0 with weathered shale fragments	
				SPT-26	37.5 - 39.0	1.5	4-5-6	25		
				SPT-27	39.0 - 40.5	1.5	1-2-4	24		
				SPT-28	40.5 - 42.0	1.5	2-2-6	23		
				SPT-29	42.0 - 43.5	1.5	2-4-8	25		
337.3	57.5	Lean Clay, brown with gray, moist, very stiff, mottled (CL)		SPT-30	43.5 - 45.0	1.5	3-5-7	22	gravel block spoon	
				SPT-31	45.0 - 46.5	1.3	5-10-12	23		
				SPT-32	47.5 - 49.0	1.5	3-5-7	23		
				SPT-33	50.0 - 51.5	0.3	5-7-12	38		
				SPT-34	52.5 - 54.0	1.0	4-5-6	25		
				SPT-35	55.0 - 56.5	0.1	2-7-9	30		
331.8	63.0	Lean Clay, green gray to light gray, moist, medium stiff, mottled (CL)		SPT-36	57.5 - 59.0	1.5	6-2-3	34		
				SPT-37	60.0 - 61.5	1.5	2-7-9	42		
327.5	67.3	Highly weathered shale interbedded with limestone fragments (Augered) (Refusal 67.3')		SPT-38	62.5 - 64.0	1.0	7-13-15	14	Began Core	
				SPT-39	65.0 - 66.3	0.9	22-17-50+	9		
322.8	72.0	Roller Bit used (for Slope Inclinator socket)			4.7	0.0	0	72.0		
Bottom of Hole										
Top of Rock = 63.0 Elevation (331.8)										

STANTEC/FNSM_LEGACY_175539009_CUF.GPJ_FNSM_GRAPHIC.LOG.GDT_11/12/09



SUBSURFACE LOG

Project Number	175539009	Location	Cumberland Fossil		
Project Name	CUF	Boring No.	STN-4	Total Depth	79.3 ft
County	Stewart, TN	Surface Elevation	393.9 ft		
Project Type	HSA 3.25	Date Started	5/30/09	Completed	5/31/09
Supervisor	D. Rogers	Driller	Mark Martin	Depth to Water	12.0 ft
Logged By	Ryan J Riker	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
393.9	0.0	Top of Hole							
389.4	4.5	Bottom Ash, dark gray to black, moist, medium dense		SPT-1	0.0 - 1.5	0.9	4-4-6	11	boring backfilled with 2 bags Quikgrout and 2 bags portland cement.
				SPT-2	1.5 - 3.0	1.5	6-6-7	9	
				SPT-3	3.0 - 4.5	1.0	4-3-4	8	
		Fly Ash, gray to light gray, moist to wet, medium stiff to soft, from 6.0 to 7.5 a layer of light gray silt with organics.	SPT-4	4.5 - 6.0	0.9	3-2-2	9		
			SPT-5	6.0 - 7.5	0.5	3-4-1	29		
			SPT-6	7.5 - 9.0	1.4	WOH-	77		
			SPT-7	9.0 - 10.5	1.5	WOH-	50		
			SPT-8	10.5 - 12.0	1.5	WOH-	50		
			SPT-9	12.0 - 13.5	1.5	WOH-	45		
			SPT-10	13.5 - 15.0	1.5	WOH-	66		
			SPT-11	15.0 - 16.5	1.5	WOR-	40		
			SPT-12	16.5 - 18.0	1.3	WOH-	42		
			SPT-13	18.0 - 19.5	1.4	WOH-	39		
			SPT-14	19.5 - 21.0	1.5	WOH-	41		
			SPT-15	21.0 - 22.5	1.5	WOH-	38		
			SPT-16	22.5 - 24.0	1.2	WOH-	41		
			SPT-17	24.0 - 25.5	1.5	WOR-	44		
			SPT-18	25.5 - 27.0	1.5	WOR-	45		
			SPT-19	27.0 - 28.5	1.5	WOR-	42		
			SPT-20	28.5 - 30.0	1.5	WOH-	49		
			SPT-21	30.0 - 31.5	1.5	WOR-	50		
			SPT-22	31.5 - 33.0	1.3	WOR-	42		
			SPT-23	33.0 - 34.5	1.3	WOR-	43		
			SPT-24	34.5 - 36.0	1.5	WOR-	45		

STANTEC/FNSM_LEGACY_175539009_CUF.GPJ_FNSM_GRAPHIC.LOG.GDT_11/12/09

Project Number		175539009			Location		Cumberland Fossil			
Project Name		CUF			Boring No.		STN-4	Total Depth		79.3 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
351.4	42.5	Fly Ash, gray to light gray, moist to wet, medium stiff to soft, from 6.0 to 7.5 a layer of light gray silt with organics. <i>(Continued)</i>		SPT-25	36.0 - 37.5	1.5	WOR	38		
				SPT-26	37.5 - 39.0	1.5	WOR- WOR-	45		
				SPT-27	39.0 - 40.5	1.5	WOH- WOR-	40		
				SPT-28	40.5 - 42.0	1.5	WOR- WOR-	35		
334.9	59.0	Silty Clay, gray to brown, moist to wet, soft to very soft, manganese concretions (CL)		SPT-29	42.0 - 43.5	1.5	WOR- WOR-	44		
				SPT-30	43.5 - 45.0	1.2	WOR- WOR-	30		
				SPT-31	45.0 - 46.5	0.7	WOR- WOR-	29		
				SPT-32	47.5 - 49.0	1.3	WOH-3 WOR-	30		
				SPT-33	50.0 - 51.5	0.7	WOR- WOR-	24		
				SPT-34	52.5 - 54.0	1.1	WOR- WOH-	23		
				SPT-35	55.0 - 56.5	1.2	WOH- WOR-	27		
				SPT-36	57.5 - 59.0	1.0	WOH- WOR-3	27		
				SPT-37	60.0 - 61.5	0.8	5-5-8 1-5-5 4-8-8 3-6-9	29		
				SPT-38	62.5 - 64.0	0.9	WOR-7-8 1-8-5	28		
327.4	66.5	Silt, gray, wet, stiff to soft, (ML) (Visual)		SPT-39	65.0 - 66.5	1.2	WOR-4-5 WOH- WOH-	28		
				SPT-40	67.5 - 69.0	1.0	WOH- WOH-3	21		
				SPT-41	70.0 - 71.5	0.9	WOH-4 7-24-33 22-28-37	16		
317.4	76.5	Gravel With Silt And Sand, gray, wet, very stiff, (GM)		SPT-42	72.5 - 74.0	0.8	14-21-14	20		
				SPT-43	75.0 - 76.5	0.6	WOH-14- 22	19		

STANTEC/FNSM_LEGACY_175539009-CUF.GPJ_FNSM-GRAPHIC.LOG.GDT_11/12/09

Project Number <u>175539009</u>	Location <u>Cumberland Fossil</u>
Project Name <u>CUF</u>	Boring No. STN-4 Total Depth <u>79.3 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
314.6	79.3	Highly weathered limestone <i>(Continued)</i>		SPT-44	77.5 - 78.3	0.3	WOR- WOR- 50+/1.3	26	
Auger Refusal / Bottom of Hole Top of Rock = 77.5 Elevation (316.4)									

STANTEC\FMSM_LEGACY_175539009_CUF.GPJ_FMSM_GRAPHIC.LOG.GDT 11/12/09

Project Number		175552005		Location		N=732555.67 ft, E=1509526.03 ft				
Project Name		CUF PZ Installation		Boring No.		STN-100		Total Depth		78.6 ft
County		Stewart, TN		Surface Elevation		395.0 ft				
Project Type				Date Started		10/8/12		Completed		10/8/12
Supervisor		D. Rogers		Driller		M. Wethington		Depth to Water		18.0 ft
Logged By		M. Jones		Depth to Water		N/A		Date/Time		N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
395.0	0.0	Top of Hole							
		Lean Clay With Gravel, reddish brown, moist, very stiff		SPT-1	5.0 - 6.5	0.8	7-18-10	--	
			SPT-2	10.0 - 11.5	0.5	6-6-12	--		
380.0	15.0	Lean Clay, brown to grayish brown, moist, stiff		SPT-3	15.0 - 16.5	0.7	3-5-8	--	
377.0	18.0								
		Gravel With Sand, gray, wet, medium dense, trace clay		SPT-4	20.0 - 21.5	0.1	7-7-8	--	free water encountered during drilling at 18' Cobbles 18' to 23'
370.0	25.0								
		Lean Clay With Gravel, yellowish brown, wet, medium stiff, trace gravel		SPT-5	25.0 - 26.5	1.0	3-3-5	--	Cobbles 27' to 29.5
365.5	29.5								
		Lean Clay, brown to grayish brown, moist to wet, stiff		SPT-6	30.0 - 31.5	1.2	9-6-7	--	
360.0	35.0								
				SPT-7	35.0 - 36.5	1.2	4-4-4	--	

STANTECFINSM_LEGACY_175552005.GPJ FINSM-GRAPHIC.LOG.GDT_11/14/12

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
355.0	40.0	Lean Clay, gray with yellowish brown, wet, medium stiff, trace organics <i>(Continued)</i>							
		Lean Clay, yellowish brown mottled gray, moist, very stiff		SPT-8	40.0 - 41.5	1.5	12-14-18	--	
350.0	45.0								
		Lean Clay With Sand, reddish brown, wet, stiff, trace gravel		SPT-9	45.0 - 46.5	0.3	10-6-6	--	
				SPT-10	50.0 - 51.5	1.5	10-17-24	--	
				SPT-11	55.0 - 56.5	1.5	8-14-14	--	
334.5	60.5								
		Fat Clay, reddish brown to greenish gray, moist, stiff to very stiff, sand lenses at 76.4'		SPT-12	60.0 - 61.5	1.5	8-14-17	--	
				SPT-13	65.0 - 66.5	1.5	7-10-15	--	
				SPT-14	70.0 - 71.5	1.0	7-6-5	--	
				SPT-15	75.0 - 76.5	1.5	3-4-6	--	

STANTECFINSM_LEGACY_175552005.GPJ FINSM-GRAPHIC.LOG.GDT 11/14/12

Project Number <u>175552005</u>	Location <u>N=732555.67 ft, E=1509526.03 ft</u>
Project Name <u>CUF PZ Installation</u>	Boring No. STN-100 Total Depth <u>78.6 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
316.4	78.6	Auger Refusal / Bottom of Hole Installed piezometer in borehole Top of Rock = 78.6 Elevation (316.4)							

STANTECFMISM_LEGACY_175552005.GPJ_FMISM-GRAPHIC.LOG.GDT_11/14/12



SUBSURFACE LOG

Project Number	175552005	Location	N=732353.39 ft, E=1509479.25 ft		
Project Name	CUF PZ Installation	Boring No.	STN-101	Total Depth	53.3 ft
County	Stewart, TN	Surface Elevation	395.1 ft		
Project Type		Date Started	10/9/12	Completed	10/9/12
Supervisor	D. Rogers	Driller	M. Wethington	Depth to Water	22.0 ft
Logged By	M. Jones	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
395.1	0.0	Top of Hole							
		Fat Clay, reddish brown to yellowish brown, moist, very stiff, trace fine gravel		SPT-1	5.0 - 6.5	1.0	9-11-10	--	
				SPT-2	10.0 - 11.5	1.5	7-11-13	--	
				SPT-3	15.0 - 16.5	1.2	5-7-9	--	
				SPT-4	20.0 - 21.5	1.0	9-16-13	--	
369.6	25.5	Lean Clay, grayish brown to dark yellowish brown, wet, very stiff, trace sand and gravel		SPT-5	25.0 - 26.5	0.2	13-7-10	--	Free water encountered during drilling at 22'
				SPT-6	30.0 - 31.5	0.5	5-22-9	--	Cobbles 25.5' to 30'
				SPT-7	35.0 - 36.5	0.0	6-6-5	--	gravel blockage

STANTECFINSM_LEGACY_175552005.GPJ FINSM-GRAPHIC.LOG.GDT_11/14/12

Project Number <u>175552005</u>	Location <u>N=732353.39 ft, E=1509479.25 ft</u>
Project Name <u>CUF PZ Installation</u>	Boring No. STN-101 Total Depth <u>53.3 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
355.1	40.0								
		Fat Clay, yellowish brown with gray, moist, very stiff		SPT-8	40.0 - 41.5	1.5	12-11-13	--	gravel blockage
				SPT-9	45.0 - 46.5	0.0	12-11-12	--	
				SPT-10	50.0 - 51.5	1.1	10-15-23	--	
341.8	53.3								

Auger Refusal /
Bottom of Hole
Installed piezometer in borehole
Top of Rock = 53.3
Elevation (341.8)

STANTECFMISM_LEGACY_175552005.GPJ_FMISM-GRAPHIC.LOG.GDT_11/14/12



SUBSURFACE LOG

Project Number	175552005	Location	N=732303.82 ft E=1509472.90 ft		
Project Name	CUF PZ Installation	Boring No.	STN-102	Total Depth	46.5 ft
County	Stewart, TN	Surface Elevation	395.0 ft		
Project Type		Date Started	10/10/12	Completed	10/10/12
Supervisor	D. Rogers	Driller	M. Wethington	Depth to Water	20.0 ft
Logged By	M. Jones	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
395.0	0.0	Top of Hole								
		Fat Clay, reddish brown to grayish brown, moist, stiff, trace fine gravel		SPT-1	5.0 - 6.5	1.1	8-6-7	--		
				SPT-2	10.0 - 11.5	1.2	8-12-12	--		
				SPT-3	15.0 - 16.5	1.5	5-7-7	--		
375.0	20.0			SPT-4	20.0 - 21.5	0.9	5-16-18	--		
			Fat Clay With Gravel, brown to reddish brown, wet, very stiff		SPT-5	25.0 - 26.5	1.2	6-9-6	--	
370.0	25.0			SPT-6	30.0 - 31.5	0.8	11-3-3	--		
			Lean Clay With Sand, reddish brown, wet, stiff, little gravel		SPT-7	35.0 - 36.5	0.9	5-7-8	--	
364.5	30.5									
		Lean Clay, brown and gray, wet, medium stiff								
360.0	35.0									

STANTECFINSL_LEGACY_175552005.GPJ FINSL-GRAPHIC.LOG.GDT 11/14/12

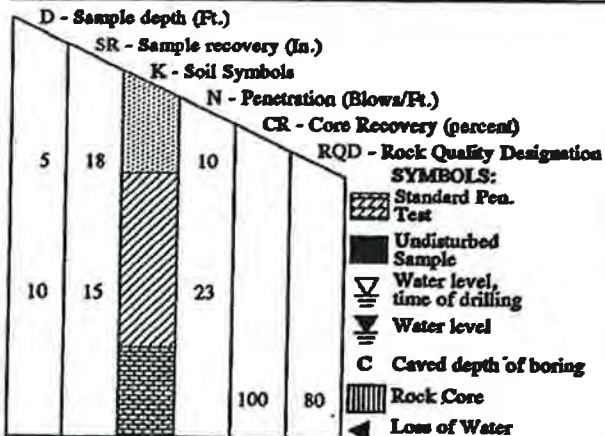
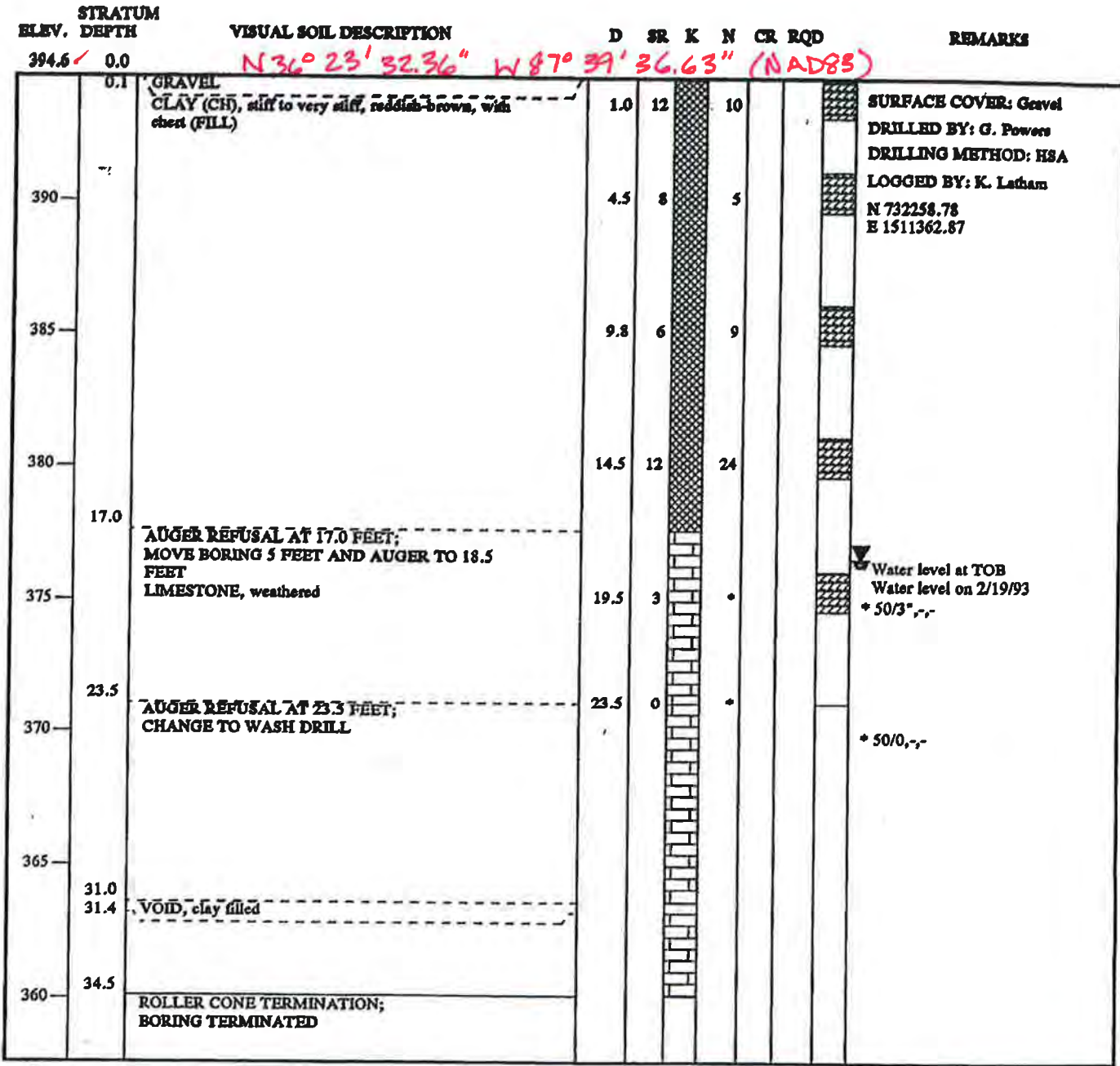
Project Number <u>175552005</u>	Location <u>N=732303.82 ft E=1509472.90 ft</u>
Project Name <u>CUF PZ Installation</u>	Boring No. STN-102 Total Depth <u>46.5 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
355.0	40.0	Lean Clay, grayish green, moist, stiff, silty, trace organics <i>(Continued)</i>							
		Fat Clay, orangish brown mottled with gray, moist, very stiff		SPT-8	40.0 - 41.5	1.5	7-9-10	--	
350.0	45.0								
348.5	46.5	Fat Clay With Sand, brown, moist, very stiff		SPT-9	45.0 - 46.5	1.0	10-11-15	--	

Auger Refusal /
Bottom of Hole

Top of Rock = 46.5
Elevation (348.5)

STANTECFM\SM_LEGACY_175552005.GPJ FMSM-GRAPHIC.LOG.GDT 11/14/12



TEST BORING RECORD	
BORING NUMBER	93-4
DATE DRILLED	February 17, 1993
PROJECT NUMBER	417.93368.01
PROJECT	CUMBERLAND STEAM
PAGE 1 OF 1	
LAW ENGINEERING	



TVA CONFIDENTIAL INFORMATION

SUBSURFACE LOG

Project Number <u>175565299</u>	Location <u>N36°23'44.48", W87°39'47.21" (NAD83)</u>
Project Name <u>TVA - CUF Well Installations</u>	Boring No. CUF-206 Total Depth <u>91.5 ft</u>
County <u>Stewart, TN</u>	Surface Elevation <u>394.9 ft (NGVD29)</u>
Project Type <u>Well Installations</u>	Date Started <u>6/2/16</u> Completed <u>6/2/16</u>
Supervisor <u>D. Pleiman</u> Driller <u>T. Taylor</u>	Depth to Water <u>Dry</u> Date/Time <u>6/2/16</u>
Logged By <u>B. Rosen</u>	Depth to Water <u>33.7 ft</u> Date/Time <u>7/22/16</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
394.9	0.0	Top of Hole							
394.7	0.2	Crushed stone							9" Sonic 4" diameter well installed
		Lean Clay, slightly silty, red-brown, brown-gray, or gray, damp to moist, some cherty zones, medium stiff							
		24.5-25.5: Limestone boulder							

STANTECFMISM_LEGACY_CUF_PROJECT.GPJ FMSM_GRAPHIC.LOG.GDT 2/3/17

Project Number <u>175565299</u>	Location <u>N36°23'44.48", W87°39'47.21" (NAD83)</u>
Project Name <u>TVA - CUF Well Installations</u>	Boring No. CUF-206 Total Depth <u>91.5 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
344.9	50.0	Lean Clay, slightly silty, red-brown, brown-gray, or gray, damp to moist, some cherty zones, medium stiff <i>(Continued)</i> 39.5-40.0: Limestone boulder							
329.9	65.0	Lean Clay, brown, moist, stiff, some chert fragments							
327.4	67.5	Gravelly Lean Clay, brown-gray, moist, stiff							
318.9	76.0	Lean Clay, dark gray, moist, stiff							

STANTECFM\NL_LEGACY_CUF_PROJECT\GRJ_FMSM_GRAPHIC.LOG.GDT 2/3/17

Project Number <u>175565299</u>	Location <u>N36°23'44.48", W87°39'47.21" (NAD83)</u>
Project Name <u>TVA - CUF Well Installations</u>	Boring No. CUF-206 Total Depth <u>91.5 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
315.4	79.5	Gravelly Lean Clay, brown to gray, moist, medium stiff to stiff, zones sandy <i>(Continued)</i> Sand with Gravel, brown and gray, wet, medium dense to dense, zones clayey and silty							
304.9	90.0								
303.4	91.5	Limestone							

No Refusal /
Bottom of Hole

STANTECFM5M_LEGACY_CUF_PROJECT.GPJ_FMSM_GRAPHIC.LOG.GDT_2/3/17

Project Number <u>175565299</u>	Location <u>N36°23'40.91", W87°39'53.24" (NAD83)</u>
Project Name <u>TVA - CUF Well Installations</u>	Boring No. CUF-207 Total Depth <u>84.3 ft</u>
County <u>Stewart, TN</u>	Surface Elevation <u>394.4 ft (NGVD29)</u>
Project Type <u>Well Installations</u>	Date Started <u>5/12/16</u> Completed <u>5/12/16</u>
Supervisor <u>D. Pleiman</u> Driller <u>D. Jessie</u>	Depth to Water <u>Dry</u> Date/Time <u>5/12/16</u>
Logged By <u>Jordan Matthews</u>	Depth to Water <u>31.9 ft</u> Date/Time <u>7/22/16</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
394.4	0.0	Top of Hole							
		Gravelly Fat Clay, red-brown, moist, medium stiff		SPT-1	0.0 - 1.5	1.1	3-4-4	--	4" diameter well installed
				SPT-2	2.5 - 4.0	0.7	2-2-4	--	
				SPT-3	5.0 - 6.5	1.1	3-3-4	--	
				SPT-4	7.5 - 9.0	1.2	4-4-3	--	
				SPT-5	10.0 - 11.5	1.3	7-7-5	--	
				SPT-6	12.5 - 14.0	1.1	4-5-5	--	
378.4	16.0		Gravelly Lean Clay, light brown, moist, stiff		SPT-7	15.0 - 16.5	1.0	4-5-9	
				SPT-8	17.5 - 19.0	1.1	2-3-16	--	
				SPT-9	20.0 - 21.5	0.6	4-4-4	--	
371.9	22.5	Gravelly Lean Clay, brown to red-brown and gray-brown, moist to wet, soft to medium stiff		SPT-10	22.5 - 24.0	1.4	2-2-3	--	
				SPT-11	25.0 - 26.5	0.3	1-2-3	--	
				SPT-12	27.5 - 29.0	0.5	3-3-3	--	
				SPT-13	30.0 - 31.5	1.5	WOH-2-3	--	
				SPT-14	32.5 - 34.0	1.5	3-3-4	--	
				SPT-15	35.0 - 36.5	1.4	5-4-6	--	

STANTECFMISM_LEGACY_CUF_PROJECT.GPJ FMSM_GRAPHIC.LOG.GDT 2/3/17

Project Number <u>175565299</u>	Location <u>N36°23'40.91", W87°39'53.24" (NAD83)</u>
Project Name <u>TVA - CUF Well Installations</u>	Boring No. <u>CUF-207</u> Total Depth <u>84.3 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
351.9	42.5	Gravelly Lean Clay, brown to red-brown and gray-brown, moist to wet, soft to medium stiff <i>(Continued)</i>		SPT-16	37.5 - 39.0	0.9	3-6-11	--	
				SPT-17	40.0 - 41.5	0.8	8-11-8	--	
336.4	58.0	Lean Clay, gray-brown, moist to wet, medium stiff		SPT-18	42.5 - 44.0	1.0	3-2-3	--	
				SPT-19	45.0 - 46.5	1.5	3-5-8	--	
				SPT-20	47.5 - 49.0	1.3	7-4-7	--	
				SPT-21	50.0 - 51.5	0.8	6-4-6	--	
				SPT-22	52.5 - 54.0	1.5	3-3-3	--	
				SPT-23	55.0 - 56.5	1.5	2-2-2	--	
321.9	72.5	Sandy Silt, brown to gray, wet, soft to very soft		SPT-24	57.5 - 59.0	1.5	2-1-2	--	
				SPT-25	60.0 - 61.5	1.5	1-3-5	--	
				SPT-26	62.5 - 64.0	1.5	3-3-1	--	
		Gravelly below 66.0		SPT-27	65.0 - 66.5	1.5	WOH-1- WOH	--	
				SPT-28	67.5 - 69.0	1.2	2-WOH-1	--	
				SPT-29	70.0 - 71.5	1.3	8-3-WOH	--	
		Gravel w/ Sand, gray, wet, loose		SPT-30	72.5 - 74.0	0.8	12-16-12	--	
				SPT-31	75.0 - 76.5	0.7	7-9-13	--	

STANTECFMNSM_LEGACY_CUF_PROJECT.GPJ FMSM_GRAPHIC.LOG.GDT 2/3/17

Project Number <u>175565299</u>	Location <u>N36°23'40.91", W87°39'53.24" (NAD83)</u>
Project Name <u>TVA - CUF Well Installations</u>	Boring No. CUF-207 Total Depth <u>84.3 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
311.9	82.5	Gravel w/ Sand, gray, wet, loose <i>(Continued)</i>		SPT-32	77.5 - 79.0	0.8	7-10-5	--	
				SPT-33	80.0 - 81.5	0.8	7-11-10	--	
310.1	84.3	Shale, gray, weathered		SPT-34	82.5 - 83.2	0.8	41-50+/.2	--	
				SPT-35	84.0 - 84.3	0.3	50+/.3	--	

Auger Refusal /
 Bottom of Hole

Top of Rock = 82.5
 Elevation (311.9)

STANTECFMISM_LEGACY_CUF_PROJECT.GPJ_FMSM_GRAPHIC.LOG.GDT_2/3/17

Project Number <u>175565299</u>	Location <u>N36°23'31.88", W87°39'59.86" (NAD83)</u>
Project Name <u>TVA - CUF Well Installations</u>	Boring No. CUF-208 Total Depth <u>60.0 ft</u>
County <u>Stewart, TN</u>	Surface Elevation <u>394.6 ft (NGVD29)</u>
Project Type <u>Well Installations</u>	Date Started <u>5/17/16</u> Completed <u>5/17/16</u>
Supervisor <u>D. Pleiman</u> Driller <u>D. Jessie</u>	Depth to Water <u>30.0 ft</u> Date/Time <u>5/17/16</u>
Logged By <u>Jordan Matthews</u>	Depth to Water <u>35.9 ft</u> Date/Time <u>7/22/16</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
394.6	0.0	Top of Hole							
		Gravelly Fat Clay, red-brown, moist, soft to medium stiff		SPT-1	0.0 - 1.5	1.1	3-3-4	--	4" diameter well installed
				SPT-2	2.5 - 4.0	1.2	2-1-2	--	
				SPT-3	5.0 - 6.5	1.2	5-8-7	--	
				SPT-4	7.5 - 9.0	0.9	3-4-6	--	
383.6	11.0			SPT-5	10.0 - 11.5	1.3	7-6-7	--	
		Gravelly Lean Clay, brown to light brown, moist, medium stiff to stiff		SPT-6	12.5 - 14.0	1.1	4-5-6	--	
				SPT-7	15.0 - 16.5	0.4	3-4-5	--	
				SPT-8	17.5 - 19.0	1.0	8-8-9	--	
				SPT-9	20.0 - 21.5	0.3	4-4-2	--	
372.1	22.5			SPT-10	22.5 - 24.0	0.1	1-1-1	--	
		Gravelly Silt, light brown to brown with gray mottling, moist to wet, soft to medium stiff		SPT-11	25.0 - 26.5	0.2	2-5-6	--	
				SPT-12	27.5 - 29.0	0.6	2-2-2	--	
				SPT-13	30.0 - 31.5	1.4	2-2-3	--	
				SPT-14	32.5 - 34.0	0.8	2-2-3	--	
				SPT-15	35.0 - 36.5	1.5	2-2-4	--	
									Water @ 30.0' during drilling

STANTECFMISM_LEGACY_CUF_PROJECT.GPJ FMSM_GRAPHIC.LOG.GDT 2/3/17



Project Number		175609014		Location						
Project Name		CUF - Spillway		Boring No.		CUF-SB-1		Total Depth		47.2 ft
County		Stewart County		Surface Elevation		387.4 ft				
Project Type		Geotechnical Exploration		Date Started		2/19/10		Completed		2/23/10
Supervisor		R. Riker		Driller		J. Felts		Depth to Water		2.5 ft
Logged By		R. Riker		Date/Time		2/19/10		Depth to Water		N/A
Date/Time		N/A		Date/Time		N/A		Date/Time		N/A
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois. Cont. %	Remarks	
Elevation	Depth		Rock Core	RCD	Run	Rec. Ft.	Rec. %	Run Depth		
387.4	0.0	Top of Excavation								
		FILL, BOTTOM ASH, dark gray, moist to wet, medium to coarse grained, loose to medium dense.		SPT-1	0.0 - 1.5	1.0	1-2-2	--	Wet below 2.5'	
				SPT-2	2.5 - 4.0	1.4	3-5-6	--		
				SPT-3	5.0 - 6.5	1.5	6-5-7	--		
				SPT-4	7.5 - 9.0	1.5	3-7-7	--		
376.6	10.8	FILL, LEAN CLAY (CL) with sand and trace gravel, brown to red brown, moist to wet, medium stiff to soft.		SPT-5	10.0 - 11.5	1.4	2-3-3	--	Drilling fluid added to boring	
				SPT-6	12.5 - 14.0	0.6	6-2-3	--		
				SPT-7	15.0 - 16.5	0.9	1-2-3	--		
369.9	17.5	LEAN CLAY (CL) with sand and trace gravel, brown to red brown, moist to wet, soft to very stiff. (Native)		SPT-8	17.5 - 19.0	0.5	1-1-2	--		
				SPT-9	20.0 - 21.5	1.0	1-1-2	--		

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mols. Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		LEAN CLAY (CL) with sand and trace gravel, brown to red brown, moist to wet, soft to very stiff. (Native) (Continued)		SPT-10	25.0 - 26.5	1.4	3-4-6	--	
				SPT-11	30.0 - 31.5	1.5	3-6-7	--	
				SPT-12	35.0 - 36.5	1.1	2-19-23	--	
				SPT-13	40.0 - 41.5	0.3	5-5-8	--	Hole relocated to CUF-SB-1A due to auger breaking off in boring. Backfilled with 2 bags Bentonite grout, 2 bags portland cement, 1/4 bag bentonite
				SPT-14	45.0 - 46.2	1.0	3-4-50+	--	
340.2	47.2	Auger Refusal / Bottom of Hole Top of Rock = 47.3 Elevation (340.1)							

PROJECT NUMBER: 175609014; DATE: 05/04/10; DRAWN BY: JLS; CHECKED BY: JLS; SCALE: AS SHOWN; SHEET: 2 OF 2



Project Number	175809014	Location	
Project Name	CUF - Spillway	Boring No.	CUF-SB-1A Total Depth <u>57.1 ft</u>
County	Stewart County	Surface Elevation	<u>387.5 ft</u>
Project Type	Geotechnical Exploration	Date Started	<u>2/23/10</u> Completed <u>2/24/10</u>
Supervisor	R. Riker Driller J. Felts	Depth to Water	<u>2.5 ft</u> Date/Time <u>2/23/10</u>
Logged By	R. Riker	Depth to Water	<u>N/A</u> Date/Time <u>N/A</u>

Lithology		Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois. Cont. %	Remarks
Elevation	Depth	Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
387.5	0.0							
								Hole offset 2 feet north and 1 foot east of Boring B-1
376.7	10.8							
370.0	17.5							

STANTEC CONSULTING SERVICES INC. 175809014 CUF - SPILLWAY



SUBSURFACE LOG

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois. Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		LEAN CLAY (CL) with sand and trace gravel, brown to red brown, moist to wet, soft to very stiff. (Native) (Continued)							
340.2	47.3								Backfilled with 2 bags Bentonite grout, 3 bags portland cement, 1/4 bag bentonite
		LIMESTONE, gray to light gray, thin bedded, Hard, Numerous Shale partings, Sandy zone from 49.7 to 54.0, Shalely zone from 56.2 to 57.1							No water return @ 47.3 Began Core



SUBSURFACE LOG

Project Number	175609014	Location			
Project Name	CUF - Spillway	Boring No.	CUF-SB-2	Total Depth	50.5 ft
County	Stewart County	Surface Elevation	386.8 ft		
Project Type	Geotechnical Exploration	Date Started	2/24/10	Completed	2/25/10
Supervisor	R. Riker	Driller	J. Felts	Depth to Water	2.5 ft
Logged By	R. Riker	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois. Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
386.8	0.0	Top of Excavation							
		FILL, BOTTOM ASH, dark gray, moist to wet, medium to coarse grained, medium dense.		SPT-1	0.0 - 1.5	1.3	2-4-12	--	Top cover bottom ash roadway
				SPT-2	2.5 - 4.0	1.1	6-7-8	--	Wet below 2.5
				SPT-3	5.0 - 6.5	1.2	5-9-12	--	
378.5	8.3	FILL, LEAN CLAY (CL) with Sand, brown to red brown, moist, very soft to medium stiff, with few gravels, and possible manganese concretions, with bottom ash to 11.5 feet		SPT-4	7.5 - 9.0	0.7	1-2-3	-	
				SPT-5	10.0 - 11.5	0.4	1-WOH-1	--	
				SPT-6	12.5 - 14.0	0.0	1-2-3	-	
				SPT-7	15.0 - 16.5	0.9	1-1-1	--	
369.3	17.5	FAT CLAY (CH) with sand, gravel and chert pieces, brown to reddish brown, moist, medium stiff to stiff (Native)		SPT-8	17.5 - 19.0	1.3	1-3-4	--	Rock fragments in tip
				SPT-9	20.0 - 21.5	1.4	6-8-4	--	



Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois. Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		FAT CLAY (CH) with sand, gravel and chert pieces, brown to reddish brown, moist, medium stiff to stiff (Native) <i>(Continued)</i>		SPT-10	25.0 - 26.5	1.4	6-8-12	--	
				SPT-11	30.0 - 31.5	1.5	6-7-10	-	
				SPT-12	35.0 - 36.5	0.9	5-7-8	--	
345.7	41.1			SPT-13	40.0 - 41.1	1.1	5-8-50+	-	Rock fragments in tip @ 40.0 Began Core
		LIMESTONE, gray to light gray, thin bedded, Hard, Numerous Shale partings and Sandy zones.							Backfilled 4 bags of portland cement, 2 bags Bentonite grout, 1/2 bag bentonite
336.3	50.5			97	9.4	9.4	100	50.5	
Bottom of Hole									
Top of Rock ≈ 41.1 Elevation (345.7)									



Project Number		175609014		Location						
Project Name		CUF - Spillway		Boring No.		CUF-SB-3		Total Depth		21.0 ft
County		Stewart County		Surface Elevation		387.2 ft				
Project Type		Geotechnical Exploration		Date Started		2/25/10		Completed		2/25/10
Supervisor		R. Riker		Driller		J. Felts		Depth to Water		2.5 ft
Logged By		R. Riker		Date/Time		2/25/10		Depth to Water		N/A
Date/Time		N/A		Date/Time		N/A		Date/Time		N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois. Cont. %	Remarks	
Elevation	Depth		Rock Core							RQD
387.2	0.0	Top of Excavation								
		FILL, BOTTOM ASH, dark gray, moist to wet, medium to coarse grained, loose to medium dense.		SPT-1	0.0 - 1.5	1.1	2-4-4	--	Top cover bottom ash roadway	
				SPT-2	2.5 - 4.0	1.2	4-5-6	--	Wet below 2.5	
				SPT-3	5.0 - 6.5	1.5	6-10-12	--		
				SPT-4	7.5 - 9.0	1.2	6-8-12	--		
377.2	10.0	LEAN CLAY with Sand, brown to red brown, fine to medium grained, moist, plastic, stiff to hard, with few gravels, and possible manganese concretions. Fill to about 15.7 feet.		SPT-5	10.0 - 11.5	1.6	9-6-4	--		
				SPT-6	12.5 - 14.0	1.1	4-6-7	--		
				SPT-7	15.0 - 15.7	0.7	6-50+	--	Boulder zone 15.7 to 20.0, auger advance slowed	
				SPT-8	18.0 - 19.4	0.4	2-4-50+	--		
				SPT-9	20.0 - 20.2	0.2	50+	--		
366.2	21.0	Auger Refusal / Bottom of Hole								
Top of Rock = 21.0 Elevation (366.2)										

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Project Number	175558201	Location	N 731,946.89, E 1,511,072.34		
Project Name	CUF Dry Ash Stack Divider Dike	Boring No.	B-212	Total Depth	86.0 ft
County	Stewart County, Tennessee	Surface Elevation	392.7 ft		
Project Type	Geotechnical Exploration	Date Started	2/15/18	Completed	2/15/18
Supervisor	W. Modrall	Driller	D. Jessie	Depth to Water	19.0 ft
Logged By	W. Modrall	Depth to Water	18.6 ft	Date/Time	2/28/18

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
392.7	0.0	Top of Hole							
392.2	0.5	Clayey Gravel, reddish brown to brown, moist							Sonic drilling method used to advance 6" PVC casing to 39 feet.
390.2	2.5	Bottom Ash, dark gray to black, moist							
		Boulders With Silty Clay, gray to brown, moist to wet							
362.7	30.0	Boulders, gray, wet							

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Project Number		175558201			Location		N 731,946.89, E 1,511,072.34			
Project Name		CUF Dry Ash Stack Divider Dike			Boring No.		B-212	Total Depth		86.0 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
353.2	39.5	Boulders, gray, wet (Continued)							Direct-mud rotary drilling method used to advance 4" HW casing to refusal WOR: Weight of Rods	
		Fly Ash, dark gray to black, wet, loose, (ML) Silt with gravel		SPT-1	39.5 - 41.0	1.3	WOR-	--		
340.2	52.5			SPT-2	41.0 - 43.0	2.0	WOR-	46	SPT-4: Non-plastic	
				SPT-3	43.0 - 44.5	0.7	WOR-	47		
				SPT-4	44.5 - 46.0	0.8	WOR-	41		
				SPT-5	46.0 - 47.5	0.5	WOR-	52		
				SPT-6	47.5 - 49.0	0.0	WOR-	--		
				SPT-7	50.5 - 52.0	1.0	WOR-	58		
				SPT-8	52.0 - 53.5	1.0	WOR-	43		
331.2	61.5	Lean Clay With Sand, grayish brown, wet, very soft to medium stiff, (CL)		ST-1	53.5 - 56.0	2.5	WOR-	--	WOH: Weight of Hammer SPT Composite: SPT-9,10 LL = 32, PI =12	
				SPT-9	56.0 - 57.5	0.4	WOH-	31		
				ST-2	57.5 - 60.0	0.9	WOH-	--		
				SPT-10	60.0 - 61.5	0.8	3-1-5	30		
320.5	72.2	Lean Clay With Sand, yellowish brown, wet, soft to very stiff, (CL)		SPT-11	61.5 - 63.0	2.0	5-2-2	--	Zero recovery SPT-13, replace sample catcher. SPT-15: LL = 43, PI =27	
				ST-3	63.0 - 65.5	0.0	7-6-9	--		
				SPT-12	64.0 - 65.5	0.4	7-6-9	29		
				SPT-13	65.5 - 67.0	0.0	7-2-4	--		
				SPT-14	67.0 - 68.5	0.4	5-4-4	--		
				SPT-15	68.5 - 70.0	1.1	8-4-4	24		
316.7	76.0	Clayey Gravel With Sand, yellowish brown, wet, medium loose to very dense		ST-4	70.0 - 72.5	2.2		--	Began Core	
				SPT-16	72.5 - 74.0	0.8	15-17-10	--		
				SPT-17	74.0 - 75.5	0.6	8-10-12	40		
				SPT-18	75.5 - 76.0	0.9	20-	--		
		Shale, very dark gray, thin bedded to thick bedded					50+/0.4			

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Project Number <u>175558201</u>	Location <u>N 731,946.89, E 1,511,072.34</u>
Project Name <u>CUF Dry Ash Stack Divider Dike</u>	Boring No. <u>B-212</u> Total Depth <u>86.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Shale, very dark gray, thin bedded to thick bedded <i>(Continued)</i>		88	2.5	2.4	96	78.5	
				56	2.5	2.5	100	81.0	
306.7	86.0			58	5.0	4.5	90	86.0	

Bottom of Hole

Top of Rock = 76.0
Elevation (316.7)

LL = Liquid Limit, PI = Plasticity Index
2" PVC standpipe piezometer installed at 74.8 ft. See Piezometer log for details.

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Project Number	175558201	Location	N 731,981.51, E 1,510,779.23				
Project Name	CUF Dry Ash Stack Divider Dike	Boring No.	B-222	Total Depth	101.0 ft		
County	Stewart County, Tennessee	Surface Elevation	392.5 ft				
Project Type	Geotechnical Exploration	Date Started	2/14/18	Completed	2/14/18		
Supervisor	W. Modrall	Driller	D. Jessie	Depth to Water	19.0 ft	Date/Time	2/20/18
Logged By	W. Modrall	Depth to Water	18.5 ft	Date/Time	2/28/18		

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
392.5	0.0	Top of Hole							
392.0	0.5	Clayey Gravel, reddish brown to brown, moist							Sonic drilling method used to advance 6" PVC casing to 39 feet.
390.0	2.5	Bottom Ash, dark gray to black, moist							
		Boulders With Silty Clay, gray to brown, moist to wet							
362.5	30.0	Boulders, gray, wet							

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Project Number		175558201			Location		N 731,981.51, E 1,510,779.23			
Project Name		CUF Dry Ash Stack Divider Dike			Boring No.		B-222	Total Depth		101.0 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
353.5	39.0	Boulders, gray, wet (Continued)							Direct-mud rotary dilling method used to advance 4" HW casing to refusal SPT-2: Non-plastic	
		Fly Ash, dark gray to black, wet, very soft to soft, (ML) Silt		SPT-1	39.0 - 40.5	0.5	3-2-1	39		
				SPT-2	40.5 - 42.0	0.2	2-1-1	53		
				SPT-3	42.0 - 43.5	2.0	1-1-1	46		
347.5	45.0			ST-1	43.5 - 45.0	0.0		47		
		Lean Clay, grayish brown, wet, very soft, (CL)		SPT-4	45.0 - 46.5	2.0	6-2-1	28	WOR: Weight of Rods	
				ST-2	46.5 - 49.0	2.5		--		
				SPT-5	49.0 - 50.5	2.0	WOR- WOH- WOH- WOH- WOH-	33	SPT-6: LL = 34, PI = 14	
				SPT-6	50.5 - 52.5	2.0		32		
				ST-3	52.5 - 54.5	2.4	WOH- WOH-	--	WOH: Weight of Hammer	
				SPT-7	54.5 - 56.0	1.5		--		
				ST-4	56.0 - 58.0	1.5	WOH- WOH-	--		
332.5	60.0			SPT-8	58.0 - 60.0	1.5	WOR- WOH- WOH-	38		
		Lean Clay With Sand, grayish brown, wet, medium stiff to stiff, (CL)		SPT-9	60.0 - 61.5	1.5	WOH- WOH- WOH-8-	27	SPT-14: LL =32, PI =12	
				SPT-10	61.5 - 63.0	0.8	11 7-2-2	22		
				SPT-11	63.0 - 64.5	0.4	3-4-4	33		
				SPT-12	64.5 - 66.0	1.5	3-4-10	29		
				SPT-13	66.0 - 67.5	0.7	6-7-2	27		
				SPT-14	67.5 - 69.0	1.5	2-3-4	30		
				ST-5	69.0 - 71.5	1.9		--		
319.5	73.0			SPT-15	71.5 - 73.0	0.0	3-4-11	--		
		Clayey Gravel With Sand, yellowish brown, wet, very loose to dense		SPT-16	73.0 - 74.5	0.8	8-10-11	27		
				SPT-17	74.5 - 76.0	0.9	7-4-4	--		
				SPT-18	76.0 - 77.5	0.7	9-14-11	21		

STANTECFMNM_LEGACY_175558201_LOGS.GPJ_FMSM.GRAPHIC.LOG.GDT_6/22/18

Project Number		175558201			Location		N 731,981.51, E 1,510,779.23			
Project Name		CUF Dry Ash Stack Divider Dike			Boring No.		B-222	Total Depth		101.0 ft
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth		
		Clayey Gravel With Sand, yellowish brown, wet, very loose to dense <i>(Continued)</i>		SPT-19	77.5 - 79.0	1.0	13-3-4	25		
			SPT-20	79.0 - 80.5	1.0	4-6-7	--			
			ST-6	80.5 - 81.5	0.0		--			
			SPT-21	81.5 - 83.0	0.6	7-7-12	19			
			SPT-22	83.0 - 84.5	0.7	14-11-7	26			
			SPT-23	84.5 - 86.0	0.9	16-18-21	--			
			SPT-24	86.0 - 87.5	1.5	17-23-20	24			
			SPT-25	87.5 - 89.0	0.6	32-25-21	--			
			SPT-26	89.0 - 90.5	0.4	22-11-16	22			
			SPT-27	90.5 - 92.0	1.5	8-8-6	--			
			SPT-28	92.0 - 93.5	0.4	2-1-1	49			
			SPT-29	93.5 - 95.0	1.8	WOR-4-3	--			
			SPT-30	95.0 - 96.5	1.5	WOH-4-15	55			
			SPT-31	96.5 - 98.0	1.2	9-7-10	54			
		SPT-32	98.0 - 99.5	1.1	33-21-12	17				
291.5	101.0			SPT-33	99.5 - 101.0	0.8	35-50+/-0.3	--		
		Auger Refusal / Bottom of Hole							LL = Liquid Limit, PI = Plasticity Index 2" PVC standpipe piezometer installed at 83.1 ft. See Piezometer log for details.	

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Project Number	175558201	Location	N 732,009.85, E 1,510,486.19		
Project Name	CUF Dry Ash Stack Divider Dike	Boring No.	B-232	Total Depth	121.0 ft
County	Stewart County, Tennessee	Surface Elevation	393.1 ft		
Project Type	Geotechnical Exploration	Date Started	2/8/18	Completed	2/13/18
Supervisor	W. Modrall	Driller	D. Jessie	Depth to Water	21.0 ft
Logged By	W. Modrall	Depth to Water	18.8 ft	Date/Time	2/28/18

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
393.1	0.0	Top of Hole							
392.6	0.5	Clayey Gravel, reddish brown to brown, moist							Sonic drilling method used to advance 6" PVC casing to 40 feet.
389.1	4.0	Bottom Ash, dark gray to black, moist to wet							
		Boulders With Silty Clay, gray to brown, moist							
363.1	30.0	Boulders, gray, dry							

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Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
356.1	37.0	Fly Ash, dark gray to black, saturated to wet, very soft, (ML) Silt		SPT-1	42.5 - 44.0	2.0	WOH- WOH-2 WOH- WOH-1	54	Direct-mud rotary dilling method used to advance 4" HW casing to refusal WOH: Weight of Hammer SPT-1: Non-plastic
				SPT-2	44.0 - 45.5	2.0		51	
				ST-1	45.5 - 48.5	2.5		--	
				SPT-3	48.5 - 50.0	0.6	1-1-1	54	
				ST-2	50.0 - 53.0	2.5		--	
340.1	53.0	Fat Clay, grayish brown, moist, very soft to soft, (CH)		SPT-4	53.0 - 54.5	2.0	WOR- WOH- WOH	53	WOR: Weight of Rods SPT-4: LL= 50, PI = 27
337.8	55.3			ST-3	54.5 - 57.5	0.8		--	
		Silty Sand, grayish brown, moist, medium dense - with Gravel at 59.0 feet		SPT-5	57.5 - 59.0	1.0	6-9-10	34	
				SPT-6	59.0 - 60.5	1.1	7-5-7	28	
				ST-4	60.5 - 63.5	0.0		--	
				SPT-7	63.5 - 65.0	1.0	6-8-12	19	
328.1	65.0	Gravel With Sand, yellowish brown, saturated, medium dense to dense		SPT-8	65.0 - 66.5	1.1	20-11-14	20	
				SPT-9	66.5 - 68.0	1.0	3-11-11	23	
				SPT-10	68.0 - 69.5	0.7	17-7-6	33	
				SPT-11	69.5 - 71.0	0.8	8-12-13	24	
				SPT-12	71.0 - 72.5	0.9	11-13-15	23	
				SPT-13	72.5 - 74.0	0.9	8-7-14	16	
				SPT-14	74.0 - 75.5	1.0	15-14-15	22	
				SPT-15	75.5 - 77.0	1.0	3-12-13	37	

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Project Number <u>175558201</u>				Location <u>N 732,009.85, E 1,510,486.19</u>					
Project Name <u>CUF Dry Ash Stack Divider Dike</u>				Boring No. <u>B-232</u>		Total Depth <u>121.0 ft</u>			
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
308.6	84.5	Gravel With Sand, yellowish brown, saturated, medium dense to dense <i>(Continued)</i>		SPT-16	77.0 - 78.5	0.6	12-12-11	19	
				SPT-17	78.5 - 80.0	0.6	6-8-13	14	
				SPT-18	80.0 - 81.5	0.7	27-10-11	21	
				SPT-19	81.5 - 83.0	0.8	14-10-13	22	
				SPT-20	83.0 - 84.5	0.9	20-16-17	24	
305.6	87.5	Clayey Sand With Gravel, yellowish brown, saturated, dense		SPT-21	84.5 - 86.0	1.0	23-20-24	21	
				SPT-22	86.0 - 87.5	0.5	19-20-17	18	
282.6	110.5	Lean Clay With Sand, light brown, saturated, soft to very stiff		SPT-23	87.5 - 89.0	0.5	15-20-14	21	
				SPT-24	89.0 - 90.5	0.7	7-19-8	35	
				SPT-25	90.5 - 92.0	1.3	WOH-3-5	--	
				SPT-26	92.0 - 93.5	1.2	7-8-12	15	
				SPT-27	93.5 - 95.0	1.3	13-18-10	--	
				SPT-28	95.0 - 96.5	0.5	10-10-17	--	
				SPT-29	96.5 - 98.0	0.4	5-5-4	48	
				SPT-30	98.0 - 99.5	0.0	16-7-4	--	
				SPT-31	99.5 - 101.0	1.5	8-7-5	30	
				SPT-32	101.0 - 102.5	0.8	4-5-8	30	
				SPT-33	102.5 - 104.0	0.9	10-8-14	35	
				SPT-34	104.0 - 105.5	0.0	12-3-1	--	
				SPT-35	105.5 - 108.2	0.1	WOH- WOH- WOH	--	
				SPT-36	108.2 - 111.0	0.8	WOR- WOR- WOR	29	
							With the weight of the hammer, the sampler and rods fell past the test interval to a depth of 108.2ft.		
							With the weight of the rods, the sampler and rods fell past the test interval to a depth of 111ft.		
							Began Core		
		Limestone, weak red to light gray		SPT-37	111.0 - 112.5	0.1	50+/-0.1	--	
				60	125	2.5	100	113.0	
				68	4.0	3.2	80	117.0	

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Project Number <u>175558201</u>	Location <u>N 732,009.85, E 1,510,486.19</u>
Project Name <u>CUF Dry Ash Stack Divider Dike</u>	Boring No. <u>B-232</u> Total Depth <u>121.0 ft</u>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
272.1	121.0	Limestone, weak red to light gray <i>(Continued)</i>		95	4.0	4.0	100	121.0	
		Bottom of Hole							LL = Liquid Limit, PI = Plasticity Index
		Top of Rock = 110.5 Elevation (282.6)							2" PVC standpipe piezometer installed at 82.5 ft. See Piezometer log for details.

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Project Number	175558201	Location	N 732,022.42, E 1,510,166.46		
Project Name	CUF Dry Ash Stack Divider Dike	Boring No.	B-242	Total Depth	105.1 ft
County	Stewart County, Tennessee	Surface Elevation	393.0 ft		
Project Type	Geotechnical Exploration	Date Started	1/23/18	Completed	2/7/18
Supervisor	W. Modrall	Driller	S. Bradford	Depth to Water	20.0 ft
Logged By	W. Modrall	Depth to Water	19.0 ft	Date/Time	2/28/18

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
393.0	0.0	Top of Hole							
392.5	0.5	Clayey Gravel, reddish brown to brown, moist							Sonic drilling method used to advance 6" PVC casing to 39 feet.
390.5	2.5	Bottom Ash, dark gray to black, moist to wet							
		Boulders With Silty Clay, gray to brown, moist							
363.0	30.0	Boulders, gray, dry							

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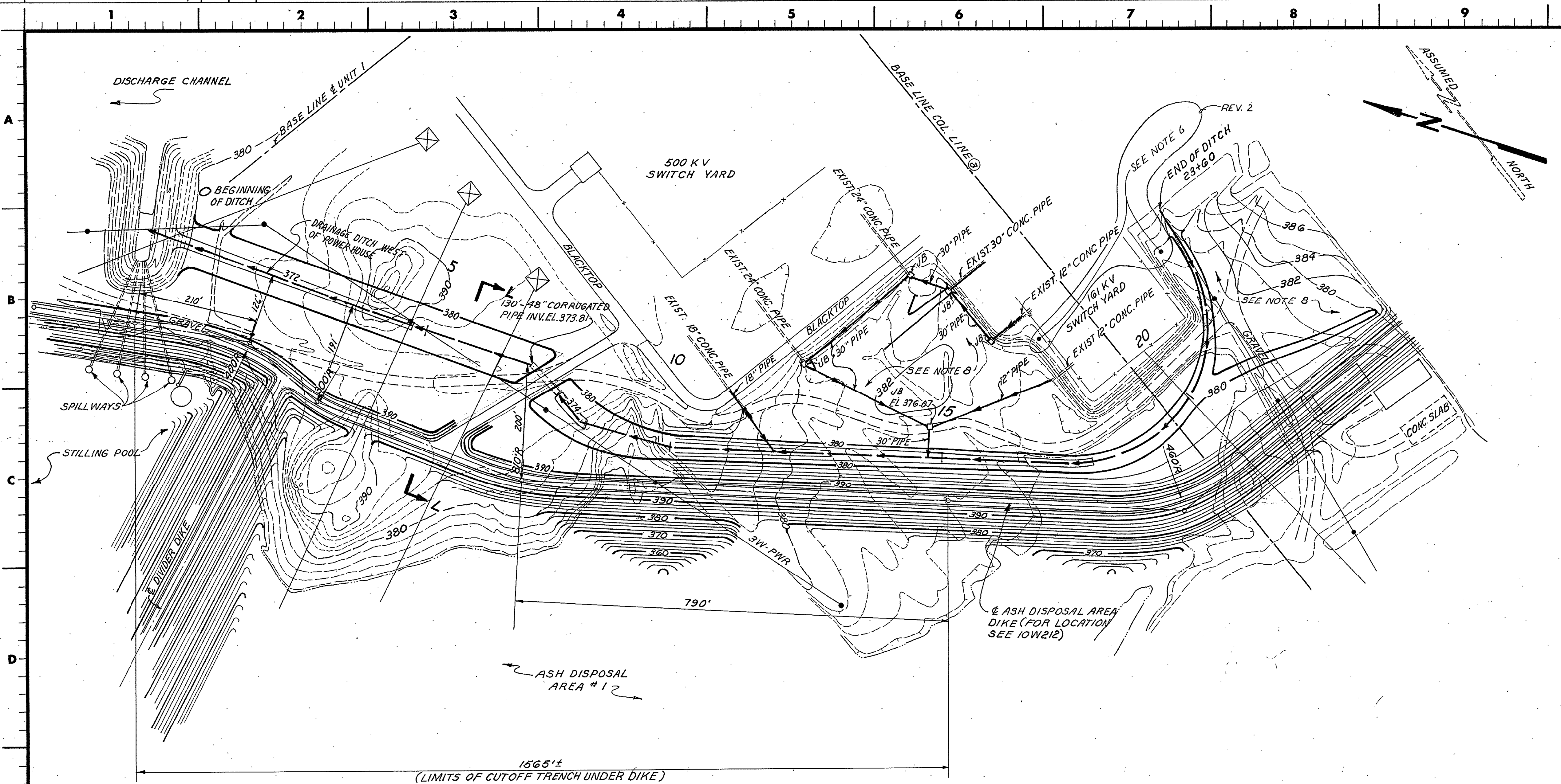
Project Number <u>175558201</u>				Location <u>N 732,022.42, E 1,510,166.46</u>					
Project Name <u>CUF Dry Ash Stack Divider Dike</u>				Boring No. <u>B-242</u>		Total Depth <u>105.1 ft</u>			
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
354.0	39.0	Boulders, gray, dry (Continued)		SPT-1	36.0 - 37.5	1.0	5-20-8	--	Direct-mud rotary drilling method used to advance 4" HW casing to refusal SPT Composite: SPT-5,6,7,8 LL=26, PI =6
				SPT-2	37.5 - 39.0	1.0	8-5-5	--	
344.3	48.7	Fly Ash, dark gray to black, saturated to wet, very soft to very stiff, (CL-ML) Silty Clay		SPT-3	39.0 - 40.5	0.5	15-10-6	12	
				SPT-4	40.5 - 42.0	0.0	5-5-4	--	
				SPT-5	42.0 - 43.5	1.5	3-2-1	38	
				SPT-6	43.5 - 45.0	1.0	1-1-1	46	
				SPT-7	45.0 - 46.5	1.5	2-2-2	27	
				SPT-8	46.5 - 48.0	0.5	1-2-2	32	
				SPT-9	48.0 - 49.5	1.5	2-2-1	--	
335.5	57.5	Lean Clay, grayish brown, moist, very soft to soft, (CL)		ST-1	49.5 - 52.5	2.0		--	
				SPT-10	52.5 - 54.0	2.0	1-2-2	28	
				SPT-11	54.0 - 55.5	2.0	WOH- WOH-2	28	
				SPT-12	55.5 - 57.0	2.0	WOH- WOH- WOH- WOH-2-2	26	
				SPT-13	57.0 - 58.5	1.0	WOH-2-2	28	
322.8	70.2	Sandy Lean Clay, grayish brown, moist, medium stiff to stiff, (CL)		SPT-14	58.5 - 60.0	2.0	3-5-7	34	SPT Composite: SPT-13,14,15,16 LL=30, PI=11
				ST-2	60.0 - 63.0	0.0		--	
				SPT-15	63.0 - 64.5	0.6	10-5-3	31	
				SPT-16	64.5 - 66.0	1.5	5-3-3	25	
				ST-3	66.0 - 69.0	0.0		--	
				SPT-17	69.0 - 70.5	0.9	6-8-3	--	
				SPT-18	70.5 - 72.0	12.0	7-4-9	--	
		Sand With Gravel, yellowish brown, saturated, medium dense to dense		SPT-19	72.0 - 73.5	1.0	10-7-4	--	
				SPT-20	73.5 - 75.0	1.1	8-5-5	--	
				SPT-21	75.0 - 76.5	1.5	7-11-11	--	
				SPT-22	76.5 - 78.0	1.5	20-20-17	--	

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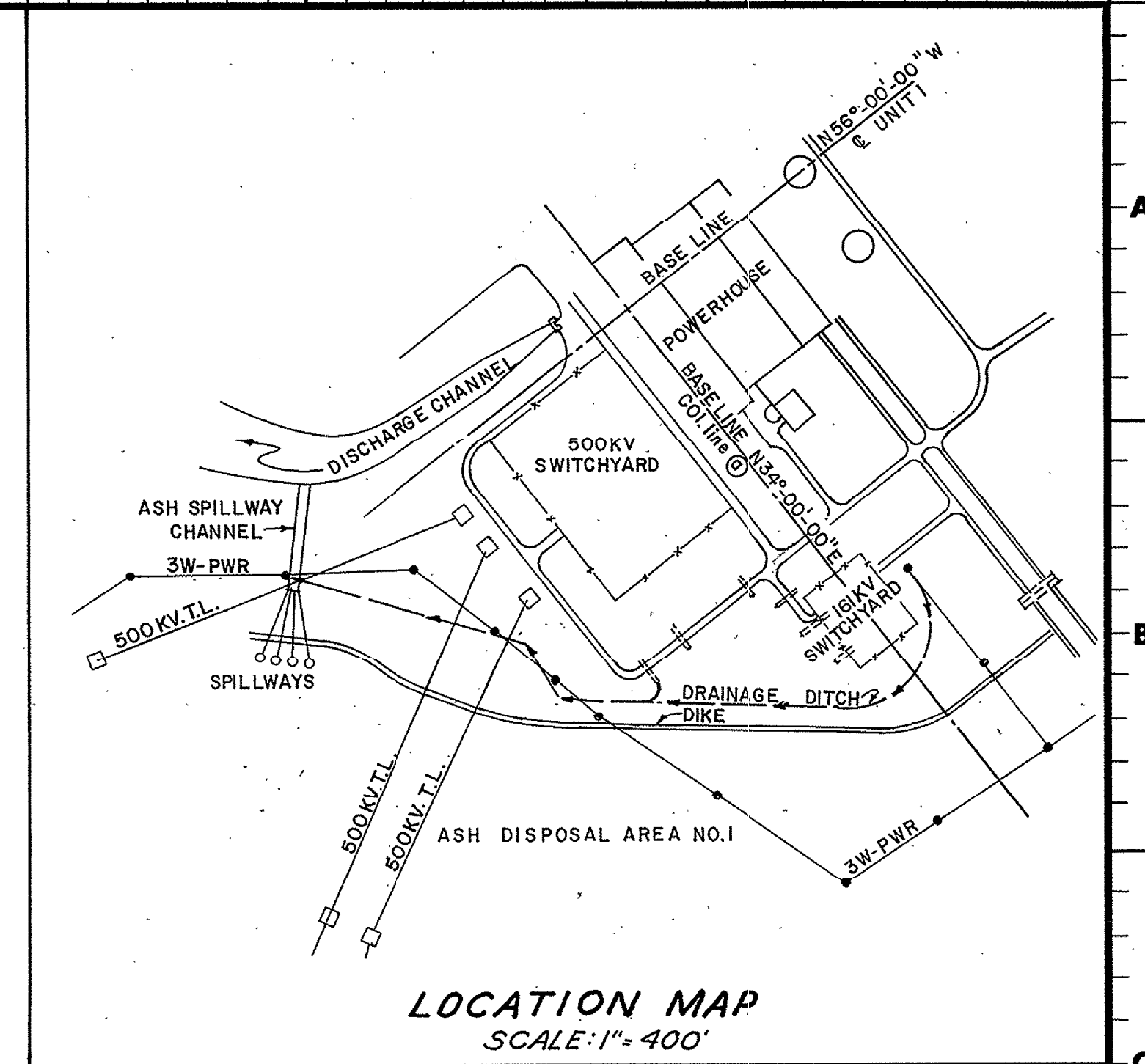
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Sand With Gravel, yellowish brown, saturated, medium dense to dense <i>(Continued)</i>		SPT-23	78.0 - 79.5	0.9	5-9-11	--	
			SPT-24	79.5 - 81.0	1.3	7-8-13	--		
			SPT-25	81.0 - 82.5	1.5	6-3-1	--		
			SPT-26	82.5 - 84.0	1.2	9-10-11	--		
			SPT-27	84.0 - 85.5	1.4	10-8-4	--		
			SPT-28	85.5 - 87.0	1.1	20-10-11	--		
			SPT-29	87.0 - 88.5	1.0	21-18-21	--		
			SPT-30	88.5 - 90.0	0.8	5-13-16	--		
			SPT-31	90.0 - 91.5	0.6	15-10-10	--		
			SPT-32	91.5 - 93.0	0.9	8-5-6	--		
			SPT-33	93.0 - 94.5	1.2	13-11-11	--		
296.5	96.5								
		Completely Weathered Shale, bluish gray and purple, moist, very stiff		SPT-34	97.0 - 98.5	1.0	13-13-17	--	WOR: Weight of Rod
			SPT-35	99.5 - 101.0	0.9	11-10-8	--		
292.0	101.0								
		Lean Clay, reddish brown, saturated, very soft		SPT-36	102.5 - 104.0	1.5	WOR- WOR- WOR	--	
			SPT-37	105.0 - 105.1					
287.9	105.1								
		Auger Refusal / Bottom of Hole					50+/-0.1		LL = Liquid Limit, PI = Plasticity Index 2" PVC standpipe piezometer installed at 95.3 ft. See Piezometer log for details.

STANTECFM\SL_LEGACY_175558201_LOGS.GPJ_FMSM\GRAPHIC.LOG.GDT_6/22/18

**ATTACHMENT B
HISTORICAL DRAWINGS**

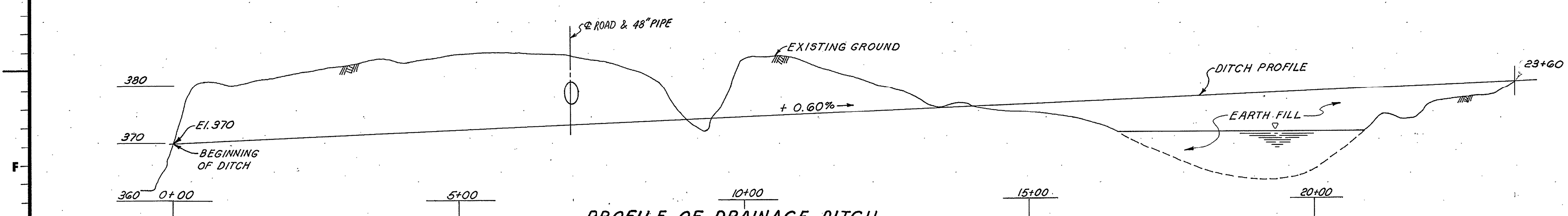


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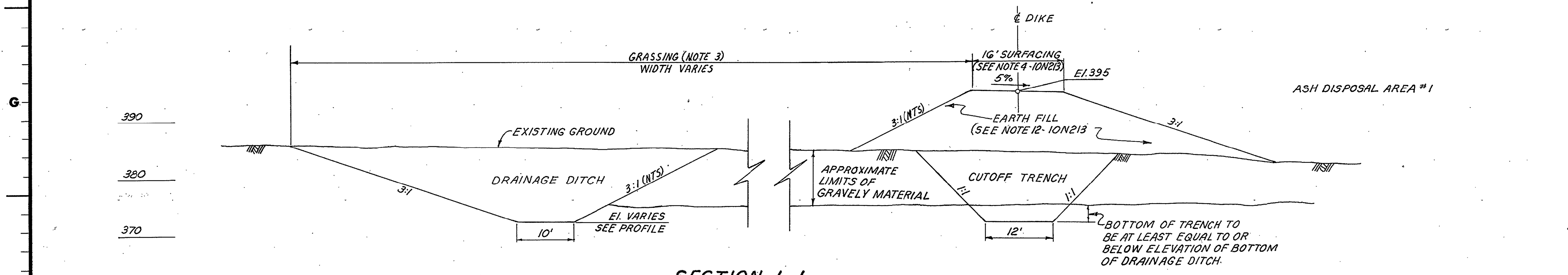


LOCATION MAP
SCALE: 1" = 400'

- NOTES:
1. ALL WORK SHALL BE IN ACCORDANCE WITH THE T-1 SPECIFICATIONS, UNLESS OTHERWISE NOTED.
 2. DASHED CONTOURS REPRESENT EXISTING GROUND. SOLID CONTOURS REPRESENT FINISHED GRADE.
 3. ALL DITCH SLOPES AND OTHER DISTURBED AREAS SHALL BE SEEDED WITH TYPE G MIXTURE E. ALL GRASSED AREAS TO BE FERTILIZED AND MULCHED IN ACCORDANCE WITH SECTIONS 180 & 182 RESPECTIVELY.
 4. AREAS INDICATED IS TO BE BACKFILLED WITH GOOD CLAY MATERIAL AND COMPACTED WITH SHEEPSFOOT ROLLER PRIOR TO EXCAVATION OF DRAINAGE DITCH (APPROXIMATELY 120,000 CY).
 5. FOR OTHER NOTES SEE ION213.
 6. REVISION 2 OF THIS DRAWING ADDRESSES EXPANSION OF THE 161 KV SWITCHYARD ON THE EAST AND WEST SIDES. THESE IMPROVEMENTS ARE SHOWN ON DRAWING ION227-1.



PROFILE OF DRAINAGE DITCH
VERT. 1" = 10'
SCALE HORIZ. 1" = 100'



SECTION L-L
SCALE: 1" = 10'

REV. NO.	ECN. NO.	DATE	ISSN	DRWN	CHKD	SUPV	ENGR	INSPECTION	APPROVED
2		01-21-93	SW	ION	ION	ION	ION	ION	ION
REVISED TO REFLECT 161 KV GRADING IMPROVEMENTS SHOWN ON DWG. ION227-1									
AS CONSTRUCTED PA 3384									
DRSN: D.A. VALENTINE					INSP: _____				
ENGR: ALBERT H. SPERBER					ENGR: _____				
CHKD: J.L. GLOVER					ENGR: _____				
SUPV: J.L. GLOVER					ENGR: <i>H. W. Burnett</i>				
SCALE: 1" = 100' EXCEPT AS NOTED									

MAIN PLANT
DETAILS OF DRAINAGE
DITCH WEST OF
POWERHOUSE

CUMBERLAND STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
<i>Albert H. Sperber</i>	<i>A. D. Stenberg</i>	<i>H. W. Burnett</i>
KNOXVILLE	7-11-79	46 C ION227 R2

INSPECTED AND APPROVED FOR ISSUE

PRINT	3
SIZE	

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PRINTS REGD-R L 217

