CDM Smith

# Memorandum


*To:* *David Mason*
*Donna Friis*
*Project File*

*From:* *Steve Whiteside*
*Danielle K. Neamtu*

*Date:* *August 17, 2012*

*Subject:* *Geotechnical Design Memorandum*
*Watts Bar Fossil Plant Coal Combustion Products Closure Project*
*Phase 2 – Ash/Stilling Pond Breaching Project*

## 1.0 Introduction

### 1.1 Project Description

CDM Smith, Inc. (CDM Smith) has been retained by the Tennessee Valley Authority (TVA) to provide professional engineering and technical services associated with the Watts Bar Fossil Plant Coal Combustion Products Closure Project at the former Watts Bar Fossil (WBF) plant near Spring City, Tennessee. CDM Smith has completed Phase 1 preliminary design services to support final closure of the WBF plant. The final closure will include five (5) main areas: (i) the Borrow Source Area, (ii), Slag Processing Area (iii), Chemical Pond Area, (iv) Ash/Stilling Pond Area, and (v) Riverbank Area. This project addresses closure of the Ash/Stilling Pond Area only.

CDM Smith has been engaged to design a breach in the Ash/Stilling Pond embankment so that the impoundment is no longer jurisdictional under the federal dam safety regulations. This breaching project is an interim measure before the final closure of the pond is designed and implemented.

The Ash/Stilling Pond area is in the southeastern portion of the WBF plant site. The proposed breach design consists of lowering the containment dike adjacent to the river and constructing a new spillway weir with box culvert outlet pipes discharging to the river to pass the 100-year storm event. The spillway weir will be set at EL. 698 and will discharge to upstream box culverts with an invert of approximately EL. 692.75 to EL. 692.35. A precast drop structure will be constructed within the containment dike to convey flows from the upstream box culverts to the downstream box culverts with an invert of approximately EL. 685.4 to EL. 685.2. Temporary works that will be constructed during this breach project include a cofferdam to divert flows away from the work area during construction and a breach of the splitter dike to maintain flow continuity between the north and south cells of the pond. These temporary features will remain-

in-place after breach of the Ash/Stilling Pond Area to provide access to the splitter dike and maintain flow continuity until final closure of the pond and other areas on site can be implemented.

CDM performed a geotechnical investigation to support the breach design and to provide geotechnical information for the pond closure. This memorandum summarizes CDM Smith's geotechnical investigation and provides geotechnical recommendations for design and construction specific to the final design of the Ash/Stilling Pond breach project.

### 1.2 Purpose and Scope

The purpose of the geotechnical exploration program was to investigate subsurface conditions for the breach and closure of the Ash/Stilling Pond area. Specifically, the project scope of work included the following;

- Drill ten (10) geotechnical test borings and three (3) hand augers to investigate subsurface conditions and obtain soil and coal combustion products (CCP) samples;
- Conduct laboratory testing to assist with classification and estimate engineering properties of soils and CCP materials encountered;
- Perform analyses and develop geotechnical engineering recommendations for design and construction of the spillway structure; and
- Prepare this geotechnical engineering memorandum presenting CDM Smith's recommendations, including data collected as part of the subsurface exploration.

### 1.3 Elevation Datum

Elevations noted herein are referenced to the North American Vertical Datum (NAVD) of 1988.

## 2.0 Site and Subsurface Conditions

### 2.1 Existing Site Conditions

The WBF plant is located along the Tennessee River approximately 7 miles southeast of Spring City, Tennessee, just south of the Watts Bar Dam. The project site includes a maintenance facility, the former plant site, and CCP disposal facilities. The site is bounded by the river to the east, undeveloped forest to the northwest, and the Watts Bar Nuclear plant to the southwest.

The area around the Ash/Stilling Pond generally slopes from west to east. Maximum land surface elevations for the project area occur along the west side of the pond and range from approximately EL. 725 to EL. 730. East of the pond, the containment dike has a crest of approximately EL. 711 and a toe of approximately EL. 695 to EL. 698. East of the toe of dike, land surface slopes steeply towards the river water surface, which varies from EL. 682 in the summer to EL. 675 in the winter. The existing site features are shown on **Figure 1**.

## 2.2 Regional Geology

The project area lies within the Tennessee Valley and Ridge Physiographic Province. This province is characterized by a series of elongated low ridges with intervening valleys that trend in the northeast-southwest direction. The geology of the Valley and Ridge consists primarily of sedimentary bedrock dominated by late Cambrian and early Ordovician material. These materials include limestone, sandstone, dolomite, and shale.

## 2.3 Subsurface Explorations

### *2.3.1 Previous Exploration Programs*

CDM Smith performed an initial subsurface investigation during Phase 1 consisting of three (3) Standard Penetration Test (SPT) borings and limited laboratory testing. These borings were performed through the east containment dike adjacent to the river, as shown on Figure 1. Two of the borings were completed as temporary groundwater observation wells. The previous exploration program is summarized in CDM Smith's Letter Report "*Existing Conditions Stability Analyses – Revision 1",* dated April 25, 2012. Boring and well installation logs as well as laboratory testing results are included as **Attachment 1**. CDM Smith also reviewed available data during Phase 1 and was unable to identify any previous exploration programs or geotechnical data for the site.

### *2.3.2 Recent Subsurface Exploration Program*

The recent Phase 2 subsurface exploration program consisted of ten (10) test borings (B-103, B-104, B-104A, B-105, and B-106. B-107, B-108, B-109, B-110, and B-111) and three (3) hand augers (HA-1, HA-2, And HA-3) drilled by Total Depth Drilling of Knoxville, Tennessee from June 11, 2012 to June 15, 2012. Test borings were drilled with a truck-mounted CME-55 drill rig advancing the borings with 3.25-inch-inside-diameter hollow stem augers for all test borings and NQ rock core sampling beyond auger refusal for B-103, B-105, B-106, and B-108. The locations were surveyed with a handheld GPS in the field by CDM Smith personnel. Test boring depths ranged from 28 to 58.5 feet below existing ground surface (ft-bgs) and hand auger depths ranged from 13 to 16 ft-bgs. Test boring locations B-103, B-107, and B-110 were converted to groundwater observation wells upon completion. The remaining boring locations were tremie grouted to the ground surface. Hand-auger locations were backfilled with cuttings. The boring and hand-auger locations are shown on Figure 1.

Split-spoon (SPT) sampling was typically conducted continuously from ground surface to a depth of 25 feet and at five-foot intervals thereafter in accordance with ASTM D1586 (2-inch-diameter sampler driven 24 inches by blows from a 140-pound hammer falling freely for a 30-inch drop). The number of blows required to drive the sampler each 6-inch increment was recorded and the Standard Penetration Resistance (N-value) was determined as the sum of the blows over the 2nd and 3rd 6-inch increment of the 24-inch drive. Representative soil samples were taken from each split-spoon and stored in jars or plastic bags for later review and laboratory testing. Undisturbed Shelby Tube samples were also collected at various depths as directed by CDM Smith's field representative.

A CDM Smith geotechnical engineer observed the test borings and hand augers in the field and visually classified the samples in accordance with the Burmister Soil Identification System. Each sample was also given a Unified Soil Classification System (USCS) designation. Test boring logs and well installation logs prepared by CDM Smith are included in **Attachment 2**. A summary of subsurface conditions encountered in the borings is provided in **Table 1A**.

## 2.4 Geotechnical Laboratory Testing

Geotechnical laboratory testing was conducted on selected split-spoon and Shelby tube samples of both soils and CCP materials as follows:

- Twenty-six (26) grain size analyses by sieve-only and combined sieve/hydrometer were performed in accordance with ASTM D422;
- Twenty-five (25) Atterberg limits tests were performed in accordance with ASTM D4318;
- Forty-one (41) moisture contents were determined in accordance with ASTM D2216;
- Two (2) Specific Gravity tests in accordance with ASTM D854;
- Three (3) one-dimensional consolidation tests in accordance with ASTM D4186; and
- Three (3) consolidated undrained triaxial shear tests in accordance with ASTM D4767.

Laboratory tests were performed by CDM Smith's geotechnical laboratory. A summary of the laboratory test results for index testing is included in **Table 1B**. The complete geotechnical laboratory test results, including strength and consolidation testing are included in **Attachment 3**.

## 2.5 Subsurface Conditions

Subsurface soil conditions were interpreted based on the subsurface explorations performed as part of this study, as well as CDM Smith's understanding of the local geology. Test borings drilled through the containment berm at the site generally encountered fill underlain by alluvial soil underlain by bedrock. Test borings drilled through the splitter dike and in the Dry Ash area at the site generally encountered CCP materials underlain by alluvial soil underlain by bedrock.

### *2.5.1 Fly Ash/Bottom Ash (CCP Materials)*

Fly Ash was encountered in the hand augers (HA-1, HA-2, and HA-3) and borings (B-109, B-110, and B-111) located in the Dry Ash Area, north of the Ash/Stilling Pond. The fly ash material was generally wet, very loose to loose, and fine-grained with blowcounts ranging from weight of hammer (WOH) to 3 blows per foot (bpf).

Bottom Ash was encountered in the borings performed through the splitter dike (B-104 and B-104A). The bottom ash material was generally wet, medium dense to dense, and medium- to coarse-grained with blowcounts ranging from 3 to greater than 50 bpf.

### *2.5.2 Fill*

Fill consisting of clay and silt was encountered in B-103, B-105, B-107, and B-108. The fill material was generally moist, varying in stiffness and was encountered at depths up to 23 ft-bgs. Blowcounts in the fill layer ranged from 8 to 30 bpf.

### *2.5.3 Alluvial Soil*

The Fill was underlain by alluvial soils consisting of sand and silt with varying amounts of clay. The stratum typically consisted of soft/loose to stiff/medium dense, gray or brown, SAND/SILT with varying amounts clay with blowcounts ranging from 2 to 18 bpf. Typically gravel-sized rounded river stone with varying amounts of sand were encountered within 1 to 5 feet of auger refusal.

### *2.5.4 Interbedded Limestone and Shale*

The Alluvial Soil was underlain by bedrock consisting of interbedded Limestone and Shale. The Limestone was typically hard, moderately to highly weathered, and extremely thin to thin bedding with very poor rock quality designation. The Shale was extremely weathered with very little recovery during coring. The top of bedrock was encountered at the boring locations between EL. 664.4 and EL. 669.2.

## 2.6 Groundwater Conditions

Groundwater levels were measured in the groundwater observation wells installed as part of CDM Smith's geotechnical investigations and are summarized in **Table 2**. In general, groundwater elevation readings in the containment berm east of the Ash/Stilling Pond range from EL. 682 to EL. 684. The groundwater elevation in the Dry Ash Area northwest of the Ash/Stilling Pond was approximately EL. 700, as measured in the observation well installed in this area.

Water levels measured in the explorations and observation wells should not necessarily be considered to represent stabilized groundwater levels. In addition, groundwater levels are expected to fluctuate with season, temperature, climate, construction in the area, and other factors. Actual conditions during construction may be different from those observed at the time of the explorations.

## 2.7 Expected Variations in Subsurface Conditions

Interpretation of general subsurface conditions presented herein is based on conditions encountered at the test boring locations. However, subsurface conditions may vary between exploration locations. If conditions are found to be different than assumed, recommendations contained in this report should be reevaluated by CDM Smith and confirmed in writing.

# 3.0 Engineering Evaluation and Design Recommendations

This section describes CDM Smith's geotechnical engineering evaluation and design recommendations for the Ash/Stilling Pond breaching project. In general, geotechnical engineering evaluations have been based on the results of field explorations, published

correlations with soil properties, and the minimum requirements of the 2006 International Building Code (IBC 2006). In addition, recommended design criteria are based on performance tolerances, such as allowable settlement, as understood to relate to similar structures.

## 3.1 Foundation Design Recommendations

The upstream culvert, drop box, and downstream culvert structures may be designed for an allowable bearing pressure of 2000 pounds per square foot (psf) with associated total and differential settlements of up to 1 inch and 0.5 inches, respectively. The spillway weir structure may be designed with service loads of up to 1000 psf with associated total and differential settlements of up to 1.5 inches and 0.75 inches, respectively. The bearing elevations for the spillway weir, upstream culverts, drop structure, and downstream culverts are approximately EL. 690, EL. 692, EL. 683, and EL. 685, respectively. The subgrade for the structures should be compacted with heavy vibratory rollers prior to placing foundation preparation materials.

For design of the culverts and drop box, an effective friction angle ($\phi$') of 30 degrees and modulus of subgrade reaction of 100 kcf is recommended.

The upstream spillway weir and the downstream culvert and wingwalls will require cutoff walls to extend below the foundation base slab. The cutoff wall shall extend to approximately EL. 687 for the spillway weir and approximately EL. 677.5 for the downstream culverts and wingwalls, as shown on the Drawings.

## 3.2 Seismic Considerations

For purposes of determining design earthquake forces for the spillway structure, in accordance with the IBC 2006, the site soils may be considered a site class "D".

## 3.3 Design Groundwater Level

Groundwater levels measured at the site to date vary from EL. 682 to EL. 700, with higher levels measured on the northwest side of the Ash/Stilling Pond and lower levels to the east, close to the river.

For the new spillway, the peak water level in the ash/stilling pond during the 100-year storm event will be EL. 700. According to the current FEMA floodplain maps, the 100-year flood level for the river adjacent to the pond is EL. 697 to EL. 698. Based upon these peak 100-year water levels, design groundwater level should be assumed as EL. 700 for the Ash/Stilling Pond structures.

## 3.4 Resistance to Uplift

The spillway weir should be designed to resist flotation due to buoyancy under the design groundwater condition.

The dead weight of the structure may be assumed to resist flotation. In accordance with USACE criteria for hydraulic structures (EM 1110-2-2100), a minimum factor of safety of 1.3 is required

when the lake is at normal pool and the structure is empty and a minimum factor of safety of 1.15 is required for the design storm condition under a 100-year flood with a 40-percent reduction of the weight of water inside the structure.

### 3.5 Lateral Earth Pressures

Below-grade structures that are backfilled on one side and restrained against rotation at the top, should be designed for lateral pressures from soil and groundwater based on an equivalent fluid pressure of 60 psf above the design groundwater level and 90 psf below the design groundwater level. A lateral pressure equal to 0.5 times (Ko) the surface vertical surcharge loads should be applied over the full height of all walls.

Earthquake-induced pressures in accordance with IBC 2006 should be included in the design of all below-grade walls. For determination of seismic lateral earth pressures, an active earth pressure coefficient (Ka) of 0.35 and a total unit weight of 115 psf may be assumed.

## 4.0 Construction Considerations

The purpose of this section is to discuss issues related to geotechnical aspects of construction for final design of the Ash/Stilling Pond breach project. Included are anticipated construction methods required to achieve the recommendations presented in the previous sections, and identification of potential construction-related problems. For specific project requirements, the reader is referred to the contract documents.

### 4.1 Excavation

Excavations for the proposed spillway structures will extend to depths up to 22 feet below existing ground surface. Excavations are anticipated to encounter fill and alluvial soils. Excavations should accommodate proposed foundations as well as site preparation activities such as over-excavation and demolition. Excavations through existing fill and alluvial soils are anticipated to be accomplished using conventional earth-moving equipment.

The Contractor will be responsible for the excavation work in accordance with applicable Federal and State laws and regulations including OSHA. The Contractor should be responsible for selection and the design of the means and methods of excavation such as open-cut with stable side slopes, trench box, etc.

The Contractor should take care to schedule the excavation to limit the duration of open cuts, slope the bottoms of the excavations to facilitate drainage and provide berms to limit runoff into the excavations. In addition, excavated material to be reused as fill should be stockpiled in such a manner that promotes runoff and limits saturation of the materials.

### 4.2 Dewatering

Based on the test borings, excavations for the new spillway may extend below the groundwater level. The groundwater levels at the time of construction may be higher than those encountered

during drilling. The Contractor will be responsible to design and implement a dewatering system that maintains a stable, undisturbed subgrade that is free from groundwater and surface water during all construction operations. To avoid disturbance of the soil subgrade, the water level in the excavations should be maintained at least 2 feet below the subgrade level during the entire period of excavation and fill placement.

## 4.3 Temporary Diversion During Construction

The existing Ash/Stilling Pond area currently collects and discharges all stormwater for the site. The stormwater enters the pond at the northeast corner, adjacent to the proposed spillway, flows around the splitter dike to the west and enters the southern cell of the pond to discharge through the existing spillway pipes adjacent to the river. As part of the pond breach construction, the pond will be drained and a cofferdam constructed around the proposed spillway to provide for diversion of storm flows and facilitate construction of the new spillway in-the-dry. The cofferdam should be constructed on 2H:1V slopes with a 16-foot-wide access road along the crest as shown in the Contract Drawings. The cofferdam should be constructed using on-site materials meeting the select fill requirements, as outlined in Section 4.5.

## 4.4 Foundation Subgrade Preparation and Protection

Care should be taken to avoid excess traffic on the excavated subgrade prior to placement of mud mat, structural fill, crushed stone, and/or concrete foundations. Final excavation in soil should be made using a smooth-edged bucket, where possible. Any unsuitable material present at the subgrade level should be removed and replaced with compacted select fill materials. The exposed soil subgrade should be protected against precipitation. Under no circumstances should fill or foundation concrete be placed on a disturbed or wet subgrade.

A geotechnical engineer should be present during foundation excavation and subgrade preparation to confirm that suitable subgrade conditions are present.

## 4.5 Backfill Materials and Compaction Requirements

### *4.5.1 Common Fill*

Common fill should consist of soil free of roots, vegetative matter, organic material, topsoil, loam, waste, debris, highly micaceous silt, frozen soil, or other deleterious material which may be compressible or which cannot be properly compacted. It should not contain stone blocks, broken concrete, masonry rubble, or other similar materials. It should have physical properties such that it can be readily spread and compacted. It should contain stones no larger than six inches, and have a maximum of 50 percent passing the No. 200 sieve a maximum liquid limit of 50 percent, a maximum plasticity index of 25 percent and exhibit a dry density of at least 95 pcf as determined by ASTM D698.

Common fill should be placed in maximum 12-inch-thick lifts, as placed, and compacted with suitable compaction equipment to at least 95 percent of the maximum dry density as determined

by ASTM D698. Lift thickness should be reduced to 6 inches in confined areas accessible only to hand-guided compaction equipment. Common fill should be placed within three percent of its optimum moisture content.

#### *4.5.2 Select Fill*

Select fill should meet the criteria of common fill except it should contain stones no larger than 2 inches.

Select fill should be placed in maximum 9-inch-thick loose lifts and compacted with suitable compaction equipment to at least 98 percent of the maximum dry density as determined by ASTM D698. Select fill should be placed within two percent of its optimum moisture content. Lift thickness should be reduced to 6 inches in confined areas accessible only to hand-guided compaction equipment.

### 4.6 Construction Monitoring

It is recommended that a qualified Geotechnical Engineer or an experienced technician under the direction of the CDM Smith Geotechnical Engineer be present during construction to confirm that the Contractor complies with the intent of the recommendations contained in this report. Specifically, the field representative would undertake the following responsibilities:

- Confirm that appropriate dewatering methods are employed;
- Observe the construction of the cofferdam;
- Confirm that the subgrade conditions encountered are suitable for support of the proposed structures; and
- Observe, test and document placement and compaction of backfill material where appropriate.

In addition, the field representative should be present to identify and provide a response should conditions encountered differ from those assumed during preparation of this report.

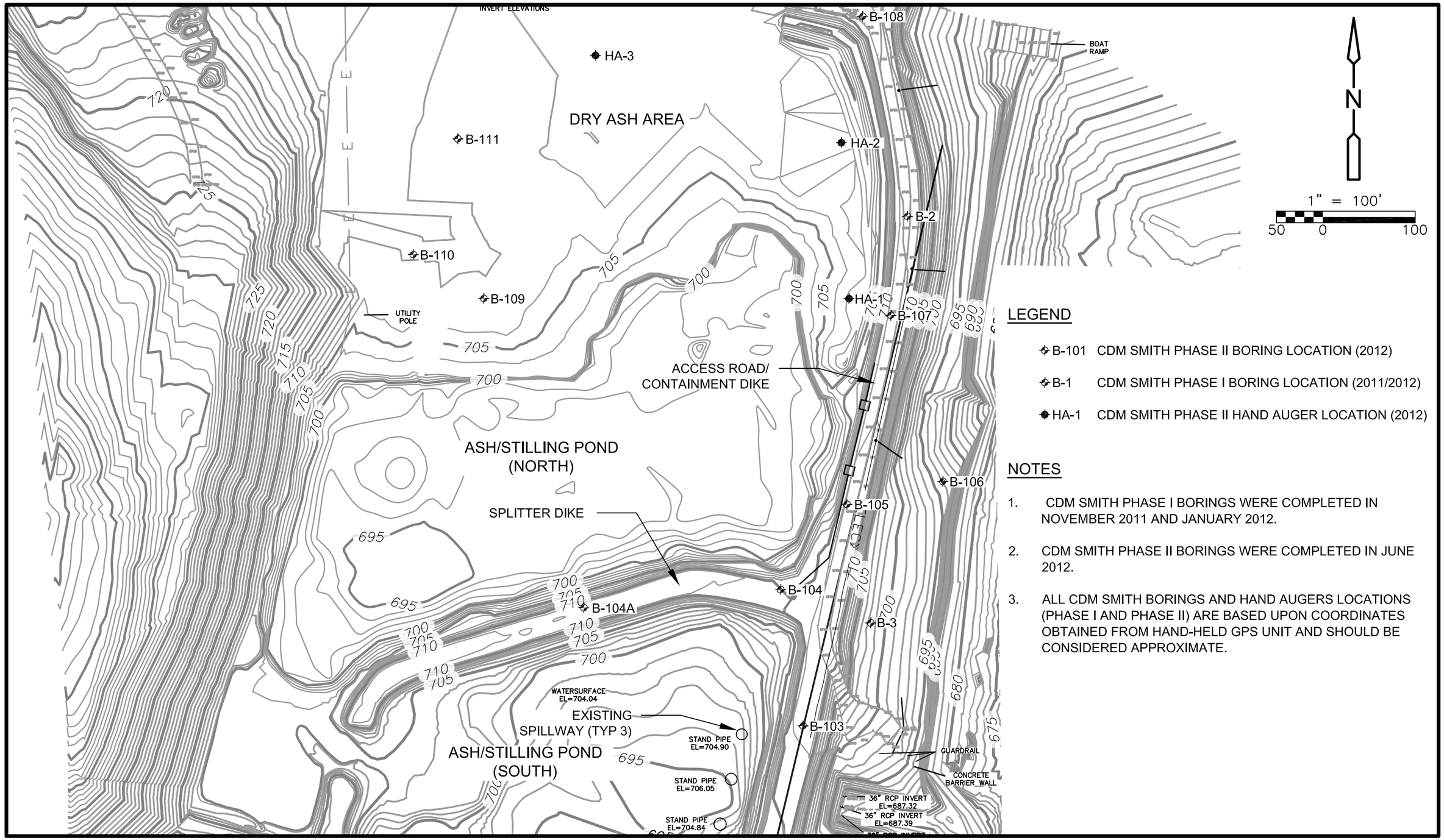
### 4.7 Closure and Limitations

These recommendations have been prepared for the proposed improvements related to the Ash/Stilling Pond breaching project for TVA Watts Barr Fossil CCP Closure Project as understood at this time and described in this memorandum. These recommendations have been prepared in accordance with generally accepted engineering practices. No other warranty, express or implied, is made. In the event that changes in the design or location of the structures occur, the conclusions and recommendations contained herein should not be considered valid unless verified in writing by CDM Smith.

Attachments:

Figure 1
Table 1A
Table 1B
Table 2
Attachment 1
Attachment 2
Attachment 3

cc: Rob Lawrence, Jintao Wen




## LEGEND

- B-101 CDM SMITH PHASE II BORING LOCATION (2012)
- B-1 CDM SMITH PHASE I BORING LOCATION (2011/2012)
- HA-1 CDM SMITH PHASE II HAND AUGER LOCATION (2012)

## NOTES

1. CDM SMITH PHASE I BORINGS WERE COMPLETED IN NOVEMBER 2011 AND JANUARY 2012.
2. CDM SMITH PHASE II BORINGS WERE COMPLETED IN JUNE 2012.
3. ALL CDM SMITH BORINGS AND HAND AUGERS LOCATIONS (PHASE I AND PHASE II) ARE BASED UPON COORDINATES OBTAINED FROM HAND-HELD GPS UNIT AND SHOULD BE CONSIDERED APPROXIMATE.

CDM Smith

TENNESSEE VALLEY AUTHORITY
WATTS BAR FOSSIL PLANT
ASH POND BREACHING PROJECT

Figure No. 1
BORING LOCATION PLAN
JUNE 2012

## Table 1A: Summary of Subsurface Explorations
## TVA WBF CCP Closure Phase 2
## Spring City, TN

| Test Boring No. | Approximate Ground Surface EL [1] | Total Drilling Depth (ft) | Stratum Thickness (ft) | | | Auger Refusal Depth (ft) | Approximate Depth to Groundwater (ft) [3] | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | Ash [2] | Fill | Alluvial Clay/Silt and Sand | | | |
| B-103 | 711.0 | 58.5 | NE | 16.0 | 32.2 | 48.2 | 27.2 | Rock coring performed from 48.2 to 58.5 feet<br>Converted to an observation well |
| B-104 | 710.0 | 30.0 | 23.0 | NE | > 7.0 | NE | - | Bottom Ash stratum |
| B-104A | 711.0 | 28.0 | 23.0 | NE | > 5.0 | NE | 25.9 | Bottom Ash stratum |
| B-105 | 711.0 | 58.0 | NE | 18.0 | 30.0 | 48.0 | 29.2 | Rock coring performed from 48.0 to 58.0 feet |
| B-106 | 693.9 | 45.5 | NE | 4.0 | 27.5 | 31.5 | 12.2 | Rock coring performed from 30.5 to 45.5 feet |
| B-107 | 710.0 | 44.3 | NE | 16.0 | >28.3 | 44.3 | 27.8 | Converted to an observation well |
| B-108 | 710.5 | 57.0 | NE | 23.0 | 24.1 | 47.1 | 22.7 | Rock coring performed from 47.0 to 57.0 feet |
| B-109 | 706.5 | 30.0 | 14.5 | NE | >15.5 | NE | NE | Fly Ash stratum |
| B-110 | 707.3 | 33.1 | 14.5 | NE | >18.6 | 33.1 | 7.2 | Fly Ash stratum<br>Converted to an observation well |
| B-111 | 706.5 | 30.0 | 14.0 | NE | >16.0 | NE | 7.4 | Fly Ash stratum |
| HA-1 | 707.0 | 13.0 | 12.0 | NE | > 1.0 | NE | 2.0 | Fly Ash stratum |
| HA-2 | 707.0 | 13.0 | 12.0 | NE | > 1.0 | NE | 3.0 | Fly Ash stratum |
| HA-3 | 707.1 | 16.0 | >16 | NE | NE | NE | 3.0 | Fly Ash stratum |

**Notes:**

1. Elevations are approximate on based hand-held GPS coordinate overlain on topographic survey. Elevation datum is North American Vertical Datum of 1988 (NAVD 88).
2. Type of Ash stratum encountered is indicated in Comments.
3. Depth to groundwater was measured at the end of drilling.

**Abbreviations:**

| | |
|---|---|
| NE | Not encountered |
| > | Indicates layer was not fully penetrated |
| B- | Test Boring |
| HA- | Hand Auger |

## Table 1-B: Summary of Laboratory Test Results
## TVA WBF CCP Closure Phase II
## Spring City, TN

| Test Boring No. | Sample No. | Sample Depth (ft) | Strata | Moisture Content[1] (%) | Grain Size Analysis[2] (%) | | | | Specific Gravity[3] | Atterberg Limits[4] (%) | | USCS Classification[5] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Gravel | Sand | Fines | | | LL | PI | |
| | | | | | | | Silt | Clay | | | | |
| B-103 | S-5 | 8~10 | Fill | 25.0 | 0.0 | 7.4 | 92.6 | | - | | - | CL |
| B-103 | S-10 | 18~20 | Alluvial | 14.5 | | | - | | - | 23 | 8 | CL |
| B-103 | S-11 | 23~25 | Alluvial | 24.2 | 0.0 | 29.7 | 37.9 | 32.4 | - | | - | CL |
| B-103 | S-13 | 33~35 | Alluvial | 29.9 | 0.0 | 64.2 | 35.8 | | - | | - | SC |
| B-103 | S-15 | 43~45 | Alluvial | 25.3 | 36.1 | 34.9 | 15.7 | 13.3 | - | | - | GC |
| B-104 | S-7 | 12~14 | Bottom Ash | 15.3 | 10.2 | 83.3 | 6.5 | | - | | - | SW-SM |
| B-104 | U-1 | 20.5~22.5 | Alluvial | 31.1 | | | - | | - | 38 | 16 | CL |
| B-104 | S-12 | 25~27 | Alluvial | 34.6 | | | - | | - | 55 | 28 | CH |
| B-104A | S-7 | 14~16 | Bottom Ash | 13.0 | 11.9 | 77.2 | 8.5 | 2.4 | - | | - | SW-SM |
| B-104A | S-12 | 26~28 | Alluvial | 25.2 | | | - | | - | 37 | 16 | CL |
| B-105 | S-3 | 4~6 | Fill | 18.0 | 0.0 | 18.0 | 82.0 | | - | 38 | 17 | CL |
| B-105 | S-9 | 18~20 | Alluvial | 29.4 | | | - | | - | 37 | 15 | CL |
| B-105 | S-13 | 33~35 | Alluvial | 27.7 | 0.0 | 60.2 | 22.1 | 17.7 | - | | - | SC |
| B-105 | S-14 | 38~40 | Alluvial | 30.5 | 0.0 | 52.5 | 47.5 | | - | | - | SC |
| B-105 | S-15 | 43~45 | Alluvial | 13.6 | 33.1 | 58.6 | 8.3 | | - | | - | SW-SM |
| B-106 | S-3 | 4~6 | Alluvial | 25.5 | | | - | | - | 37 | 15 | CL |
| B-106 | S-4 | 6~8 | Alluvial | 25.2 | 0.0 | 40.1 | 31.0 | 28.9 | - | | - | CL |
| B-106 | S-5 | 8~10 | Alluvial | 23.6 | | | - | | - | 28 | 9 | CL |
| B-106 | S-6 | 10~12 | Alluvial | 27.0 | 0.0 | 41.1 | 32.4 | 26.5 | - | | - | CL |
| B-106 | U-1 | 12.5~14.5 | Alluvial | 20.4 | 0.0 | 67.8 | 19.3 | 12.9 | - | NV | NP | SM |
| B-106 | S-10 | 23~25 | Alluvial | 21.8 | 0.0 | 54.5 | 24.8 | 20.7 | - | | - | SC |
| B-107 | S-10 | 23~25 | Alluvial | 25.4 | 0.0 | 23.0 | 77.0 | | - | 33 | 13 | CL |
| B-107 | S-13 | 38~40 | Alluvial | 31.8 | 0.0 | 53.7 | 26.7 | 19.6 | - | | - | SC |
| B-108 | S-3 | 4~6 | Fill | 20.3 | | | - | | - | 37 | 18 | CL |
| B-108 | S-10 | 20~22 | Fill | 23.2 | 0.0 | 25.1 | 74.9 | | - | | - | CL |
| B-108 | S-12 | 28~30 | Alluvial | 26.6 | 0.2 | 38.6 | 32.7 | 28.5 | - | | - | CL |
| B-108 | S-14 | 38~40 | Alluvial | 28.1 | 0.0 | 74.2 | 25.8 | | - | | - | SC |
| B-109 | S-2 | 2~4 | Fly Ash | 48.4 | 0.0 | 10.2 | 89.8 | | - | NV | NP | ML |
| B-109 | S-9 | 19~21 | Alluvial | 24.6 | | | - | | - | 29 | 10 | CL |
| B-110 | S-4 | 6~8 | Fly Ash | 46.4 | 0.0 | 2.3 | 91.2 | 6.5 | 2.36 | NV | NP | ML |
| B-110 | U-1 | 10~12 | Alluvial | 38.5 | | | - | | - | 34 | 14 | CL |
| B-110 | S-8 | 17~19 | Alluvial | 25.6 | | | - | | - | 31 | 11 | CL |
| B-110 | S-11 | 28~30 | Alluvial | 24.4 | 10.3 | 65.5 | 15.0 | 9.2 | - | NV | NP | SM |
| B-111 | S-3 | 4~6 | Fly Ash | 70.3 | 0.0 | 4.4 | 95.6 | | - | NV | NP | ML |
| B-111 | S-5 | 8~10 | Fly Ash | - | | | - | | 2.35 | - | - | - |
| B-111 | S-9 | 16~18 | Alluvial | 37.1 | | | - | | - | 46 | 22 | CL |
| B-111 | S-10 | 18~20 | Alluvial | 39.0 | | | - | | - | 49 | 23 | CL |
| B-111 | U-1 | 23~25 | Alluvial | 26.2 | | | - | | - | 40 | 19 | CL |
| B-111 | S-13 | 28~30 | Alluvial | 27.9 | | | - | | - | 35 | 15 | CL |
| HA-1 | S-4 | 3~4 | Fly Ash | 61.8 | 0.0 | 1.1 | 98.9 | | - | NV | NP | ML |
| HA-1 | S-9 | 7~8 | Fly Ash | 50.1 | 0.0 | 1.8 | 98.2 | | - | NV | NP | ML |
| HA-2 | S-2 | 2~4 | Fly Ash | 46.2 | 0.0 | 2.3 | 97.7 | | - | NV | NP | ML |

**Notes:**

1. Moisture contents were determined in accordance with ASTM D2216.
2. Grain size analyses were conducted in accordance with ASTM D422.
3. Specific gravity tests were performed in accordance with ASTM D854.
4. Atterberg limits tests were performed in accordance with ASTM D4318.
5. USCS classifications were performed in accordance with ASTM D2477, except where ASTM D2488 is indicated on the laboratory testing results.

**Abbreviations:**

| | | | |
|---|---|---|---|
| CL | Lean Clay | LL | Liquid Limit |
| CH | Fat Clay | PI | Plasticity Index |
| ML | Silt | NP | Non-Plastic |
| SM | Silty Sand | NV | Not Viscous |
| SC | Clayey Sand | - | Not Tested |
| SW-SM | Well Graded Silty Sand | S- | Jar Sample |
| GC | Clayey Gravel | U- | Shelby Tube sample |

**Table 2: Summary of Groundwater Level Readings**
**TVA WBF CCP Closure Phase 2**
**Spring City, TN**

| Location | Ground Surface Elevation | Groundwater Level Readings | | Date | Time (24 hr) |
|---|---|---|---|---|---|
| | | in feet below ground surface | Elevation, ft | | |
| B-1 | 699 | 12.1 | 686.9 | 11/16/2011 | 17:15 |
| | | 13.1 | 685.9 | 11/16/2011 | 17:40 |
| | | 9.3 | 689.7 | 1/11/2012 | 10:40 |
| B-2 | 711 | 37.1 | 673.9 | 1/10/2012 | 13:05 |
| | | 27.4 | 683.6 | 1/10/2012 | 14:50 |
| B-3 | 701 | 31.2 | 669.9 | 11/15/2011 | 10:20 |
| | | 15.7 | 685.3 | 11/16/2011 | 11:00 |
| | | 19.0 | 682.0 | 1/10/2012 | 15:10 |
| | | 18.1 | 682.9 | 1/11/2012 | 11:10 |
| | | 17.4 | 683.6 | 6/15/2012 | 11:00 |
| | | 17.5 | 683.5 | 6/20/2012 | 14:40 |
| B-103 | 711 | 27.2 | 683.8 | 6/13/2012 | 7:15 |
| | | 27.3 | 683.7 | 6/14/2012 | 8:00 |
| | | 27.5 | 683.5 | 6/15/2012 | 10:50 |
| | | 27.7 | 683.3 | 6/20/2012 | 11:30 |
| B-107 | 710 | 27.8 | 682.2 | 6/14/2012 | 17:30 |
| | | 26.2 | 683.8 | 6/15/2012 | 10:45 |
| | | 26.4 | 683.6 | 6/20/2012 | 12:50 |
| B-110 | 707.3 | 7.2 | 700.1 | 6/20/2012 | 8:40 |

# Attachment 1

Phase 1 Subsurface Investigation

Test Boring Logs
Well Installation Logs
Laboratory Testing

CDM Smith

# BOREHOLE LOG
## B-1

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant
**Project Location:** Spring City, TN
**Project Number:** 83529

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 699
**Drilling Method/Rig:** 3.25" HSA/CME-55
**Total Depth (ft.):** 44.6
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** 9.3
**Drilling Date: Start:** 11-16-11 **End:** 11-17-11
**Abandonment Method:** Converted to observation well
**Borehole Coordinates:**
**Field Screening Instrument:**
N 466,232.9 E 2,331,561.1
**Logged By:** M. Howe

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 699.0 | | | | | |
| SS | S-1 | 12/11 | 0 | | 10<br>40 | | FILL | 2-inches GRAVEL. **-FILL-**<br>Moist to wet, dense to very dense, tan-brown and gray, GRAVEL and SILT. |
| SS | S-2 | 24/22 | | | 12<br>17<br>27<br>22 | | | Moist, dense, dark brown and yellow-brown, fine to coarse SAND, little silt, gravel, trace clay. |
| SS | S-3 | 24/18 | | 0.25 | 13<br>19<br>21<br>11 | | | Moist, hard, orange-brown to blue-gray and tan, SILT, some sand. |
| | | | 694.0<br>5 | | | | | |
| SS | S-4 | 24/20 | | 1.0 | 3<br>8<br>5<br>6 | | | Moist, stiff, tan to blue-gray mottling, CLAY, trace silt, sand, and wood fragments. |
| SS | S-5 | 24/16 | | 0.75 | 2<br>3<br>2<br>2 | | | Moist, medium stiff, tan to blue-gray, CLAY, trace silt, sand, and gravel. |
| SS | S-6 | 24/18 | 689.0<br>10 | 0.5 | 3<br>3<br>4<br>6 | | | Moist, medium stiff, medium brown to tan-brown, SILT, some sand, trace gravel. |
| | | | | | | | | |
| SS | S-7 | 24/18 | | | 2<br>2<br>2<br>2 | | SC/SM | Wet, very loose to loose, gray to tan, fine SAND, some clay, little silt. **- ALLUVIAL SOIL -** |
| | | | 684.0 | | | | | |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** Danielle Neamtu **Date:** 4-25-12

BOREHOLE-PP READINGS/NO ROCK TVA WATTS BAR FOSSIL PLANT.GPJ CDM_CORP.GDT 6/29/12

CDM Smith

# BOREHOLE LOG
## B-1

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant
**Project Location:** Spring City, TN
**Project Number:** 83529

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 684.0<br>15 | | | | SC/SM | |
| SS | S-8 | 24/24 | 679.0<br>20 | 0.75 | 2<br>3<br>4<br>5 | | CL | Moist to wet, medium stiff, red-brown to tan-brown, CLAY, little to some sand. |
| SS | S-9 | 24/24 | 674.0<br>25 | 0.5 | 2<br>4<br>4<br>5 | | | Moist to wet, medium stiff to stiff, orange-brown to gray-tan, CLAY, some silt, trace to little sand. |
| SS | S-10 | 24/24 | 669.0<br>30 | | 1<br>2<br>3<br>7 | | SM/SC | Wet, loose, gray to tan, fine SAND, little silt, clay. |
| SS | S-11 | 15/10 | | | 11<br>67<br>100/3" | | SC/SM | Moist to wet, very dense, gray, fine to coarse SAND, little clay, silt, trace gravel. **-WEATHERED ROCK-**<br>Auger refusal at 33.0 feet below ground surface. |
| NQ | C-1 | 63/6 | 664.0<br>35 | | 2:45<br>1:45<br>2:15<br>8:30<br>3:15 | | GW | Split-spoon refusal at 34.3 feet below ground surface.<br>**RUN 1: 34.3 to 39.6 feet-bgs**<br>REC = 9.5%, RQD = 0%<br>Moderately hard, highly weathered, green and brown to gray, aphanitic, INTERBEDDED SHALE, LIMESTONE, and RIVER ROCK; extremely thin bedding, low angle jointing, very close spacing, rough, discolored, open, quartz vugs. |

BOREHOLE-PP READINGS/NO ROCK TVA WATTS BAR FOSSIL PLANT.GPJ CDM_CORP.GDT 6/29/12

CDM Smith

# BOREHOLE LOG
B-1

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant
**Project Location:** Spring City, TN
**Project Number:** 83529

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | | | 3:00 | | GW | |
| NQ | C-2 | 60/7.5 | 659.0<br>40 | | 8:15<br>5:00<br>4:15<br>6:45<br>3:30 | | SHALE/LS | **RUN 2: 39.6 to 44.6 feet-bgs**<br>REC = 12.5%, RQD = 0%<br>Moderately hard to hard, highly weathered, gray, aphanitic, INTERBEDDED SHALE and LIMESTONE; very thin to extremely thin bedding, low angle jointing, very close to close spacing, rough, discolored, open, calcite veins. |
| | | | 654.0<br>45 | | | | | Boring terminated at 44.6 feet below ground surface. |
| | | | 649.0<br>50 | | | | | |
| | | | 644.0<br>55 | | | | | |
| | | | 639.0<br>60 | | | | | |

CDM Smith

# BOREHOLE LOG
## B-2

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant
**Project Location:** Spring City, TN
**Project Number:** 83529

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 711
**Drilling Method/Rig:** 3.25" HSA/CME-55
**Total Depth (ft.):** 46.1
**Drillers:** Allan Fowler
**Depth to Initial Water Level (ft-bgs):** 27.4
**Drilling Date: Start:** 1-10-12 **End:** 1-10-12
**Abandonment Method:** Grouted to ground surface
**Borehole Coordinates:**
**Field Screening Instrument:**
N 465,036.4 E 2,331,471.0
**Logged By:** M. Howe

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 711.0<br>0 | | | | ASPHALT<br>FILL | 3-inches ASPHALT PAVEMENT.<br>8-inches GRAVEL BASE. **-FILL-** |
| SS | 1 | 24/23 | | 3.0 | 5<br>6<br>8<br>9 | | | Moist, stiff, orange brown, CLAY, |
| SS | 2 | 24/24 | | >4.5 | 3<br>6<br>10<br>14 | | | Moist, very stiff, orange brown, CLAY, some silt, trace gravel.<br>Moist, very stiff, dark brown, CLAY, some silt, trace gravel. |
| SS | 3 | 24/24 | 706.0<br>5 | >4.5 | 5<br>8<br>11<br>12 | | | Moist, very stiff, dark brown with gray mottling, CLAY, some silt. |
| SS | 4 | 24/24 | | 4.0 | 5<br>8<br>10<br>11 | | | Moist, very stiff, dark brown with light brown and gray mottling, CLAY, some silt. |
| SS | 5 | 24/24 | 701.0<br>10 | 4.5 | 4<br>6<br>7<br>9 | | | Moist, stiff, dark brown with gray and light brown mottling, CLAY, some silt. |
| SS | 6 | 24/14 | 696.0 | 2.0 | 3<br>6<br>7 | | | Moist, stiff, orange to yellow brown, CLAY, little sand (in lenses). |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** Danielle Neamtu **Date:** 4-25-12

BOREHOLE-PP READINGS/NO ROCK TVA WATTS BAR FOSSIL PLANT.GPJ CDM_CORP.GDT 6/29/12

CDM Smith

# BOREHOLE LOG
## B-2

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant
**Project Location:** Spring City, TN
**Project Number:** 83529

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 696.0<br>15 | | 8 | | FILL | |
| SS | 7 | 24/24 | 691.0<br>20 | 2.3 | 3<br>3<br>5<br>5 | | CL | Moist, medium stiff to stiff, medium brown to tan, CLAY, trace to little sand. **- ALLUVIAL SOIL -** |
| ST | 1 | 24/24 | | 1.0 | | | | Shelby tube sample collected from 20.5 to 22.5 feet below ground surface.<br>Moist to wet, medium brown, CLAY, little silt, trace sand. |
| SS | 8 | 24/19 | | 0.8 | 2<br>3<br>3<br>3 | | | Moist, medium stiff, medium brown, CLAY, trace to little silt. |
| | | | 686.0<br>25 | | | | | |
| SS | 9 | 24/24 | 681.0<br>30 | 1.0 | 1<br>2<br>3<br>3 | | | Moist to wet, medium stiff, medium brown, CLAY, little silt, trace sand. |
| SS | 10 | 24/24 | 676.0<br>35 | 0.5 | 1<br>2<br>2<br>2 | | | Wet, soft to medium stiff, medium brown, CLAY, some silt, little sand. |
| | | | | | 1 | | | Wet, loose, medium brown, fine to medium SAND, trace silt. |

CDM Smith

# BOREHOLE LOG
## B-2

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant

**Project Location:** Spring City, TN

**Project Number:** 83529

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| SS | 11 | 24/24 | 671.0<br>40 | | 2<br>4<br>6 | | SP-SM | |
| SS | 12 | 23/23 | 666.0<br>45 | | 1<br>11<br>13<br>100/5" | | SW/GW | Wet, medium dense, medium brown, fine to medium SAND, trace silt.<br>Wet, very dense, gray, fine to coarse SAND and GRAVEL, trace silt. **-WEATHERED ROCK-** |
| SS | 13 | 1/1 | | | 100/1" | | | Auger refusal at 46.0 feet below ground surface.<br>Split-spoon refusal at 46.1 feet below ground surface.<br>Boring terminated at 46.1 feet below ground surface upon split spoon refusal. |
| | | | 661.0<br>50 | | | | | |
| | | | 656.0<br>55 | | | | | |
| | | | 651.0<br>60 | | | | | |

BOREHOLE-PP READINGS/NO ROCK TVA WATTS BAR FOSSIL PLANT.GPJ CDM_CORP.GDT 6/29/12

CDM Smith

# BOREHOLE LOG
## B-3

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant
**Project Location:** Spring City, TN
**Project Number:** 83529

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 701
**Drilling Method/Rig:** 3.25" HSA/CME-55
**Total Depth (ft.):** 54.8
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** 18.1
**Drilling Date: Start:** 11-15-11 **End:** 11-16-11
**Abandonment Method:** Converted to observation well
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,593.8 E 2,331,431.1
**Logged By:** M. Howe

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 701.0 | | | | | |
| | | | 0 | | 2 | | TOPSOIL | 2-inches TOPSOIL. |
| SS | S-1 | 24/18 | | 3.5 | 4<br>5<br>6 | | FILL | Moist, stiff, medium brown to dark brown, CLAY, trace sand, **-FILL-** |
| SS | S-2 | 24/24 | | 1.0 | 4<br>7<br>12<br>9 | | | Moist, very stiff, medium brown to dark brown with orange, CLAY, trace sand. |
| SS | S-3 | 24/20 | 696.0<br>5 | 2.0 | 4<br>6<br>6<br>5 | | | Moist, stiff, medium brown with orange, SILT, some sand. |
| SS | S-4 | 24/22 | | 1.0 | 6<br>5<br>7<br>5 | | | Moist, medium dense, medium brown to orange-brown, fine SAND, little silt. |
| SS | S-5 | 24/19 | | 1.0 | 4<br>4<br>7<br>5 | | | Moist, stiff, medium brown to orange-brown, CLAY, little sand.<br>Moist, medium dense, medium brown to orange-brown, fine SAND, some silt, clay. |
| | | | 691.0<br>10 | | | | | |
| SS | S-6 | 24/22 | | 1.0 | 3<br>4<br>5<br>5 | | CL | Moist to wet, stiff, medium brown, CLAY, little silt. **- ALLUVIAL SOIL -** |
| | | | 686.0 | | | | | |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** Danielle Neamtu **Date:** 4-25-12

BOREHOLE-PP READINGS/NO ROCK TVA WATTS BAR FOSSIL PLANT.GPJ CDM_CORP.GDT 6/29/12

CDM Smith

# BOREHOLE LOG
## B-3

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant
**Project Location:** Spring City, TN
**Project Number:** 83529

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 686.0<br>15 | | | | CL | |
| SS | S-7 | 24/10 | 681.0<br>20 | 0.3 | 1<br>1<br>1<br>2 | | CL-ML | Wet, very soft to soft, medium brown to tan-brown, SILT and CLAY, little sand. |
| SS | S-8 | 24/24 | 676.0<br>25 | 0.5 | 2<br>1<br>2<br>2 | | CL | Wet, soft, medium brown to tan-brown, CLAY, some silt, trace sand. |
| SS | S-9 | 24/24 | 671.0<br>30 | | 2<br>1<br>2<br>3 | | SP-SM | Wet, very loose, medium brown to gray-brown, fine SAND, little silt. |
| SS | S-10 | 24/15 | 666.0<br>35 | | 2<br>8<br>11<br>12 | | | Wet, medium dense, tan to gray, fine to coarse SAND, some gravel, trace silt. |
| SS | S-11 | 8/8 | | | 48<br>100/2" | | SM/SC | Wet, very dense, gray, fine to coarse SAND, little silt, clay, trace gravel. **-WEATHERED ROCK-** |

BOREHOLE-PP READINGS/NO ROCK TVA WATTS BAR FOSSIL PLANT.GPJ CDM_CORP.GDT 6/29/12

CDM Smith

# BOREHOLE LOG
## B-3

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant
**Project Location:** Spring City, TN
**Project Number:** 83529

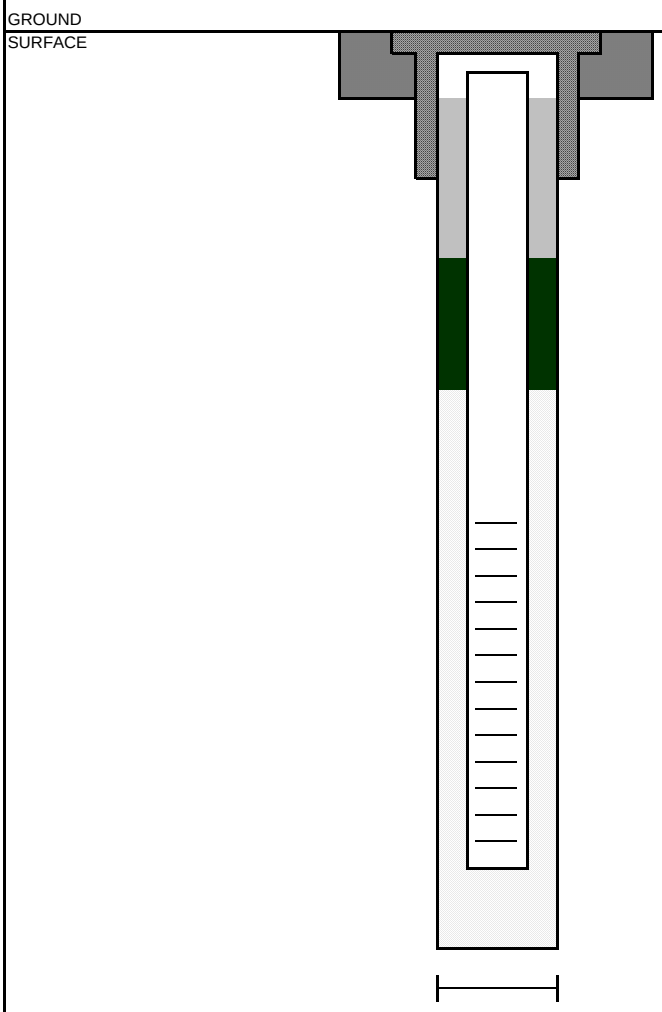
| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 661.0<br>40 | | | | SM/SC | Split-spoon refusal at 38.7 feet below ground surface.<br>Auger refusal at 40.4 feet below ground surface. |
| NQ | C-1 | 52.8/6 | | | 7:30<br>6:00<br>6:00<br>5:15<br>2:00 | | GW | **RUN 1: 40.4 to 44.8 feet-bgs**<br>REC = 9%, RQD = 0%<br>Moderately hard to hard, highly weathered, brown and orange to gray, aphanitic, interbedded SHALE, LIMESTONE, and RIVER ROCK; extremely thin bedding, low angle jointing, very close spacing, rough, discolored, open, calcite veins. |
| | | | 656.0<br>45 | | | | | |
| NQ | C-2 | 60/14 | | | 4:30<br>7:00<br>6:00<br>7:15<br>8:15 | | SHALE/LS | **RUN 2: 44.8 to 49.8 feet-bgs**<br>REC = 23%, RQD = 0%<br>Moderately hard to hard, highly weathered,gray, aphanitic, interbedded LIMESTONE and SHALE; very thin bedding, low angle jointing, very close spacing, rough, discolored, open, calcite veins. |
| | | | 651.0<br>50 | | | | | |
| NQ | C-3 | 60/9.5 | | | 9:45<br>16:15<br>7:30<br>8:15<br>6:45 | | SHALE/LS | **RUN 3: 49.8 to 54.8 feet-bgs**<br>REC = 16%, RQD = 0%<br>Moderately hard, highly weathered,gray, aphanitic, interbedded LIMESTONE and SHALE; extremely thin to very thin bedding, low angle jointing, very close spacing, rough, discolored, open. |
| | | | 646.0<br>55 | | | | | Boring terminated at 54.8 feet below ground surface. |
| | | | 641.0<br>60 | | | | | |

CDM Smith

5400 Glenwood Ave
Suite 300
Raleigh, NC 27612
(919) 787-5620

# Monitoring Well Installation Log

| | | | | | |
|---|---|---|---|---|---|
| Client: | TVA | Contractor: | Total Depth Drilling | Boring/Well No.: | B-1/MW-1 |
| Project Name: | Watts Bar Fossil Plant | Driller: | Tim Hall | Date Installed: | 11/17/11 - 01/11/12 |
| Project Location: | Watts Bar (Rhea Co.), TN | Ground EL: | 699.0 ft | Logged By: | MRH |
| Project Number: | 83529 | Riser EL: | | Page: | 1 of 1 |




| | |
|---|---|
| SURFACE SEAL: (Thickness & Type) | 1 ft - Portland Cement |
| BACKFILL MATERIAL: (Type) | Soil sloughed into hole |
| TOP OF SEAL: | 16 ft |
| SEAL CONSTRUCTION: (Thickness & Type) | 7 ft - Bentonite |
| TOP OF SANDPACK: | 23 ft |
| RISER CONSTRUCTION: (Type, Diameter Material) | Schedule 40 PVC, 2 - Inch |
| TOP OF SCREEN: | 25 ft |
| SANDPACK TYPE: | Filter Sand - DSI Well Gravel Pack |
| SCREEN MATERIAL: (Type, Slot, Diameter Material) | Schedule 40 PVC, 0.10, 2-Inch |
| BOTTOM OF SCREEN: | 35 ft |
| BOTTOM OF BOREHOLE: | 44.6 ft |
| BOREHOLE DIAMETER: | 0.75 ft - soil/0.24 ft - rock |

**NOTE:** All depths are in feet below ground surface, unless noted otherwise.

Remarks:

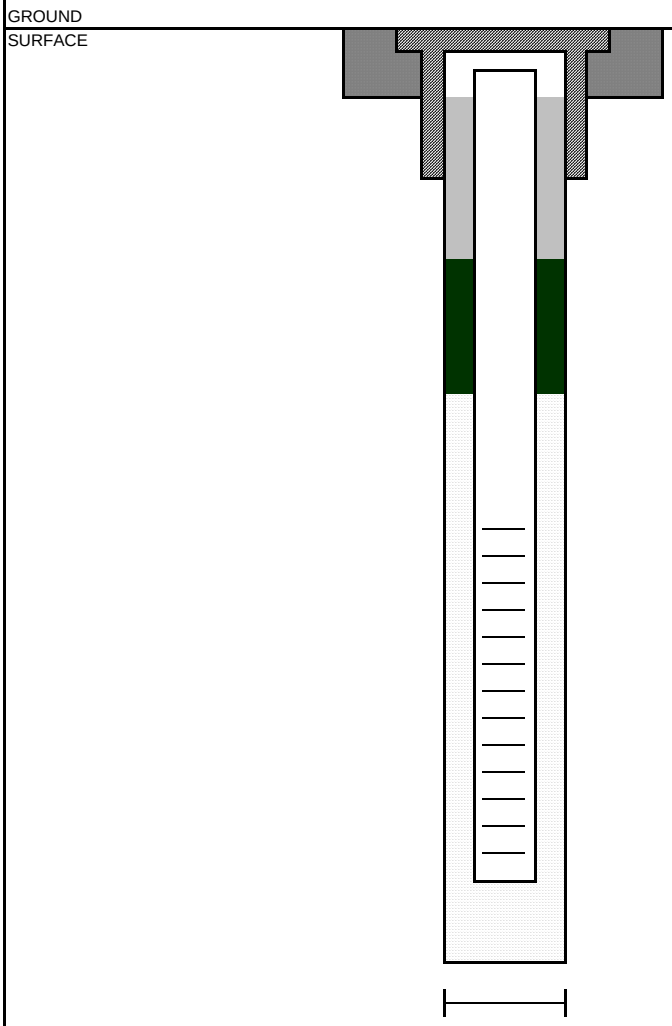
Updated On: 04/09/01

CDM Smith

5400 Glenwood Ave
Suite 300
Raleigh, NC 27612
(919) 787-5620

# Monitoring Well Installation Log

| | | | | | |
|---|---|---|---|---|---|
| Client: | TVA | Contractor: | Total Depth Drilling | Boring/Well No.: | B-3/MW-3 |
| Project Name: | Watts Bar Fossil Plant | Driller: | Tim Hall | Date Installed: | 11/16/2011 |
| Project Location: | Watts Bar (Rhea Co.), TN | Ground EL: | 701.0 ft | Logged By: | MRH |
| Project Number: | 83529 | Riser EL: | | Page: 1 of | 1 |



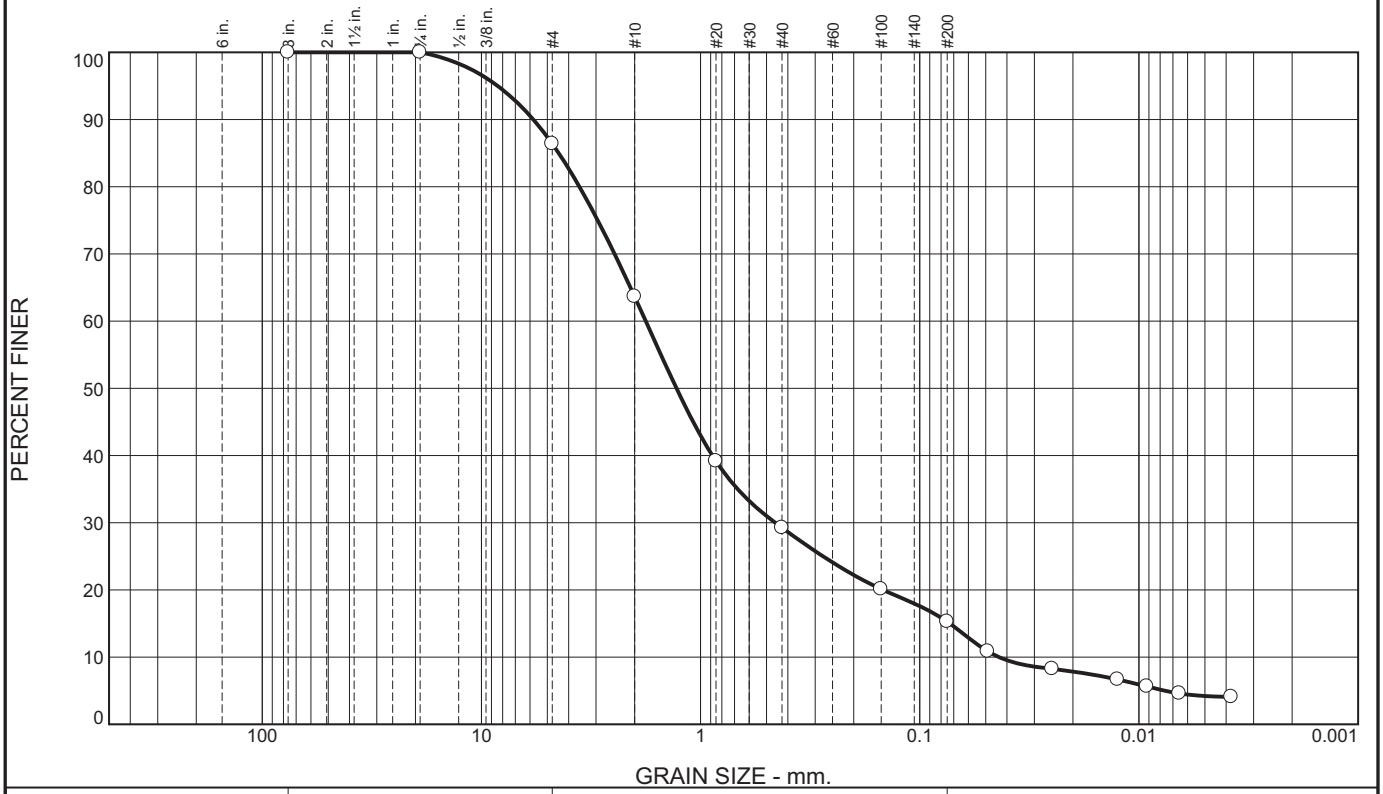

| | |
|---|---|
| SURFACE SEAL: (Thickness & Type) | 3 ft - Portland Cement |
| BACKFILL MATERIAL: (Type) | Filter Sand (DSI gravel pack) |
| TOP OF SEAL: | 24 ft |
| SEAL CONSTRUCTION: (Thickness & Type) | 4 ft - Bentonite |
| TOP OF SANDPACK: | 28 ft |
| RISER CONSTRUCTION: (Type, Diameter Material) | Schedule 40 PVC, 2-Inch |
| TOP OF SCREEN: | 30 ft |
| SANDPACK TYPE: | :Filter Sand - DSI Well Gravel Pack |
| SCREEN MATERIAL: (Type, Slot, Diameter Material) | Schedule 40 PVC, 0.10, 2-Inch |
| BOTTOM OF SCREEN: | 40 ft |
| BOTTOM OF BOREHOLE: | 54.8 ft |
| BOREHOLE DIAMETER: | 0.75 ft - soil/0.24 ft - rock |

**NOTE:** All depths are in feet below ground surface, unless noted otherwise.

Remarks:

Updated On: 04/09/01

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 13.6 | 22.8 | 34.4 | 13.9 | 11.1 | 4.2 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 86.4 | | |
| #10 | 63.6 | | |
| #20 | 39.1 | | |
| #40 | 29.2 | | |
| #100 | 20.1 | | |
| #200 | 15.3 | | |

* (no specification provided)

**Material Description**

Silty Sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 5.8002 $D_{85}$= 4.4393 $D_{60}$= 1.7795
$D_{50}$= 1.2880 $D_{30}$= 0.4565 $D_{15}$= 0.0730
$D_{10}$= 0.0435 $C_u$= 40.87 $C_c$= 2.69

**Classification**

USCS= SM AASHTO=

**Remarks**

As received moisture content=6.9%
Soil classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** B-1 **Depth:** 1-3
**Sample Number:** S-2

**Date:** 11/16/2011

**CDM Smith**

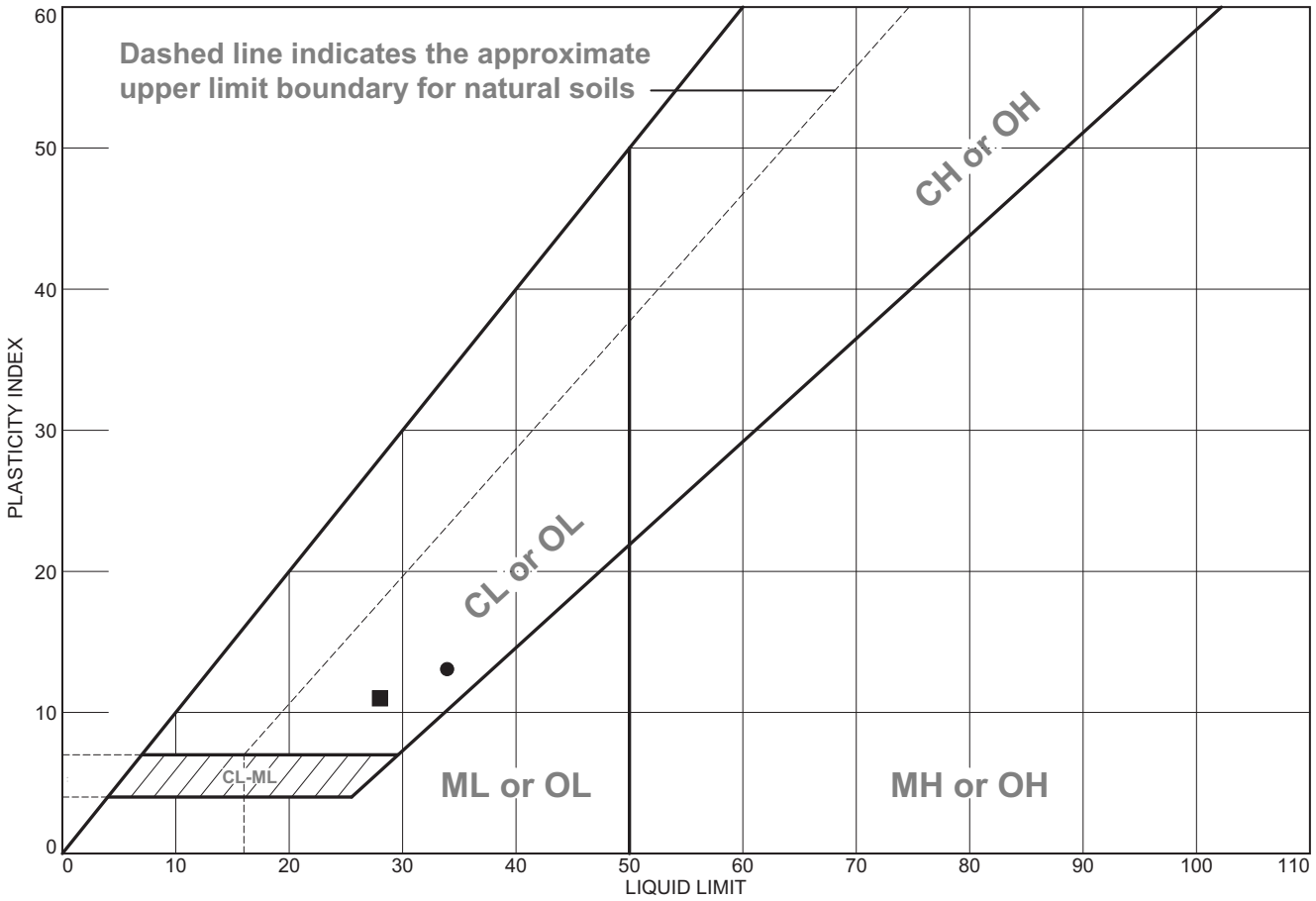
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-83529 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay | 34 | 21 | 13 | | | CL |
| ■ | Lean clay | 28 | 17 | 11 | | | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-83529 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-1 **Depth:** 5-7 **Sample Number:** S-4

■**Source of Sample:** B-1 **Depth:** 23-25 **Sample Number:** S-9

**Remarks:**

●As received moisture content=16.2%

■As received moisture content=23.0%

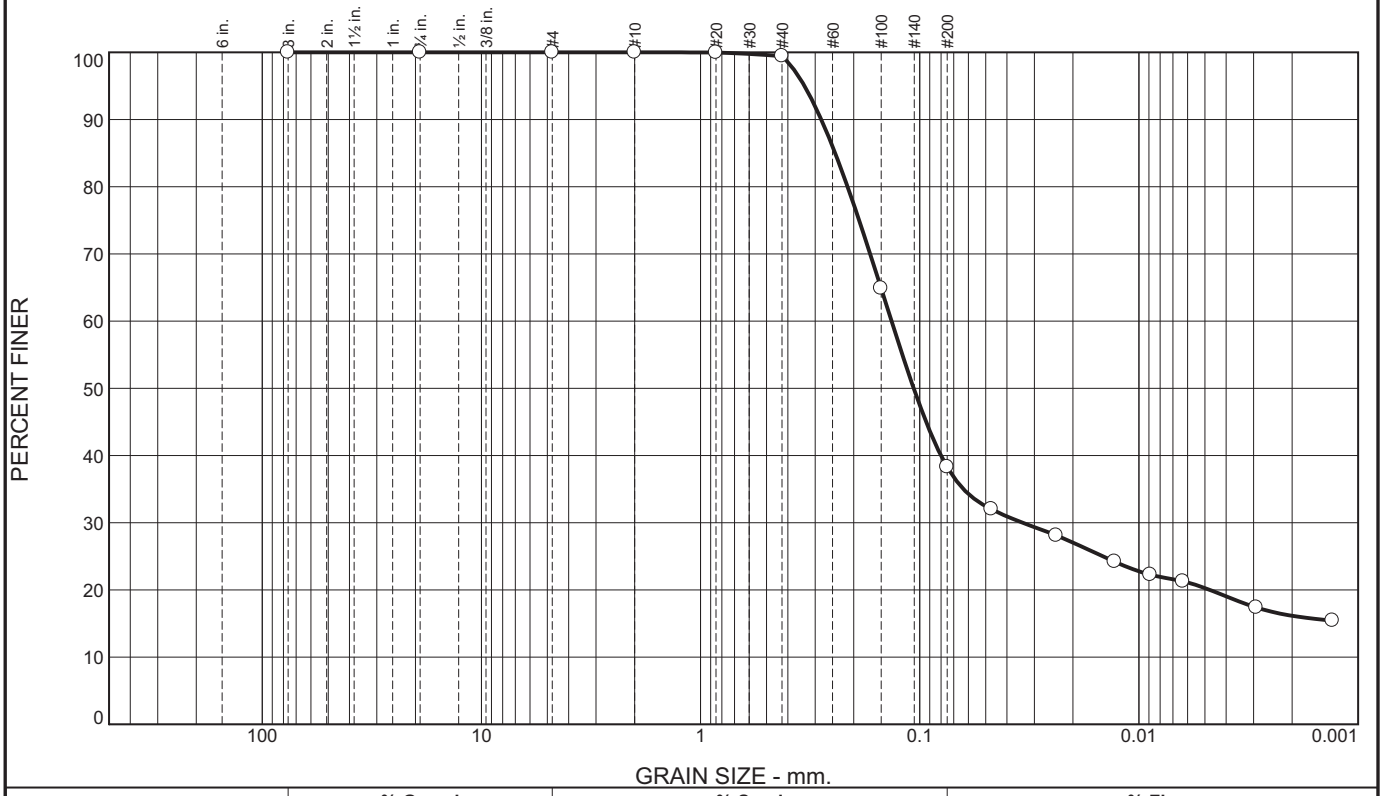
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 61.1 | 18.0 | 20.3 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.4 | | |
| #100 | 64.9 | | |
| #200 | 38.3 | | |

* (no specification provided)

**Material Description**

Clayey sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.2815 $D_{85}$= 0.2433 $D_{60}$= 0.1345
$D_{50}$= 0.1066 $D_{30}$= 0.0339 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO=

**Remarks**

As received moisture content=20.2%
Soil classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** B-1 **Depth:** 13-15
**Sample Number:** S-7

**Date:** 11/16/2011

**CDM Smith**

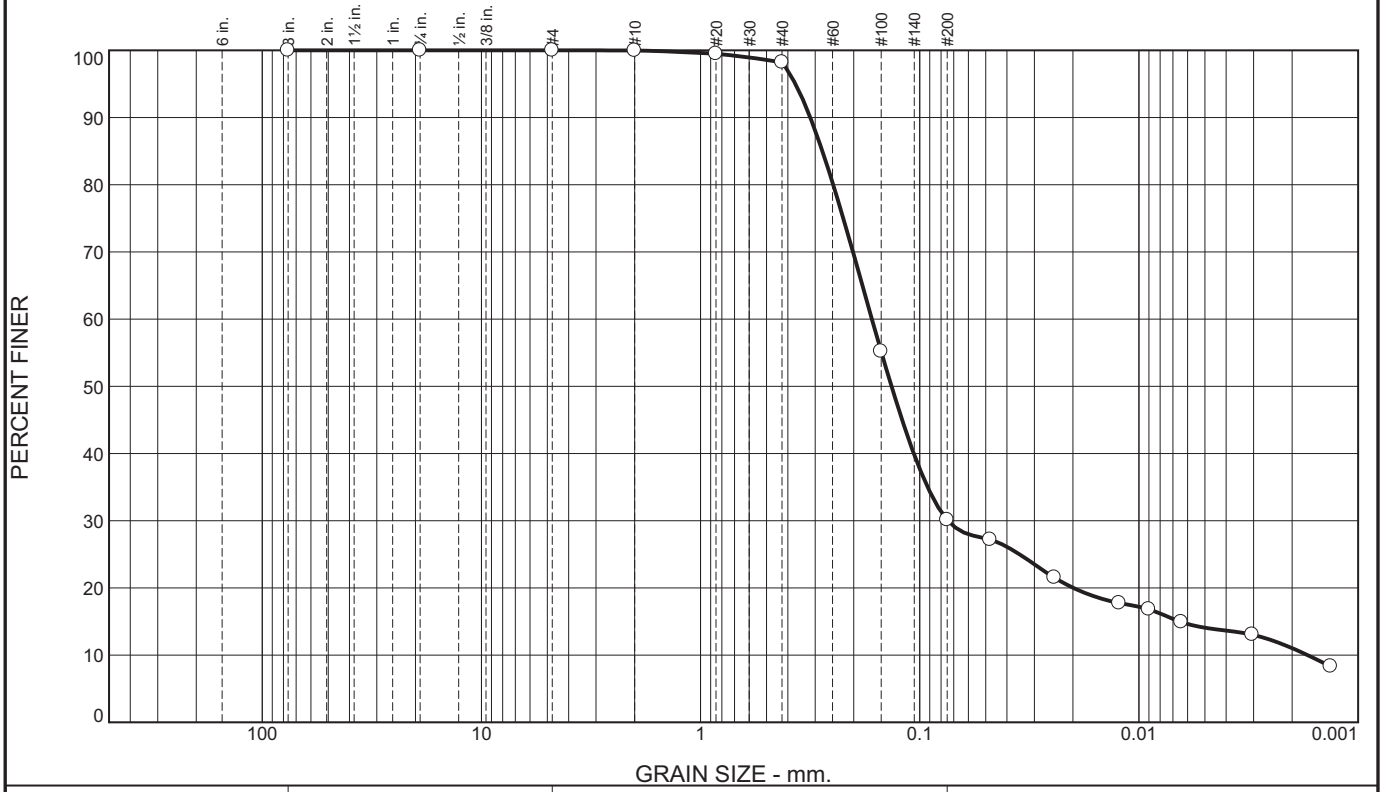
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-83529 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 1.8 | 68.1 | 16.0 | 14.1 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.5 | | |
| #40 | 98.2 | | |
| #100 | 55.2 | | |
| #200 | 30.1 | | |

* (no specification provided)

**Material Description**

Silty sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.3160 $D_{85}$= 0.2782 $D_{60}$= 0.1653
$D_{50}$= 0.1346 $D_{30}$= 0.0744 $D_{15}$= 0.0065
$D_{10}$= 0.0017 $C_u$= 97.09 $C_c$= 19.66

**Classification**

USCS= SM AASHTO=

**Remarks**

As received moisture content=34.5%
Soil classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** B-1 **Depth:** 28-30
**Sample Number:** S-10

**Date:** 11/16/2012

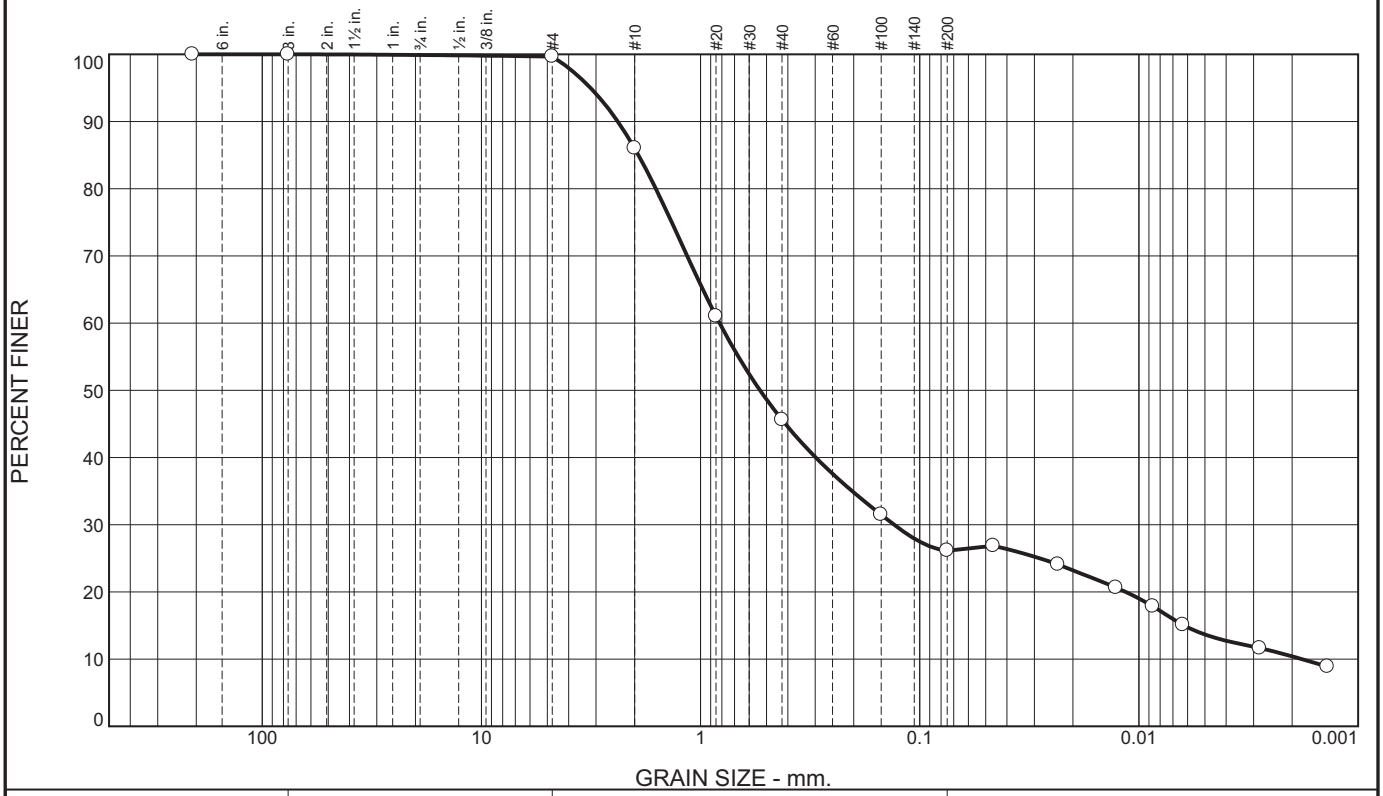
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-83529 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.1 | 0.2 | 13.7 | 40.4 | 19.5 | 12.4 | 13.7 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 8.19 | 100.0 | | |
| 3 | 100.0 | | |
| #4 | 99.7 | | |
| #10 | 86.0 | | |
| #20 | 61.0 | | |
| #40 | 45.6 | | |
| #100 | 31.5 | | |
| #200 | 26.1 | | |

* (no specification provided)

**Material Description**

Silty sand
Note: Portion of sample soft, weathered rock easily broken into smaller fractions during sample preparation.

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 2.3878 $D_{85}$= 1.9212 $D_{60}$= 0.8189
$D_{50}$= 0.5357 $D_{30}$= 0.1310 $D_{15}$= 0.0062
$D_{10}$= 0.0018 $C_u$= 453.07 $C_c$= 11.59

**Classification**

USCS= SM AASHTO=

**Remarks**

As received moisture content=7.4%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-1 **Depth:** 33-34.5
**Sample Number:** S-11

**Date:** 11/16/2011

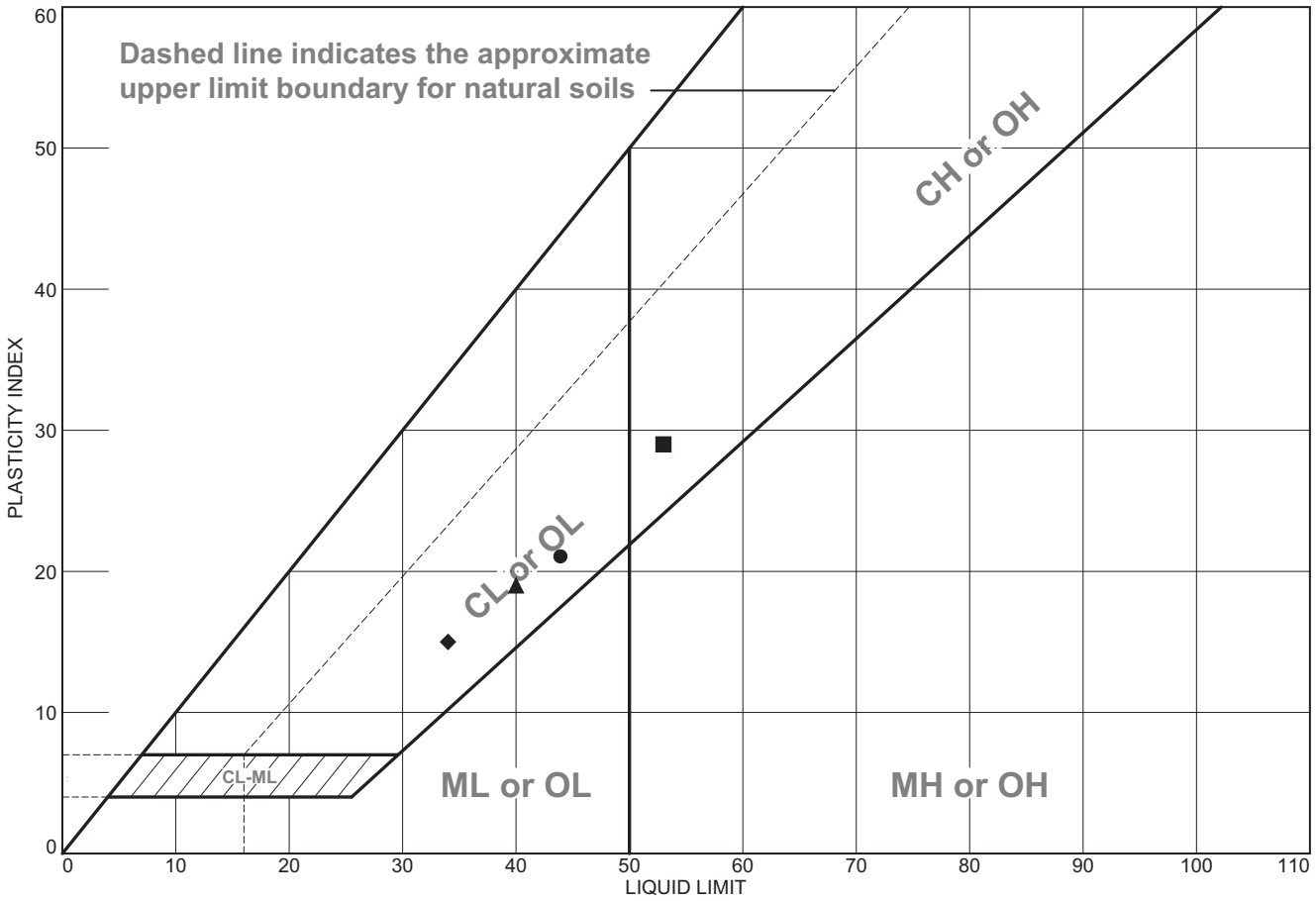
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-83529 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay | 44 | 23 | 21 | | | CL |
| ■ | Fat clay | 53 | 24 | 29 | | | CH |
| ▲ | Lean clay | 40 | 21 | 19 | | | CL |
| ◆ | Lean clay | 34 | 19 | 15 | | | CL |
| | | | | | | | |

**Project No.** 95618-83529 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-2 **Depth:** 5-7 **Sample Number:** S-3

■**Source of Sample:** B-2 **Depth:** 13.5-15.5 **Sample Number:** S-6

▲**Source of Sample:** B-2 **Depth:** 28.5-30.5 **Sample Number:** S-9

◆**Source of Sample:** B-2 **Depth:** 20.5-22.5 **Sample Number:** U-1

**CDM Smith**

**Cambridge, Massachusetts**

**Remarks:**

●As received moisture content=21.7%

■As received moisture content=20.6%

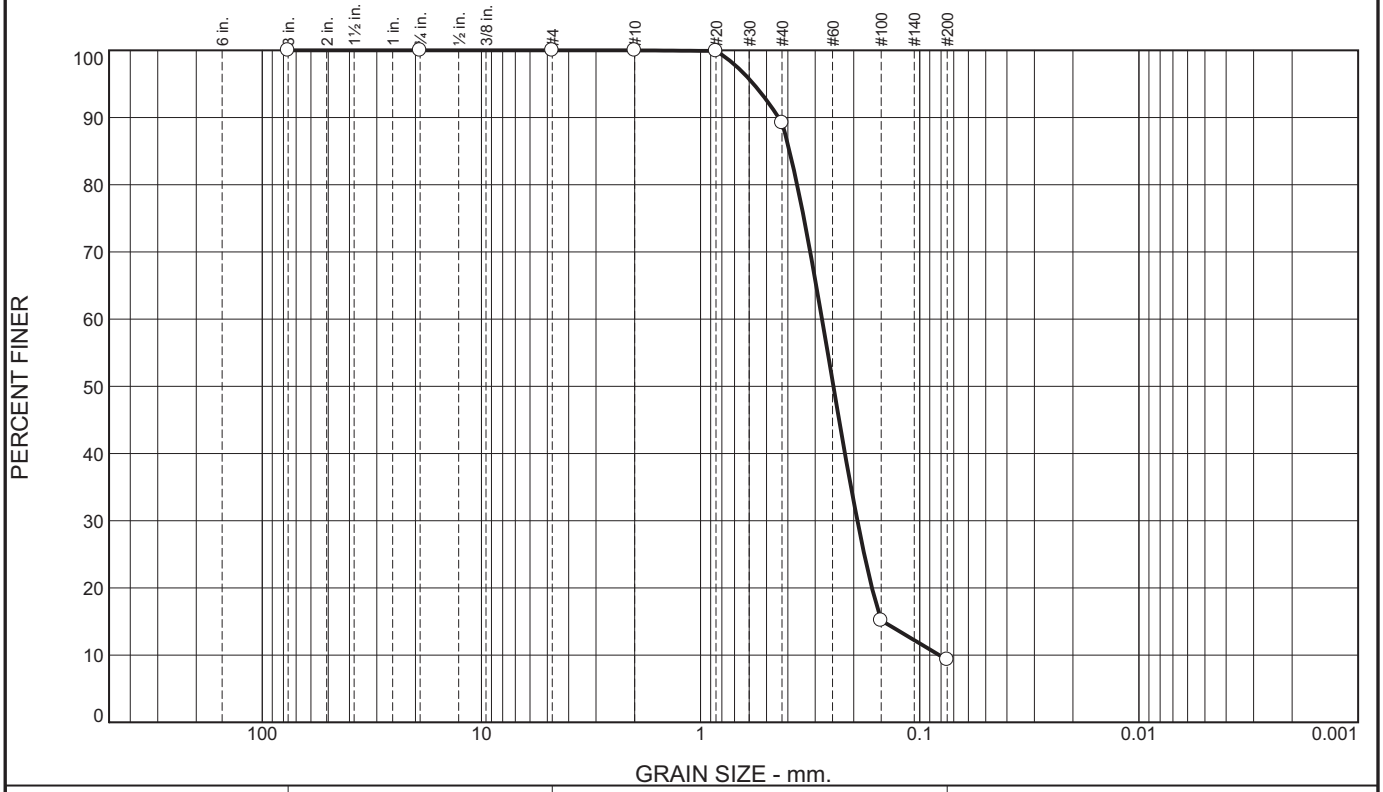
▲As received moisture content=27.8%

◆As received moisture content=14.6%

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 10.8 | 79.9 | 9.3 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.9 | | |
| #40 | 89.2 | | |
| #100 | 15.2 | | |
| #200 | 9.3 | | |

* (no specification provided)

**Material Description**

Poorly graded sand with silt

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.4406 $D_{85}$= 0.3927 $D_{60}$= 0.2792
$D_{50}$= 0.2477 $D_{30}$= 0.1926 $D_{15}$= 0.1470
$D_{10}$= 0.0814 $C_u$= 3.43 $C_c$= 1.63

**Classification**

USCS= SP-SM AASHTO=

**Remarks**

As received moisture content=27.6%
Soil classification and description based on
Visual Manual Procedure ASTM D 2488

**Source of Sample:** B-2 **Depth:** 38.5-40.5
**Sample Number:** S-11

**Date:** 1/10/2012

**CDM Smith**

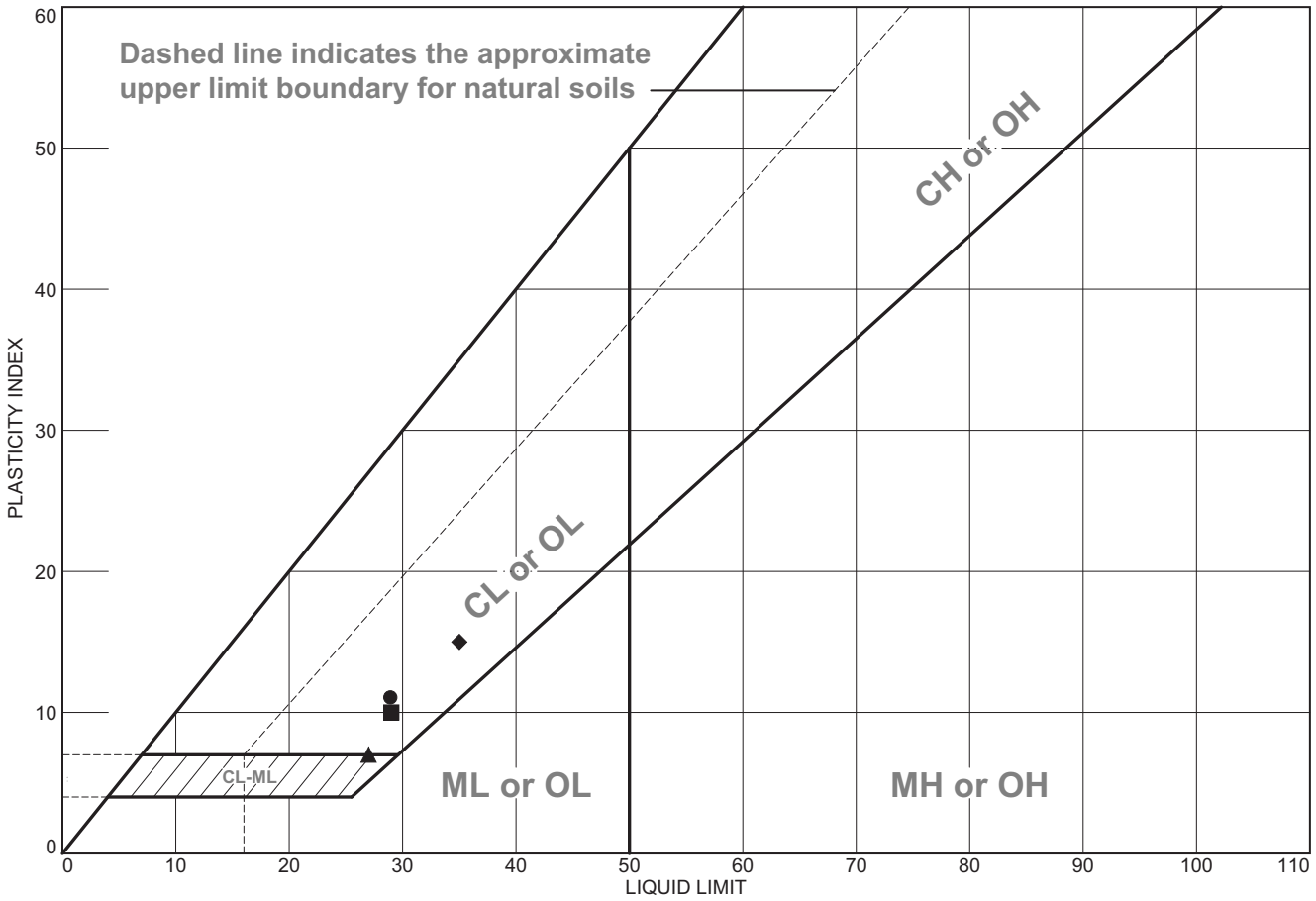
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-83529 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay | 29 | 18 | 11 | | | CL |
| ■ | Lean clay | 29 | 19 | 10 | | | CL |
| ▲ | Lean clay-low plasticity silt | 27 | 20 | 7 | | | CL-ML |
| ◆ | Lean clay | 35 | 20 | 15 | | | CL |
| | | | | | | | |

**Project No.** 95618-83529 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-3 **Depth:** 2-4 **Sample Number:** S-2

■**Source of Sample:** B-3 **Depth:** 13-15 **Sample Number:** S-6

▲**Source of Sample:** B-3 **Depth:** 18-20 **Sample Number:** S-7

◆**Source of Sample:** B-3 **Depth:** 23-25 **Sample Number:** S-8

**CDM Smith**

**Cambridge, Massachusetts**

**Remarks:**

●As received moisture content=14.5%

■As received moisture content=21.3%

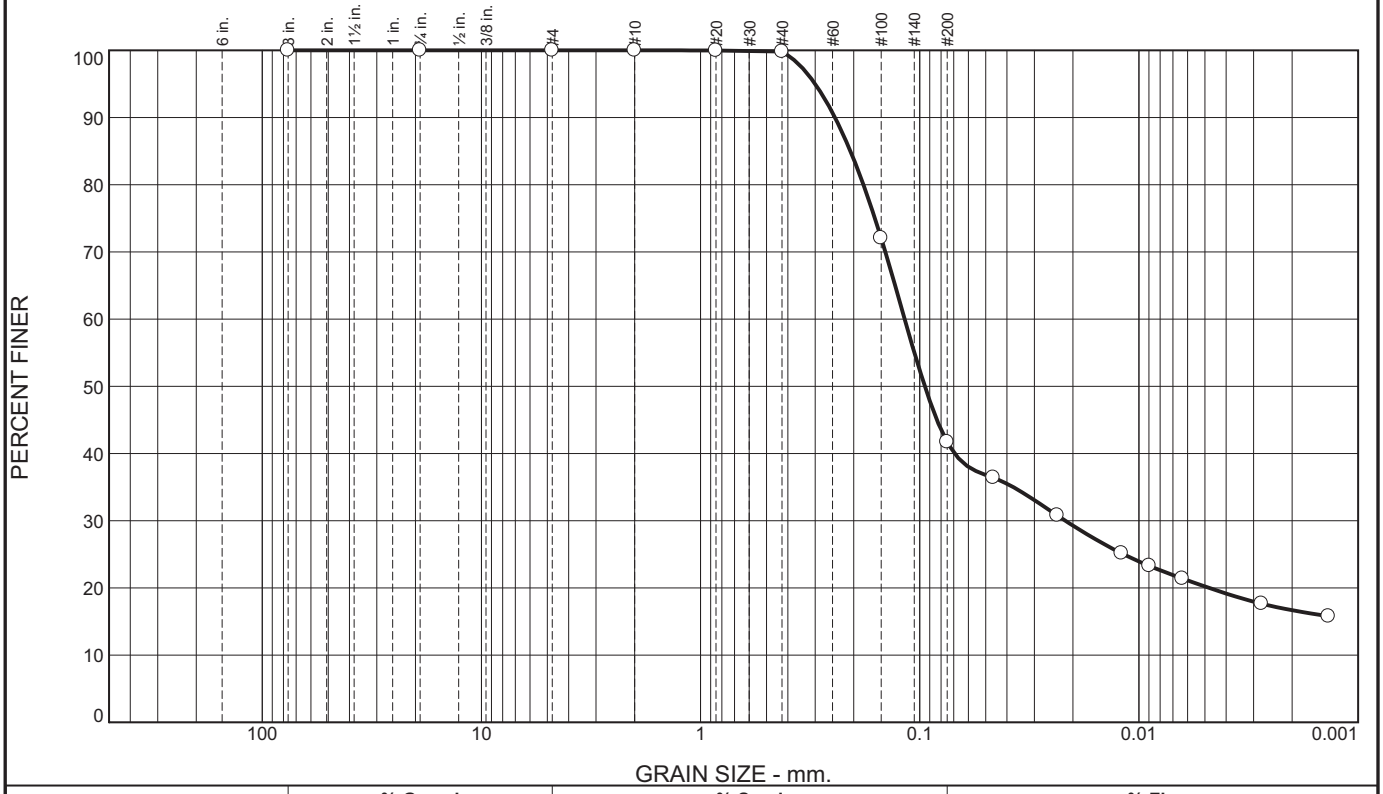
▲As received moisture content=28.1%

◆As received moisture content=31.9%

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 58.1 | 21.5 | 20.2 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.8 | | |
| #100 | 72.1 | | |
| #200 | 41.7 | | |

* (no specification provided)

**Material Description**

Clayey sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.2437 $D_{85}$= 0.2072 $D_{60}$= 0.1172
$D_{50}$= 0.0948 $D_{30}$= 0.0217 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO=

**Remarks**

As received moisture content=14.5%
Soil classification and description based on Visual Manual Procedure ASTM D 2488

**Source of Sample:** B-3 **Depth:** 8-10
**Sample Number:** S-5

**Date:** 11/15/2011

**CDM Smith**

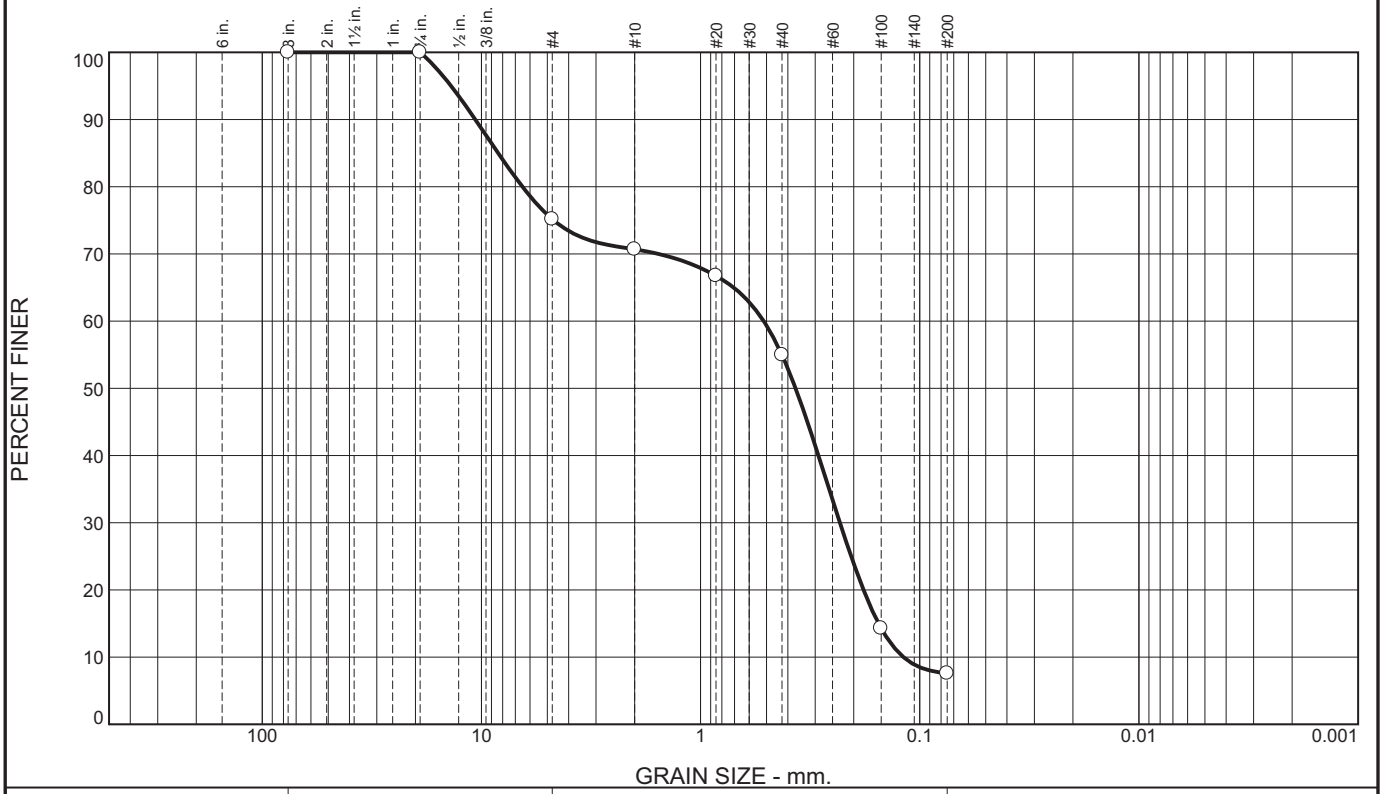
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-83529 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 24.8 | 4.5 | 15.8 | 47.3 | 7.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 75.2 | | |
| #10 | 70.7 | | |
| #20 | 66.7 | | |
| #40 | 54.9 | | |
| #100 | 14.3 | | |
| #200 | 7.6 | | |

* (no specification provided)

**Material Description**

Poorly graded sand with silt and gravel

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 10.6723 $D_{85}$= 8.3878 $D_{60}$= 0.5154
$D_{50}$= 0.3688 $D_{30}$= 0.2314 $D_{15}$= 0.1542
$D_{10}$= 0.1187 $C_u$= 4.34 $C_c$= 0.88

**Classification**

USCS= SP-SM AASHTO=

**Remarks**

As received moisture content=22.0%
Soil classification and description based on
Visual Manual Procedure ASTM D 2488

**Source of Sample:** B-3 **Depth:** 33-35
**Sample Number:** S-10

**Date:** 11/15/2011

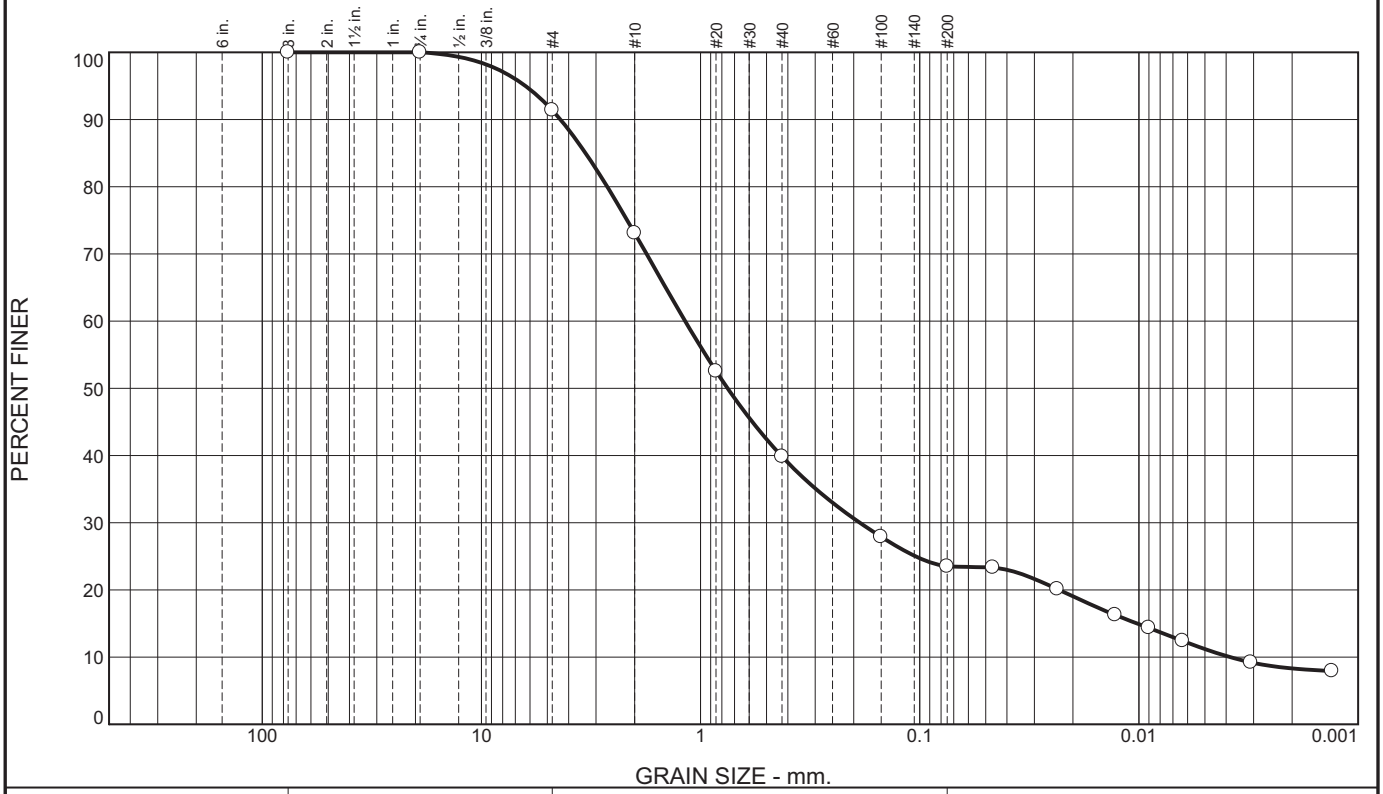
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-83529 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 8.6 | 18.3 | 33.3 | 16.3 | 12.3 | 11.2 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 91.4 | | |
| #10 | 73.1 | | |
| #20 | 52.5 | | |
| #40 | 39.8 | | |
| #100 | 27.9 | | |
| #200 | 23.5 | | |

* (no specification provided)

**Material Description**

Silty sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 4.3626 $D_{85}$= 3.3491 $D_{60}$= 1.1759
$D_{50}$= 0.7530 $D_{30}$= 0.1876 $D_{15}$= 0.0102
$D_{10}$= 0.0038 $C_u$= 306.42 $C_c$= 7.80

**Classification**

USCS= SM AASHTO=

**Remarks**

As received moisture content=11.6%
Soil classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** B-3 **Depth:** 38-38.7
**Sample Number:** S-11

**Date:** 11/15/2011

**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-83529 **Figure**

**Tested By:** NE **Checked By:** MR

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 3/14/2012 | **LL :** | 34 |
| **Project:** | Watts Bar | **Exploration No:** | B-2 | **PL :** | 19 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 Specimen 1 | **PI :** | 15 |
| **Project No:** | 95618-83529 | **Depth (ft):** | 21 | **USCS:** | CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 20.7% |
| **Dry Unit Weight (pcf):** | 105.9 |
| **Diameter (in):** | 1.407 |
| **Height (in):** | 3.125 |
| **Void Ratio (-):** | 0.59 |
| **Saturation (%):** | 94.7% |
| **Moisture Content (Trim.%):** | 19.9% |
| **Cross Sectional Area ($in^2$):** | 1.555 |

**Final**

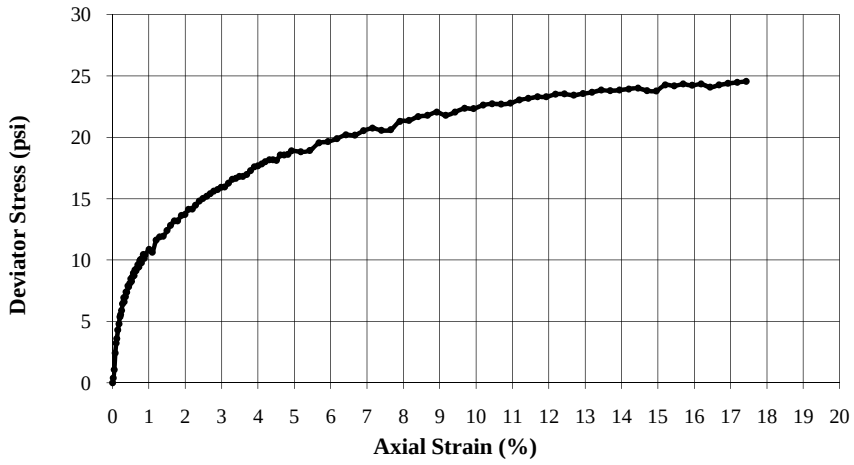
| | |
|---|---|
| **Moisture Content (%):** | 23.2% |
| **Dry Unit Weight (pcf):** | 103.3 |
| **Height (in):** | 2.564 |
| **Void Ratio (-):** | 0.63 |
| **Saturation (%):** | 99.4% |
| **Cross Sectional Area ($in^2$):** | 1.926 |

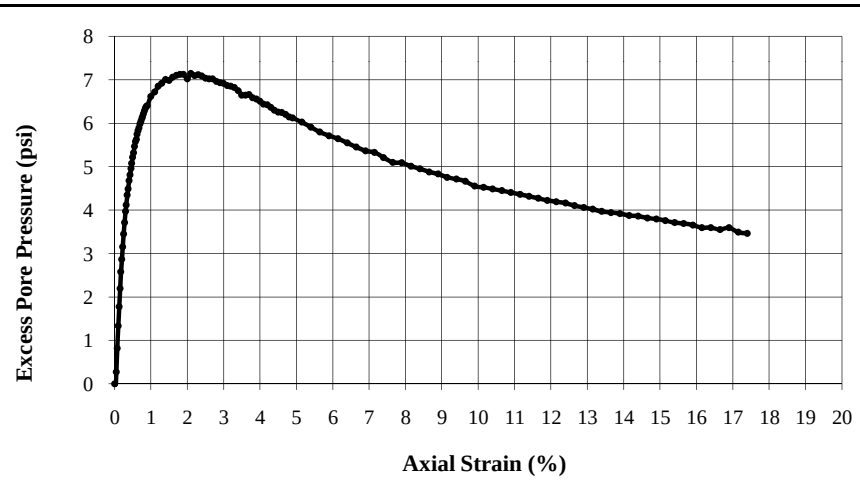
**End of Consolidation Data**

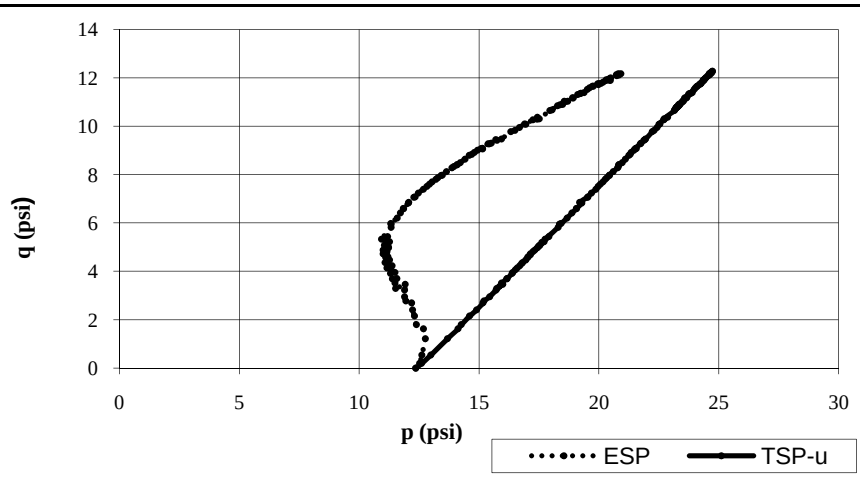
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 23.2% |
| **Dry Unit Weight (pcf):** | 103.3 |
| **Height (in):** | 3.125 |
| **Void Ratio (-):** | 0.63 |
| **Saturation (%):** | 99.4% |
| **Cross Sectional Area ($in^2$):** | 1.590 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 80 |
| **Consolidation Pressure (psi):** | 12.21 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1% |
| **Max. Deviator Stress (psi):** | 24.56 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 8.88 |
| **Major Eff. Pr. Stress (psi):** | 33.44 |
| **Undrained Strength Ratio (-):** | 1.01 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 3/14/2012 | **LL :** | 34 |
| **Project:** | Watts Bar | **Exploration No:** | B-2 | **PL :** | 19 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 Specimen 2 | **PI :** | 15 |
| **Project No:** | 95618-83529 | **Depth (ft):** | 21 | **USCS:** | CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 19.3% |
| **Dry Unit Weight (pcf):** | 104.4 |
| **Diameter (in):** | 1.385 |
| **Height (in):** | 3.220 |
| **Void Ratio (-):** | 0.61 |
| **Saturation (%):** | 84.8% |
| **Moisture Content (Trim.%):** | 20.6% |
| **Cross Sectional Area ($in^2$):** | 1.507 |

**Final**

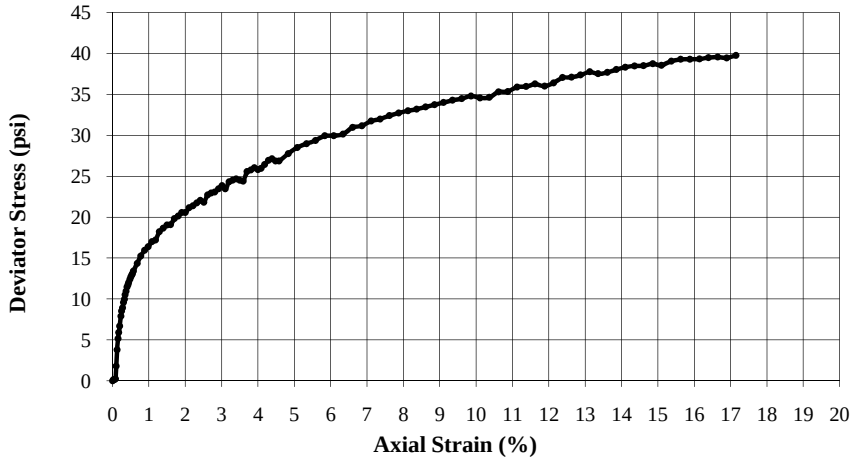
| | |
|---|---|
| **Moisture Content (%):** | 22.8% |
| **Dry Unit Weight (pcf):** | 104.0 |
| **Height (in):** | 2.651 |
| **Void Ratio (-):** | 0.62 |
| **Saturation (%):** | 99.4% |
| **Cross Sectional Area ($in^2$):** | 1.820 |

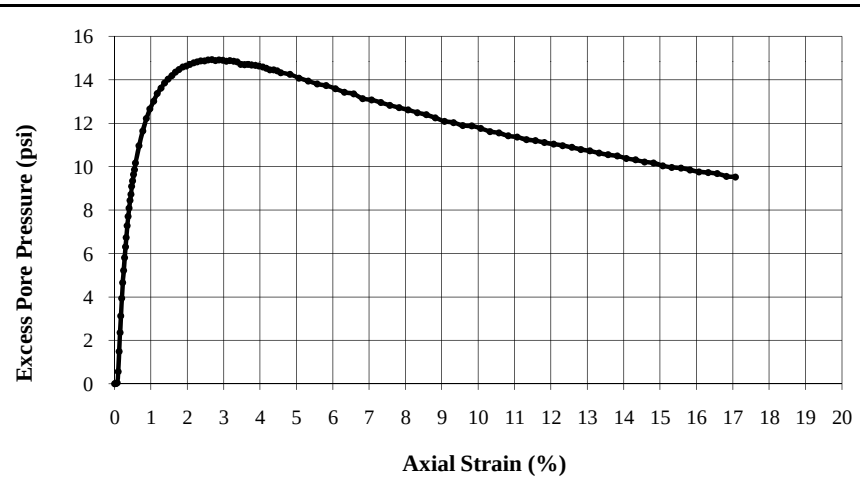
**End of Consolidation Data**

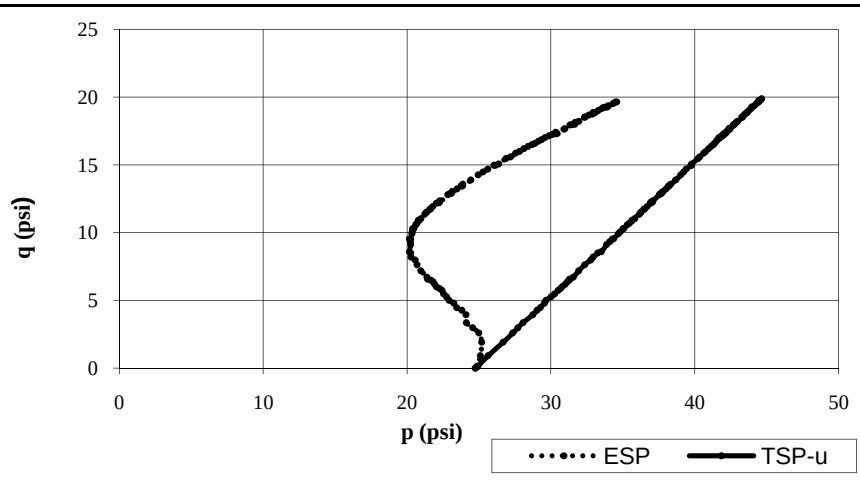
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 22.8% |
| **Dry Unit Weight (pcf):** | 104.0 |
| **Height (in):** | 3.219 |
| **Void Ratio (-):** | 0.62 |
| **Saturation (%):** | 99.4% |
| **Cross Sectional Area ($in^2$):** | 1.508 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 85 |
| **Consolidation Pressure (psi):** | 24.34 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1% |
| **Max. Deviator Stress (psi):** | 39.77 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 15.25 |
| **Major Eff. Pr. Stress (psi):** | 55.02 |
| **Undrained Strength Ratio (-):** | 0.82 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 3/14/2012 | **LL :** | 34 |
| **Project:** | Watts Bar | **Exploration No:** | B2 | **PL :** | 19 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 Specimen 3 | **PI :** | 15 |
| **Project No:** | 95618-83529 | **Depth (ft):** | 21 | **USCS:** | CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 20.8% |
| **Dry Unit Weight (pcf):** | 104.5 |
| **Diameter (in):** | 1.411 |
| **Height (in):** | 3.085 |
| **Void Ratio (-):** | 0.61 |
| **Saturation (%):** | 91.7% |
| **Moisture Content (Trim.%):** | 20.2% |
| **Cross Sectional Area ($in^2$):** | 1.564 |

**Final**

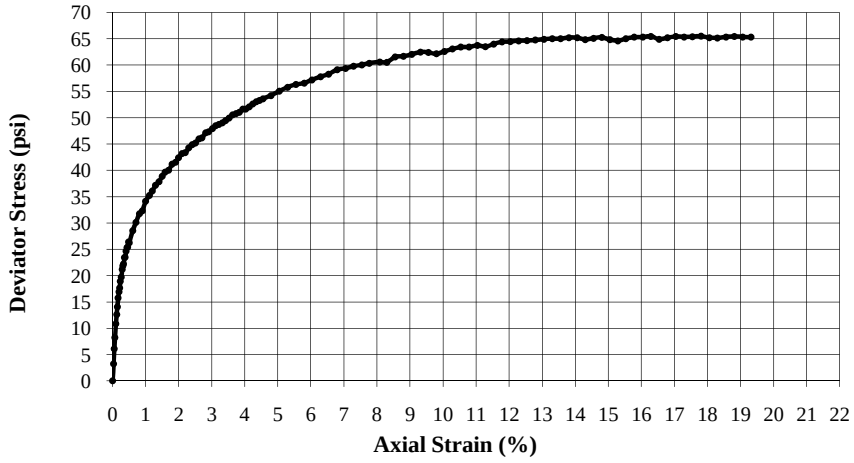
| | |
|---|---|
| **Moisture Content (%):** | 21.1% |
| **Dry Unit Weight (pcf):** | 107.1 |
| **Height (in):** | 2.480 |
| **Void Ratio (-):** | 0.57 |
| **Saturation (%):** | 99.4% |
| **Cross Sectional Area ($in^2$):** | 1.853 |

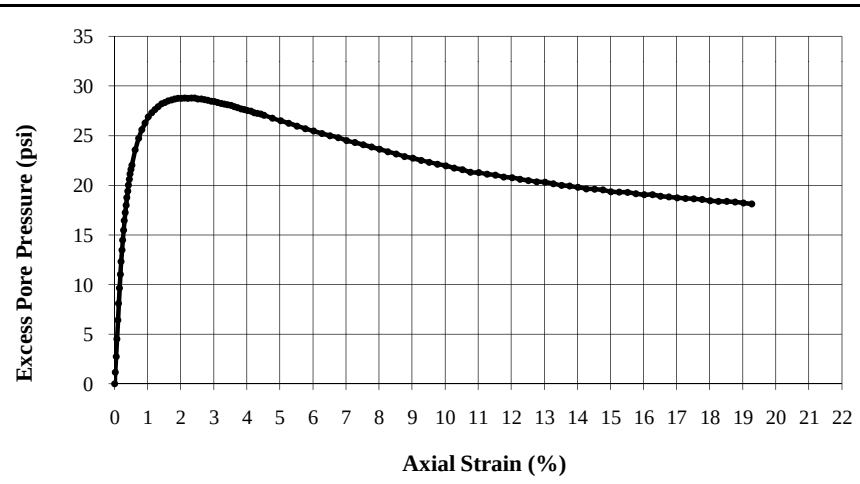
**End of Consolidation Data**

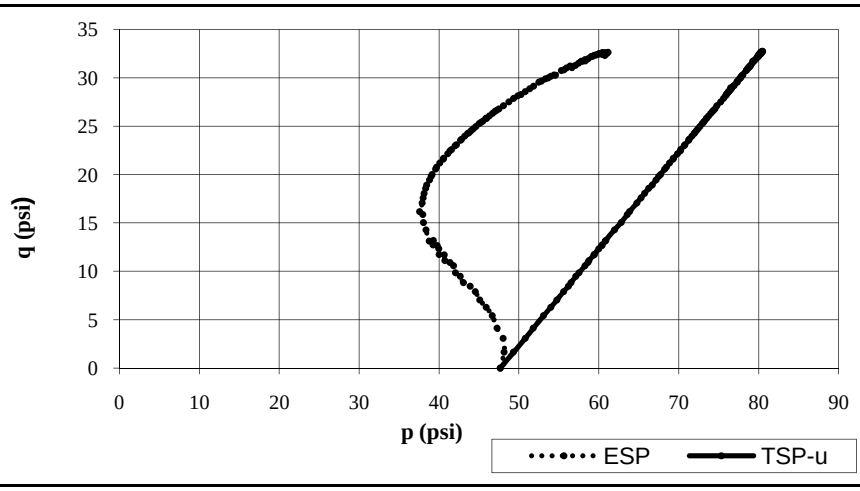
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 21.1% |
| **Dry Unit Weight (pcf):** | 107.1 |
| **Height (in):** | 3.084 |
| **Void Ratio (-):** | 0.57 |
| **Saturation (%):** | 99.4% |
| **Cross Sectional Area ($in^2$):** | 1.523 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 107 |
| **Consolidation Pressure (psi):** | 48.22 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1% |
| **Max. Deviator Stress (psi):** | 65.49 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 29.14 |
| **Major Eff. Pr. Stress (psi):** | 94.62 |
| **Undrained Strength Ratio (-):** | 0.68 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

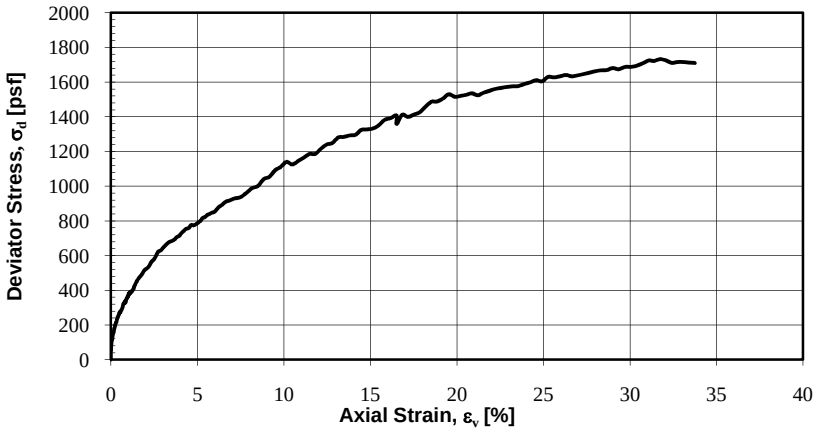
CDM Smith

## Geotechnical Engineering Laboratory

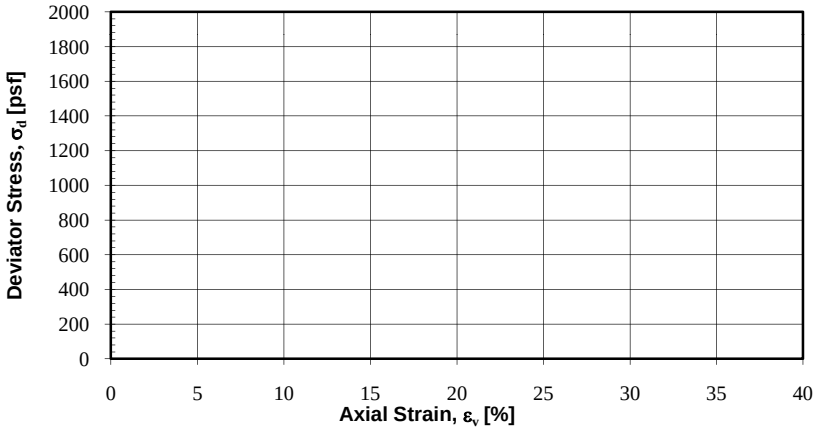
### UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D2850

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 3/14/2012 | **LL :** | 34 |
| **Project:** | Watts Bar | **Exploration No:** | B-2 | **PL :** | 19 |
| **Location:** | | **Sample No:** | U-1 | **PI :** | 15 |
| **Project No:** | 95618-83529 | **Depth (ft):** | 21.5 | **USCS:** | CL |

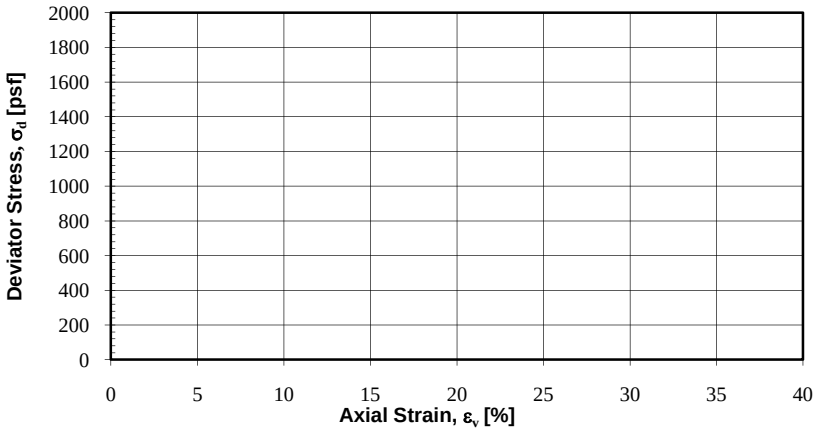
| **Specimen 1** | **Initial** | **Final** |
|---|---|---|
| **Moisture Content (%):** | 21.1% | 22.0% |
| **Dry Unit Weight (pcf):** | 126.5 | - |
| **Diameter (in):** | 1.390 | - |
| **Height (in):** | 2.750 | - |
| **Void Ratio (-):** | 0.61 | 0.61 |
| **Saturation (%):** | 93.3% | 97.4% |
| **Specific Gravity (-)[1]:** | 2.70 | |
| **Moisture Content (Trim.%):** | 20.2% | |
| **Strain Rate (%/min):** | 0.7 | |
| **Confining Pressure (psi):** | 7 | |
| **Strain at Failure (%):** | 15.00 | |
| **Compressive Strength (psf)[2]** | 12.0 | |




| **Specimen** | **Initial** | **Final** |
|---|---|---|
| **Moisture Content (%):** | | |
| **Dry Unit Weight (pcf):** | | |
| **Diameter (in):** | | |
| **Height (in):** | | |
| **Void Ratio (-):** | | |
| **Saturation (%):** | | |
| **Specific Gravity (-)[1]:** | | |
| **Moisture Content (Trim.%):** | | |
| **Strain Rate (%/min):** | | |
| **Confining Pressure (psi):** | | |
| **Strain at Failure (%):** | | |
| **Compressive Strength (psi)[2]** | | |




| **Specimen** | **Initial** | **Final** |
|---|---|---|
| **Moisture Content (%):** | | |
| **Dry Unit Weight (pcf):** | | |
| **Diameter (in):** | | |
| **Height (in):** | | |
| **Void Ratio (-):** | | |
| **Saturation (%):** | | |
| **Specific Gravity (-)[1]:** | | |
| **Moisture Content (Trim.%):** | | |
| **Strain Rate (%/min):** | | |
| **Confining Pressure (psi):** | | |
| **Strain at Failure (%):** | | |
| **Compressive Strength (psi)[2]** | | |




**Notes:**

1. Value of specific gravity is assumed
2. Failure criterion: maximum deviator stress at strain less than or equal to 15%

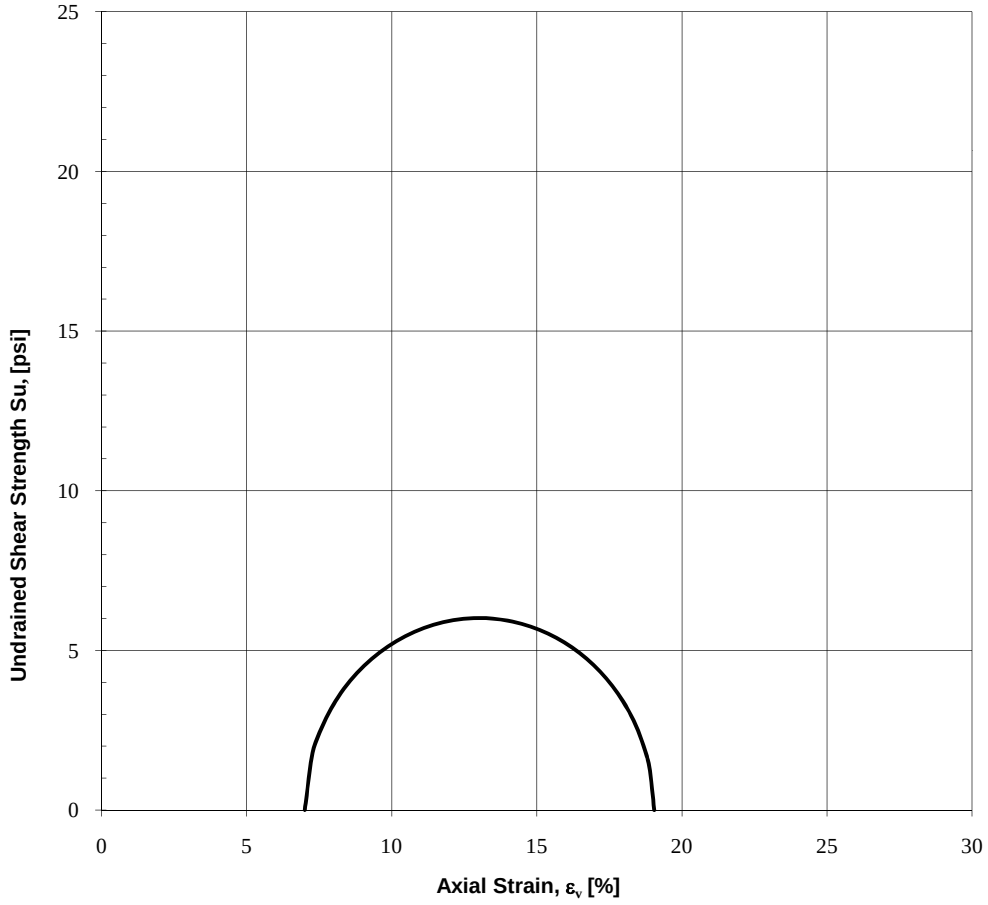
**Test Remarks:**

## Geotechnical Engineering Laboratory

### UNCONSOLIDATED-UNDRAINED TEST - MOHR CIRCLES

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 3/14/2012 | **LL :** | 34 |
| **Project:** | Watts Bar | **Exploration No:** | B-2 | **PL :** | 19 |
| **Location:** | 0 | **Sample No:** | U-1 | **PI :** | 15 |
| **Project No:** | 95618-83529 | **Depth (ft):** | 21.5 | **USCS:** | CL |

| | Specimen 1 | Specimen 2 | Specimen 3 |
|---|---|---|---|
| Confining Pressure (psi) | 7 | 0 | 0 |
| Undrained Shear Strength Su (psi) | 6.02 | 0.00 | 0.00 |
| Strain at Failure (%) | 15.00 | 0.00 | 0.00 |
| Initial Moisture Content (%) | 21.1% | 0.0% | 0.0% |
| Initial Saturation (%) | 93.3% | 0.0% | 0.0% |
| Average Su (psi) | | | |




**Notes:**

**Test Remarks:**

# Attachment 2

Phase 2 Investigation

Test Boring Logs
Well Installation Logs

CDM Smith

# BOREHOLE LOG
## B-103

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 711
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 58.5
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** 27.2
**Drilling Date: Start:** 6-11-12 **End:** 6-11-12
**Abandonment Method:** Converted to observation well
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,486.5 E 2,331,360.8
**Logged By:** J. Wen

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 711.0 | | | | | |
| | | | 0 | | 13 | | FILL | 3-inches of Gravel **-FILL-** |
| SS | S-1 | 24/20 | | PP>4.5 TV=0.5 | 9 10 10 | | | Moist, very stiff, reddish brown, CLAY, trace Sand and Gravel. |
| SS | S-2 | 24/17 | | PP>4.5 TV=1.2 | 4 7 10 12 | | | Moist, very stiff, reddish brown, CLAY, trace Sand. |
| SS | S-3 | 24/18 | 706.0 5 | PP=3.5 TV=0.7 | 3 6 7 9 | | | Moist, stiff, reddish brown, CLAY, trace Sand. |
| SS | S-4 | 24/21 | | PP=4.5 TV=1.7 | 4 7 10 12 | | | Moist, very stiff, reddish brown, CLAY, trace Sand. |
| SS | S-5 | 24/21 | | PP=4.5 TV=0.9 | 2 4 8 12 | | | Moist, stiff, reddish brown CLAY, trace Sand. |
| | | | 701.0 10 | | | | | |
| SS | S-6 | 24/18 | | PP=2.3 TV=0.8 | 3 4 8 9 | | | Moist, stiff, reddish brown CLAY, trace Sand. |
| SS | S-7 | 24/20 | | PP=3.5 TV=0.9 | 4 5 9 11 | | | Moist, stiff, reddish brown CLAY, trace Sand. |
| | | | 696.0 | | 4 6 | | | Moist, very stiff, dark gray, CLAY & SILT, trace Sand. |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

CDM Smith

# BOREHOLE LOG
## B-103

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 696.0 | | | | | |
| SS | S-8 | 24/18 | 15 | PP=4.5 TV=1.2 | 11<br>16 | | FILL | |
| SS | S-9 | 24/24 | | PP=3.0 TV=1.3 | 6<br>6<br>8<br>11 | | CL | Moist, stiff, dark brown, CLAY & SILT, some Sand. **-ALLUVIAL SOIL-** |
| SS | S-10 | 24/24 | | PP=2.5 TV=1.1 | 2<br>4<br>6<br>8 | | | Moist, stiff, dark brown, CLAY & SILT, little Sand. |
| | | | 691.0 | | | | | |
| ST | U-1 | 24/24 | 20 | | | | | Moist, dark brown, CLAY & SILT, little Sand. |
| | | | | | | | | |
| SS | S-11 | 24/24 | | | 2<br>4<br>7<br>6 | | | Wet, stiff, dark brown, CLAY & SILT, some Sand. |
| | | | 686.0 | | | | | |
| | | | 25 | | | | | |
| | | | | | | | SC | Wet, loose, light brown, fine SAND, some Clay & Silt. |
| SS | S-12 | 24/24 | | | 2<br>2<br>4<br>5 | | | |
| | | | 681.0 | | | | | |
| | | | 30 | | | | | |
| SS | S-13 | 24/24 | | | 1<br>WOH<br>1<br>4 | | | Wet, very loose, light brown, fine SAND, some Clay & Silt. |
| | | | 676.0 | | | | | |
| | | | 35 | | | | | |
| | | | | | 1<br>1 | | | Wet, very loose, dark gray, fine to medium SAND, some Clay & Silt. |

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## B-103

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant Phase II

**Project Location:** Spring City, Tennessee

**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| SS | S-14 | 24/24 | 671.0<br>40 | | 2<br>4 | | SC | |
| SS | S-15 | 24/24 | 666.0<br>45 | | 2<br>3<br>6<br>10 | | GC | Wet, loose, dark gray, fine GRAVEL and fine to coarse SAND, some Clay & Silt (rounded river rocks).<br><br>Difficult drilling starting from 46 feet, sand heave before shale. |
| SS | S-16 | 2/0 | | | 50/2" | | LS | NO SAMPLE RECOVERY.<br>Auger refusal at 48.2 feet-bgs. |
| NQ | C-1 | 21.6/2 | 661.0<br>50 | | 3:00<br>3:00 | | | **RUN 1: 48.2 to 50 feet-bgs**<br>REC = 10%, RQD = 0%<br>Hard, slightly to completely weathered, gray, fine-grained, LIMESTONE, jointing horizontal, very close to close, rough, planar, fresh to decomposed, open. |
| NQ | C-2 | 24/7 | | | 2:15<br>2:15 | | | **RUN 2: 50 to 52 feet-bgs**<br>REC = 33.3%, RQD = 0%<br>Hard, slightly to completely weathered, gray, fine-grained, LIMESTONE, jointing horizontal to moderately dipping, very close, rough, stepped, fresh to decomposed, open. |
| NQ | C-3 | 12/0 | | | 6:00 | | | **RUN 3: 52 to 53 feet-bgs**<br>REC = 0%, RQD = 0%<br>No Recovery. |
| NQ | C-4 | 24/18 | | | 6:00<br>7:00 | | | **RUN 4: 53 to 55 feet-bgs**<br>REC = 75%, RQD = 66.7%<br>Hard, slightly to moderately weathered, gray with white, fine grained, LIMESTONE, jointing horizontal to low angle, very close to moderate spacing, rough, undulating, fresh to decomposed, open. |
| NQ | C-5 | 24/12 | 656.0<br>55 | | 5:00<br>5:00 | | SHALE / LS | |
| NQ | C-6 | 18/0 | | | 6:00<br>3:00 | | | **RUN 5: 55 to 57 feet-bgs**<br>REC = 50%, RQD = 0%<br>Hard, slightly to moderately weathered, gray with white, fine grained, LIMESTONE and SHALE, jointing moderately dipping, very close, rough, planar, fresh to decomposed, open. |
| | | | 651.0<br>60 | | | | | **RUN 6: 57 to 58.5 feet-bgs**<br>REC = 0%, RQD = 0%<br>No Recovery.<br><br>Boring terminated at 58.5 feet-bgs. |

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## B-104

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 710
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 30
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** Not Measured
**Drilling Date: Start:** 6-12-12 **End:** 6-12-12
**Abandonment Method:** Grouted to ground surface
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,634.1 E 2,331,336.6
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 710.0 | | | | | |
| | | | 0 | | | | | |
| SS | S-1 | 24/20 | | | 9<br>14<br>18<br>17 | | BOT-TOM ASH | Dry, dense, black, fine to coarse BOTTOM ASH, trace Clay and Gravel. |
| SS | S-2 | 24/19 | | | 8<br>19<br>38<br>41 | | | Moist, very dense, black, fine to coarse BOTTOM ASH, trace Clay. |
| SS | S-3 | 12/11 | 705.0 | | 32<br>50 | | | Moist, very dense, black, fine to coarse BOTTOM ASH, trace Clay. |
| | | | 5 | | | | | |
| SS | S-4 | 24/15 | | | 11<br>10<br>9<br>6 | | | Wet, medium dense, black, fine to coarse BOTTOM ASH, trace Clay. |
| SS | S-5 | 24/14 | 700.0 | | 3<br>3<br>4<br>4 | | | Wet, loose, black, fine to coarse BOTTOM ASH. |
| SS | S-6 | 24/0 | 10 | | 2<br>4<br>6<br>4 | | | NO SAMPLE RECOVERY. |
| SS | S-7 | 24/14 | | | 7<br>3<br>3<br>2 | | | Wet, loose, black, fine to coarse BOTTOM ASH. |
| | | | 695.0 | | 8<br>3 | | | Wet, loose, black, medium coarse to coarse BOTTOM ASH. |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

CDM Smith

# BOREHOLE LOG
## B-104

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant Phase II

**Project Location:** Spring City, Tennessee

**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 695.0 | | | | | |
| SS | S-8 | 24/24 | 15 | | 3<br>2 | | BOT-TOM ASH | |
| SS | S-9 | 24/24 | | PP=2.2<br>TV=0.5 | 5<br>1<br>1<br>6 | | BOT-TOM ASH / CL | Wet, loose, black, medium coarse to coarse BOTTOM ASH.<br>Wet, medium stiff, dark gray CLAY & SILT and black, medium coarse BOTTOM ASH trace Sand. |
| SS | S-10 | 24/24 | | | 8<br>6<br>5<br>5 | | | Wet, stiff, dark gray, CLAY & SILT and black, medium to coarse BOTTOM ASH, trace Sand. |
| | | | 690.0<br>20 | | | | | |
| ST | U-1 | 24/24 | | | | | | Wet, dark gray, CLAY & SILT and black, medium to coarse BOTTOM ASH, trace Sand. |
| | | | | | | | CL | Wet, dark gray, CLAY & SILT, trace Sand. **-ALLUVIAL SOIL-** |
| SS | S-11 | 24/24 | | PP=0.5<br>TV=0.2 | 4<br>4<br>7<br>6 | | CH | Wet, stiff, dark gray, Silty CLAY, trace Sand. |
| | | | 685.0<br>25 | | | | | |
| SS | S-12 | 24/24 | | PP=1.0<br>TV=0.5 | 5<br>5<br>5<br>6 | | | Wet, stiff, dark gray, Silty CLAY, trace Sand. |
| SS | S-13 | 24/24 | | PP=0.5<br>TV=0.2 | 6<br>7<br>7<br>9 | | | Wet, stiff, dark gray, Silty CLAY, trace Sand. |
| | | | 680.0<br>30 | | | | | Boring terminated at 30 feet-bgs. |
| | | | 675.0<br>35 | | | | | |

CDM Smith

# BOREHOLE LOG
## B-104A

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 711.04
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 28
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** 25.9
**Drilling Date: Start:** 6-12-12 **End:** 6-12-12
**Abandonment Method:** Grouted to ground surface
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,614.4 E 2,331,123.6
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 711.0 | | | | | |
| | | | 0 | | | | | |
| SS | S-1 | 24/22 | | | 6<br>19<br>18<br>16 | | BOT-TOM ASH | Dry, dense, black, fine to coarse BOTTOM ASH. |
| SS | S-2 | 24/19 | | | 6<br>17<br>18<br>22 | | | Dry, dense, black, fine to coarse BOTTOM ASH, trace Clay. |
| SS | S-3 | 24/20 | 706.0<br>5 | | 12<br>17<br>23<br>23 | | | Moist, dense, black, fine to coarse BOTTOM ASH, little Clay. |
| SS | S-4 | 24/16 | | | 15<br>20<br>18<br>19 | | | Wet, dense, black, fine to coarse BOTTOM ASH. |
| SS | S-5 | 24/19 | | | 4<br>8<br>4<br>12 | | | Wet, medium dense, black, medium coarse to coarse BOTTOM ASH. |
| ST | U-1 | 15/15 | 701.0<br>10 | | | | | Wet, black, medium coarse to coarse BOTTOM ASH. |
| SS | S-6 | 24/22 | | | 20<br>21<br>17<br>17 | | | Wet, dense, black, medium coarse to coarse BOTTOM ASH. |
| | | | | | 4<br>4 | | | Wet, loose, black, coarse BOTTOM ASH. |
| | | | 696.0 | | | | | |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## B-104A

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant Phase II

**Project Location:** Spring City, Tennessee

**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 696.0 | | | | | |
| SS | S-7 | 24/16 | 15 | | 4<br>4 | | BOT-TOM ASH | |
| SS | S-8 | 24/8 | | | 13<br>8<br>4<br>3 | | | Wet, medium dense, black, coarse BOTTOM ASH. |
| SS | S-9 | 24/22 | | | 7<br>7<br>6<br>6 | | | Wet, medium dense, black, coarse BOTTOM ASH. |
| | | | 691.0<br>20 | | | | | |
| SS | S-10 | 24/24 | | PP=2.5<br>TV=0.5 | 4<br>8<br>5<br>10 | | | Wet, medium dense, black, coarse BOTTOM ASH. |
| | | | | | | | CL | Wet, stiff, reddish brown, CLAY & SILT. **-ALLUVIAL SOIL-** |
| SS | S-11 | 24/24 | 686.0<br>25 | PP=1.0<br>TV=0.5 | 4<br>3<br>4<br>5 | | | Wet, medium stiff, reddish brown, CLAY & SILT. |
| SS | S-12 | 24/24 | | PP=1.2<br>TV=0.7 | 3<br>4<br>6<br>7 | | | Wet, stiff, reddish brown, CLAY& SILT, trace Sand. |
| | | | 681.0<br>30 | | | | | Boring termintated at 28 feet-bgs. |
| | | | 676.0<br>35 | | | | | |

CDM Smith

# BOREHOLE LOG
## B-105

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 711
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 58
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** 29.2
**Drilling Date: Start:** 6-12-12 **End:** 6-13-12
**Abandonment Method:** Grouted to ground surface
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,726.4 E 2,331,408.3
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 711.0 | | | | | |
| | | | 0 | | 5 | | FILL | 6-inches GRAVEL / ASH **-FILL-** |
| SS | S-1 | 24/22 | | PP>4.5 TV=1.2 | 11 10 10 | | | Moist, very stiff, reddish brown, CLAY, trace Sand. |
| SS | S-2 | 24/20 | | PP>4.5 TV=1.2 | 7 7 10 11 | | | Moist, very stiff, reddish brown, CLAY, trace Sand. |
| SS | S-3 | 24/24 | 706.0 5 | PP>4.5 TV=1.5 | 5 5 10 14 | | | Moist, stiff to very stiff, reddish brown, CLAY & SILT, little Sand. |
| SS | S-4 | 24/24 | | PP=4.5 TV=2.0 | 5 8 8 11 | | | Moist, very stiff, dark gray to reddish brown, CLAY & SILT, trace Sand. |
| SS | S-5 | 24/24 | | PP>4.5 TV=1.5 | 5 7 7 11 | | | Moist, stiff, dark gray to reddish brown, CLAY & SILT, trace Sand. |
| | | | 701.0 10 | | | | | |
| SS | S-6 | 24/20 | | PP=3.5 TV=1.0 | 5 6 8 6 | | | Moist, stiff, dark gray to reddish brown, CLAY & SILT, trace Sand. |
| SS | S-7 | 24/24 | | PP>4.5 TV=1.2 | 3 7 8 9 | | | Moist, very stiff, reddish brown, CLAY, trace Sand. |
| | | | 696.0 | | 1 4 | | | Moist, stiff, reddish brown to gray, CLAY, some Sand. |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
- DTR - Dual Tube Rotary
- FR - Foam Rotary
- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## B-105

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 696.0 | | | | | |
| SS | S-8 | 24/24 | 15 | PP=2.0 TV=0.7 | 6<br>8 | | FILL | |
| ST | U-1 | 24/21 | | | | | | Moist, reddish brown to gray, CLAY, some Sand. |
| SS | S-9 | 24/24 | | PP=1.2 TV=0.2 | 3<br>5<br>3<br>4 | | CL | Wet, medium stiff to stiff, dark gray CLAY & SILT, trace Sand.<br>**-ALLUVIAL SOIL-** |
| | | | 691.0 | | | | | |
| SS | S-10 | 24/4 | 20 | PP=1.5 TV=0.2 | 3<br>3<br>5<br>5 | | | Wet, medium stiff to stiff, dark gray CLAY & SILT, trace Sand. |
| | | | | | | | | |
| SS | S-11 | 24/18 | | PP=1.0 TV=0.1 | 1<br>2<br>4<br>3 | | | Wet, medium stiff, dark gray CLAY & SILT, trace Sand. |
| | | | 686.0 | | | | | |
| | | | 25 | | | | | |
| SS | S-12 | 24/6 | | | WOH<br>WOH<br>2<br>2 | | SC | Wet, very loose, gray, fine to medium SAND and CLAY & SILT. |
| | | | 681.0 | | | | | |
| | | | 30 | | | | | |
| SS | S-13 | 24/24 | | | 1<br>1<br>2<br>2 | | | Wet, very loose, brown, fine SAND and CLAY & SILT. |
| | | | 676.0 | | | | | |
| | | | 35 | | | | | |
| | | | | | 2<br>1 | | | Wet, very loose, gray, fine to medium SAND and CLAY & SILT. |

CDM Smith

# BOREHOLE LOG
## B-105

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant Phase II

**Project Location:** Spring City, Tennessee

**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| SS | S-14 | 24/24 | 671.0<br>40 | | 2<br>1 | | SC | |
| SS | S-15 | 24/24 | 666.0<br>45 | | 4<br>4<br>31<br>43 | | SW-SM | Wet, dense to very dense, gray, fine to coarse SAND, some Gravel, trace Silt, roots.<br><br>Auger refusal at 48.0 feet-bgs. |
| NQ | C-1 | 60/15 | 661.0<br>50 | | 5:00<br>.<br>5:00<br>.<br>6:00<br>.<br>8:00<br>.<br>8:00 | | GW / SHALE / LS | **RUN 1: 48 to 53 feet-bgs**<br>REC = 25%, RQD = 7%<br>Hard, moderately weathered, gray, aphanitic, INTERBEDDED SHALE, LIMESTONE, and RIVER ROCK, very thin to thin bedding, low angle jointing, very close to close spacing, rough, discolored, open. |
| NQ | C-2 | 60/15 | 656.0<br>55 | | 8:00<br>.<br>8:00<br>.<br>11:00<br>.<br>9:00<br>.<br>10:00 | | SHALE / LS | **RUN 2: 53 to 58 feet-bgs**<br>REC = 25%, RQD = 0%<br>Hard, highly weathered, gray, aphanitic, INTERBEDDED SHALE and LIMESTONE, very thin bedding, low angle to moderately dipping jointing, very close spacing, rough, discolored, open. |
| | | | 651.0<br>60 | | | | | Boring terminated at 58.0 feet-bgs. |

CDM Smith

# BOREHOLE LOG
## B-106

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 693.9
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 45.5
**Drillers:** Tim Hall / Alan
**Depth to Initial Water Level (ft-bgs):** 12.2
**Drilling Date: Start:** 6-13-12 **End:** 6-14-12
**Abandonment Method:** Grouted to ground surface
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,751.2 E 2,331,512.0
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 693.9 | | | | | |
| | | | 0 | | | | | |
| SS | S-1 | 24/18 | | PP=2.5 | 6<br>12<br>8<br>12 | | FILL | Dry, very stiff, brown, SILT, little Sand. **-FILL-** |
| SS | S-2 | 24/16 | | PP=2.5 | 6<br>5<br>4<br>4 | | | Moist, stiff, brown, SILT, trace Sand. |
| SS | S-3 | 24/20 | 688.9<br>5 | PP=1.0<br>TV=0.2 | 1<br>2<br>2<br>3 | | CL | Moist, soft to medium stiff, brown, CLAY & SILT, trace roots. **-ALLUVIAL SOIL-** |
| SS | S-4 | 24/12 | | | 2<br>2<br>2<br>3 | | CL | Moist, soft to medium stiff, brown, CLAY & SILT and fine SAND, trace roots. |
| SS | S-5 | 24/15 | | PP=2.0<br>TV =0.4 | 2<br>2<br>3<br>5 | | | Moist, medium stiff, brown, SILT & CLAY, some Sand. |
| SS | S-6 | 24/24 | 683.9<br>10 | | 2<br>2<br>2<br>3 | | | Wet, soft to medium stiff, brown, SILT & CLAY and fine SAND, trace roots. |
| | | | | | | | | |
| ST | U-1 | 24/24 | | | | | SM | Wet, brown, fine to medium SAND, some Silt. |
| | | | 678.9 | | | | | |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## B-106

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant Phase II

**Project Location:** Spring City, Tennessee

**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 678.9<br>15 | | | | SM | |
| SS | S-7 | 24/0 | | | 2<br>2<br>2<br>2 | | | NO SAMPLE RECOVERY. |
| SS | S-8 | 24/24 | | | 1<br>2<br>2<br>3 | | SC | Wet, loose, brown, fine to medium SAND, little Clay & Silt. |
| | | | 673.9<br>20 | | | | | |
| SS | S-9 | 24/24 | | | 4<br>4<br>4<br>4 | | | Wet, loose to medium, brown, fine to medium SAND, little Clay & Silt. |
| | | | | | | | | |
| SS | S-10 | 24/24 | | | WOH<br>1<br>2<br>2 | | | Wet, very loose, brown, fine to medium SAND and CLAY & SILT. |
| | | | 668.9<br>25 | | | | | |
| SS | S-11 | 24/24 | | | 7<br>12<br>20<br>52/5" | | GW / SHALE | Wet, dense, dark gray, fine to coarse gravel size RIVER ROCK and weathered SHALE.<br>Auger refusal at 31.5 feet-bgs. |
| | | | 663.9<br>30 | | | | | |
| NQ | C-1 | 60/20 | | | 0:30<br>.<br>0:30<br>.<br>4:30<br>.<br>4:30<br>.<br>4:30 | | GW / SHALE / LS | **RUN 1: 30.5 to 35.5 feet-bgs**<br>REC = 33%, RQD = 0%<br>Hard, highly weathered, gray, aphanitic, INTERBEDDED SHALE, LIMESTONE, and RIVER ROCK, very thin bedding, low angle to moderately dipping jointing, very close to close spacing, rough, discolored, open. |
| | | | 658.9<br>35 | | | | | |
| NQ | C-2 | 60/36 | | | 4:30<br>.<br>4:00<br>.<br>5:30<br>.<br>7:30 | | SHALE / LS | **RUN 2: 35.5 to 40.5 feet-bgs**<br>REC = 60%, RQD = 10%<br>Hard, moderately to highly weathered, gray, aphanitic, INTERBEDDED SHALE and LIMESTONE, very thin to thin bedding, low angle to moderately dipping jointing, very close to close spacing, rough, discolored, open. |

CDM Smith

# BOREHOLE LOG
## B-106

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant Phase II

**Project Location:** Spring City, Tennessee

**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 653.9 / 40 | | . 3:30 | | SHALE / LS | |
| NQ | C-3 | 60/17 | | | 3:30 . 4:30 . 3:30 . 3:00 . 3:30 | | | **RUN 3: 40.5 to 45.5 feet-bgs**<br>REC = 28%, RQD = 0%<br>Medium hard to hard, highly weathered, gray, aphanitic, INTERBEDDED SHALE and LIMESTONE, very thin bedding, horizontal to moderately dipping jointing, very close spacing, rough, discolored, open. |
| | | | 648.9 / 45 | | | | | |
| | | | 643.9 / 50 | | | | | Boring terminated at 45.5 feet-bgs. |
| | | | 638.9 / 55 | | | | | |
| | | | 633.9 / 60 | | | | | |

CDM Smith

# BOREHOLE LOG
## B-107

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 710.04
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 44.3
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** 27.8
**Drilling Date: Start:** 6-13-12 **End:** 6-13-12
**Abandonment Method:** Converted to observation well
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,931.0 E 2,331,455.9
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 710.0 | | | | | |
| | | | 0 | | | | ASPHALT | 5-inches ASPHALT. |
| | | | | | | | FILL | 7-inches GRAVEL BASE. **-FILL-** |
| | | | | | | | | Moist, reddish brown, CLAY, trace Sand. |
| SS | S-1 | 24/12 | | PP=2.5 TV=0.8 | 8 8 7 8 | | | Moist, stiff to very stiff, reddish brown, CLAY, trace Sand. |
| SS | S-2 | 24/20 | 705.0 5 | PP>4.5 TV=2.0 | 5 6 7 12 | | | Moist, stiff, gray, CLAY, trace Sand. |
| SS | S-3 | 24/24 | | PP>4.5 TV=1.8 | 3 6 9 10 | | | Moist, stiff to very stiff, reddish brown, CLAY, trace Sand. |
| SS | S-4 | 24/24 | | PP>4.5 TV=2.0 | 6 7 10 12 | | | Moist, very stiff, gray to reddish brown, CLAY, trace Sand. |
| | | | 700.0 10 | | | | | |
| ST | U-1 | 24/18 | | | | | | Moist, gray to reddish brown, CLAY, trace Sand. |
| SS | S-5 | 24/20 | | PP=2.5 TV=1.3 | 4 8 10 13 | | | Moist, very stiff, gray to reddish brown, CLAY, trace Sand. |
| | | | 695.0 | | 4 9 | | | Moist, very stiff, gray to reddish brown, CLAY, trace Sand. |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

CDM Smith

# BOREHOLE LOG
## B-107

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 695.0 | | | | | |
| SS | S-6 | 24/24 | 15 | PP=4.0 TV=1.2 | 13 13 | | FILL | |
| SS | S-7 | 24/20 | | PP=2.5 TV=1.0 | WOH 7 8 10 | | CL | Wet, stiff to very stiff, brown, CLAY & SILT. **-ALLUVIAL SOIL-** |
| SS | S-8 | 24/24 | | PP=1.0 TV=0.6 | 5 5 8 6 | | | Wet, stiff, brown, CLAY & SILT. |
| | | | 690.0 | | | | | |
| SS | S-9 | 24/12 | 20 | PP=1.0 TV=0.6 | 4 4 6 4 | | | Wet, stiff, brown, CLAY & SILT. |
| | | | | | | | | |
| SS | S-10 | 24/24 | | PP=2.0 TV=0.4 | 1 3 3 3 | | | Wet, medium stiff, reddish brown, CLAY & SILT, some Sand. |
| | | | 685.0 | | | | | |
| | | | 25 | | | | | |
| SS | S-11 | 24/0 | | | 1 1 1 2 | | | NO SAMPLE RECOVERY. |
| | | | 680.0 | | | | | |
| | | | 30 | | | | | |
| SS | S-12 | 24/24 | | | WOH WOH 1 3 | | SC | Wet, very loose, brown, fine to medium SAND and CLAY & SILT. |
| | | | 675.0 | | | | | |
| | | | 35 | | | | | |
| | | | | | 1 2 | | | Wet, very loose, brown to gray, fine SAND and CLAY & SILT. |

CDM Smith

# BOREHOLE LOG
## B-107

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant Phase II

**Project Location:** Spring City, Tennessee

**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| SS | S-13 | 24/20 | 670.0<br>40 | | 3<br>3 | | SC | |
| SS | S-14 | 15/15 | | | 12<br>29<br>58/3" | | GP | Wet, very dense, dark gray, fine GRAVEL, some Sand. |
| | | | 665.0<br>45 | | | | | Boring terminated at 44.3 feet-bgs upon auger refusal. |
| | | | 660.0<br>50 | | | | | |
| | | | 655.0<br>55 | | | | | |
| | | | 650.0<br>60 | | | | | |

CDM Smith

# BOREHOLE LOG
## B-108

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 710.48
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 57
**Drillers:** Alan
**Depth to Initial Water Level (ft-bgs):** 22.7
**Drilling Date: Start:** 6-14-12 **End:** 6-14-12
**Abandonment Method:** Grouted to ground surface
**Borehole Coordinates:**
**Field Screening Instrument:**
N 465,254.7 E 2,331,425.3
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 710.5 | | | | | |
| | | | 0 | | 7 | | FILL | Dry, medium to dense, gray, fine to medium GRAVEL, trace Clay. |
| SS | S-1 | 24/16 | | PP=2.0 | 18<br>12<br>6 | | | Dry, medium stiff, reddish brown, CLAY, trace Gravel, Sand. |
| SS | S-2 | 24/18 | | PP=2.5<br>TV=1.2 | 5<br>3<br>4<br>6 | | | Moist, medium stiff, reddish brown, CLAY & SILT, trace Sand. |
| SS | S-3 | 24/20 | 705.5<br>5 | PP=3.0<br>TV=1.5 | 2<br>5<br>7<br>9 | | | Moist, stiff, reddish brown, CLAY & SILT, trace Sand. |
| SS | S-4 | 24/20 | | PP=3.5<br>TV=1.2 | 2<br>6<br>7<br>9 | | | Moist, stiff, reddish brown, CLAY & SILT, trace Sand. |
| SS | S-5 | 24/20 | | PP=4.2<br>TV=1.2 | 2<br>5<br>7<br>9 | | | Moist, stiff, reddish brown, CLAY & SILT, trace Sand, roots. |
| | | | 700.5<br>10 | | | | | |
| SS | S-6 | 24/24 | | PP>4.5<br>TV=2.1 | 3<br>4<br>10<br>14 | | | Moist, stiff, reddish brown, CLAY & SILT, trace Sand, roots.<br>Moist, stiff, dark gray CLAY & SILT, trace Sand. |
| SS | S-7 | 24/22 | | PP=3.5<br>TV=0.9 | 3<br>6<br>7<br>8 | | | Moist, stiff, dark gray CLAY & SILT, trace Sand. |
| | | | 695.5 | | 3<br>4 | | | Moist, stiff, dark gray CLAY & SILT, trace Sand. |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

CDM Smith

# BOREHOLE LOG
## B-108

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 695.5 | | | | | |
| SS | S-8 | 24/24 | 15 | PP=3.0 TV=1.0 | 6<br>7 | | FILL | |
| ST | U-1 | 24/18 | | | | | | Moist, reddish brown, CLAY & SILT, trace Sand. |
| SS | S-9 | 24/3 | | | 3<br>4<br>5<br>7 | | | Moist, stiff, reddish brown, CLAY & SILT, trace Sand. |
| | | | 690.5 | | | | | |
| SS | S-10 | 24/24 | 20 | PP=2.5 TV=1.0 | 3<br>4<br>4<br>5 | | | Moist, medium stiff to stiff, reddish brown, CLAY & SILT, some Sand. |
| SS | S-11 | 24/24 | | | 1<br>2<br>2<br>2 | | CL | Wet, soft to medium stiff, brown, CLAY & SILT and fine SAND. **-ALLUVIAL SOIL-** |
| | | | 685.5 | | | | | |
| | | | 25 | | | | | |
| SS | S-12 | 24/8 | | | 1<br>2<br>2<br>3 | | | Wet, soft to medium stiff, brown, CLAY & SILT and fine to medium SAND, trace Gravel, roots. |
| | | | 680.5 | | | | | |
| | | | 30 | | | | | |
| SS | S-13 | 24/24 | | | WOH<br>WOH<br>1<br>2 | | SC | Wet, very loose, gray, fine SAND, some Clay & Silt. |
| | | | 675.5 | | | | | |
| | | | 35 | | | | | |
| | | | | | WOH<br>1 | | | Wet, very loose, gray, fine SAND, some Clay & Silt. |

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## B-108

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| SS | S-14 | 24/24 | 670.5<br>40 | | 2<br>3 | | SC | |
| SS | S-15 | 24/22 | 665.5<br>45 | | 3<br>9<br>9<br>27 | | GW | Wet, medium dense, gray, fine to coarse gravel size RIVER ROCK and fine to coarse SAND.<br><br>Auger refusal at 47.1 feet-bgs. |
| NQ | C-1 | 60/23 | 660.5<br>50 | | 1:00<br>.<br>1:30<br>.<br>5:00<br>.<br>4:00<br>.<br>6:00 | | GW / SHALE / LS | **RUN 1: 47 to 52 feet-bgs**<br>REC = 38%, RQD = 0%<br>Hard, highly weathered, gray, aphanitic, INTERBEDDED SHALE, LIMESTONE, and RIVER ROCK, extremely thin to thin bedding, horizontal to moderately dipping jointing, very close spacing, rough, discolored, open. |
| NQ | C-2 | 60/27 | 655.5<br>55 | | 3:30<br>.<br>6:00<br>.<br>5:00<br>.<br>4:30<br>.<br>5:00 | | SHALE / LS | **RUN 2: 52 to 57 feet-bgs**<br>REC = 45%, RQD = 7%<br>Hard, highly weathered, gray, aphanitic, INTERBEDDED SHALE and LIMESTONE, extremely thin to thin bedding, horizontal to low angular jointing, very close spacing, rough, discolored, open. |
| | | | 650.5<br>60 | | | | | Boring terminated at 57.0 feet-bgs. |

CDM Smith

# BOREHOLE LOG
## B-109

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 706.53
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 30
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** Not Encountered
**Drilling Date: Start:** 6-15-12 **End:** 6-15-12
**Abandonment Method:** Grouted to ground surface
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,949.2 E 2,331,015.2
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 706.5 | | | | | |
| SS | S-1 | 24/4 | 0 | | 1<br>1<br>WOH<br>1 | | FLY ASH | Dry, very loose, black, fine FLY ASH, little roots. |
| SS | S-2 | 24/24 | | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, FLY ASH, trace roots. |
| SS | S-3 | 24/2 | 701.5<br>5 | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, FLY ASH, little Gravel. |
| SS | S-4 | 24/6 | | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, FLY ASH. |
| SS | S-5 | 24/20 | | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, FLY ASH. |
| SS | S-6 | 24/12 | 696.5<br>10 | | WOH<br>WOH<br>WOH<br>WOH | | ML / FLY ASH | Wet, loose, black to gray, SILT and FLY ASH, trace roots, Gravel. |
| ST | U-1 | 24/24 | | | | | | Wet, black to gray, SILT and FLY ASH, trace roots, Gravel. |
| | | | 691.5 | | 4 | | | Wet, stiff, gray, Clayey SILT. **-ALLUVIAL SOIL-** |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

CDM Smith

# BOREHOLE LOG
## B-109

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 691.5 | | | | | |
| SS | S-7 | 24/24 | 15 | PP=1.2 TV=0.6 | 5<br>7<br>11 | | CL | Wet, stiff, reddish brown, CLAY & SILT, trace Sand, roots. |
| | | | | | | | | |
| SS | S-8 | 24/12 | | PP=1.7 TV=0.7 | 2<br>4<br>5<br>6 | | | Wet, stiff, reddish brown, CLAY & SILT, trace Sand. |
| SS | S-9 | 24/24 | 686.5<br>20 | PP=1.0 TV=0.2 | 1<br>4<br>5<br>6 | | | Wet, stiff, reddish brown, CLAY & SILT, trace Sand. |
| | | | | | | | | |
| SS | S-10 | 24/24 | 681.5<br>25 | PP=1.0 TV=0.5 | 1<br>3<br>4<br>5 | | | Wet, medium stiff, reddish brown, CLAY & SILT, tace Sand. |
| | | | | | | | | |
| SS | S-11 | 24/24 | 676.5<br>30 | PP=0.5 TV=0.2 | WOH<br>1<br>2<br>3 | | ML | Wet, soft, light brown, SILT, little Sand, trace Gravel. |
| | | | 671.5<br>35 | | | | | Boring terminated at 30 feet-bgs. |

CDM Smith

# BOREHOLE LOG
## B-110

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 707.29
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 33.1
**Drillers:** Tim Hall
**Depth to Initial Water Level (ft-bgs):** 7.2
**Drilling Date: Start:** 6-15-12 **End:** 6-15-12
**Abandonment Method:** Converted to observation well
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,996.7 E 2,330,939.0
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 707.3 | | | | | |
| | | | 0 | | | | | |
| SS | S-1 | 24/12 | | | 2<br>1<br>2<br>2 | | FLY ASH | Moist, soft, gray to black, TOP SOIL and FLY ASH, trace roots. |
| SS | S-2 | 24/3 | | | 1<br>WOH<br>1<br>WOH | | | Moist, soft, gray to black, TOP SOIL and FLY ASH. |
| SS | S-3 | 24/8 | 702.3<br>5 | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, fine FLY ASH. |
| SS | S-4 | 24/18 | | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, fine FLY ASH. |
| SS | S-5 | 24/2 | | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, fine FLY ASH. |
| | | | 697.3 | | | | | |
| ST | U-1 | 24/20 | 10 | | | | | Wet, black, fine FLY ASH. |
| SS | S-6 | 24/24 | | | WOH<br>WOH<br>1<br>2 | | | Wet, very loose, black, fine FLY ASH. |
| | | | 692.3 | | | | ML | Wet, very soft, dark gray, SILT, some Fly Ash, trace roots. |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

CDM Smith

# BOREHOLE LOG
## B-110

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 692.3 | | | | | |
| | | | 15 | | | | | |
| SS | S-7 | 24/18 | | | WOH<br>WOH<br>WOH<br>1 | | ML | Wet, very soft, dark gray SILT, little Fly Ash, roots. |
| SS | S-8 | 24/18 | | PP=0.7<br>TV=0.2 | 1<br>2<br>3<br>4 | | CL | Wet, stiff, reddish brown, CLAY & SILT, trace Sand, Fly Ash.<br>**-ALLUVIAL SOIL-** |
| SS | S-9 | 24/9 | 687.3<br>20 | PP=0.7<br>TV=0.1 | WOH<br>1<br>2<br>2 | | | Wet, soft, brown to gray, CLAY & SILT, trace Sand. |
| SS | S-10 | 24/6 | 682.3<br>25 | | 1<br>WOH<br>1<br>2 | | | Wet, soft, brown to gray, CLAY & SILT, trace Sand. |
| SS | S-11 | 24/24 | 677.3<br>30 | | 1<br>1<br>2<br>4 | | SM | Wet, very loose, brown, fine to medium SAND, some Silt & Clay, little Gravel. |
| SS | S-12 | 1/1 | | | 50/1" | | GW | Wet, very dense, brown, fine to coarse GRAVEL, little Sand.<br>Boring terminated at 33.1 feet-bgs upon auger refusal. |
| | | | 672.3<br>35 | | | | | |

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## B-111

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 706.54
**Drilling Method/Rig:** 3.25" HSA// CME-55
**Total Depth (ft.):** 30
**Drillers:** Alan / Tim Hall
**Depth to Initial Water Level (ft-bgs):** 7.4
**Drilling Date: Start:** 6-14-12 **End:** 6-14-12
**Abandonment Method:** Grouted to ground surface
**Borehole Coordinates:**
**Field Screening Instrument:**
N 465,122.0 E 2,330,987.2
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 706.5 | | | | | |
| | | | 0 | | | | | |
| SS | S-1 | 24/9 | | | 1<br>1<br>1<br>1 | | FLY ASH | Moist, very loose, black, fine FLY ASH, trace Clay, roots. |
| SS | S-2 | 24/0 | | | 1<br>WOH<br>1<br>WOH | | | NO SAMPLE RECOVERY. |
| SS | S-3 | 24/16 | 701.5<br>5 | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, fine, FLY ASH. |
| SS | S-4 | 24/22 | | | WOH<br>WOH<br>1<br>WOH | | | Wet, very loose, black, fine, FLY ASH. |
| SS | S-5 | 24/20 | | | WOH<br>1<br>WOH<br>WOH | | | Wet, very loose, black, fine, FLY ASH. |
| | | | 696.5 | | | | | |
| SS | S-6 | 24/24 | 10 | | WOH<br>WOH<br>1<br>5 | | | Wet, very loose, black, fine, FLY ASH. |
| SS | S-7 | 24/2 | | | WOH<br>WOH<br>WOH<br>WOH | | | Wet, very loose, black, fine, FLY ASH. |
| | | | 691.5 | | WOH<br>1 | | CL | Wet, soft, gray to brown, Silty CLAY, trace Fly Ash, roots.<br>**-ALLUVIAL SOIL-** |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Hammer weight = 140 pounds, drop height = 30 inches
Split spoon = 2 inches OD, 24 inches long
PP = Pocket Penetrometer
TV = Torvane
WOH = Weight of Hammer

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## B-111

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 691.5 | | | | | |
| SS | S-8 | 24/24 | 15 | | 1<br>2 | | CL | |
| SS | S-9 | 24/24 | | PP=0.5<br>TV=0.7 | WOH<br>WOH<br>1<br>1 | | | Wet, soft, gray to brown, Silty CLAY, trace Fly Ash, roots. |
| SS | S-10 | 24/6 | | | WOH<br>WOH<br>WOH<br>3 | | | Wet, soft, gray to brown, Silty CLAY, trace Sand. |
| | | | 686.5 | | | | | |
| SS | S-11 | 24/24 | 20 | | 1<br>2<br>2<br>5 | | | Wet, soft to medium stiff, reddish brown, CLAY & SILT. |
| | | | | | | | | |
| ST | U-1 | 24/19 | | | | | | Wet, reddish brown, CLAY & SILT. |
| | | | 681.5 | | | | | |
| SS | S-12 | 24/24 | 25 | PP=0.5 | 1<br>1<br>1<br>1 | | | Wet, very soft to soft, gray, CLAY & SILT, trace Sand. |
| | | | | | | | | |
| SS | S-13 | 24/24 | | | 1<br>2<br>2<br>3 | | | Wet, soft to medium stiff, gray, CLAY & SILT, trace Sand. |
| | | | 676.5 | | | | | |
| | | | 30 | | | | | Boring terminated at 30 feet-bgs. |
| | | | 671.5 | | | | | |
| | | | 35 | | | | | |

CDM Smith

# BOREHOLE LOG
## HA-1

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 707
**Drilling Method/Rig:** HA/
**Total Depth (ft.):** 13
**Drillers:**
**Depth to Initial Water Level (ft-bgs):** 2
**Drilling Date: Start:** 6-11-12 **End:** 6-12-12
**Abandonment Method:** Backfilled with Cuttings
**Borehole Coordinates:**
**Field Screening Instrument:**
N 464,949.0 E 2,331,410.5
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 707.0 | | | | | |
| AS | S-1 | 12/12 | 0 | | | | FLY ASH | Moist, black FLY ASH, trace grass roots. |
| AS | S-2 | 12/12 | | | | | | Moist, black FLY ASH. |
| AS | S-3 | 12/12 | | | | | | Wet, black FLY ASH. |
| AS | S-4 | 12/12 | | | | | | |
| AS | S-5 | 12/12 | | | | | | |
| | | | 702.0 | | | | | |
| AS | S-6 | 12/12 | 5 | | | | | |
| AS | S-8 | 12/12 | | | | | | |
| AS | S-9 | 12/12 | | | | | | |
| AS | S-10 | 12/12 | | | | | | |
| | | | 697.0 | | | | | |
| | | | 10 | | | | | |
| | | | | | | | ML | Wet, dark gray SILT. **-ALLUVIAL SOILS-** |
| | | | | | | | | Hand auger terminated at 13 feet-bgs. |
| | | | 692.0 | | | | | |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
- DTR - Dual Tube Rotary
- FR - Foam Rotary
- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface

### REMARKS

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## HA-2

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 707
**Drilling Method/Rig:** HA/
**Total Depth (ft.):** 13
**Drillers:**
**Depth to Initial Water Level (ft-bgs):** 3
**Drilling Date: Start:** 6-11-12 **End:** 6-12-12
**Abandonment Method:** Backfilled with Cuttings
**Borehole Coordinates:**
**Field Screening Instrument:**
N 465,117.8 E 2,331,402.3
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 707.0 | | | | | |
| | | | 0 | | | | FLY ASH | |
| AS | S-1 | 24/12 | | | | | | Moist, black FLY ASH, trace grass roots. |
| AS | S-2 | 24/12 | | | | | | Moist, black FLY ASH. |
| AS | S-3 | 24/12 | 702.0 / 5 | | | | | Wet, black FLY ASH. |
| | | | 697.0 / 10 | | | | CL / ML | Wet, reddish brown to gray, CLAY & SILT -ALLUVIAL SOIL-. |
| | | | | | | | | Hand auger terminated at 13 feet-bgs. |
| | | | 692.0 | | | | | |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
- DTR - Dual Tube Rotary
- FR - Foam Rotary
- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface

### REMARKS

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

BOREHOLE-PP READINGS/NO ROCK TVA PHASE II_RHL.GPJ CDM_CORP.GDT 8/30/12

CDM Smith

# BOREHOLE LOG
## HA-3

**Client:** TVA
**Project Name:** TVA Watts Bar Fossil Plant Phase II
**Project Location:** Spring City, Tennessee
**Project Number:** 95618-92016

**Drilling Contractor:** Total Depth Drilling
**Surface Elevation (ft.):** 707.1
**Drilling Method/Rig:** HA/
**Total Depth (ft.):** 16
**Drillers:**
**Depth to Initial Water Level (ft-bgs):** 3
**Drilling Date: Start:** 6-11-12 **End:** 6-12-12
**Abandonment Method:** Backfilled with Cuttings
**Borehole Coordinates:**
**Field Screening Instrument:**
N 465,212.4 E 2,331,136.2
**Logged By:** R. Lawrence

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 707.1<br>0 | | | | FLY ASH | Moist, black FLY ASH, trace grass roots. |
| | | | | | | | | Moist, black FLY ASH. |
| | | | | | | | | Wet, black FLY ASH. |
| | | | 702.1<br>5 | | | | | |
| | | | 697.1<br>10 | | | | | |
| | | | 692.1 | | | | | |

### EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

### REMARKS

Groundwater level was measured during drilling and may not represent stabilized levels.

Borehole coordinates are approximate based upon handheld GPS and elevations are estimated by overlaying coordinates with the survey.

**Reviewed by:** D. Neamtu **Date:** 8-17-12

CDM Smith

# BOREHOLE LOG
## HA-3

**Client:** TVA

**Project Name:** TVA Watts Bar Fossil Plant Phase II

**Project Location:** Spring City, Tennessee

**Project Number:** 95618-92016

| Sample Type | Sample Number | Sample Adv/Rec (inches) | Elev. Depth (ft.) | Pocket Penetrometer Reading (tsf) | Blows per 6-in | Graphic Log | USCS Designation | Material Description |
|---|---|---|---|---|---|---|---|---|
| | | | 692.1<br>15 | | | | FLY ASH | |
| | | | | | | | | Hand auger terminated at 16 feet-bgs. |
| | | | 687.1<br>20 | | | | | |
| | | | 682.1<br>25 | | | | | |
| | | | 677.1<br>30 | | | | | |
| | | | 672.1<br>35 | | | | | |

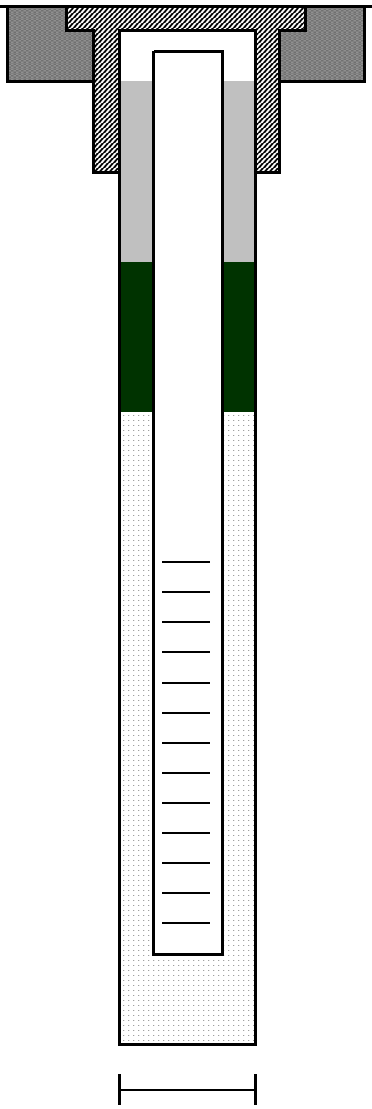
CDM

5400 Glenwood Avenue
Suite 300
Raleigh, NC 27612
(919) 787-5620

# Monitoring Well Installation Log

| | | | | | |
|---|---|---|---|---|---|
| Client: | TVA | Contractor: | Total Depth Drilling | Boring/Well No.: | B-103/MW-103 |
| Project Name: | TVA WBF CCP Phase II | Driller: | Tim Hall | Date Installed: | 6/11/2012 |
| Project Location: | Spring City, Tennessee | Ground EL: | 711 | Logged By: | R. Lawrence |
| Project Number: | 95618-92016 | Riser EL: | 711 | Page: | 1 of 1 |

GROUND SURFACE



ROADWAY BOX

| | |
|---|---|
| SURFACE SEAL: (Thickness & Type) | 1 ft - Portland Cement |
| BACKFILL MATERIAL: (Type) | Soil sloughed into hole |
| TOP OF SEAL: | 29 ft |
| SEAL CONSTRUCTION: (Thickness & Type) | 3 ft - Bentonite |
| TOP OF SANDPACK: | 32 ft |
| RISER CONSTRUCTION: (Type, Diameter Material) | Schedule 40 PVC, 2-Inch |
| TOP OF SCREEN: | 35 ft |
| SANDPACK TYPE: | Filter Sand - DSI Well Gravel Pack |
| SCREEN MATERIAL: (Type, Slot, Diameter Material) | Schedule 40 PVC, 0.01, 2-Inch |
| BOTTOM OF SCREEN: | 45 ft |
| BOTTOM OF BOREHOLE: | 58.5 ft |
| BOREHOLE DIAMETER: | 0.60 ft - soil / 0.24 - rock |

**NOTE:** All depths are in feet below ground surface, unless noted otherwise.

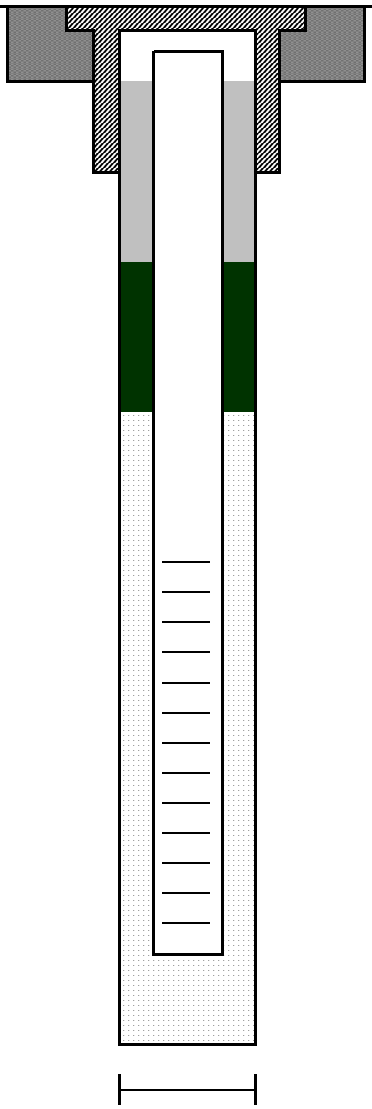
Remarks:

CDM

5400 Glenwood Avenue
Suite 300
Raleigh, NC 27612
(919) 787-5620

# Monitoring Well Installation Log

| | | | | | |
|---|---|---|---|---|---|
| Client: | TVA | Contractor: | Total Depth Drilling | Boring/Well No.: | B-107/MW-107 |
| Project Name: | TVA WBF CCP Phase II | Driller: | Tim Hall | Date Installed: | 6/13/2012 |
| Project Location: | Spring City, Tennessee | Ground EL: | 710.04 | Logged By: | R. Lawrence |
| Project Number: | 95618-92016 | Riser EL: | 710.04 | Page: | 1 of 1 |




| | |
|---|---|
| SURFACE SEAL: (Thickness & Type) | 1 ft - Portland Cement |
| BACKFILL MATERIAL: (Type) | Soil sloughed into hole |
| TOP OF SEAL: | 28 ft |
| SEAL CONSTRUCTION: (Thickness & Type) | 3 ft - Bentonite |
| TOP OF SANDPACK: | 31 ft |
| RISER CONSTRUCTION: (Type, Diameter Material) | Schedule 40 PVC, 2-Inch |
| TOP OF SCREEN: | 34.3 ft |
| SANDPACK TYPE: | Filter Sand - DSI Well Gravel Pack |
| SCREEN MATERIAL: (Type, Slot, Diameter Material) | Schedule 40 PVC, 0.01, 2-Inch |
| BOTTOM OF SCREEN: | 44.3 ft |
| BOTTOM OF BOREHOLE: | 44.3 ft |
| BOREHOLE DIAMETER: | 0.60 ft - soil |

**NOTE:** All depths are in feet below ground surface, unless noted otherwise.

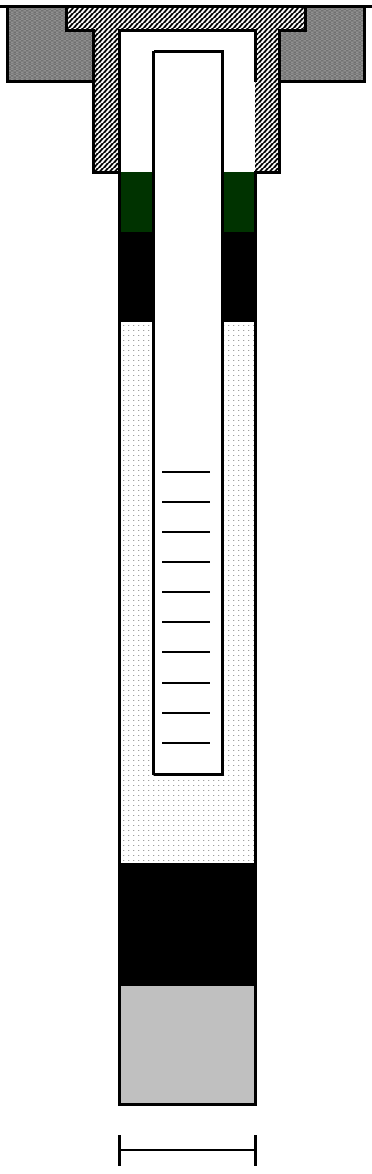
Remarks:

CDM

5400 Glenwood Avenue
Suite 300
Raleigh, NC 27612
(919) 787-5620

# Monitoring Well Installation Log

| | | | | | |
|---|---|---|---|---|---|
| Client: | TVA | Contractor: | Total Depth Drilling | Boring/Well No.: | B-110/MW-110 |
| Project Name: | TVA WBF CCP Phase II | Driller: | Tim Hall | Date Installed: | 6/20/2012 |
| Project Location: | Spring City, Tennessee | Ground EL: | 707.29 | Logged By: | R. Lawrence |
| Project Number: | 95618-92016 | Riser EL: | 707.29 | Page: | 1 of 1 |




| | |
|---|---|
| SURFACE SEAL: (Thickness & Type) | 1 ft - Portland Cement |
| TOP OF SEAL: | 1 ft |
| SEAL CONSTRUCTION: (Thickness & Type) | 2 ft - Bentonite |
| TOP OF SANDPACK: | 3 ft |
| RISER CONSTRUCTION: (Type, Diameter Material) | Schedule 40 PVC, 2-Inch |
| TOP OF SCREEN: | 5 ft |
| SANDPACK TYPE: | Filter Sand - DSI Well Gravel Pack |
| SCREEN MATERIAL: (Type, Slot, Diameter Material) | Schedule 40 PVC, 0.01, 2-Inch |
| BOTTOM OF SCREEN: | 15 ft |
| TOP OF LOWER SEAL: | 17 ft |
| SEAL CONSTRUCTION: (Thickness & Type) | 3 ft - Bentonite |
| BACKFILL MATERIAL: (Type) | Soil sloughed into hole |
| BOTTOM OF BOREHOLE: | 33.1 ft |
| BOREHOLE DIAMETER: | 0.60 ft - soil |

**NOTE:** All depths are in feet below ground surface, unless noted otherwise.

Remarks:

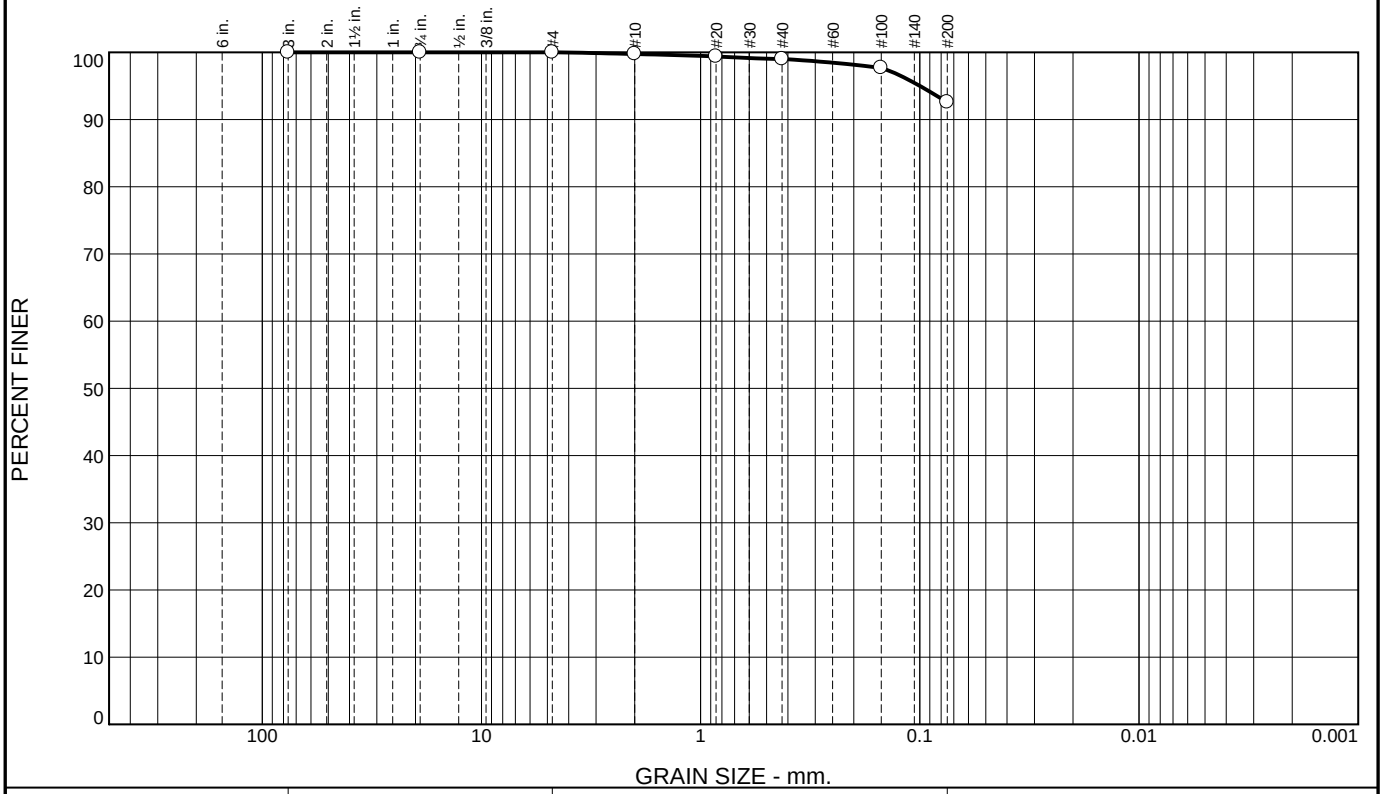
Updated On: 04/09/01

# Attachment 3

Phase 2 Investigation

Laboratory Testing

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.3 | 0.7 | 6.4 | 92.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 99.7 | | |
| #20 | 99.4 | | |
| #40 | 99.0 | | |
| #100 | 97.7 | | |
| #200 | 92.6 | | |

* (no specification provided)

**Material Description**

Lean Clay

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO=

**Remarks**

As received moisture content=25.0%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-103 **Depth:** 8-10
**Sample Number:** S-5

**Date:** 6/11/2012

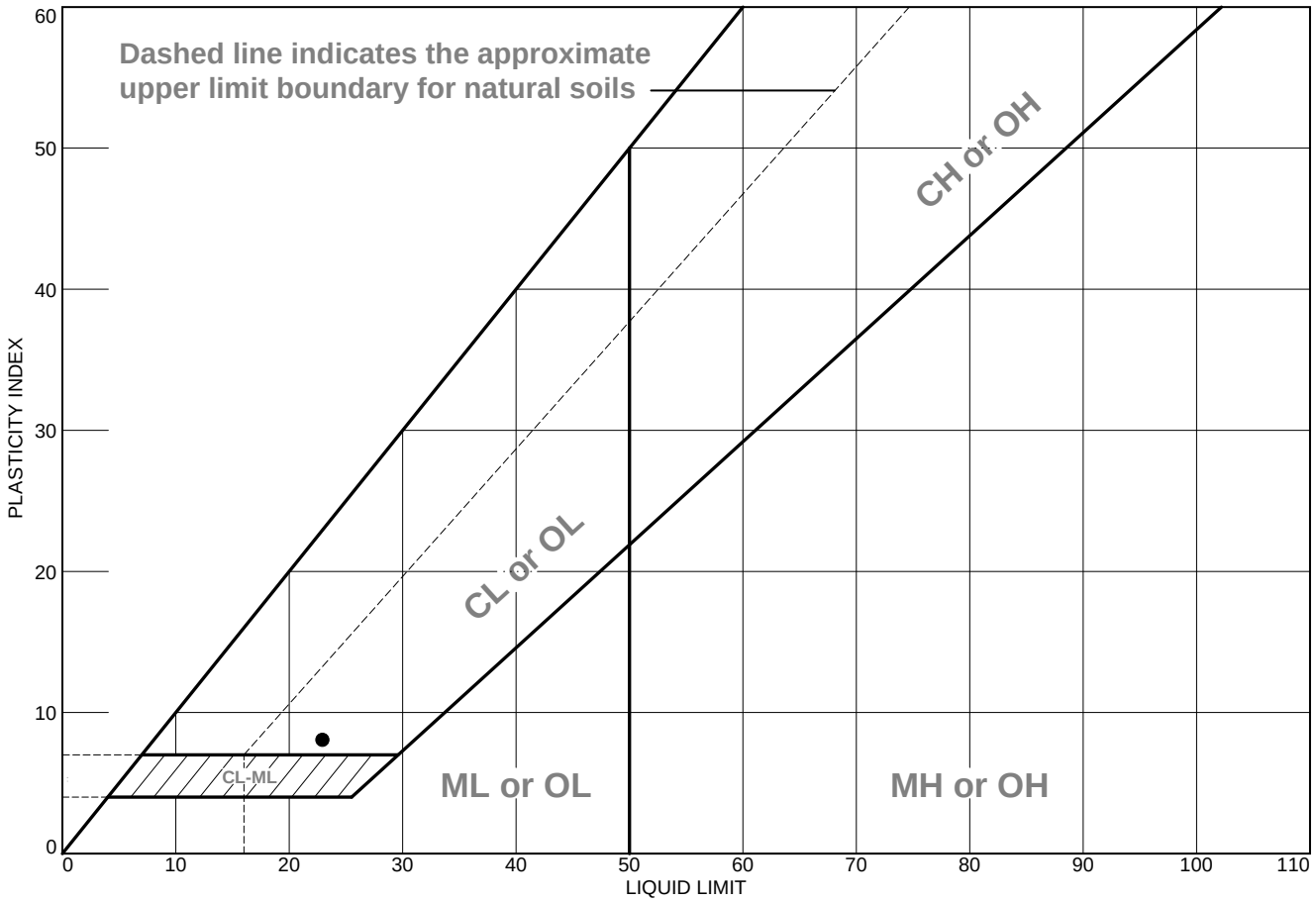
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean Clay | 23 | 15 | 8 | | | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-103 **Depth:** 18-20 **Sample Number:** S-10

**Remarks:**

●As received moisture content=14.5%

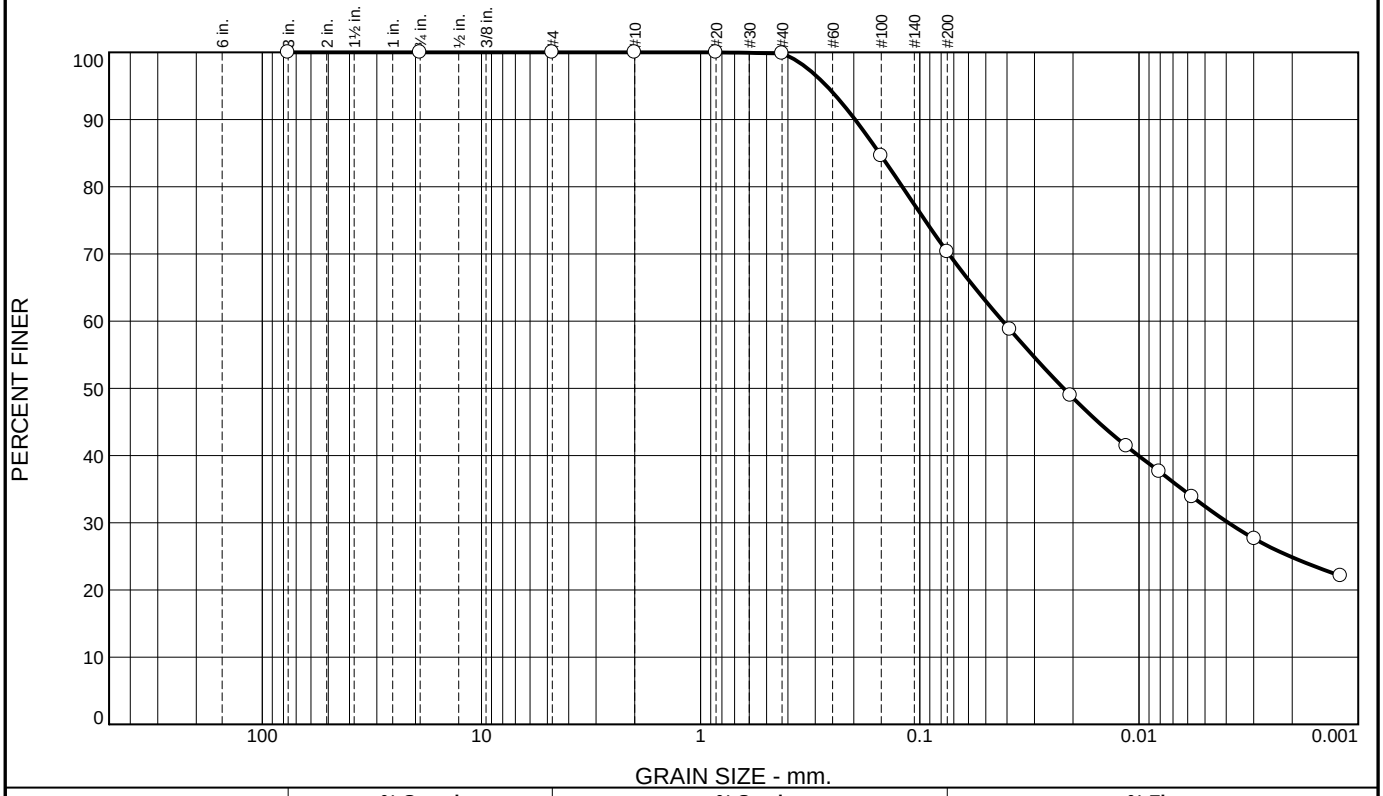
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 29.5 | 37.9 | 32.4 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.8 | | |
| #100 | 84.6 | | |
| #200 | 70.3 | | |

* (no specification provided)

**Material Description**

Lean clay with sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.1976 $D_{85}$= 0.1529 $D_{60}$= 0.0419
$D_{50}$= 0.0221 $D_{30}$= 0.0039 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO=

**Remarks**

As received moisture content=24.2%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-103 **Depth:** 23-25
**Sample Number:** S-11 **Date:** 6/11/2012

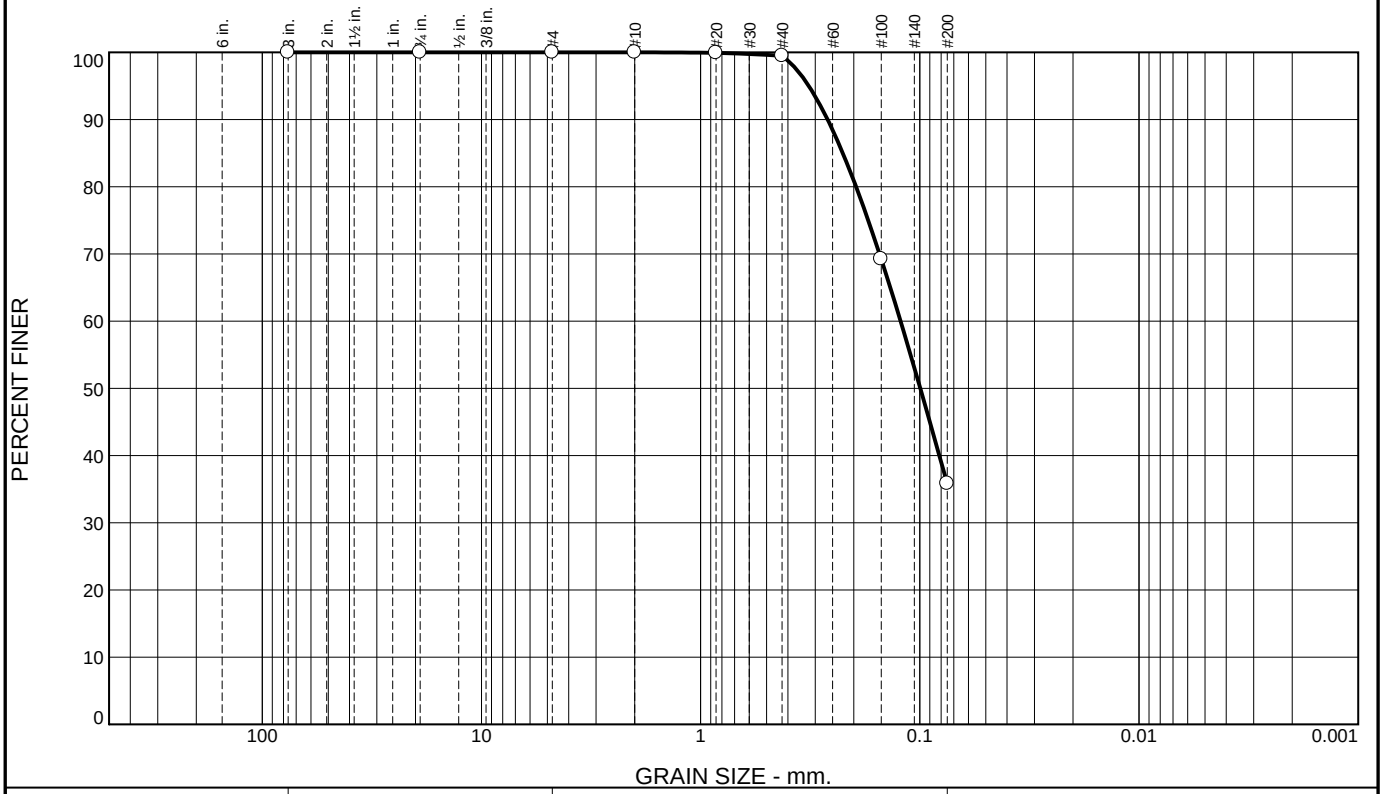
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 63.7 | 35.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.9 | | |
| #40 | 99.5 | | |
| #100 | 69.2 | | |
| #200 | 35.8 | | |

* (no specification provided)

**Material Description**

Clayey sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.2635 $D_{85}$= 0.2246 $D_{60}$= 0.1224
$D_{50}$= 0.0995 $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO=

**Remarks**

As received moisture content=29.9%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-103 **Depth:** 33-35
**Sample Number:** S-13

**Date:** 6/11/2012

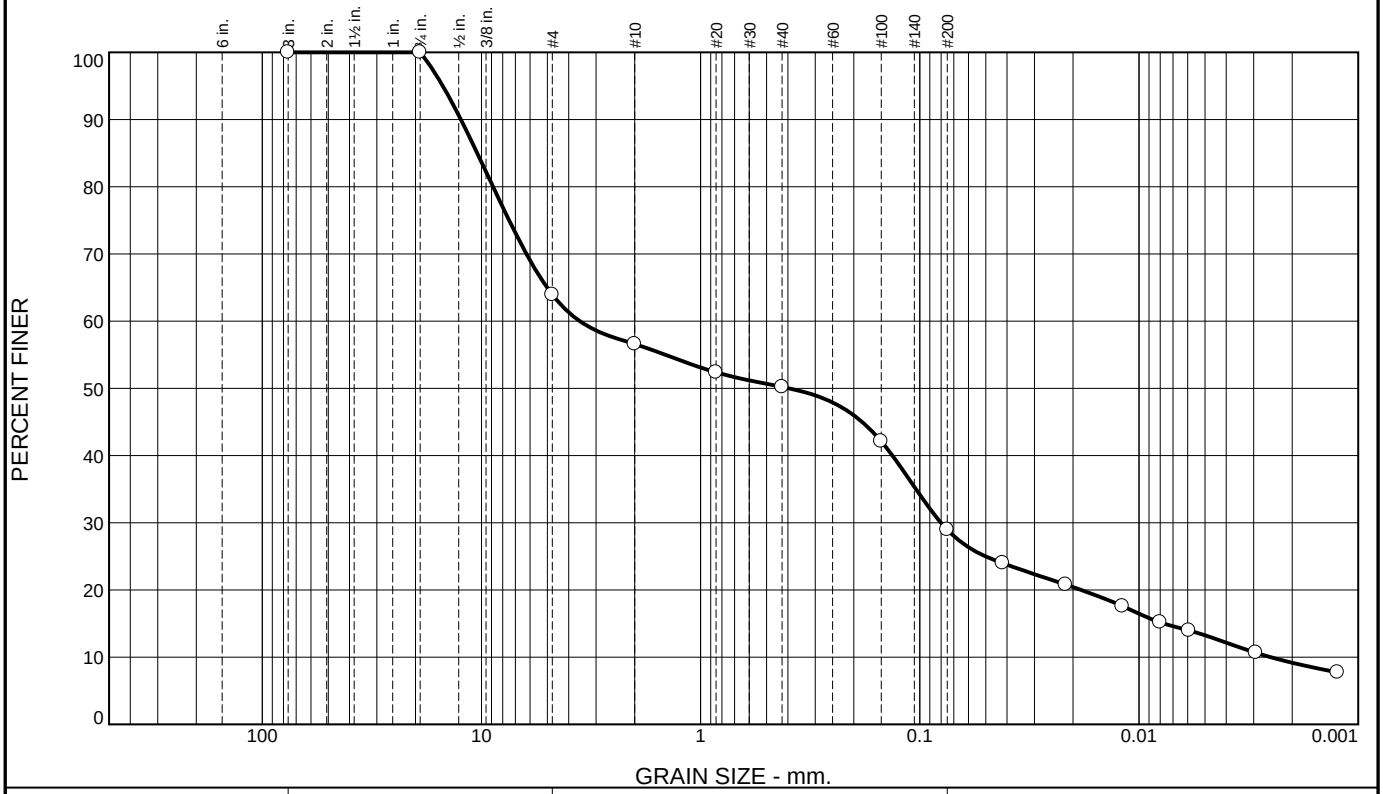
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 36.1 | 7.3 | 6.4 | 21.2 | 15.7 | 13.3 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 63.9 | | |
| #10 | 56.6 | | |
| #20 | 52.4 | | |
| #40 | 50.2 | | |
| #100 | 42.1 | | |
| #200 | 29.0 | | |

* (no specification provided)

**Material Description**

Clayey gravel with sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 12.4179 $D_{85}$= 10.4570 $D_{60}$= 3.5602
$D_{50}$= 0.3960 $D_{30}$= 0.0801 $D_{15}$= 0.0077
$D_{10}$= 0.0025 $C_u$= 1417.47 $C_c$= 0.72

**Classification**

USCS= GC AASHTO=

**Remarks**

As received moisture content=25.3%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-103 **Depth:** 43-45
**Sample Number:** S-15

**Date:** 6/11/2012

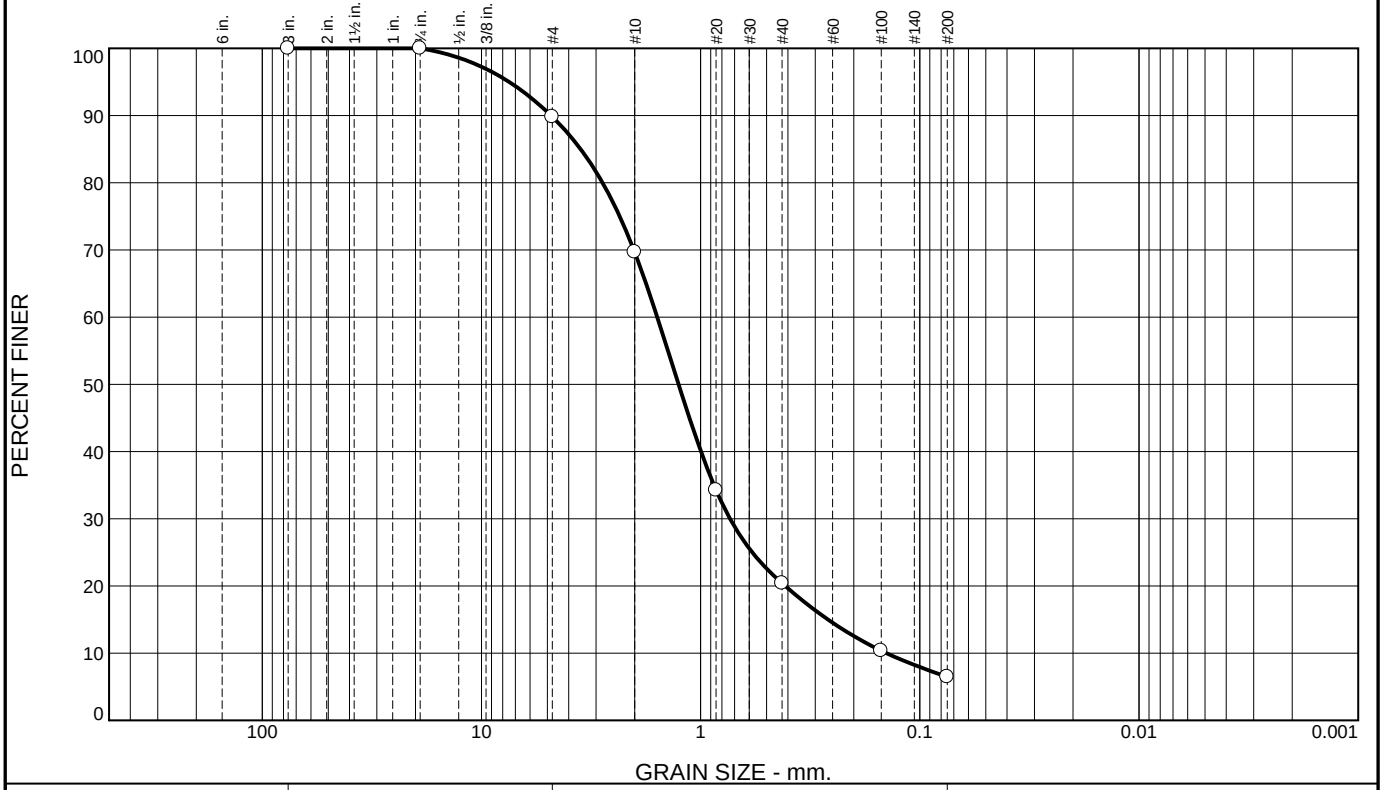
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 10.2 | 20.1 | 49.3 | 13.9 | 6.5 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 89.8 | | |
| #10 | 69.7 | | |
| #20 | 34.2 | | |
| #40 | 20.4 | | |
| #100 | 10.4 | | |
| #200 | 6.5 | | |

* (no specification provided)

**Material Description**

Well-graded sand with silt
Insufficient fines to run limits testing

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 4.8165 $D_{85}$= 3.5276 $D_{60}$= 1.5780
$D_{50}$= 1.2608 $D_{30}$= 0.7346 $D_{15}$= 0.2624
$D_{10}$= 0.1421 $C_u$= 11.11 $C_c$= 2.41

**Classification**

USCS= SW-SM AASHTO=

**Remarks**

As received moisture content=15.3%
Soil classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** B-104 **Depth:** 12-14
**Sample Number:** S-7

**Date:** 6/12/2012

**CDM Smith**

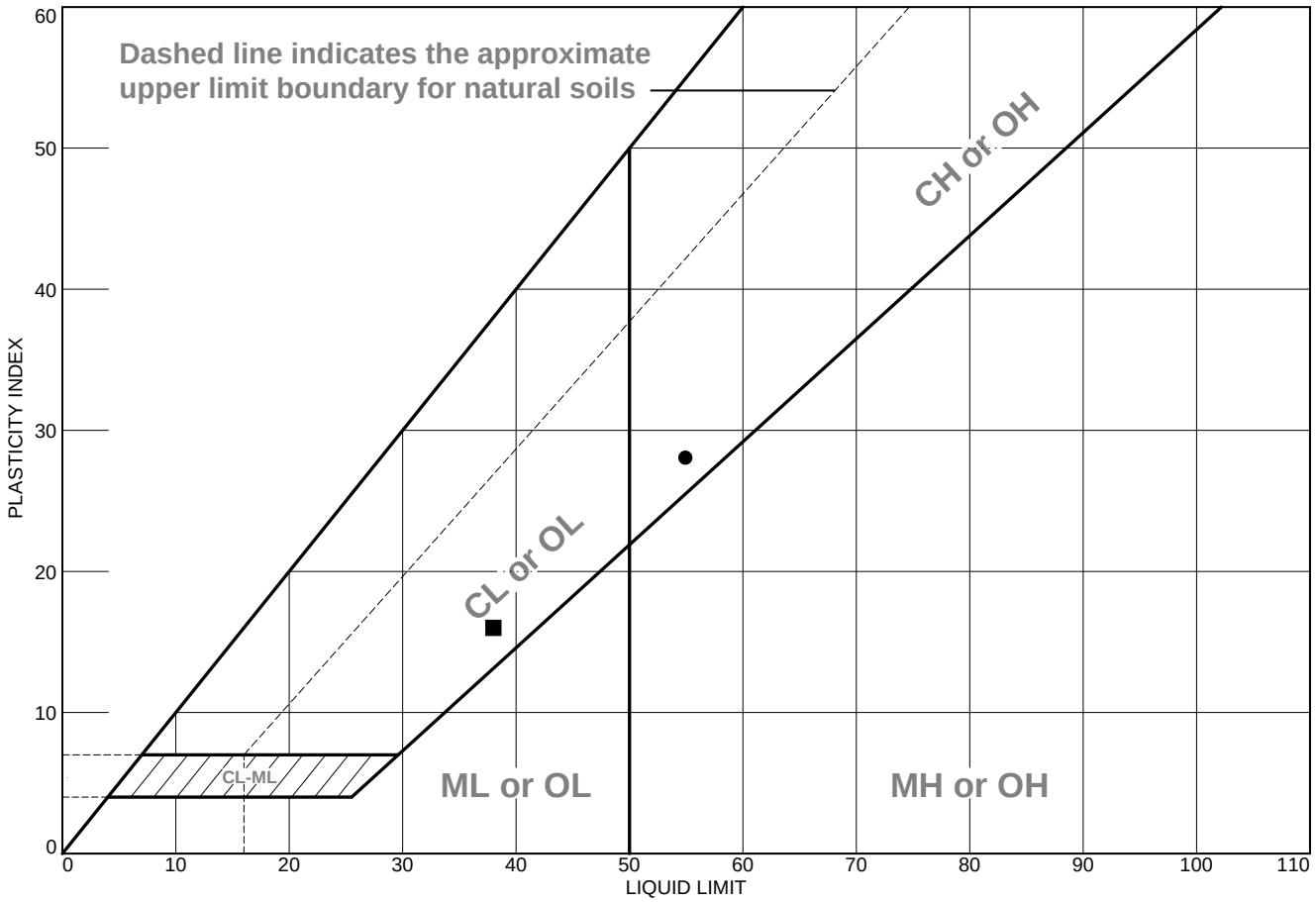
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Fat clay | 55 | 27 | 28 | | | CH |
| ■ | Lean clay | 38 | 22 | 16 | | | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-104 **Depth:** 25-27 **Sample Number:** S-12

■**Source of Sample:** B-104 **Depth:** 20.5-22.5 **Sample Number:** U-1

**Remarks:**

●As received moisture content=34.6%

■As received moisture content=31.1%

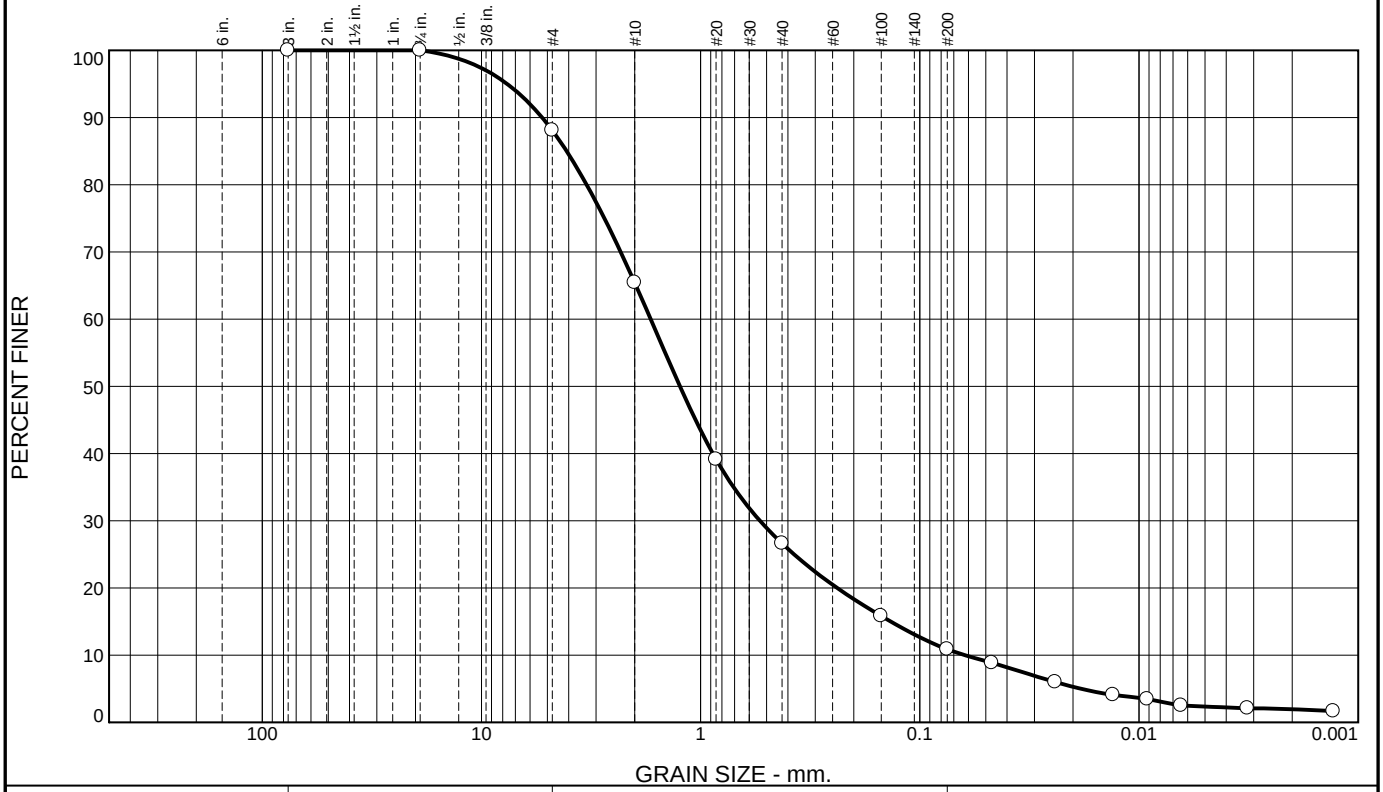
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 11.9 | 22.7 | 38.8 | 15.7 | 8.5 | 2.4 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 88.1 | | |
| #10 | 65.4 | | |
| #20 | 39.1 | | |
| #40 | 26.6 | | |
| #100 | 15.8 | | |
| #200 | 10.9 | | |

* (no specification provided)

**Material Description**

Well-graded sand with silt
Small clay ball in jar
Insufficient fines to run limits testing

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 5.2881 $D_{85}$= 4.0871 $D_{60}$= 1.6909
$D_{50}$= 1.2424 $D_{30}$= 0.5368 $D_{15}$= 0.1358
$D_{10}$= 0.0622 $C_u$= 27.19 $C_c$= 2.74

**Classification**

USCS= SW-SM AASHTO=

**Remarks**

As received moisture content=13.0%
Soil classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** B-104A **Depth:** 14-16
**Sample Number:** S-7

**Date:** 6/12/2012

**CDM Smith**

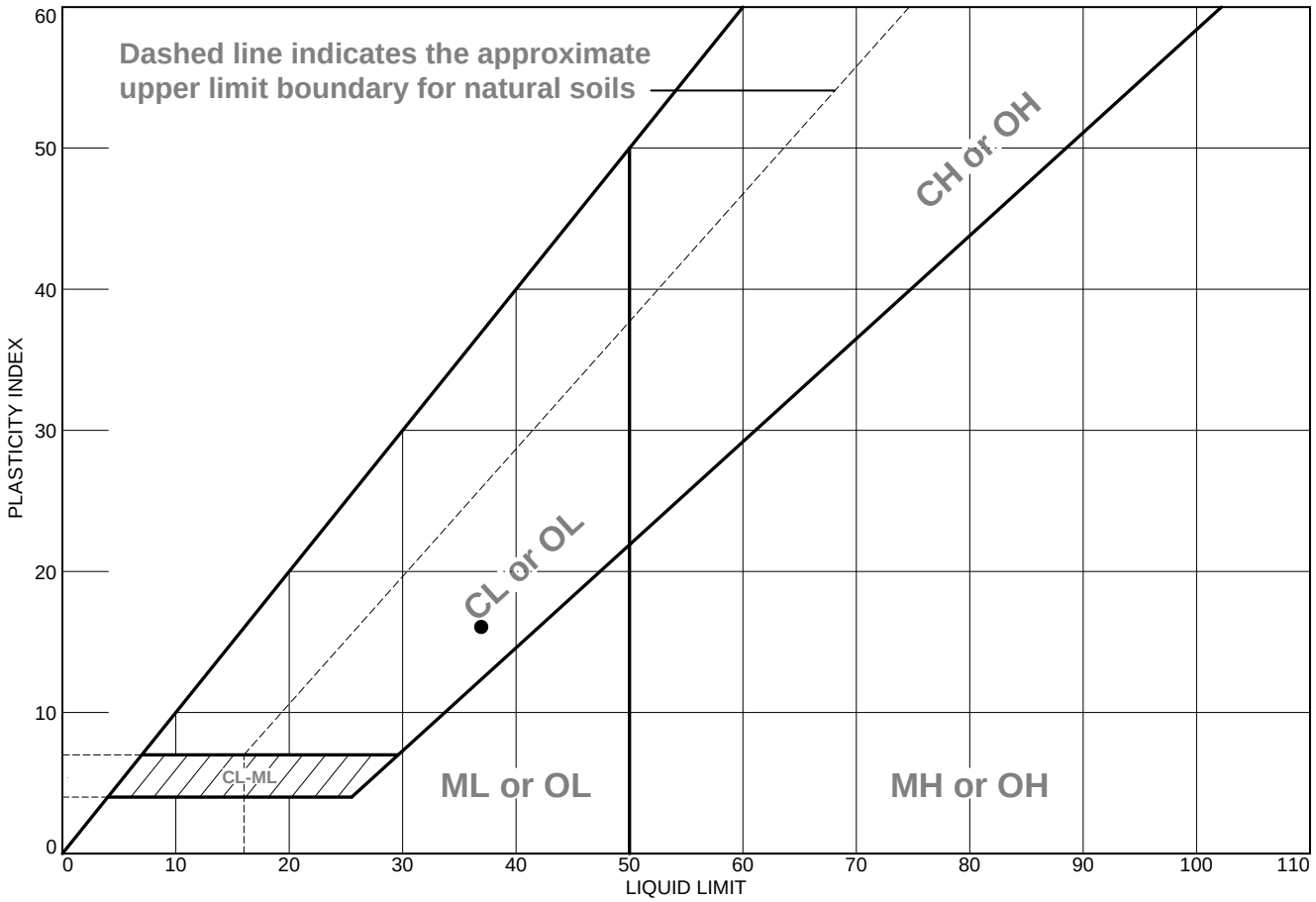
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay | 37 | 21 | 16 | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-104A **Depth:** 26-28 **Sample Number:** S-12

**Remarks:**

●As received moisture content=25.2%

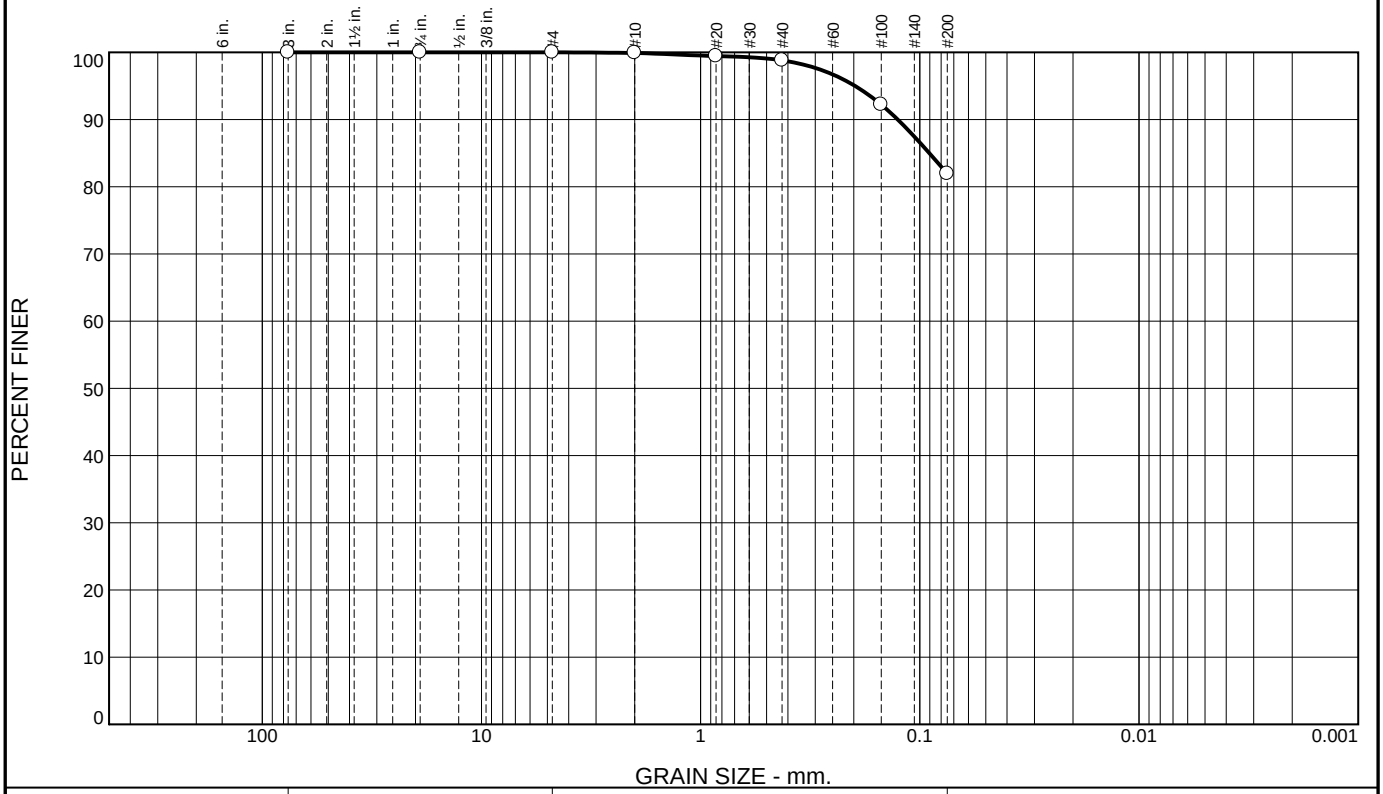
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.1 | 1.1 | 16.8 | 82.0 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 99.9 | | |
| #20 | 99.4 | | |
| #40 | 98.8 | | |
| #100 | 92.2 | | |
| #200 | 82.0 | | |

* (no specification provided)

**Material Description**

Lean clay with sand

**Atterberg Limits**

PL= 21 LL= 38 PI= 17

**Coefficients**

$D_{90}$= 0.1262 $D_{85}$= 0.0905 $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO= A-6(14)

**Remarks**

As received moisture content=18.0%

**Source of Sample:** B-105 **Depth:** 4-6
**Sample Number:** S-3

**Date:** 6/12/2012

**CDM Smith**

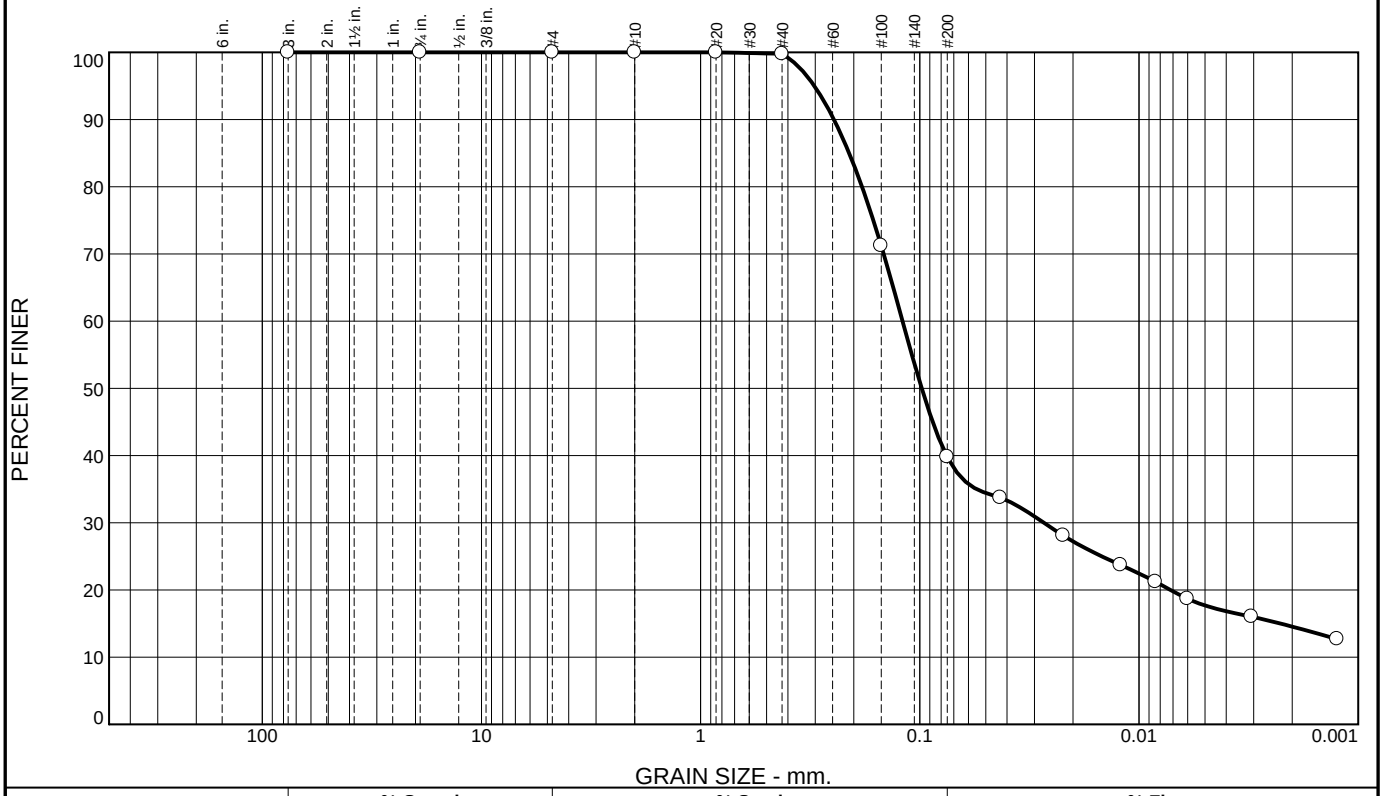
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 60.0 | 22.1 | 17.7 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.8 | | |
| #100 | 71.2 | | |
| #200 | 39.8 | | |

* (no specification provided)

**Material Description**

Clayey sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.2466 $D_{85}$= 0.2101 $D_{60}$= 0.1200
$D_{50}$= 0.0981 $D_{30}$= 0.0272 $D_{15}$= 0.0023
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO=

**Remarks**

As received moisture content=27.7%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-105 **Depth:** 33-35
**Sample Number:** S-13

**Date:** 6/13/2012

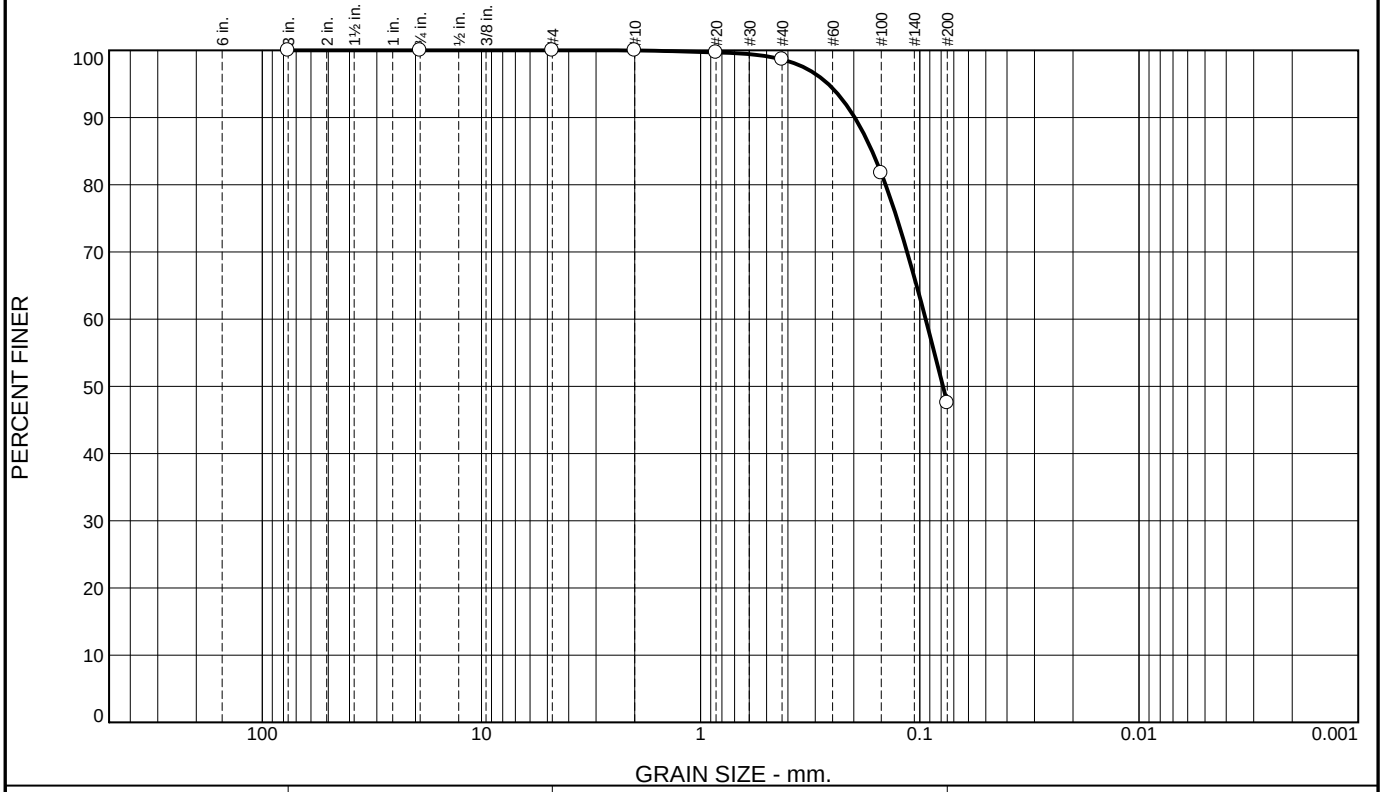
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 1.4 | 51.1 | 47.5 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.7 | | |
| #40 | 98.6 | | |
| #100 | 81.7 | | |
| #200 | 47.5 | | |

* (no specification provided)

**Material Description**

Clayey sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.1981 $D_{85}$= 0.1650 $D_{60}$= 0.0941
$D_{50}$= 0.0784 $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO=

**Remarks**

As received moisture content=30.5%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-105 **Depth:** 38-40
**Sample Number:** S-14 **Date:** 6/13/2012

**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report


| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 33.1 | 15.6 | 15.7 | 27.3 | 8.3 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 66.9 | | |
| #10 | 51.3 | | |
| #20 | 42.8 | | |
| #40 | 35.6 | | |
| #100 | 14.0 | | |
| #200 | 8.3 | | |

* (no specification provided)

**Material Description**

Well-graded sand with silt and gravel
Sticks

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 11.4795 $D_{85}$= 9.4408 $D_{60}$= 3.4432
$D_{50}$= 1.7991 $D_{30}$= 0.3201 $D_{15}$= 0.1597
$D_{10}$= 0.1020 $C_u$= 33.75 $C_c$= 0.29

**Classification**

USCS= SW-SM AASHTO=

**Remarks**

As received moisture content=13.6%
Soil classification and description based on
Visual Manual Procedure ASTM D2488

**Source of Sample:** B-105 **Depth:** 43-45
**Sample Number:** S-15

**Date:** 6/13/2012

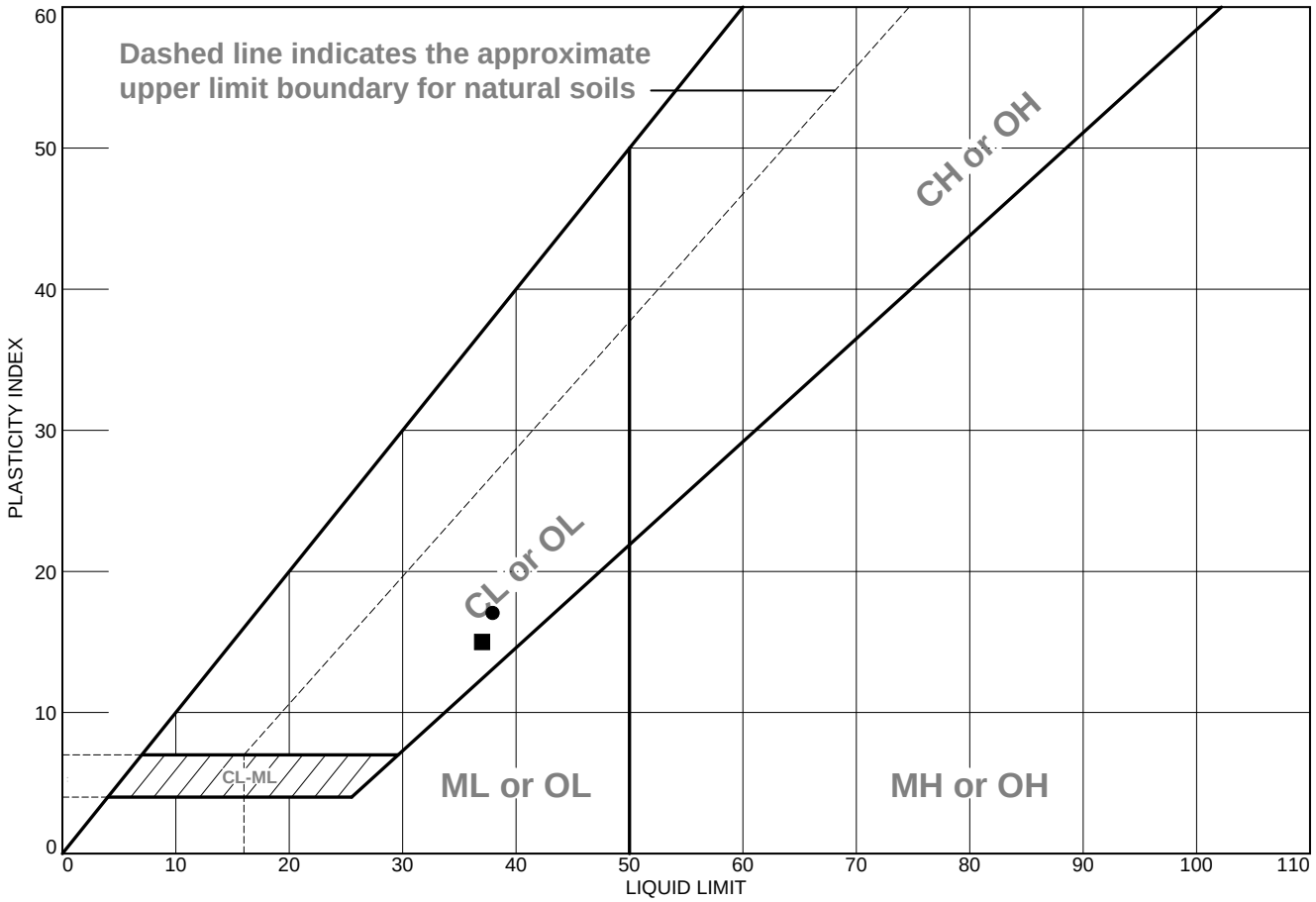
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay with sand | 38 | 21 | 17 | 98.8 | 82.0 | CL |
| ■ | Lean clay | 37 | 22 | 15 | | | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-105 **Depth:** 4-6 **Sample Number:** S-3

■**Source of Sample:** B-105 **Depth:** 18-20 **Sample Number:** S-9

**Remarks:**

●As received moisture content=18.0%

■As received moisture content=29.4%

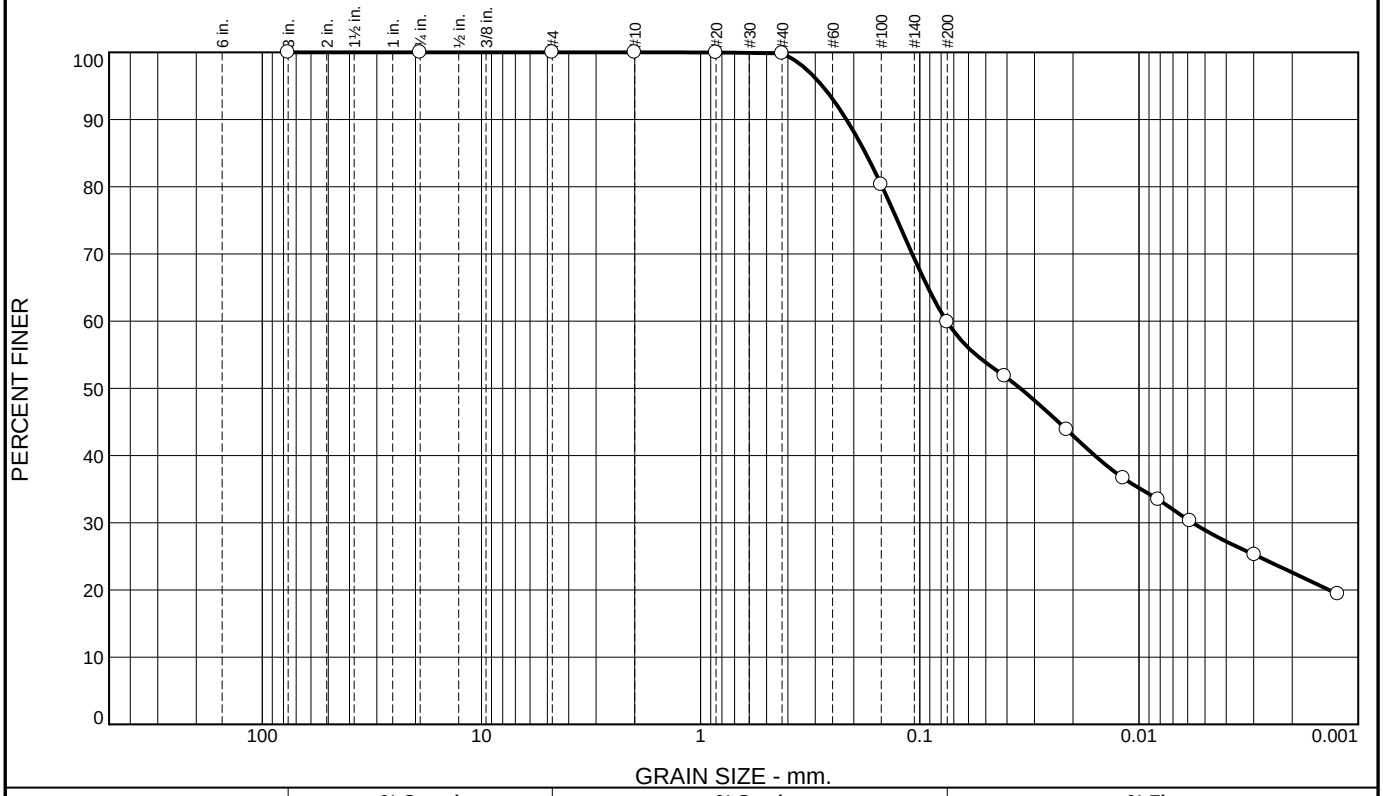
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 39.9 | 31.0 | 28.9 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.8 | | |
| #100 | 80.3 | | |
| #200 | 59.9 | | |

* (no specification provided)

**Material Description**

Sandy lean clay

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.2161 $D_{85}$= 0.1767 $D_{60}$= 0.0755
$D_{50}$= 0.0348 $D_{30}$= 0.0057 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO=

**Remarks**

As received moisture content=25.2%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-106 **Depth:** 6-8
**Sample Number:** S-4 **Date:** 6/13/2012

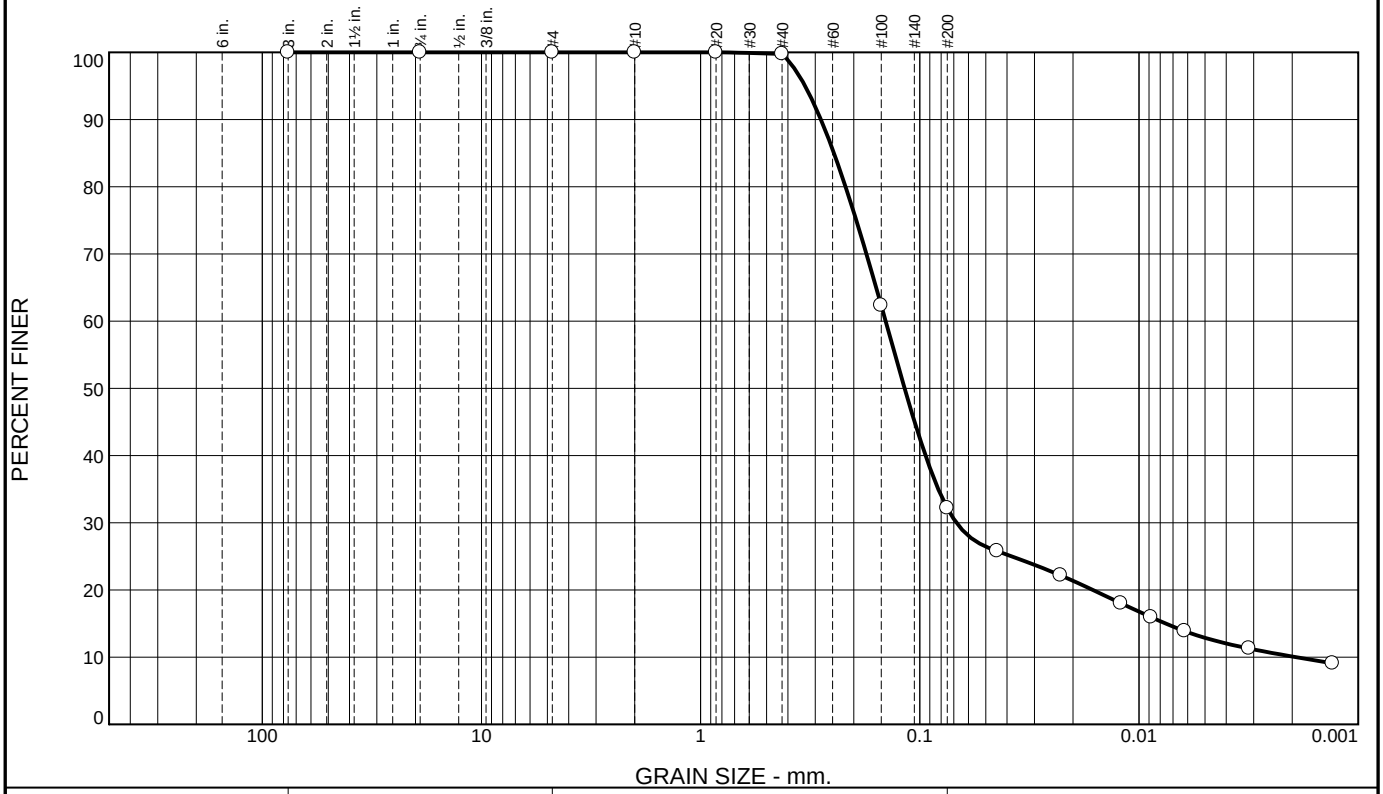
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 67.6 | 19.3 | 12.9 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.8 | | |
| #100 | 62.3 | | |
| #200 | 32.2 | | |

* (no specification provided)

**Material Description**

Silty sand

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= 0.2828 $D_{85}$= 0.2465 $D_{60}$= 0.1432
$D_{50}$= 0.1173 $D_{30}$= 0.0681 $D_{15}$= 0.0076
$D_{10}$= 0.0019 $C_u$= 74.40 $C_c$= 16.82

**Classification**

USCS= SM AASHTO= A-2-4(0)

**Remarks**

As received moisture content=20.4%

**Source of Sample:** B-106 **Depth:** 12.5-14.5
**Sample Number:** U-1 **Date:** 6/13/2012

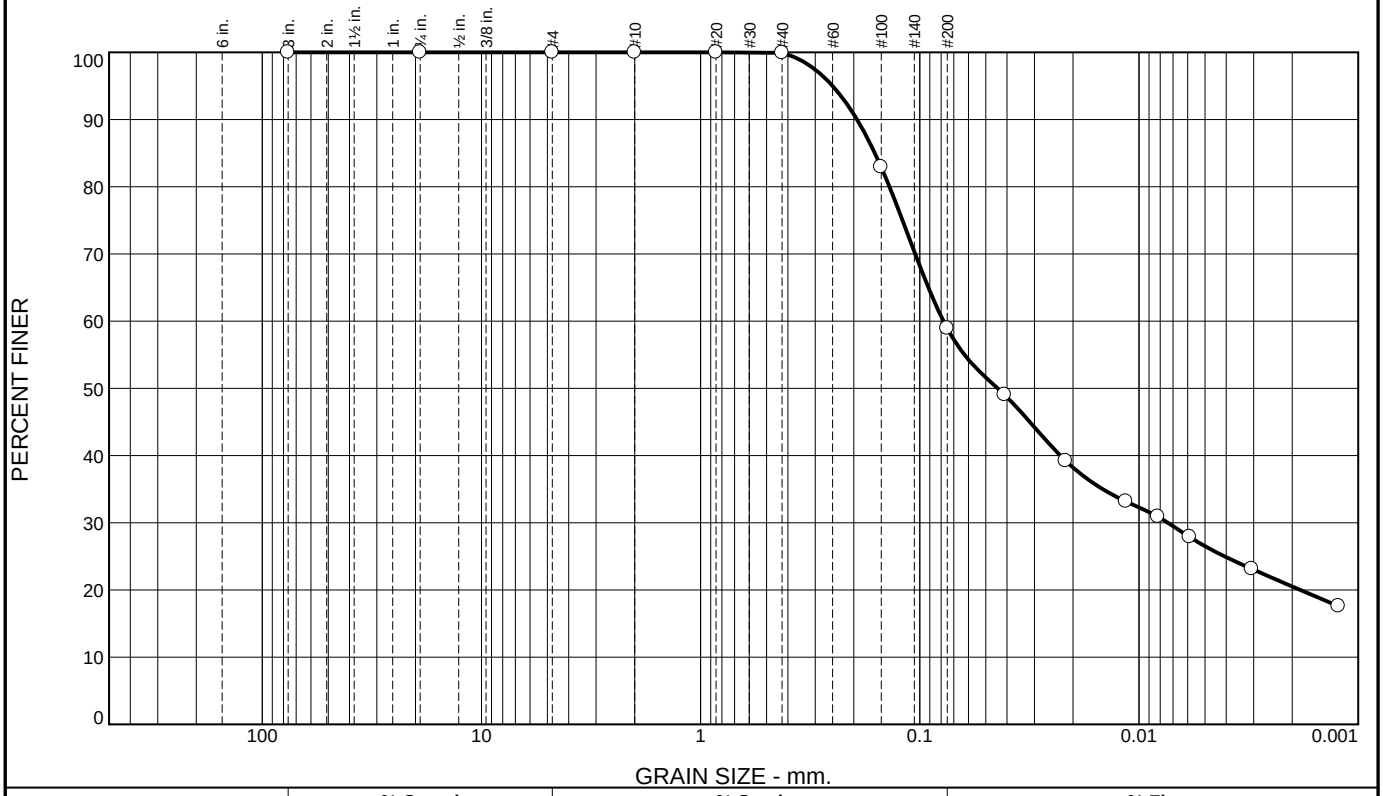
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 41.0 | 32.4 | 26.5 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.9 | | |
| #100 | 82.9 | | |
| #200 | 58.9 | | |

* (no specification provided)

**Material Description**

Sandy lean clay

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.1935 $D_{85}$= 0.1604 $D_{60}$= 0.0781
$D_{50}$= 0.0441 $D_{30}$= 0.0074 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO=

**Remarks**

As received moisture content=27.0%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-106 **Depth:** 10-12
**Sample Number:** S-6

**Date:** 6/13/2012

**CDM Smith**

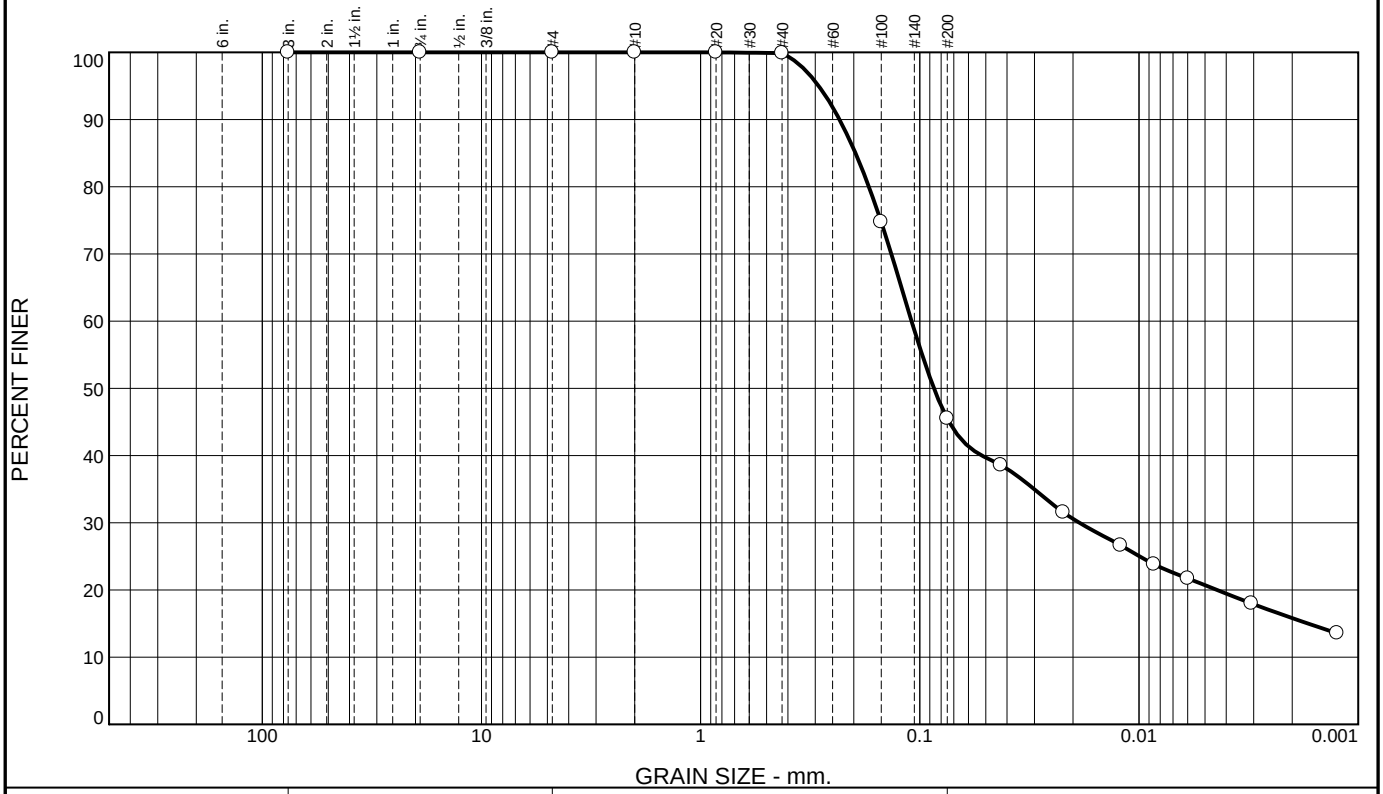
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 54.4 | 24.8 | 20.7 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.9 | | |
| #100 | 74.7 | | |
| #200 | 45.5 | | |

* (no specification provided)

**Material Description**

Clayey sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.2325 $D_{85}$= 0.1966 $D_{60}$= 0.1091
$D_{50}$= 0.0862 $D_{30}$= 0.0187 $D_{15}$= 0.0017
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO=

**Remarks**

As received moisture content=21.8%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-106 **Depth:** 23-25
**Sample Number:** S-10

**Date:** 6/13/2012

**CDM Smith**

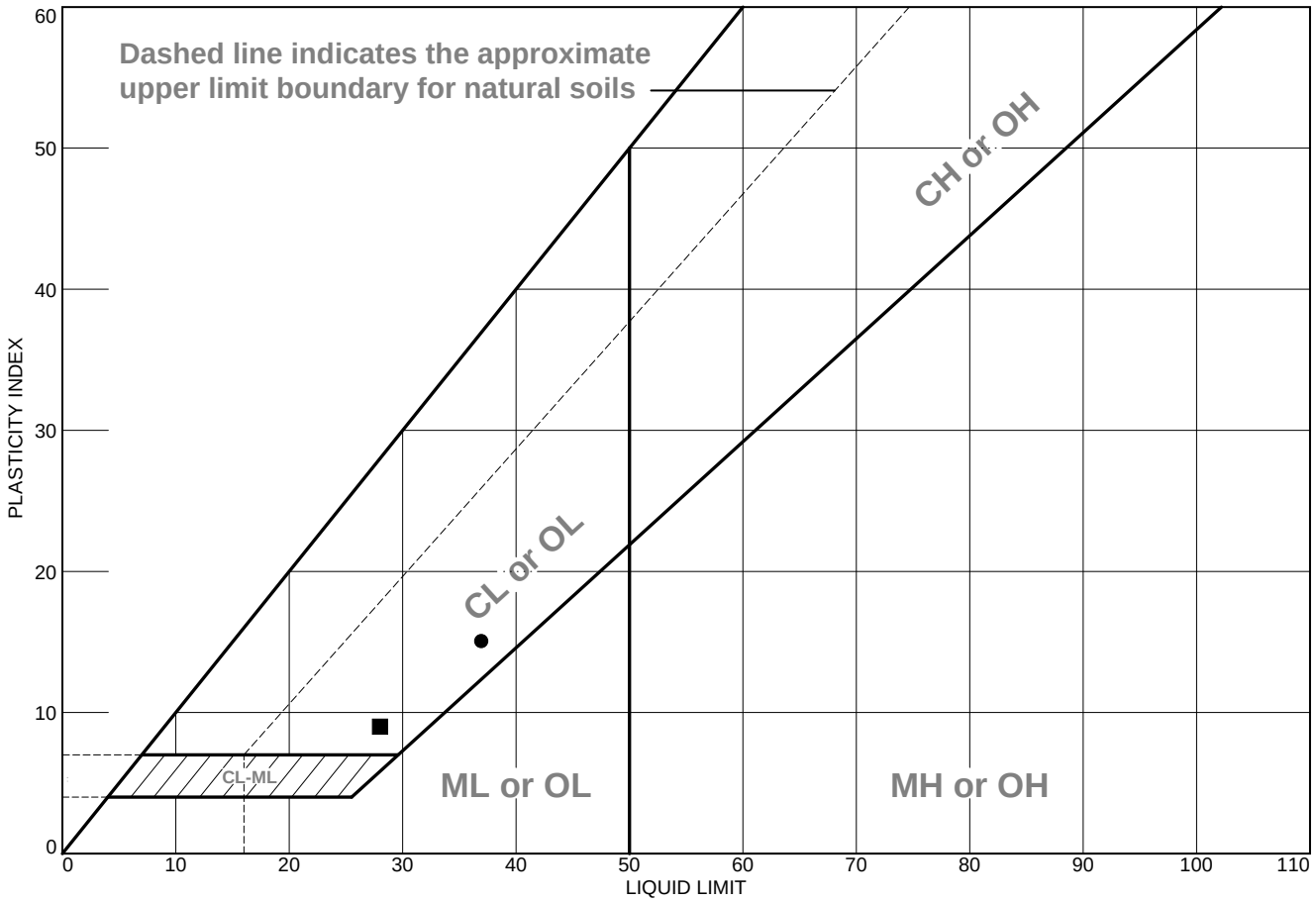
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay | 37 | 22 | 15 | | | CL |
| ■ | Lean clay | 28 | 19 | 9 | | | CL |
| ▲ | Silty sand | NV | NP | NP | 99.8 | 32.2 | SM |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-106 **Depth:** 4-6 **Sample Number:** S-3

■**Source of Sample:** B-106 **Depth:** 8-10 **Sample Number:** S-5

▲**Source of Sample:** B-106 **Depth:** 12.5-14.5 **Sample Number:** U-1

**Remarks:**

●As received moisture content=25.5%

■As received moisture content=23.6%

▲As received moisture content=20.4%

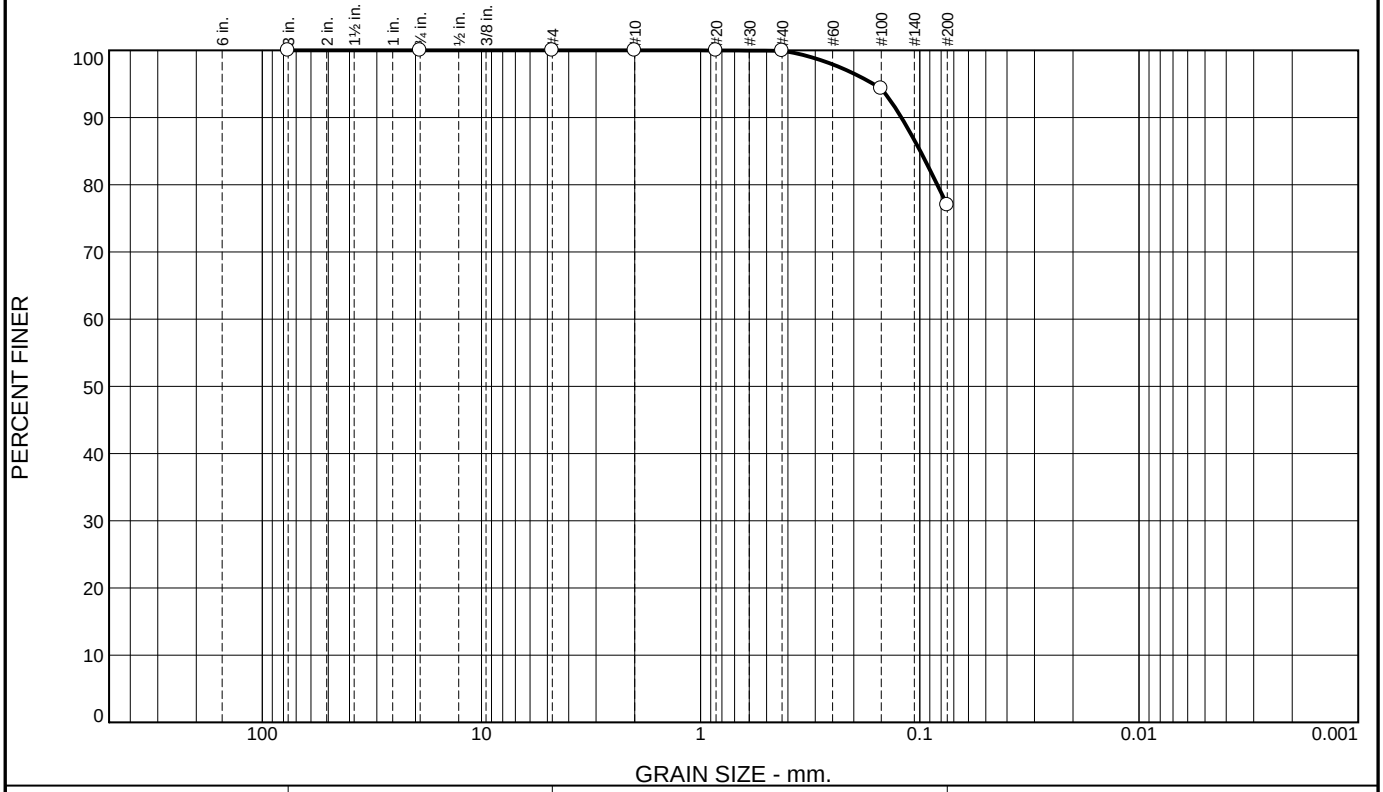
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 22.9 | 77.0 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.9 | | |
| #100 | 94.3 | | |
| #200 | 77.0 | | |

* (no specification provided)

**Material Description**

Lean clay with sand

**Atterberg Limits**

PL= 20 LL= 33 PI= 13

**Coefficients**

$D_{90}$= 0.1214 $D_{85}$= 0.0996 $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO= A-6(9)

**Remarks**

As received moisture content=25.4%

**Source of Sample:** B-107 **Depth:** 23-25
**Sample Number:** S-10

**Date:** 6/13/2012

**CDM Smith**

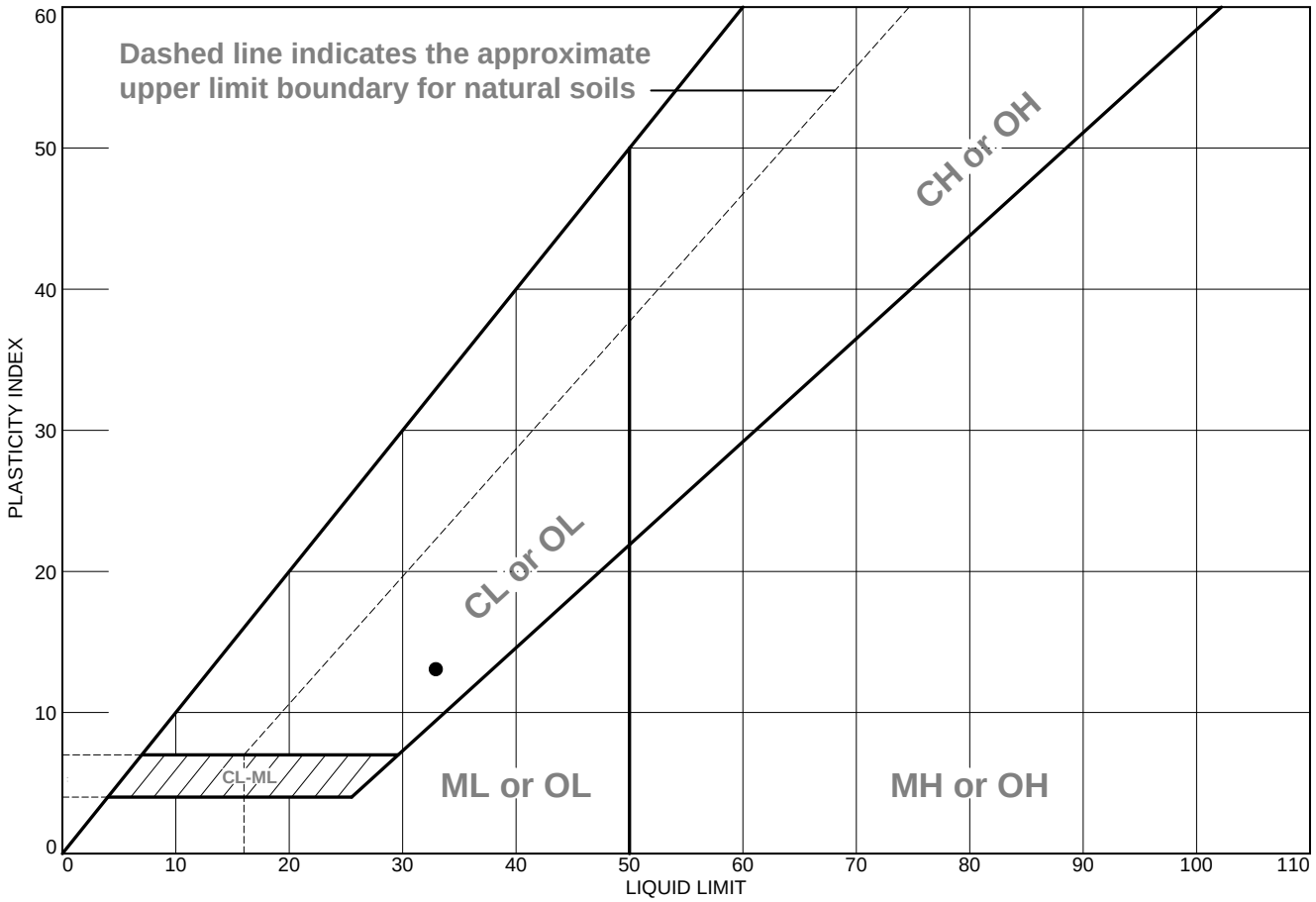
**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay with sand | 33 | 20 | 13 | 99.9 | 77.0 | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-107 **Depth:** 23-25 **Sample Number:** S-10

**Remarks:**

●As received moisture content=25.4%

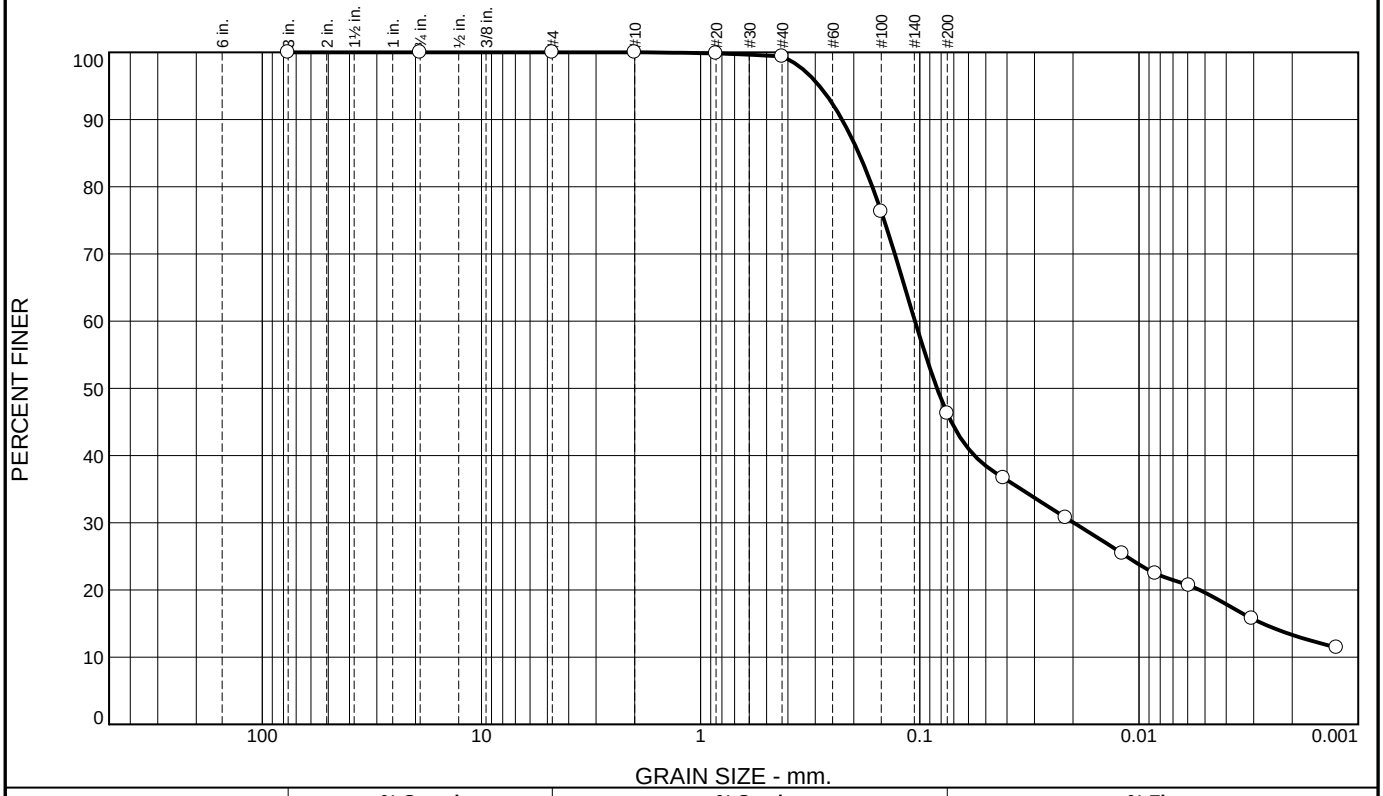
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 53.1 | 26.7 | 19.6 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.8 | | |
| #40 | 99.4 | | |
| #100 | 76.3 | | |
| #200 | 46.3 | | |

* (no specification provided)

**Material Description**

Clayey sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.2265 $D_{85}$= 0.1900 $D_{60}$= 0.1053
$D_{50}$= 0.0835 $D_{30}$= 0.0198 $D_{15}$= 0.0027
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO=

**Remarks**

As received moisture content=31.8%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-107 **Depth:** 38-40
**Sample Number:** S-13

**Date:** 6/13/2012

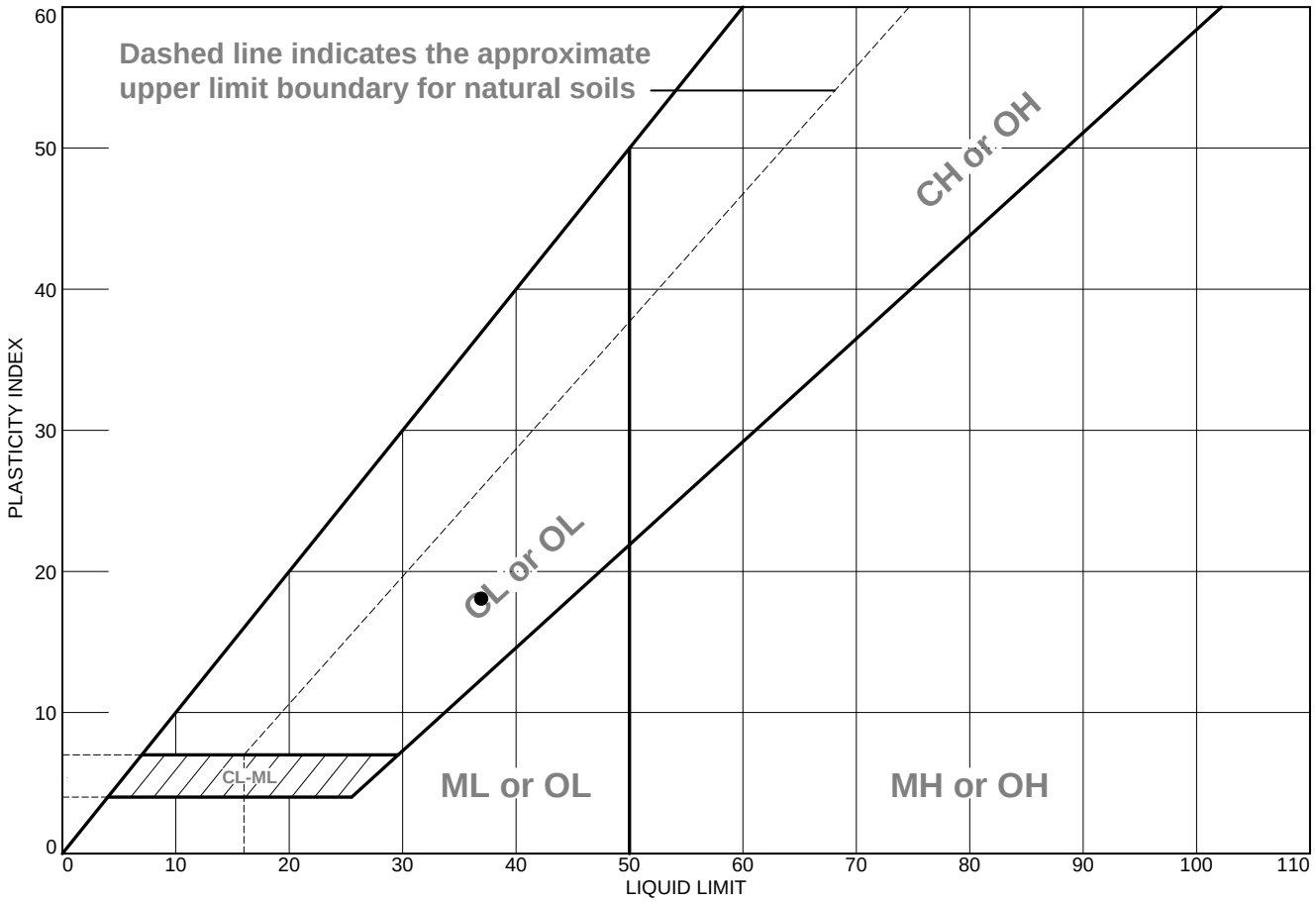
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Lean clay | 37 | 19 | 18 | | | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-108 **Depth:** 4-6 **Sample Number:** S-3

**Remarks:**

●As received moisture content=20.3%

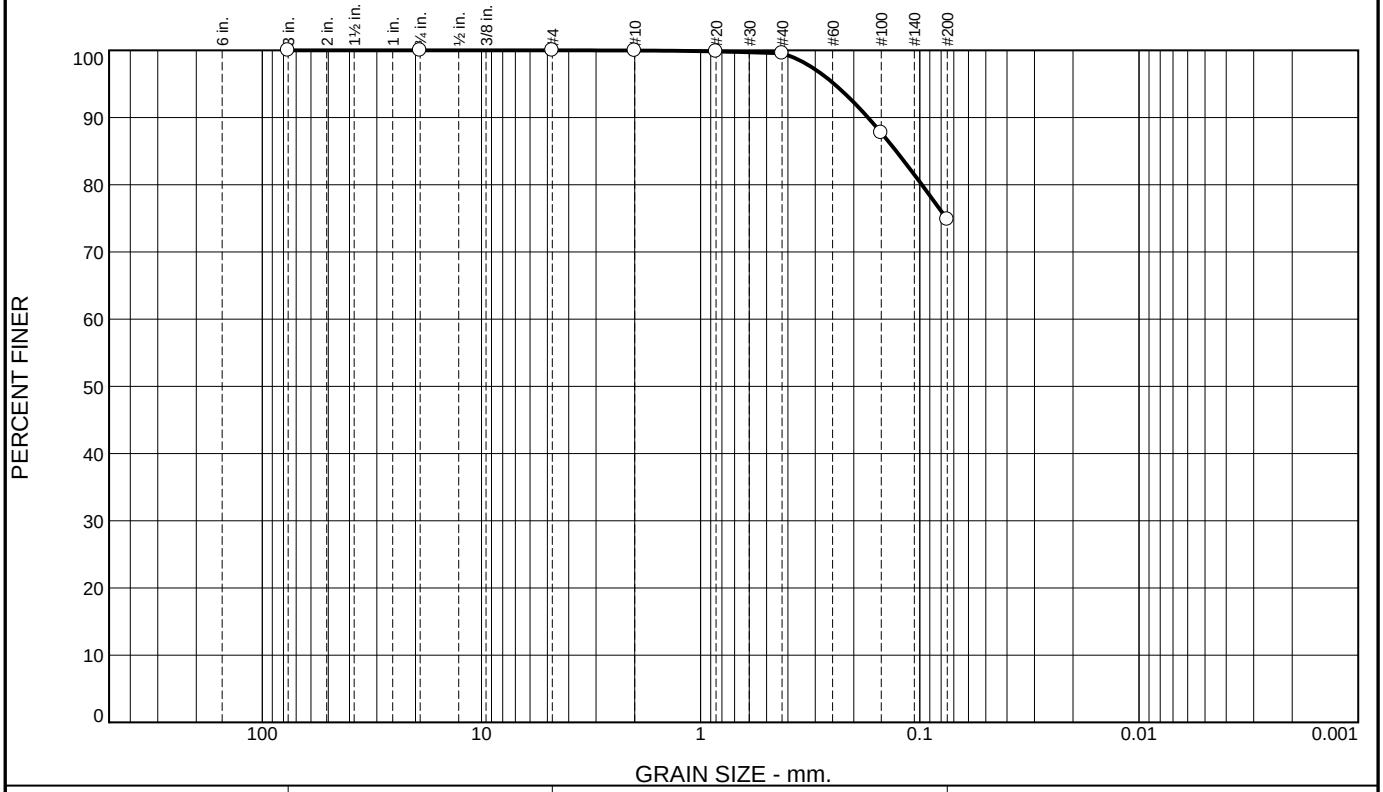
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 24.6 | 74.9 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.8 | | |
| #40 | 99.5 | | |
| #100 | 87.7 | | |
| #200 | 74.9 | | |

* (no specification provided)

**Material Description**

Lean clay with sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.1723 $D_{85}$= 0.1283 $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO=

**Remarks**

As received moisture content=23.2%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-108 **Depth:** 20-22
**Sample Number:** S-10

**Date:** 6/14/2012

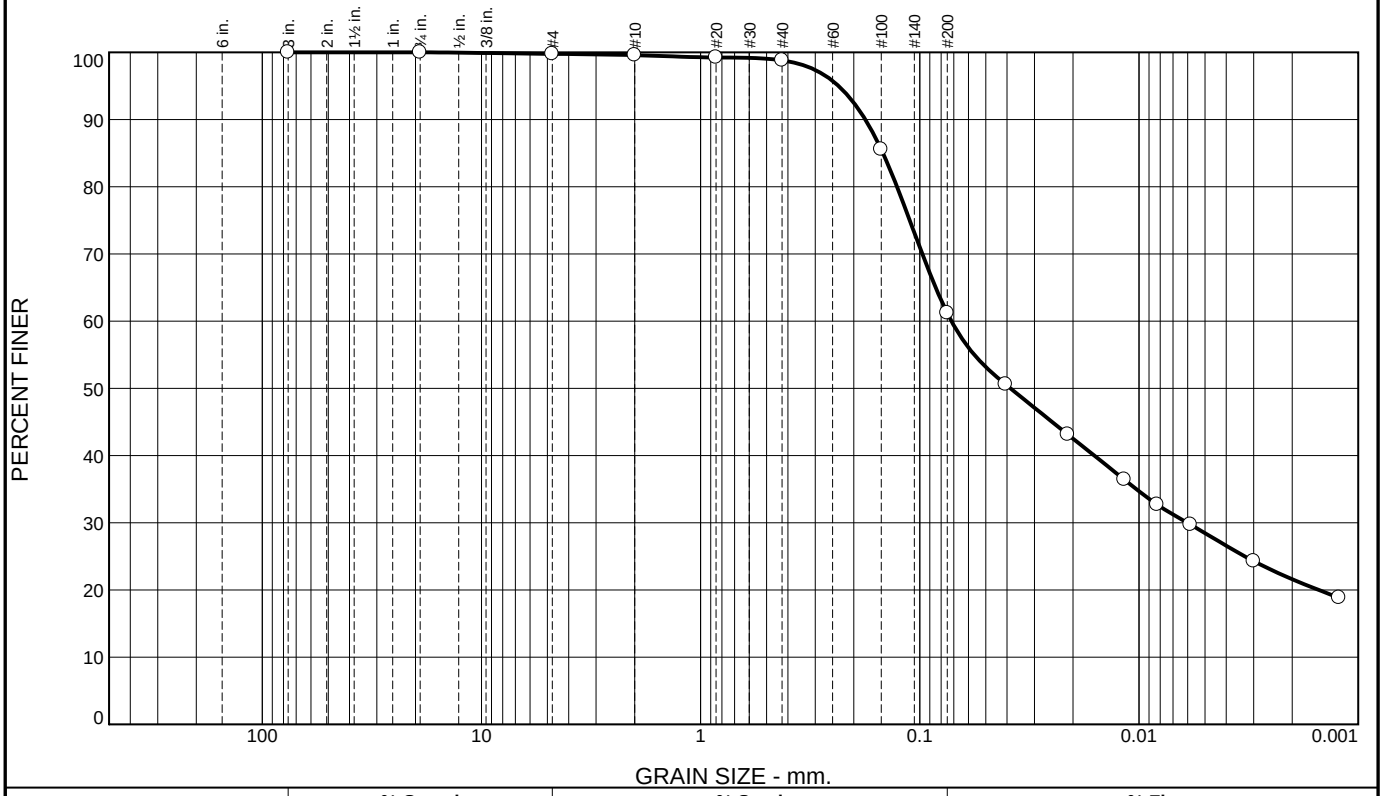
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.2 | 0.2 | 0.8 | 37.6 | 32.7 | 28.5 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 99.8 | | |
| #10 | 99.6 | | |
| #20 | 99.2 | | |
| #40 | 98.8 | | |
| #100 | 85.6 | | |
| #200 | 61.2 | | |

* (no specification provided)

**Material Description**

Sandy lean clay

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.1773 $D_{85}$= 0.1473 $D_{60}$= 0.0717
$D_{50}$= 0.0386 $D_{30}$= 0.0060 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= CL AASHTO=

**Remarks**

As received moisture content=26.6%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-108 **Depth:** 28-30
**Sample Number:** S-12 **Date:** 6/14/2012

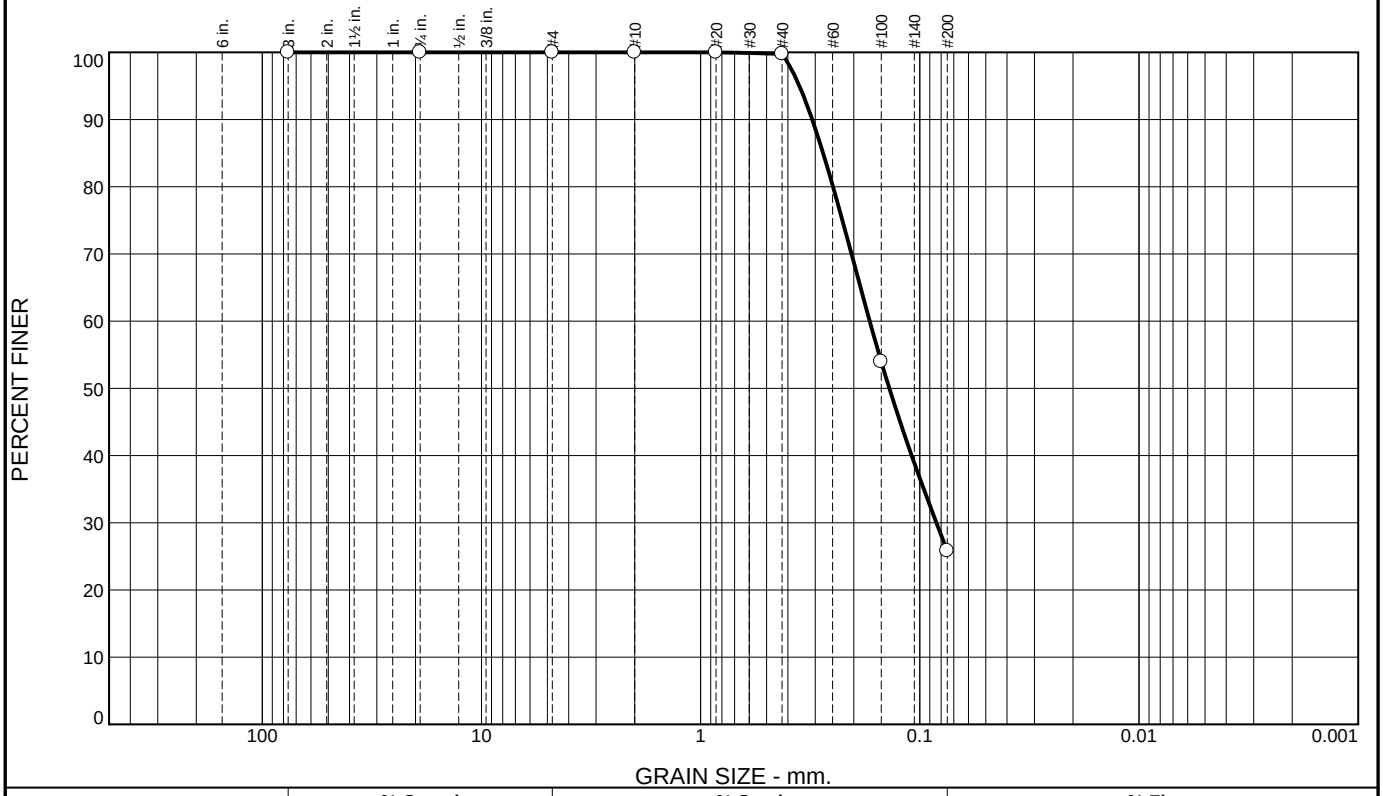
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 73.9 | 25.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.7 | | |
| #100 | 54.0 | | |
| #200 | 25.8 | | |

* (no specification provided)

**Material Description**

Clayey sand

**Atterberg Limits**

PL= LL= PI=

**Coefficients**

$D_{90}$= 0.3096 $D_{85}$= 0.2762 $D_{60}$= 0.1693
$D_{50}$= 0.1378 $D_{30}$= 0.0840 $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= SC AASHTO=

**Remarks**

As received moisture content=28.1%
Soil classification and description based on Visual Manual Procedure ASTM D2488

**Source of Sample:** B-108 **Depth:** 38-40
**Sample Number:** S-14 **Date:** 6/14/2012

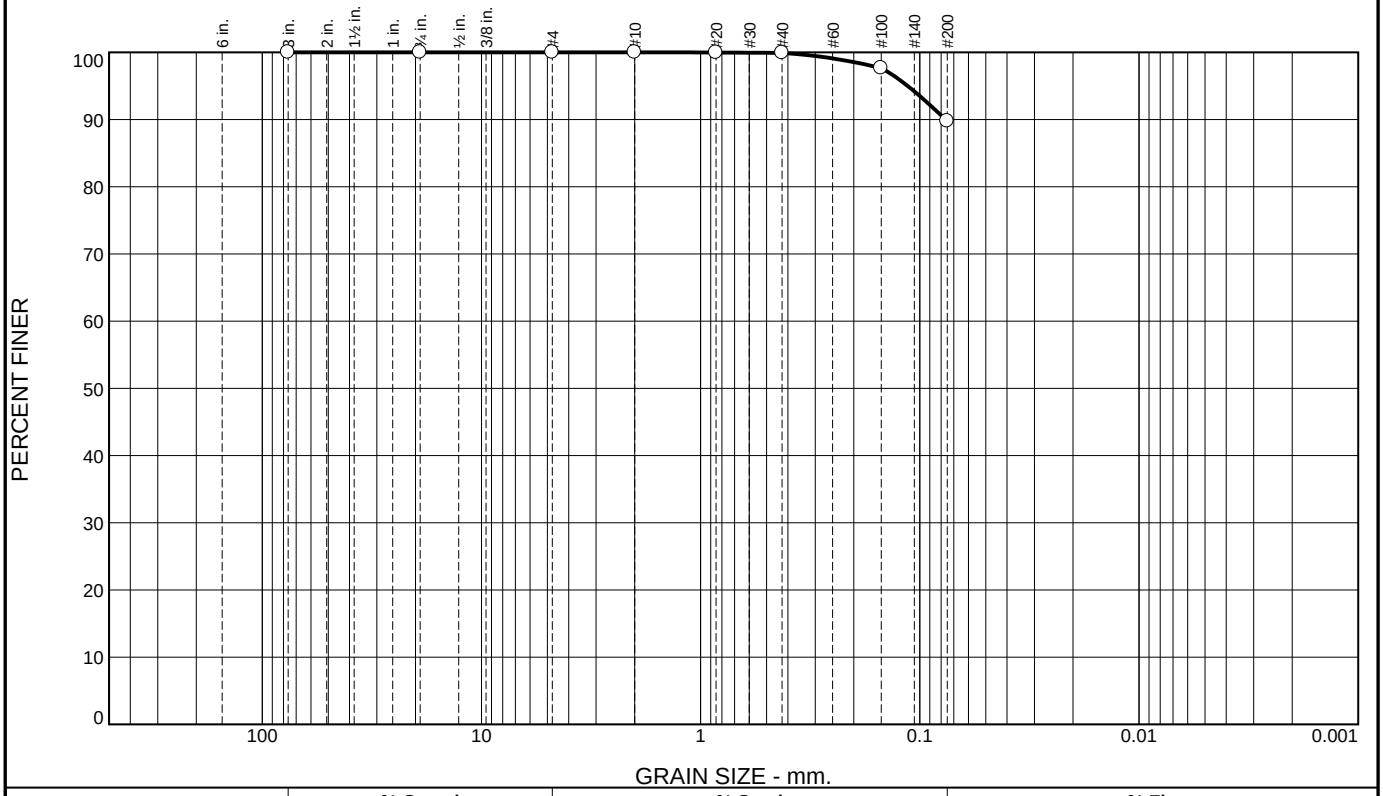
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 10.1 | 89.8 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 99.9 | | |
| #100 | 97.6 | | |
| #200 | 89.8 | | |

* (no specification provided)

**Material Description**

Silt

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= 0.0763 $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= ML AASHTO= A-4(0)

**Remarks**

As received moisture content=48.4%

**Source of Sample:** B-109 **Depth:** 2-4
**Sample Number:** S-2 **Date:** 6/15/2012

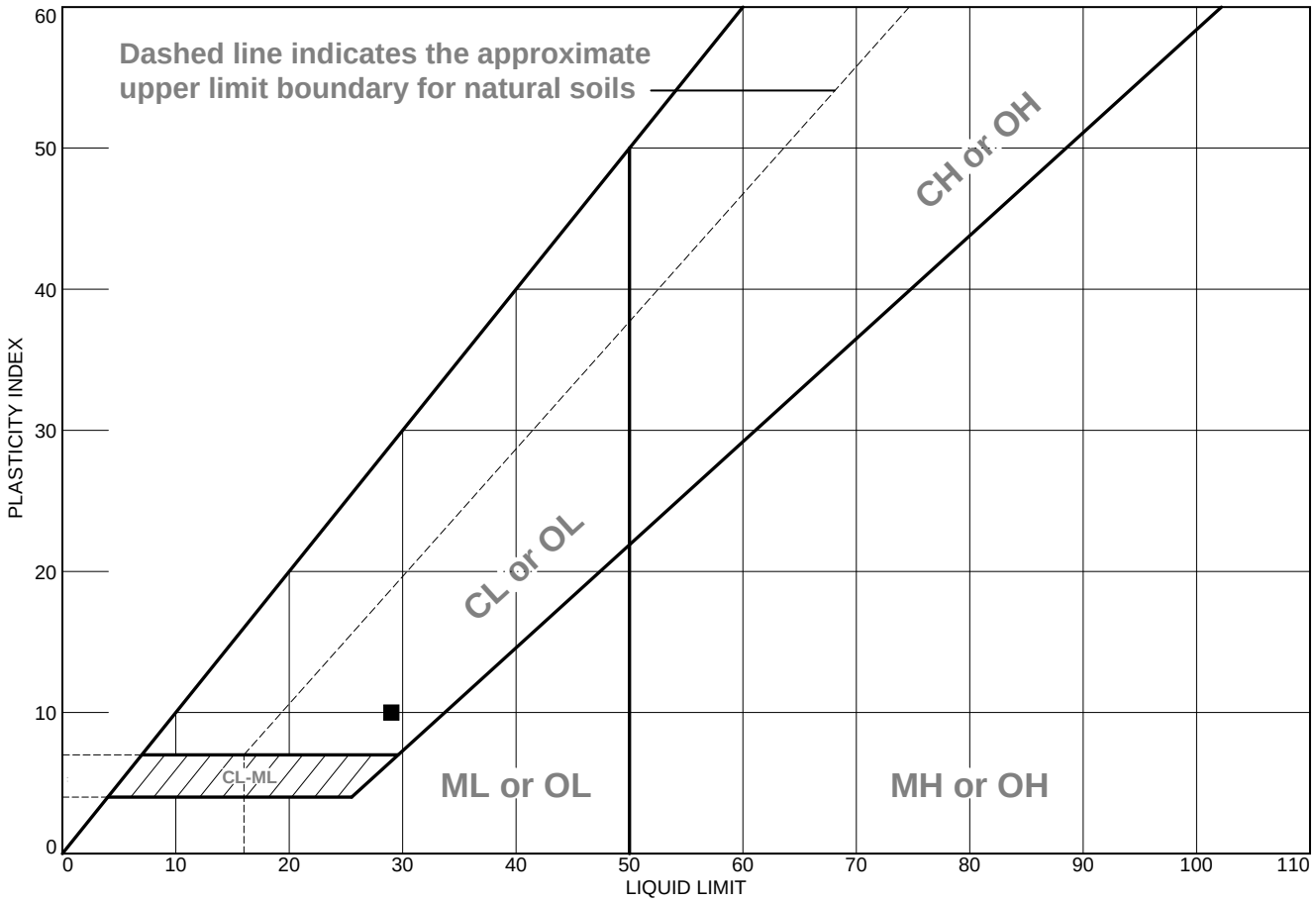
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silt | NV | NP | NP | 99.9 | 89.8 | ML |
| ■ | Lean clay | 29 | 19 | 10 | | | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-109 **Depth:** 2-4 **Sample Number:** S-2

■**Source of Sample:** B-109 **Depth:** 19-21 **Sample Number:** S-9

**Remarks:**

●As received moisture content=48.4%

■As received moisture content=24.6%

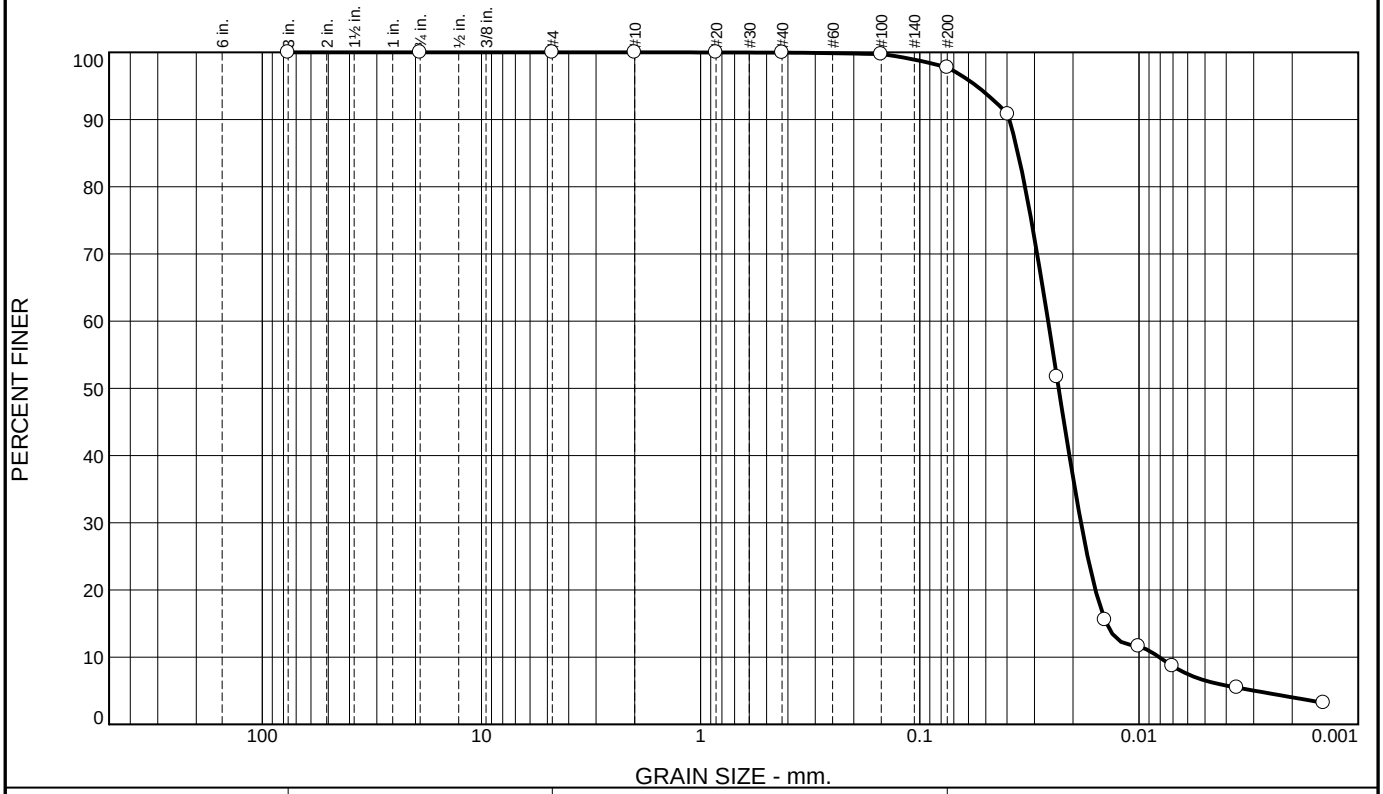
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.3 | 91.2 | 6.5 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 100.0 | | |
| #100 | 99.7 | | |
| #200 | 97.7 | | |

* (no specification provided)

**Material Description**

Silt

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= 0.0390 $D_{85}$= 0.0357 $D_{60}$= 0.0260
$D_{50}$= 0.0233 $D_{30}$= 0.0184 $D_{15}$= 0.0141
$D_{10}$= 0.0081 $C_u$= 3.22 $C_c$= 1.61

**Classification**

USCS= ML AASHTO= A-4(0)

**Remarks**

As received moisture content=46.4%

**Source of Sample:** B-110 **Depth:** 6-8
**Sample Number:** S-4

**Date:** 6/15/2012

**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure

**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

**CDM**

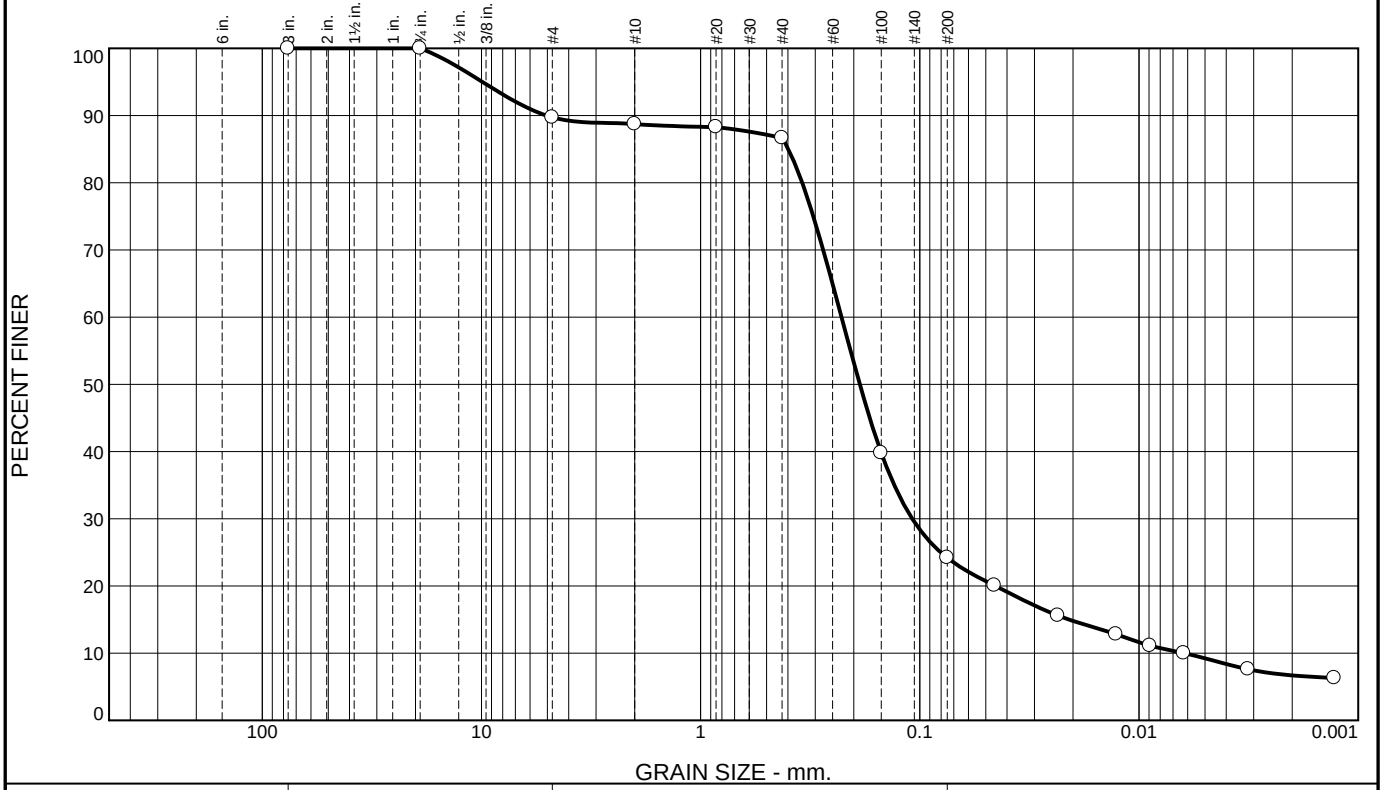
**Geotechnical Engineering Laboratory**

**Standard Test Method for Specific Gravity (ASTM D854)**

| | | | |
|---|---|---|---|
| Client: | TVA | | |
| Project Name: | Watts Bar Fossil Plant CCP Closure | | |
| Project Location: | Spring City, TN | | |
| Project Number: | 95608-92016 | | |
| Sample Number: | S-4 | | |
| Sample Location: | B-110 | Tested By: | NE |
| Sample Depth(ft): | 6.0-8.0 | Test Date: | 7/16/2012 |
| Lab Sample ID: | | Checked By: | ADT |

| **Specific Gravity of Soils** | |
|---|---|
| Test Procedure | A |
| Calibration Temperature $T_a$, ($^oC$) | 23.9 |
| Weight of flask $M_f$, (g) | 150.35 |
| Weight of oven-dry soil $M_o$, (g) | 20.53 |
| Weight of flask and distilled water at test temperature $M_a$,(g) | 422.52 |
| Weight of flask, soil and distilled water at test temperature $M_b$, (g) | 434.36 |
| Test Temperature $T_b$, ($^oC$) | 24.2 |
| Specific gravity at test temperature. | 2.36 |
| Specific gravity at $20^OC$ | 2.36 |

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 10.3 | 1.0 | 2.0 | 62.5 | 15.0 | 9.2 |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 89.7 | | |
| #10 | 88.7 | | |
| #20 | 88.3 | | |
| #40 | 86.7 | | |
| #100 | 39.8 | | |
| #200 | 24.2 | | |

* (no specification provided)

**Material Description**

Silty sand

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= 5.0583 $D_{85}$= 0.3981 $D_{60}$= 0.2276
$D_{50}$= 0.1878 $D_{30}$= 0.1083 $D_{15}$= 0.0209
$D_{10}$= 0.0062 $C_u$= 36.56 $C_c$= 8.28

**Classification**

USCS= SM AASHTO= A-2-4(0)

**Remarks**

As received moisture content=24.4%

**Source of Sample:** B-110 **Depth:** 28-30
**Sample Number:** S-11

**Date:** 6/15/2012

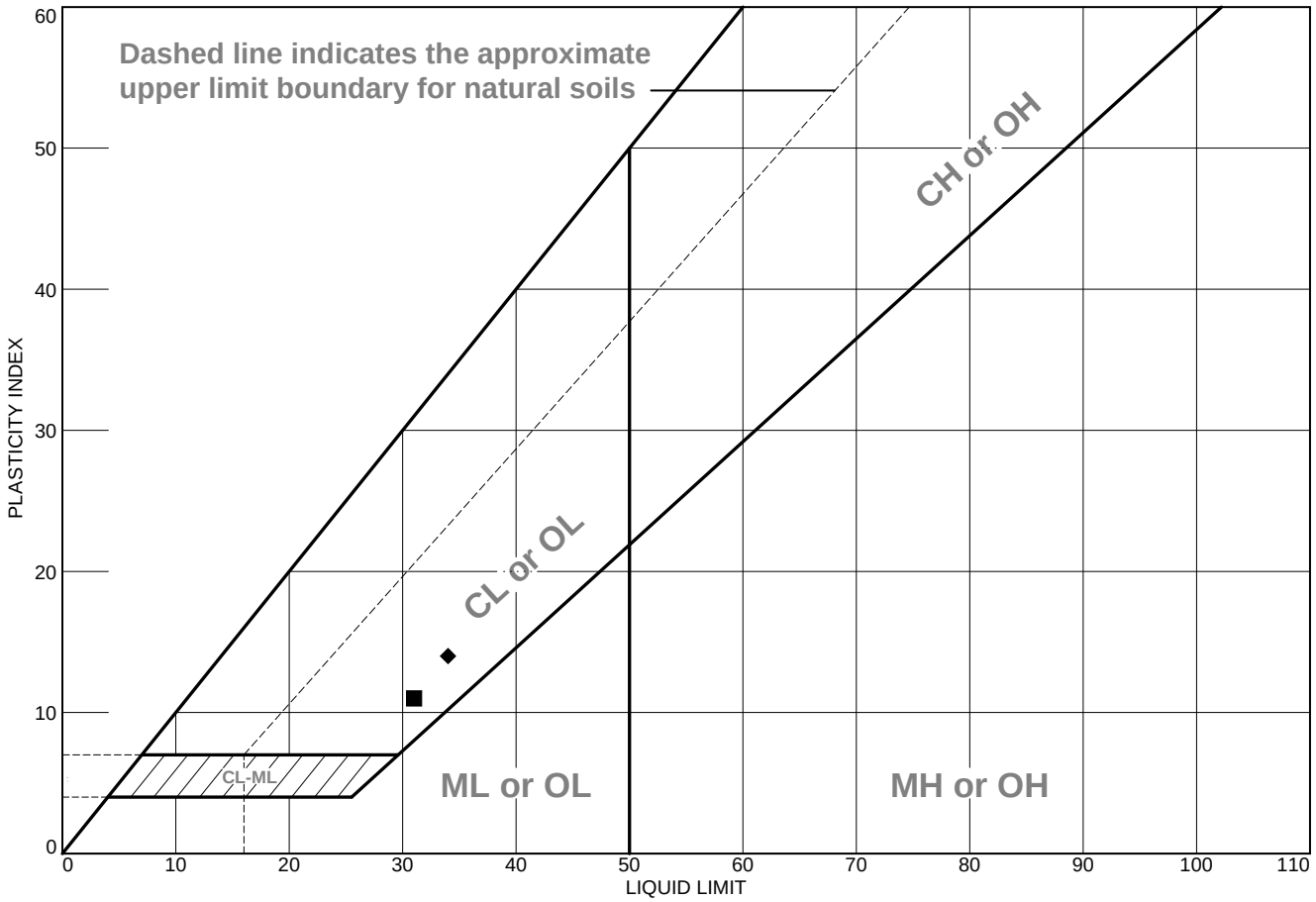
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silt | NV | NP | NP | 100.0 | 97.7 | ML |
| ■ | Lean clay | 31 | 20 | 11 | | | CL |
| ▲ | Silty sand | NV | NP | NP | 86.7 | 24.2 | SM |
| ◆ | Lean clay | 34 | 20 | 14 | | | CL |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-110 **Depth:** 6-8 **Sample Number:** S-4

■**Source of Sample:** B-110 **Depth:** 17-19 **Sample Number:** S-8

▲**Source of Sample:** B-110 **Depth:** 28-30 **Sample Number:** S-11

◆**Source of Sample:** B-110 **Depth:** 10-12 **Sample Number:** U-1

**CDM Smith**

**Cambridge, Massachusetts**

**Remarks:**

●As received moisture content=46.4%

■As received moisture content=25.6%
Organic odor

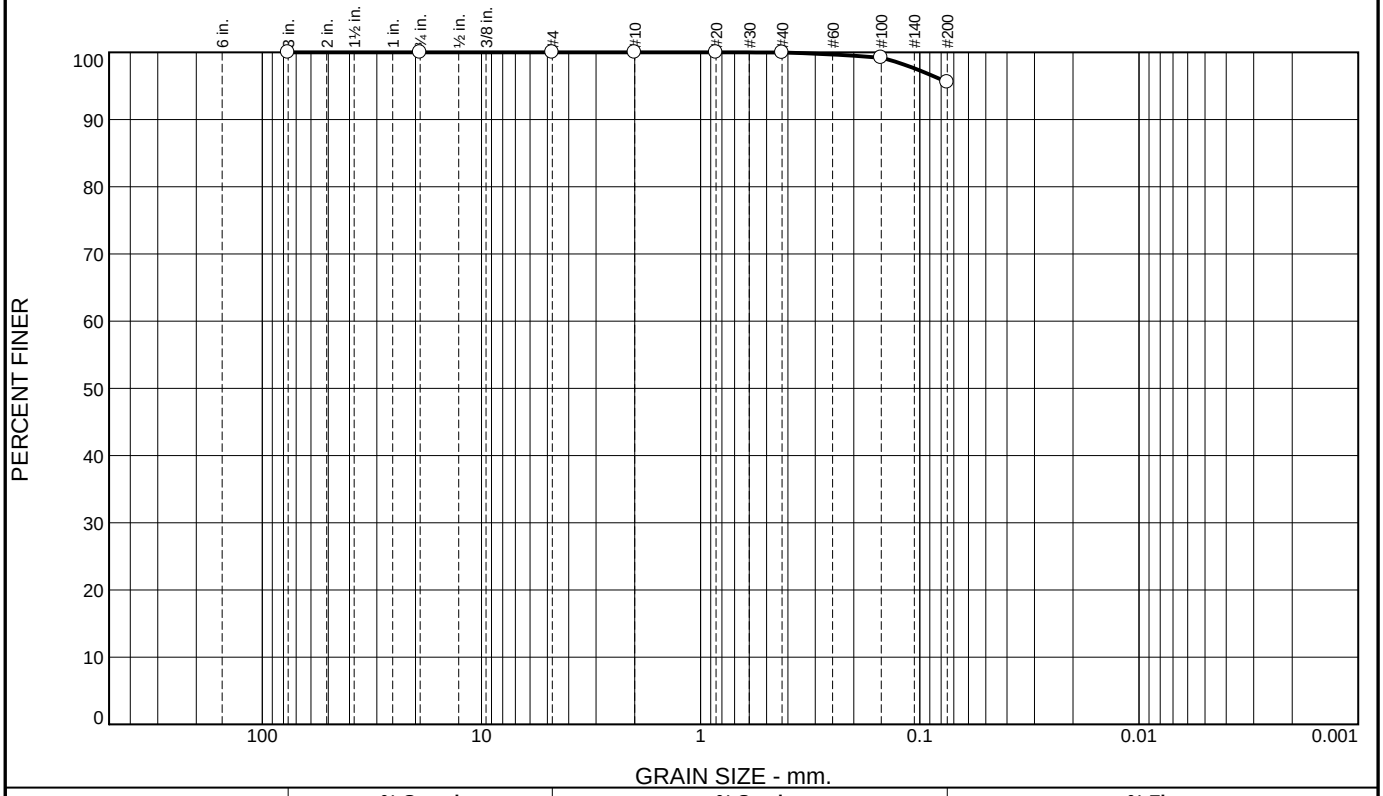
▲As received moisture content=24.4%

◆As received moisture content=38.5%

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 95.6 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 100.0 | | |
| #40 | 100.0 | | |
| #100 | 99.2 | | |
| #200 | 95.6 | | |

* (no specification provided)

**Material Description**

Silt

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= ML AASHTO= A-4(0)

**Remarks**

As received moisture content=70.3%

**Source of Sample:** B-111 **Depth:** 4-6
**Sample Number:** S-3 **Date:** 6/14/2012

**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

**CDM**

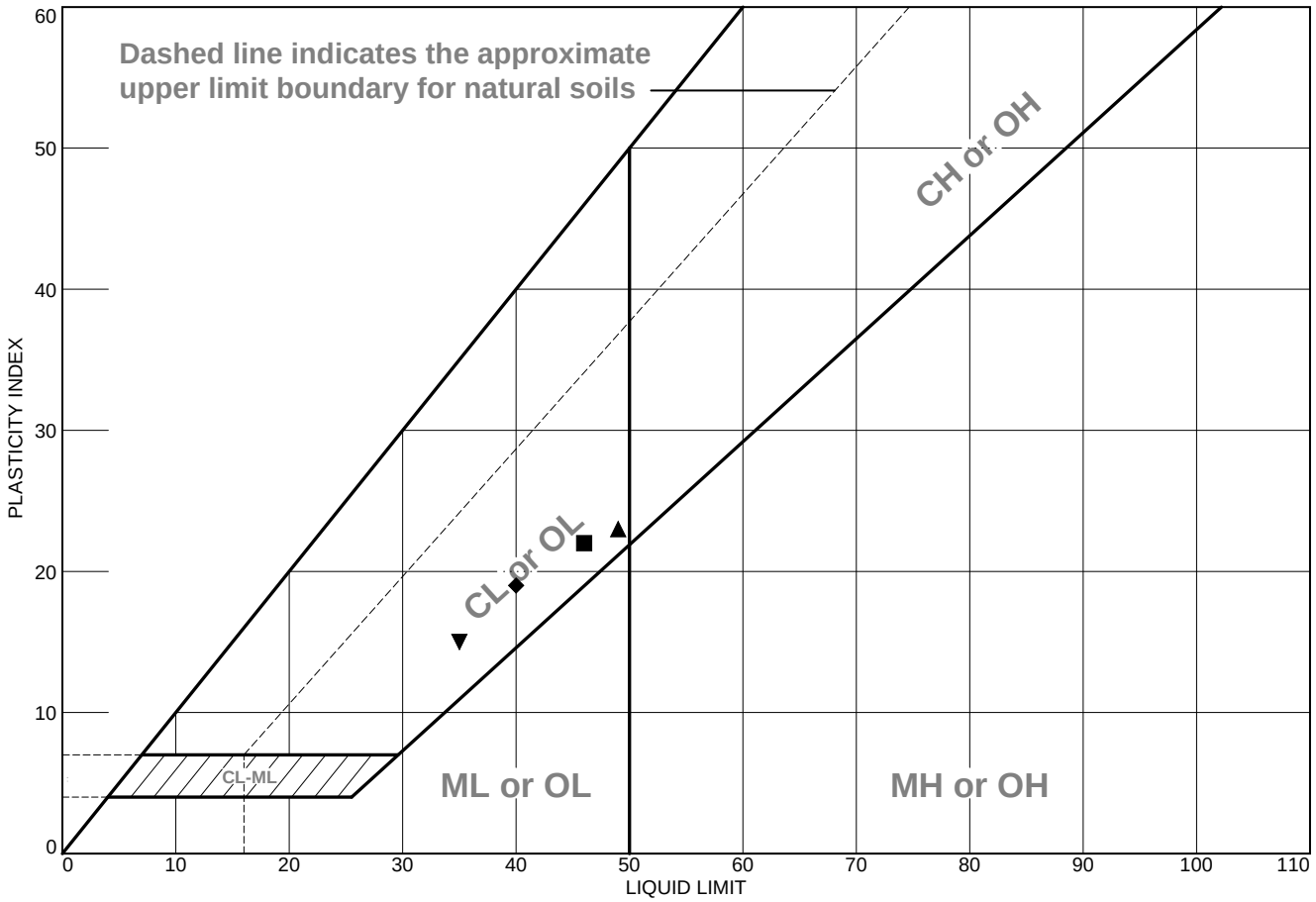
**Geotechnical Engineering Laboratory**

**Standard Test Method for Specific Gravity (ASTM D854)**

| | | | |
|---|---|---|---|
| Client: | TVA | | |
| Project Name: | Watts Bar Fossil Plant CCP Closure | | |
| Project Location: | Spring City, TN | | |
| Project Number: | 95618-92016 | | |
| Sample Number: | S-5 | | |
| Sample Location: | B-111 | Tested By: | NE |
| Sample Depth(ft): | 8.0-10.0 | Test Date: | 7/16/2012 |
| Lab Sample ID: | | Checked By: | ADT |

| **Specific Gravity of Soils** | |
|---|---|
| Test Procedure | A |
| Calibration Temperature $T_a$, ($^oC$) | 24.2 |
| Weight of flask $M_f$, (g) | 143.41 |
| Weight of oven-dry soil $M_o$, (g) | 20.27 |
| Weight of flask and distilled water at test temperature $M_a$,(g) | 418.40 |
| Weight of flask, soil and distilled water at test temperature $M_b$, (g) | 430.04 |
| Test Temperature $T_b$, ($^oC$) | 24.2 |
| Specific gravity at test temperature. | 2.35 |
| Specific gravity at $20^OC$ | 2.35 |

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silt | NV | NP | NP | 100.0 | 95.6 | ML |
| ■ | Lean Clay | 46 | 24 | 22 | | | CL |
| ▲ | Lean clay | 49 | 26 | 23 | | | CL |
| ◆ | Lean clay | 40 | 21 | 19 | | | CL |
| ▼ | Lean clay | 35 | 20 | 15 | | | CL |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** B-111 **Depth:** 4-6 **Sample Number:** S-3
■**Source of Sample:** B-111 **Depth:** 16-18 **Sample Number:** S-9
▲**Source of Sample:** B-111 **Depth:** 18-20 **Sample Number:** S-10
◆**Source of Sample:** B-111 **Depth:** 23-25 **Sample Number:** U-1
▼**Source of Sample:** B-111 **Depth:** 28-30 **Sample Number:** S-13

**CDM Smith**

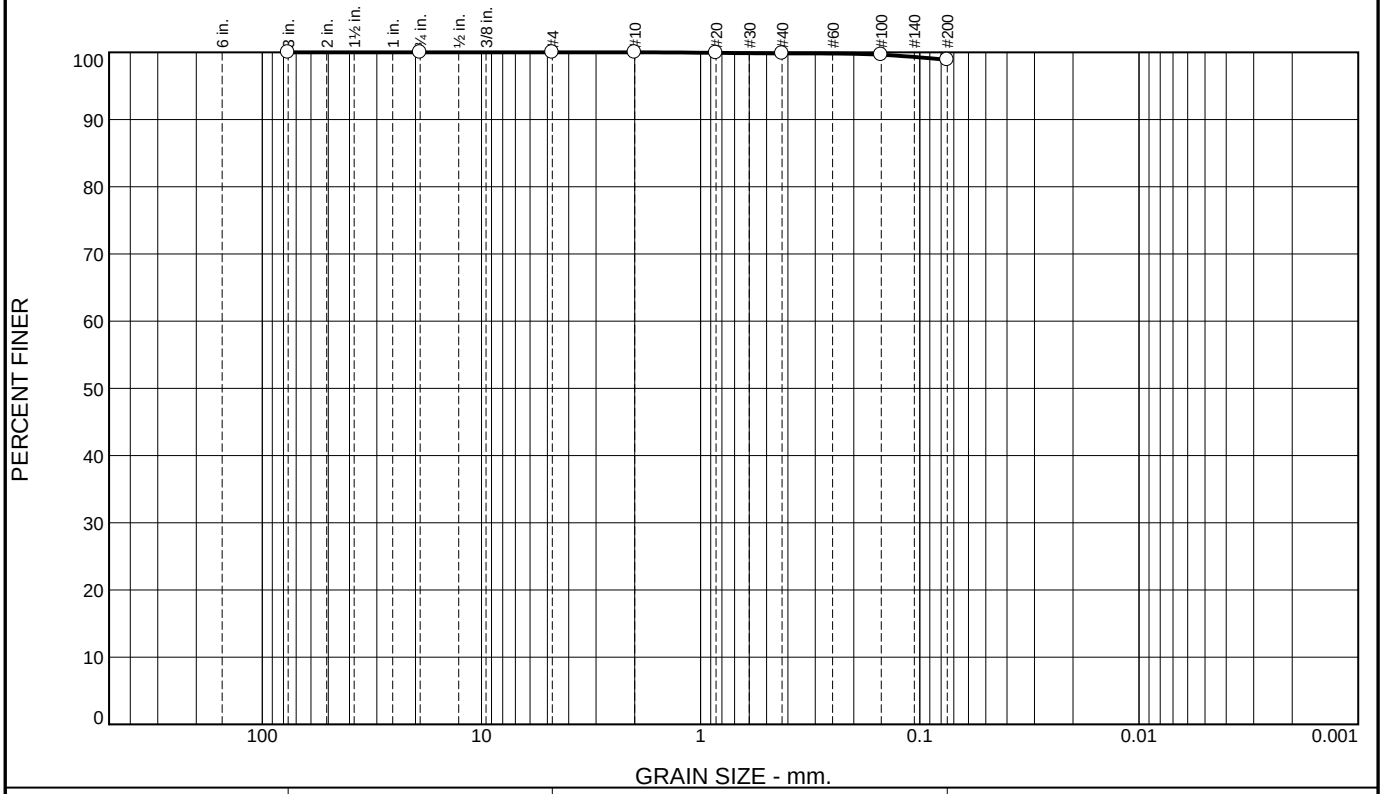
**Cambridge, Massachusetts**

**Remarks:**
●As received moisture content=70.3%
■As received moisture content=37.1%
Organic odor
▲As received moisture content=39.0%
◆As received moisture content=26.2%
▼As received moisture content=27.9%

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.9 | 98.9 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.9 | | |
| #40 | 99.8 | | |
| #100 | 99.6 | | |
| #200 | 98.9 | | |

* (no specification provided)

**Material Description**

Silt

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= ML AASHTO= A-4(0)

**Remarks**

As received moisture content=61.8%

**Source of Sample:** HA-1 **Depth:** 3-4
**Sample Number:** S-4 **Date:** 6/11/2012

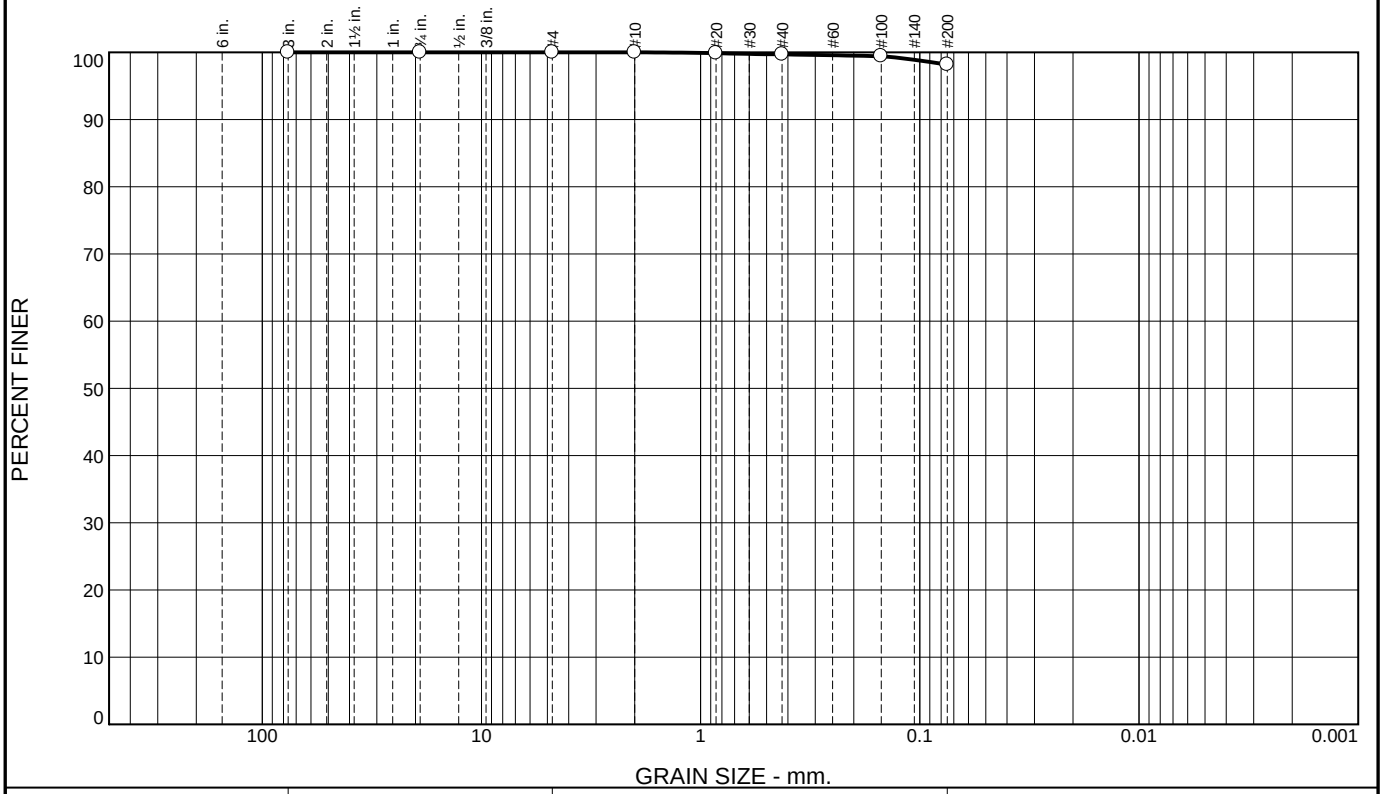
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1.5 | 98.2 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.9 | | |
| #40 | 99.7 | | |
| #100 | 99.4 | | |
| #200 | 98.2 | | |

* (no specification provided)

**Material Description**

Silt

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= ML AASHTO= A-4(0)

**Remarks**

As received moisture content=50.1%

**Source of Sample:** HA-1 **Depth:** 7-8
**Sample Number:** S-9 **Date:** 6/11/2012

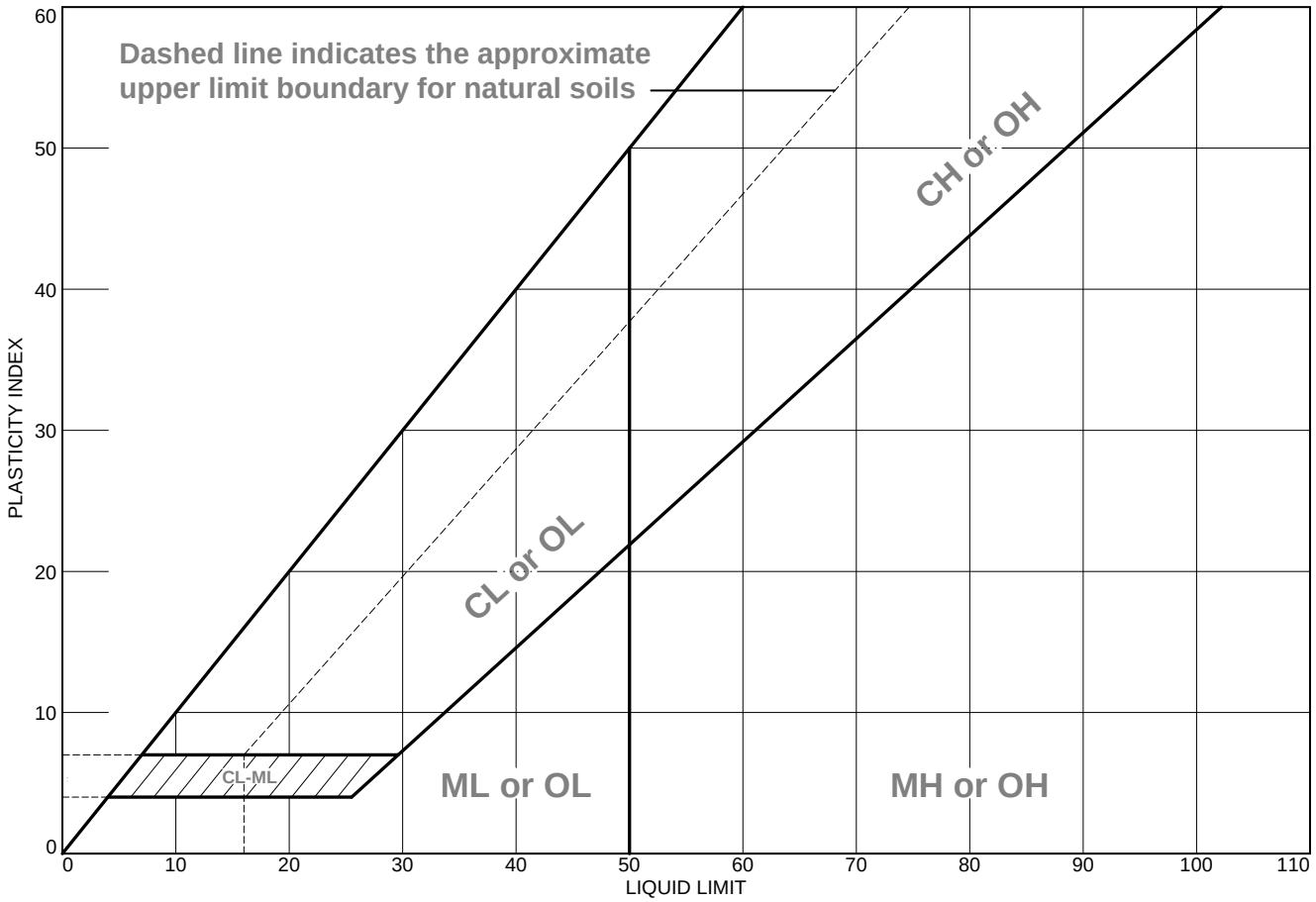
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silt | NV | NP | NP | 99.8 | 98.9 | ML |
| ■ | Silt | NV | NP | NP | 99.7 | 98.2 | ML |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** HA-1 **Depth:** 3-4 **Sample Number:** S-4

■**Source of Sample:** HA-1 **Depth:** 7-8 **Sample Number:** S-9

**Remarks:**

●As received moisture content=61.8%

■As received moisture content=50.1%

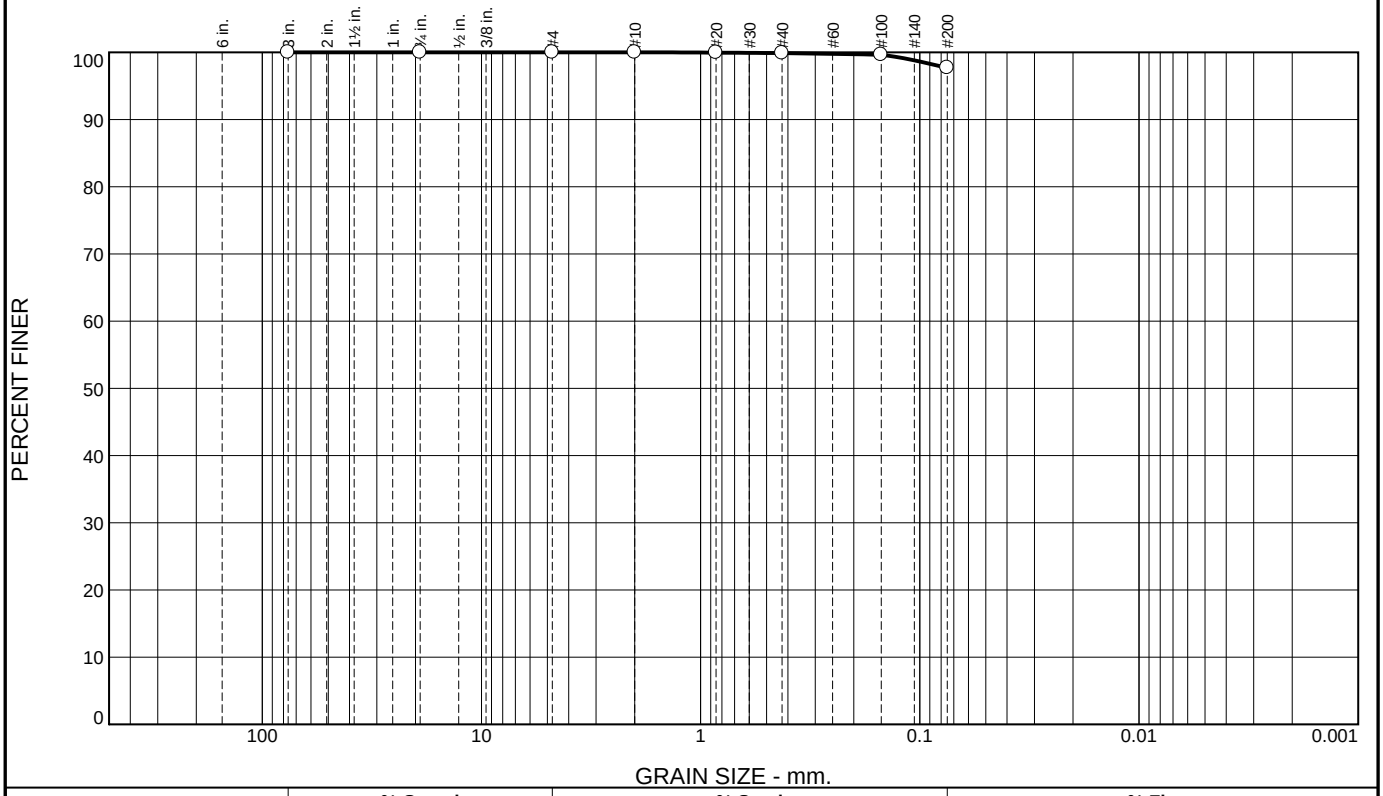
**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 2.2 | 97.7 | |

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT | PASS? (X=NO) |
|---|---|---|---|
| 3 | 100.0 | | |
| 3/4 | 100.0 | | |
| #4 | 100.0 | | |
| #10 | 100.0 | | |
| #20 | 99.9 | | |
| #40 | 99.9 | | |
| #100 | 99.6 | | |
| #200 | 97.7 | | |

* (no specification provided)

**Material Description**

Silt

**Atterberg Limits**

PL= NP LL= NV PI= NP

**Coefficients**

$D_{90}$= $D_{85}$= $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Classification**

USCS= ML AASHTO= A-4(0)

**Remarks**

As received moisture content=46.2%

**Source of Sample:** HA-2 **Depth:** 2-4
**Sample Number:** S-2 **Date:** 6/11/2012

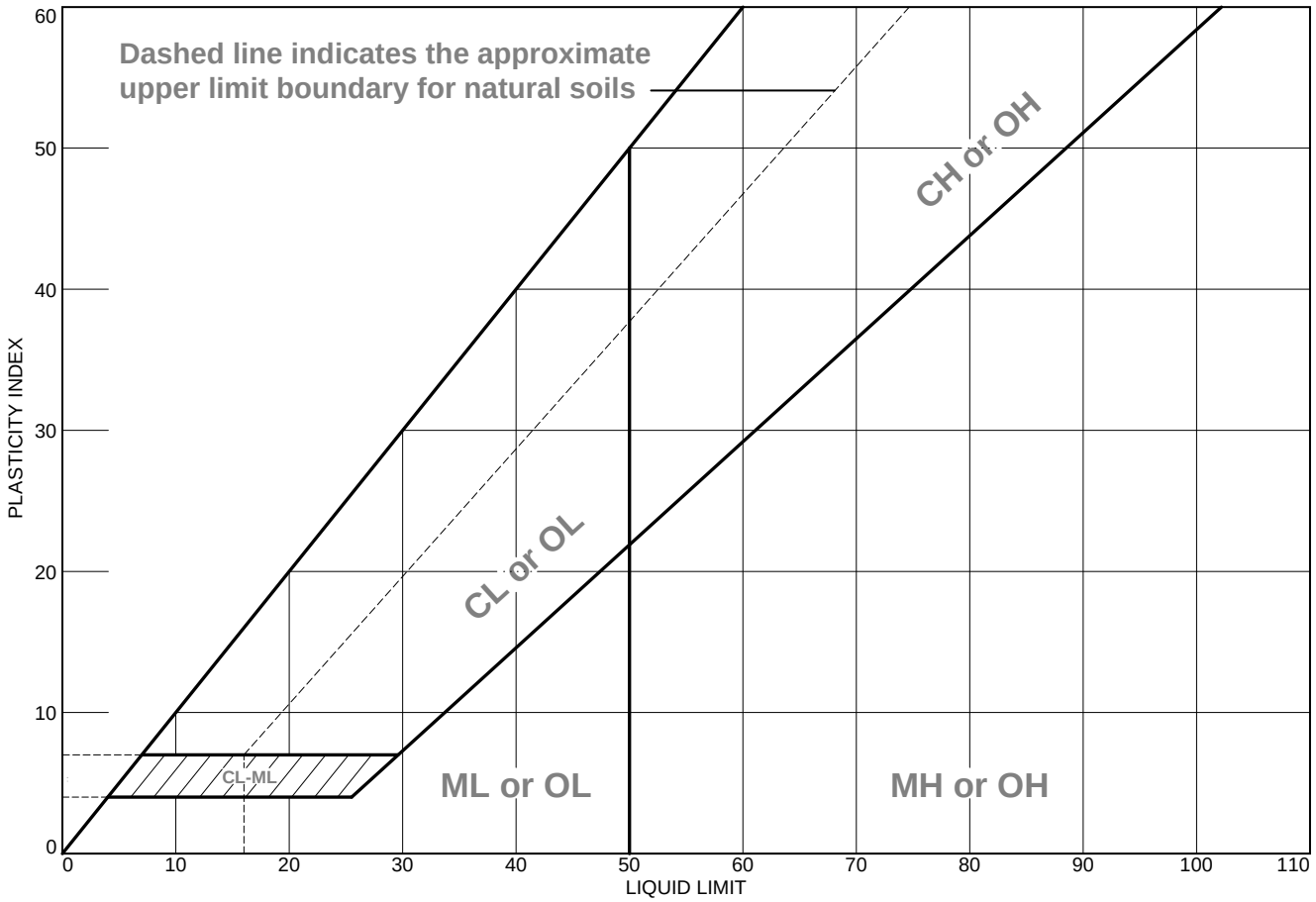
**CDM Smith**

**Cambridge, Massachusetts**

**Client:** TVA
**Project:** Watts Bar Fossil Plant CCP Closure
**Project No:** 95618-92016 **Figure**

**Tested By:** NE **Checked By:** MR

# LIQUID AND PLASTIC LIMITS TEST REPORT




| | MATERIAL DESCRIPTION | LL | PL | PI | %<#40 | %<#200 | USCS |
|---|---|---|---|---|---|---|---|
| ● | Silt | NV | NP | NP | 99.9 | 97.7 | ML |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**Project No.** 95618-92016 **Client:** TVA

**Project:** Watts Bar Fossil Plant CCP Closure

●**Source of Sample:** HA-2 **Depth:** 2-4 **Sample Number:** S-2

**Remarks:**

●As received moisture content=46.2%

**CDM Smith**

**Cambridge, Massachusetts**

**Figure**

**Tested By:** NE **Checked By:** MR

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 8/28/2012 | **LL :** | 38 |
| **Project:** | Watts Bar Fossil Plant | **Exploration No:** | B-1O4 | **PL :** | 22 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 | **PI :** | 16 |
| **Project No:** | 95618-92016 | **Depth (ft):** | 21.5 | **USCS:** | Lean Clay CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 29.4% |
| **Dry Unit Weight (pcf):** | 91.8 |
| **Diameter (in):** | 2.857 |
| **Height (in):** | 6.125 |
| **Void Ratio (-):** | 0.83 |
| **Saturation (%):** | 95.2% |
| **Moisture Content (Trim.%):** | 31.1% |
| **Cross Sectional Area ($in^2$):** | 6.411 |

**Final**

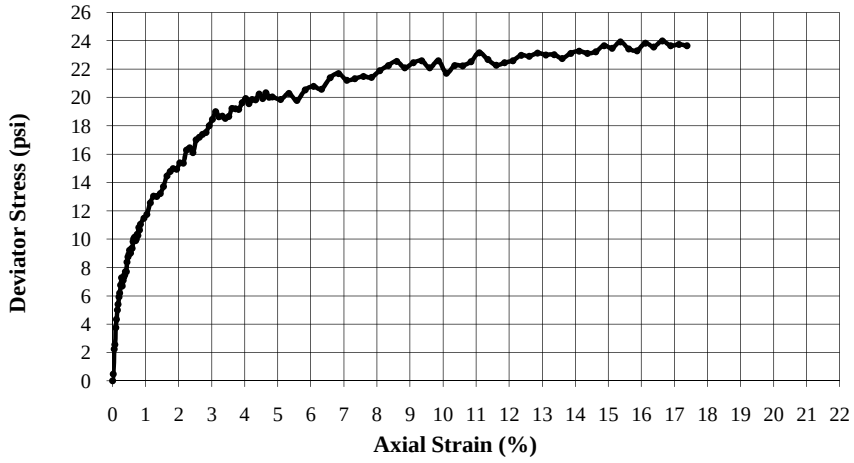
| | |
|---|---|
| **Moisture Content (%):** | 27.9% |
| **Dry Unit Weight (pcf):** | 95.8 |
| **Height (in):** | 4.906 |
| **Void Ratio (-):** | 0.76 |
| **Saturation (%):** | 99.5% |
| **Cross Sectional Area ($in^2$):** | 7.352 |

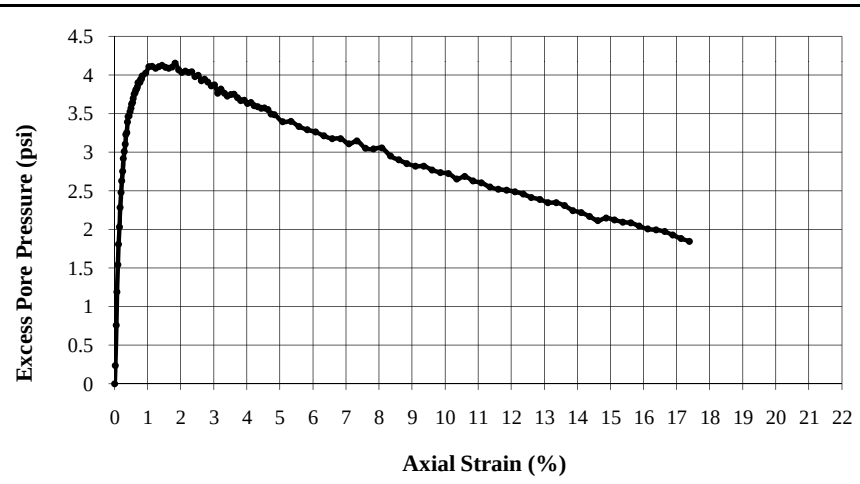
**End of Consolidation Data**

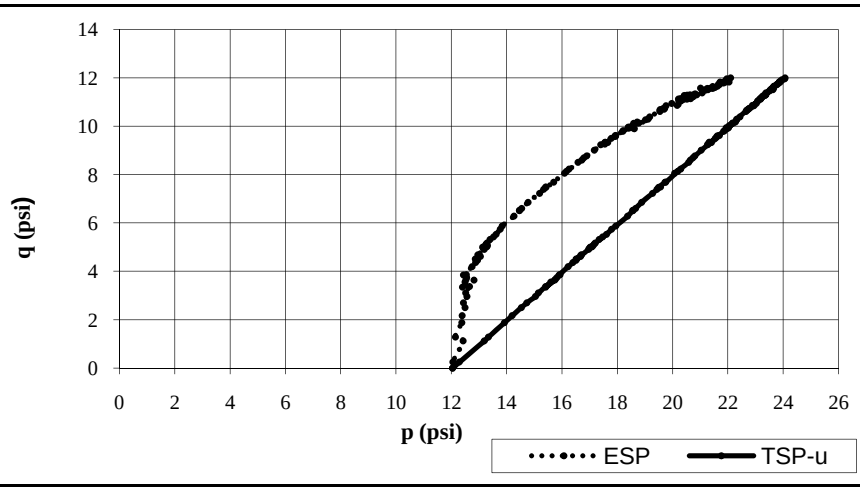
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 27.9% |
| **Dry Unit Weight (pcf):** | 95.8 |
| **Height (in):** | 6.125 |
| **Void Ratio (-):** | 0.76 |
| **Saturation (%):** | 99.5% |
| **Cross Sectional Area ($in^2$):** | 6.129 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 79 |
| **Consolidation Pressure (psi):** | 12.49 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1 |
| **Max. Deviator Stress (psi):** | 23.67 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 10.10 |
| **Major Eff. Pr. Stress (psi):** | 34.09 |
| **Undrained Strength Ratio (-):** | 0.95 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 8/28/2012 | **LL :** | 38 |
| **Project:** | Watts Bar Fossil Plant | **Exploration No:** | B-104 | **PL :** | 22 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 | **PI :** | 16 |
| **Project No:** | 95618-92016 | **Depth (ft):** | 21.5 | **USCS:** | Lean Clay CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 28.2% |
| **Dry Unit Weight (pcf):** | 92.3 |
| **Diameter (in):** | 2.859 |
| **Height (in):** | 6.030 |
| **Void Ratio (-):** | 0.83 |
| **Saturation (%):** | 92.3% |
| **Moisture Content (Trim.%):** | 31.1% |
| **Cross Sectional Area ($in^2$):** | 6.420 |

**Final**

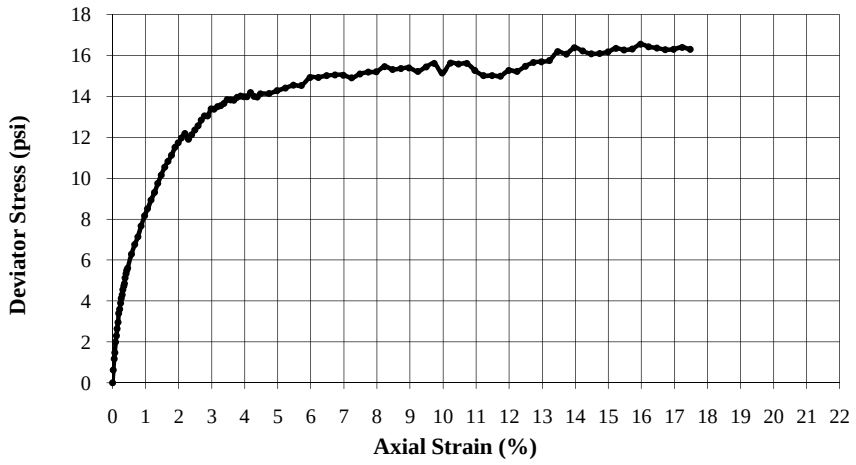
| | |
|---|---|
| **Moisture Content (%):** | 28.7% |
| **Dry Unit Weight (pcf):** | 94.7 |
| **Height (in):** | 4.890 |
| **Void Ratio (-):** | 0.78 |
| **Saturation (%):** | 99.5% |
| **Cross Sectional Area ($in^2$):** | 7.430 |

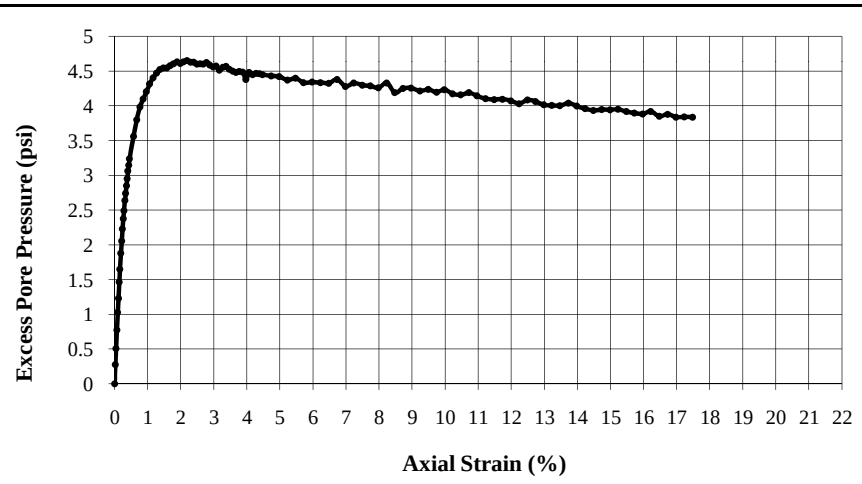
**End of Consolidation Data**

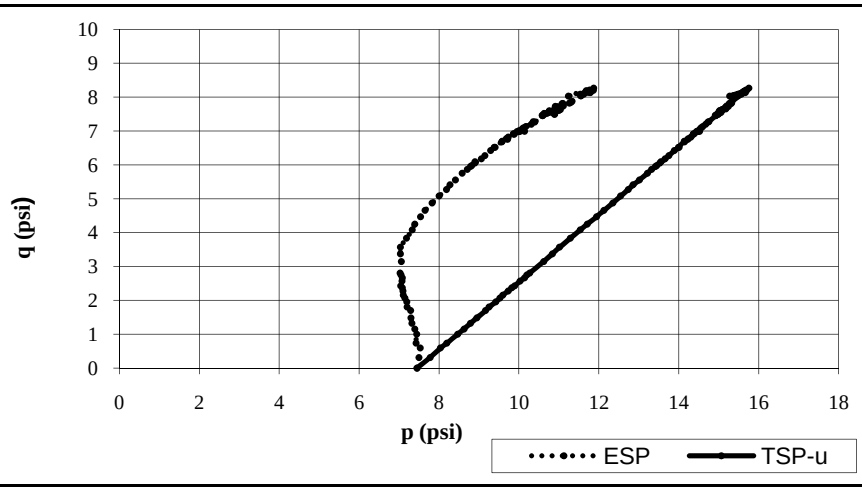
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 28.7% |
| **Dry Unit Weight (pcf):** | 94.7 |
| **Height (in):** | 6.030 |
| **Void Ratio (-):** | 0.78 |
| **Saturation (%):** | 99.5% |
| **Cross Sectional Area ($in^2$):** | 6.243 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 76 |
| **Consolidation Pressure (psi):** | 7.45 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1 |
| **Max. Deviator Stress (psi):** | 16.56 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 3.60 |
| **Major Eff. Pr. Stress (psi):** | 20.14 |
| **Undrained Strength Ratio (-):** | 1.11 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 8/8/2012 | **LL :** | 38 |
| **Project:** | Watts Bar Fossil Plant | **Exploration No:** | B-104 | **PL :** | 22 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 | **PI :** | 16 |
| **Project No:** | 95618-92016 | **Depth (ft):** | 21.5 | **USCS:** | Lean Clay CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 33.7% |
| **Dry Unit Weight (pcf):** | 87.8 |
| **Diameter (in):** | 2.844 |
| **Height (in):** | 6.563 |
| **Void Ratio (-):** | 0.92 |
| **Saturation (%):** | 99.0% |
| **Moisture Content (Trim.%):** | 31.1% |
| **Cross Sectional Area ($in^2$):** | 6.353 |

**Final**

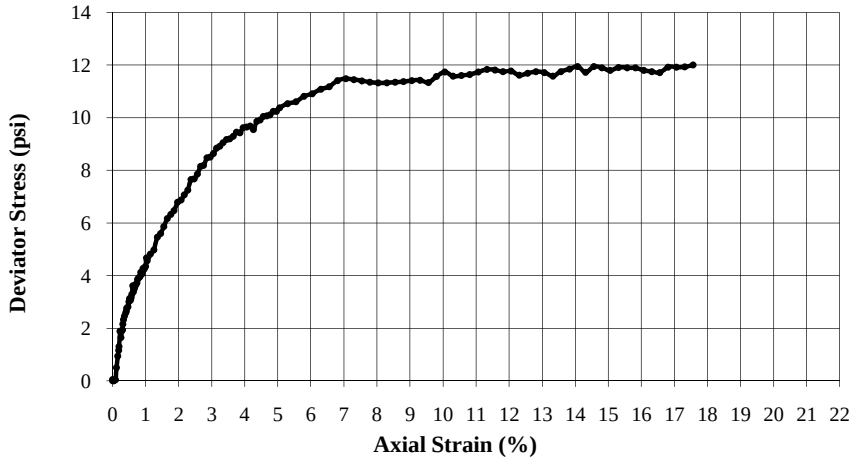
| | |
|---|---|
| **Moisture Content (%):** | 34.0% |
| **Dry Unit Weight (pcf):** | 87.7 |
| **Height (in):** | 5.245 |
| **Void Ratio (-):** | 0.92 |
| **Saturation (%):** | 99.5% |
| **Cross Sectional Area ($in^2$):** | 7.888 |

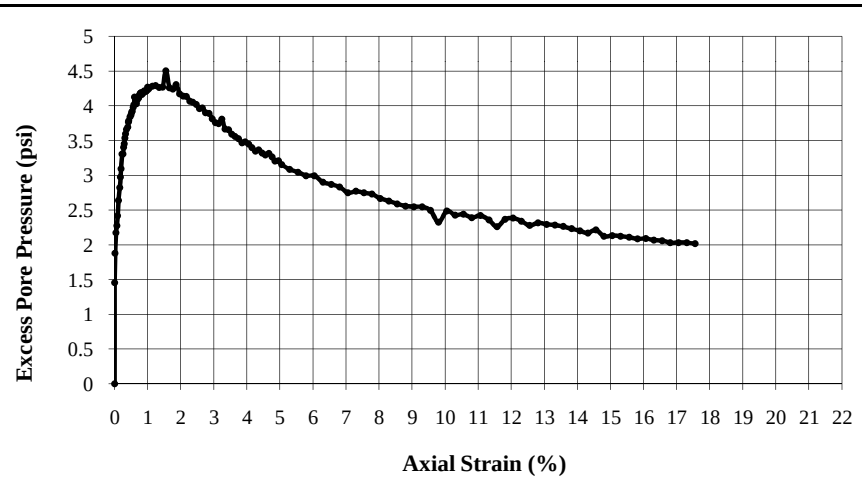
**End of Consolidation Data**

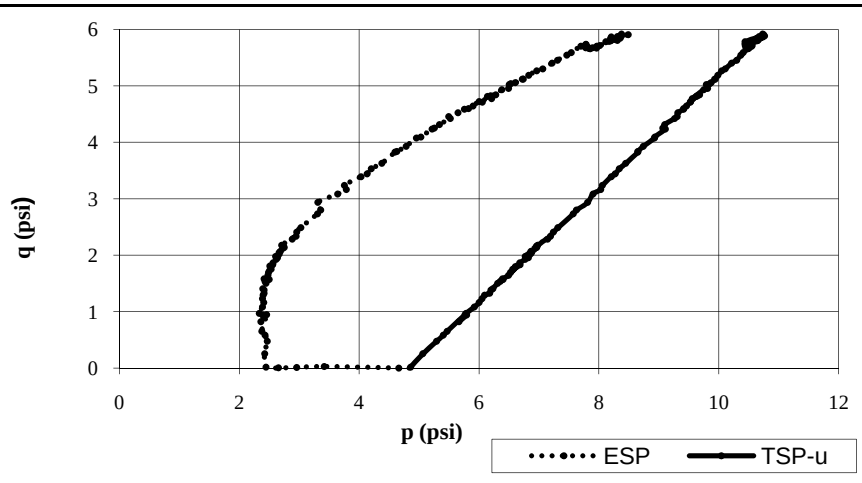
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 34.0% |
| **Dry Unit Weight (pcf):** | 87.7 |
| **Height (in):** | 6.562 |
| **Void Ratio (-):** | 0.92 |
| **Saturation (%):** | 99.5% |
| **Cross Sectional Area ($in^2$):** | 6.346 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 87 |
| **Consolidation Pressure (psi):** | 4.66 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1 |
| **Max. Deviator Stress (psi):** | 12.33 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 2.98 |
| **Major Eff. Pr. Stress (psi):** | 15.06 |
| **Undrained Strength Ratio (-):** | 1.32 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 8/8/2012 | **LL :** | 37 |
| **Project:** | Watts Bar Fossil Plant | **Exploration No:** | B-105 | **PL :** | 22 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 | **PI :** | 15 |
| **Project No:** | 95618-92016 | **Depth (ft):** | 17 | **USCS:** | CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 16.1% |
| **Dry Unit Weight (pcf):** | 117.4 |
| **Diameter (in):** | 1.387 |
| **Height (in):** | 3.041 |
| **Void Ratio (-):** | 0.44 |
| **Saturation (%):** | 99.7% |
| **Moisture Content (Trim.%):** | - |
| **Cross Sectional Area ($in^2$):** | 1.511 |

**Final**

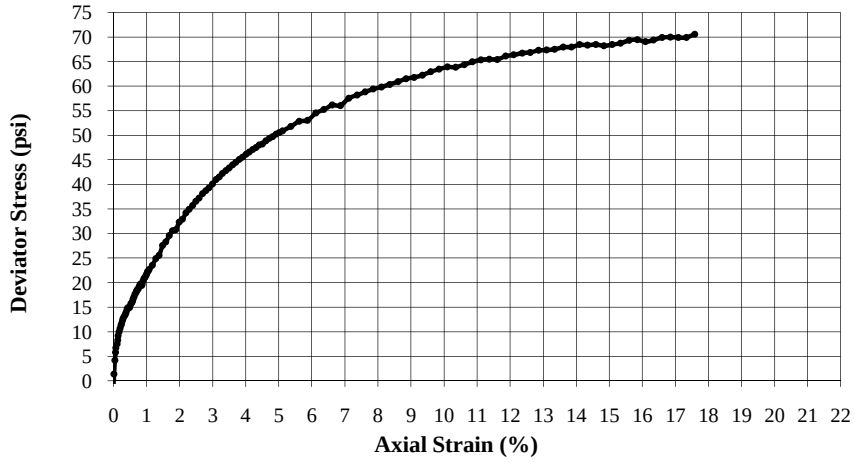
| | |
|---|---|
| **Moisture Content (%):** | 16.8% |
| **Dry Unit Weight (pcf):** | 115.6 |
| **Height (in):** | 2.490 |
| **Void Ratio (-):** | 0.46 |
| **Saturation (%):** | 99.3% |
| **Cross Sectional Area ($in^2$):** | 1.858 |

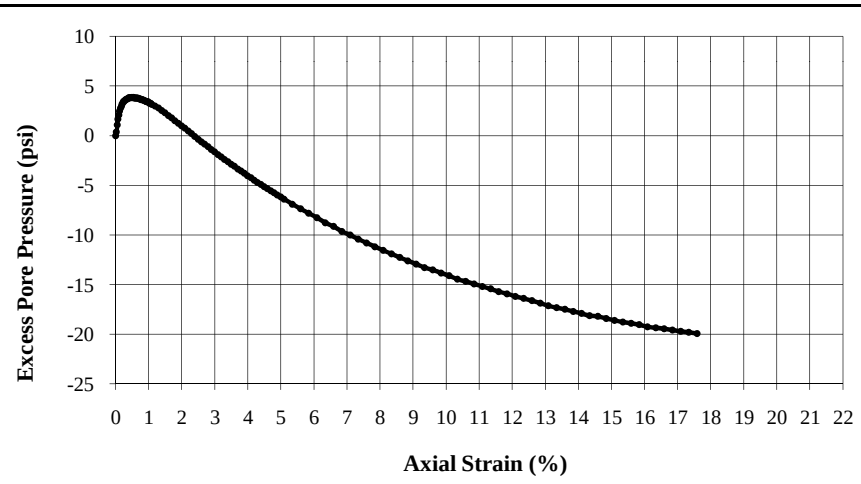
**End of Consolidation Data**

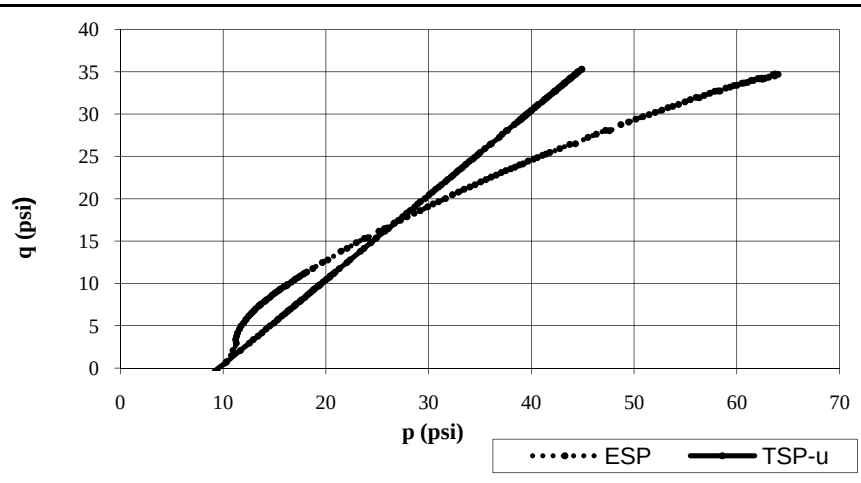
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 16.8% |
| **Dry Unit Weight (pcf):** | 115.6 |
| **Height (in):** | 3.040 |
| **Void Ratio (-):** | 0.46 |
| **Saturation (%):** | 99.3% |
| **Cross Sectional Area ($in^2$):** | 1.531 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 90 |
| **Consolidation Pressure (psi):** | 9.73 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1% |
| **Max. Deviator Stress (psi):** | 70.57 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 29.94 |
| **Major Eff. Pr. Stress (psi):** | 100.51 |
| **Undrained Strength Ratio (-):** | 3.63 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 8/8/2012 | **LL :** | 37 |
| **Project:** | Watts Bar Fossil Plant | **Exploration No:** | B-105 | **PL :** | 22 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 | **PI :** | 15 |
| **Project No:** | 95618-92016 | **Depth (ft):** | 19 | **USCS:** | Lean Clay CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 18.1% |
| **Dry Unit Weight (pcf):** | 112.8 |
| **Diameter (in):** | 2.857 |
| **Height (in):** | 6.000 |
| **Void Ratio (-):** | 0.49 |
| **Saturation (%):** | 98.8% |
| **Moisture Content (Trim.%):** | - |
| **Cross Sectional Area ($in^2$):** | 6.411 |

**Final**

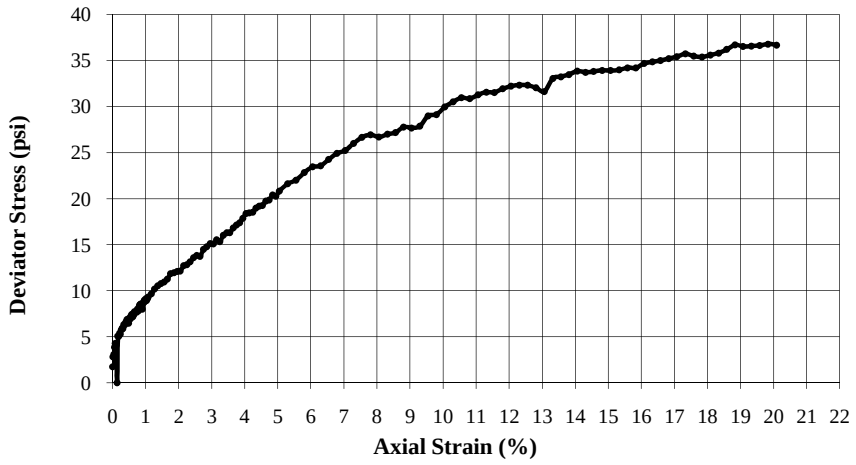
| | |
|---|---|
| **Moisture Content (%):** | 19.2% |
| **Dry Unit Weight (pcf):** | 110.6 |
| **Height (in):** | 4.794 |
| **Void Ratio (-):** | 0.52 |
| **Saturation (%):** | 99.3% |
| **Cross Sectional Area ($in^2$):** | 8.134 |

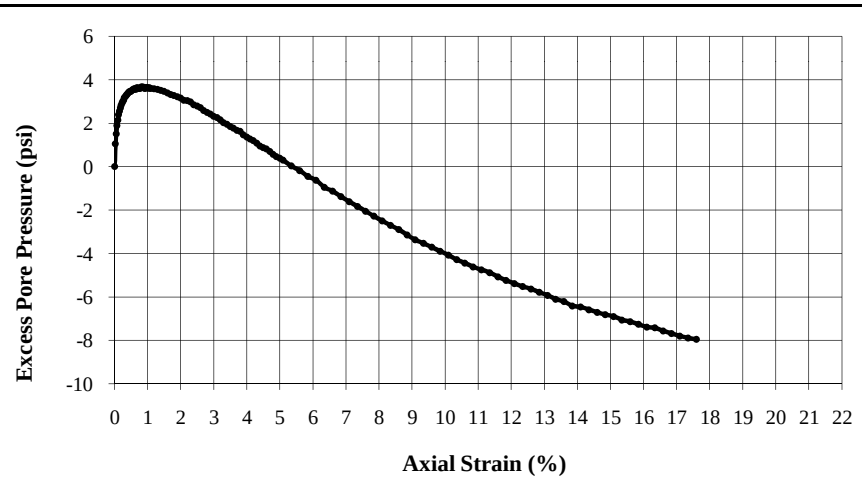
**End of Consolidation Data**

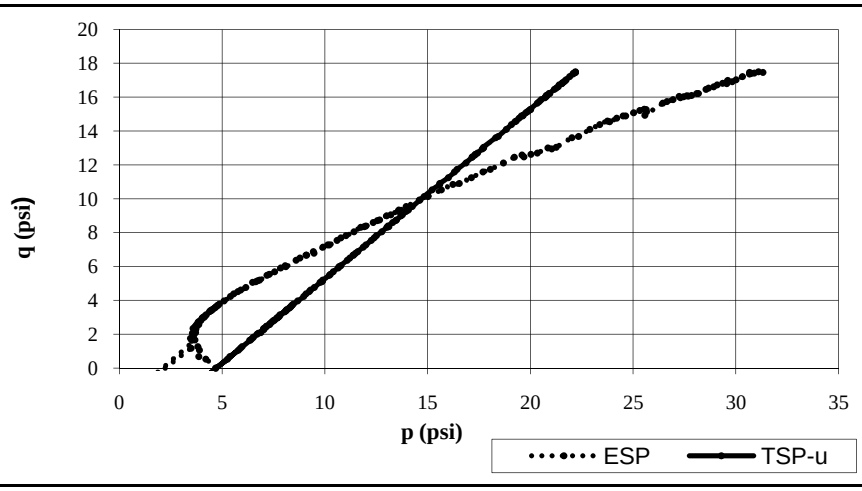
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 19.2% |
| **Dry Unit Weight (pcf):** | 110.6 |
| **Height (in):** | 6.000 |
| **Void Ratio (-):** | 0.52 |
| **Saturation (%):** | 99.3% |
| **Cross Sectional Area ($in^2$):** | 6.521 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 81 |
| **Consolidation Pressure (psi):** | 4.58 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1 |
| **Max. Deviator Stress (psi):** | 36.78 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 13.59 |
| **Major Eff. Pr. Stress (psi):** | 48.60 |
| **Undrained Strength Ratio (-):** | 4.01 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 5/14/2012 | **LL :** | 34 |
| **Project:** | Watts Bar Fossil Plant | **Exploration No:** | B-110 | **PL :** | 20 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 | **PI :** | 14 |
| **Project No:** | 95618-92016 | **Depth (ft):** | 11 | **USCS:** | Lean Clay CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 22.2% |
| **Dry Unit Weight (pcf):** | 104.4 |
| **Diameter (in):** | 2.845 |
| **Height (in):** | 6.125 |
| **Void Ratio (-):** | 0.61 |
| **Saturation (%):** | 97.6% |
| **Moisture Content (Trim.%):** | 38.5% |
| **Cross Sectional Area ($in^2$):** | 6.357 |

**Final**

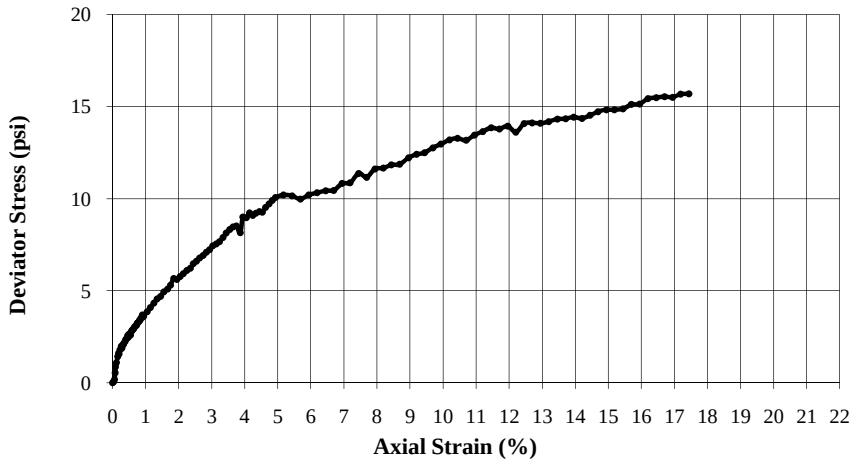
| | |
|---|---|
| **Moisture Content (%):** | 24.0% |
| **Dry Unit Weight (pcf):** | 102.0 |
| **Height (in):** | 4.903 |
| **Void Ratio (-):** | 0.65 |
| **Saturation (%):** | 99.4% |
| **Cross Sectional Area ($in^2$):** | 8.081 |

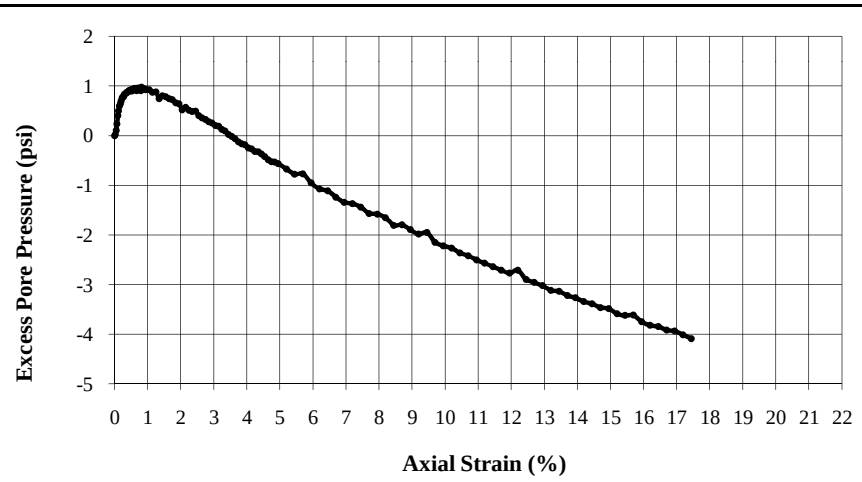
**End of Consolidation Data**

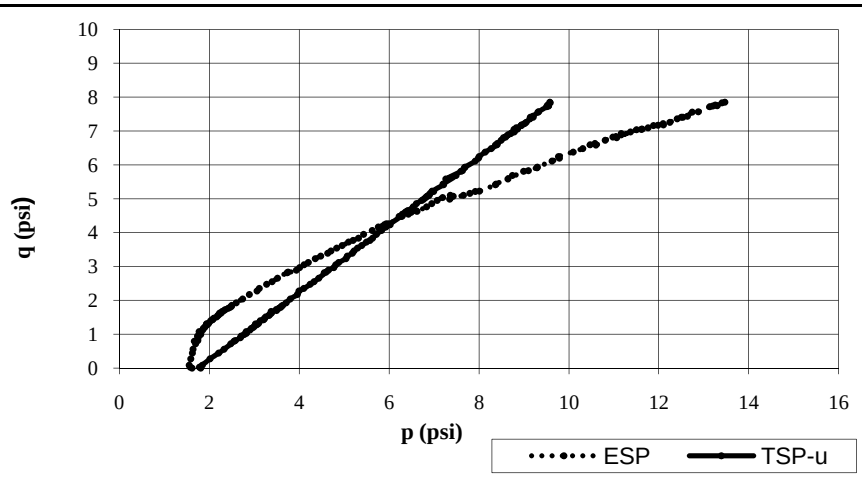
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 24.0% |
| **Dry Unit Weight (pcf):** | 102.0 |
| **Height (in):** | 6.124 |
| **Void Ratio (-):** | 0.65 |
| **Saturation (%):** | 99.4% |
| **Cross Sectional Area ($in^2$):** | 6.491 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 60 |
| **Consolidation Pressure (psi):** | 1.90 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1 |
| **Max. Deviator Stress (psi):** | 16.65 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 5.87 |
| **Major Eff. Pr. Stress (psi):** | 22.53 |
| **Undrained Strength Ratio (-):** | 4.38 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

CDM Smith

## Geotechnical Engineering Laboratory

### ISOTROPICALLY CONSOLIDATED UNDRAINED TRIAXIAL TEST SUMMARY - ASTM D4767

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | TVA | **Test Date:** | 5/14/2012 | **LL :** | 34 |
| **Project:** | Watts Bar Fossil Plant | **Exploration No:** | B-110 | **PL :** | 20 |
| **Location:** | Spring City, TN | **Sample No:** | U-1 | **PI :** | 14 |
| **Project No:** | 95618-92016 | **Depth (ft):** | 11 | **USCS:** | Lean Clay CL |

**Initial**

| | |
|---|---|
| **Moisture Content (%):** | 39.8% |
| **Dry Unit Weight (pcf):** | 80.7 |
| **Diameter (in):** | 2.845 |
| **Height (in):** | 6.078 |
| **Void Ratio (-):** | 1.09 |
| **Saturation (%):** | 99.0% |
| **Moisture Content (Trim.%):** | 38.5% |
| **Cross Sectional Area ($in^2$):** | 6.357 |

**Final**

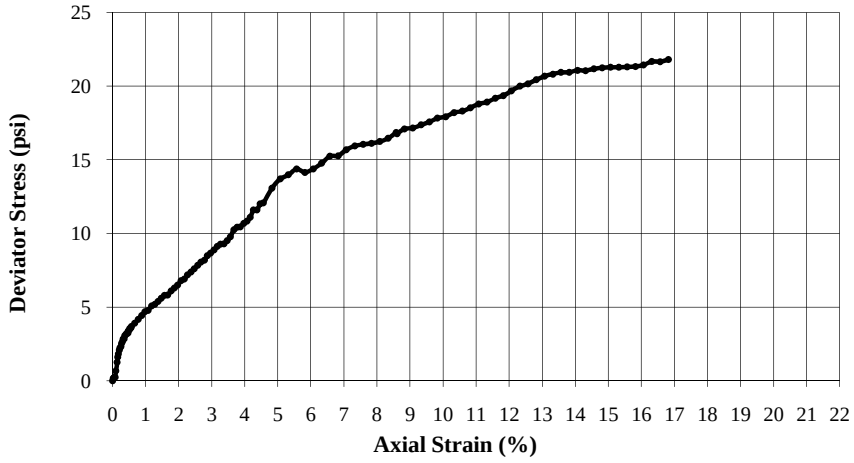
| | |
|---|---|
| **Moisture Content (%):** | 34.6% |
| **Dry Unit Weight (pcf):** | 86.9 |
| **Height (in):** | 4.954 |
| **Void Ratio (-):** | 0.94 |
| **Saturation (%):** | 99.5% |
| **Cross Sectional Area ($in^2$):** | 6.389 |

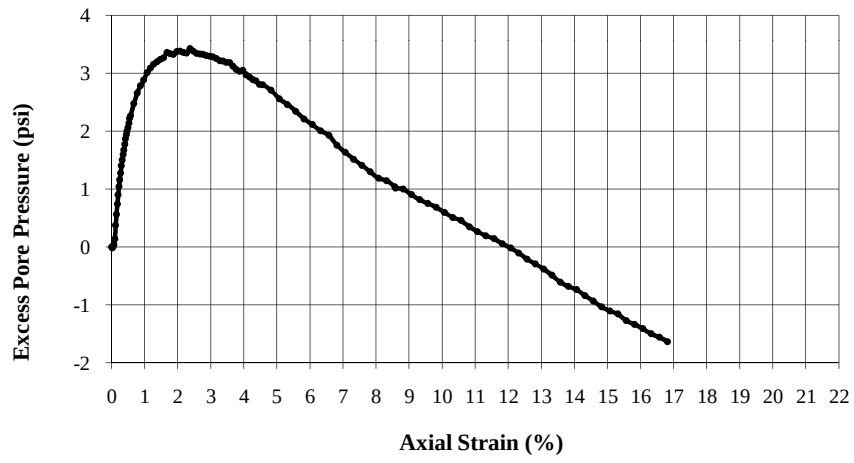
**End of Consolidation Data**

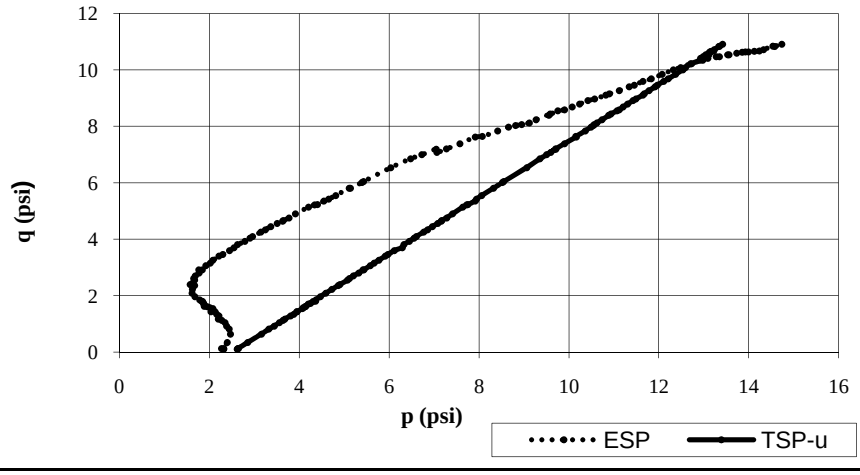
| | |
|---|---|
| **$A_c$ Evaluated using Method** | B |
| **Sample Saturated using Method** | B |
| **Moisture Content (%):** | 34.6% |
| **Dry Unit Weight (pcf):** | 86.9 |
| **Height (in):** | 6.077 |
| **Void Ratio (-):** | 0.94 |
| **Saturation (%):** | 99.5% |
| **Cross Sectional Area ($in^2$):** | 5.897 |
| **Pore Pressure Parameter B (-):** | 0.97 |
| **Final Back Pressure (psi):** | 50 |
| **Consolidation Pressure (psi):** | 2.89 |

**Shear Data**

| | |
|---|---|
| **Shear Strain Rate (%/hr):** | 1 |
| **Max. Deviator Stress (psi):** | 22.34 |
| **Strain at Failure (%):** | 15.00 |
| **Minor Eff. Pr. Stress (psi):** | 4.16 |
| **Major Eff. Pr. Stress (psi):** | 26.50 |
| **Undrained Strength Ratio (-):** | 3.86 |




**Notes:**

1. Value of Specific Gravity Gs is assumed
2. Failure criterion: max. deviator stress at strain ≤ 15%

**Remarks:**

# CDM Smith Geotechnical Engineering Laboratory

## CRS CONSOLIDATION TEST SUMMARY - ASTM D4186

**Client:** TVA
**Project:** Watts Bar Fossil Plant
**Location:** Spring City, TN
**Project No:** 95618-92016

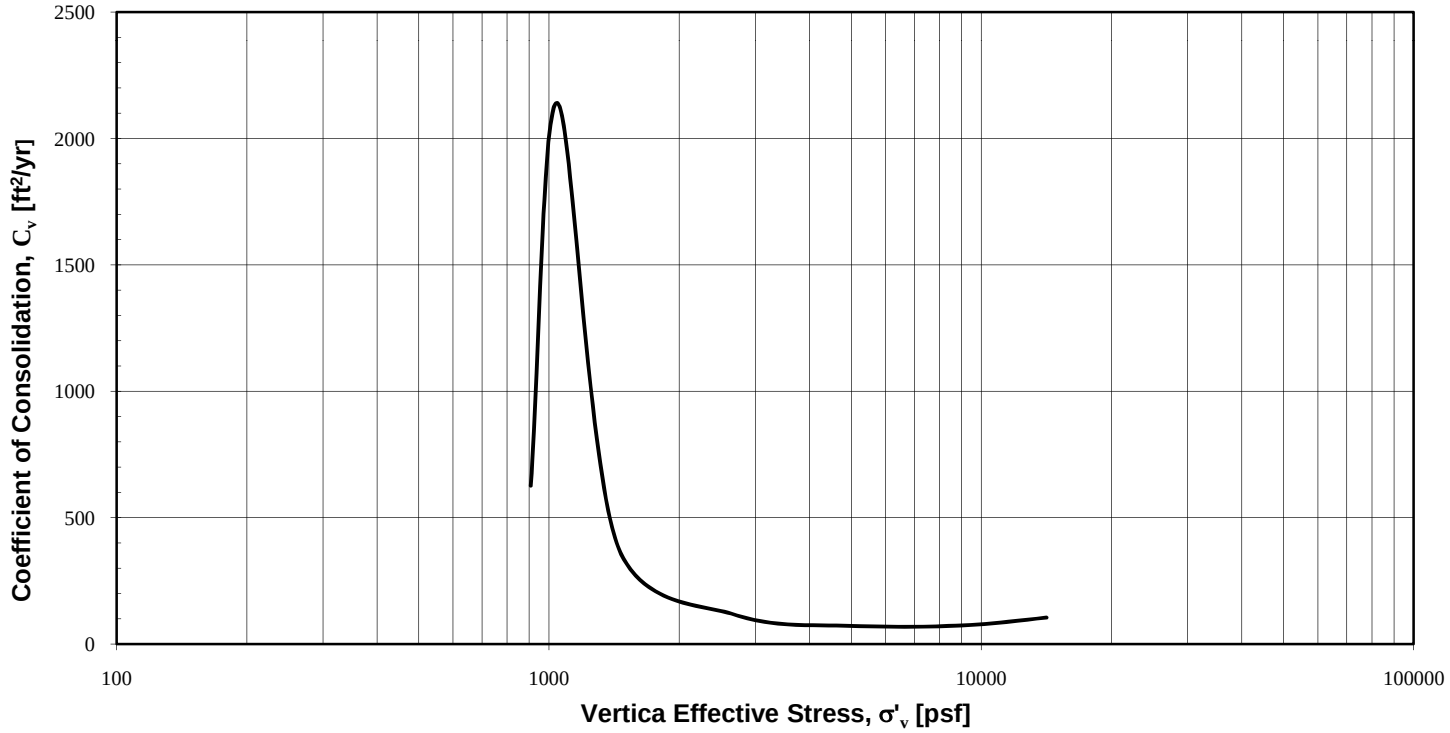
**Test Date:** 8/26/2012
**Exploration No:** B-110
**Sample No:** U-1
**Depth (ft):** 11
**Sample Description:** Lean Clay CL

| | Initial | Final |
|---|---|---|
| **Wet Mass (g)** | 152.98 | 144.19 |
| **Dry Mass (g)** | 119.26 | 119.26 |
| **Moisture Content (%):** | 28.3 | - |
| **Moist Unit Weight (pcf):** | 118.5 | - |
| **Dry Unit Weight (pcf):** | 92.4 | - |
| **Diameter (in):** | 2.50 | - |
| **Height (in)(*):** | 1.00 | 0.85 |
| **Void Ratio (-)(*):** | 0.81 | 0.54 |
| **Saturation (%):** | 93.48 | 100.0 |
| **Moisture Content (Trim.%):** | 29.9 | |

**Atterberg Limits:**

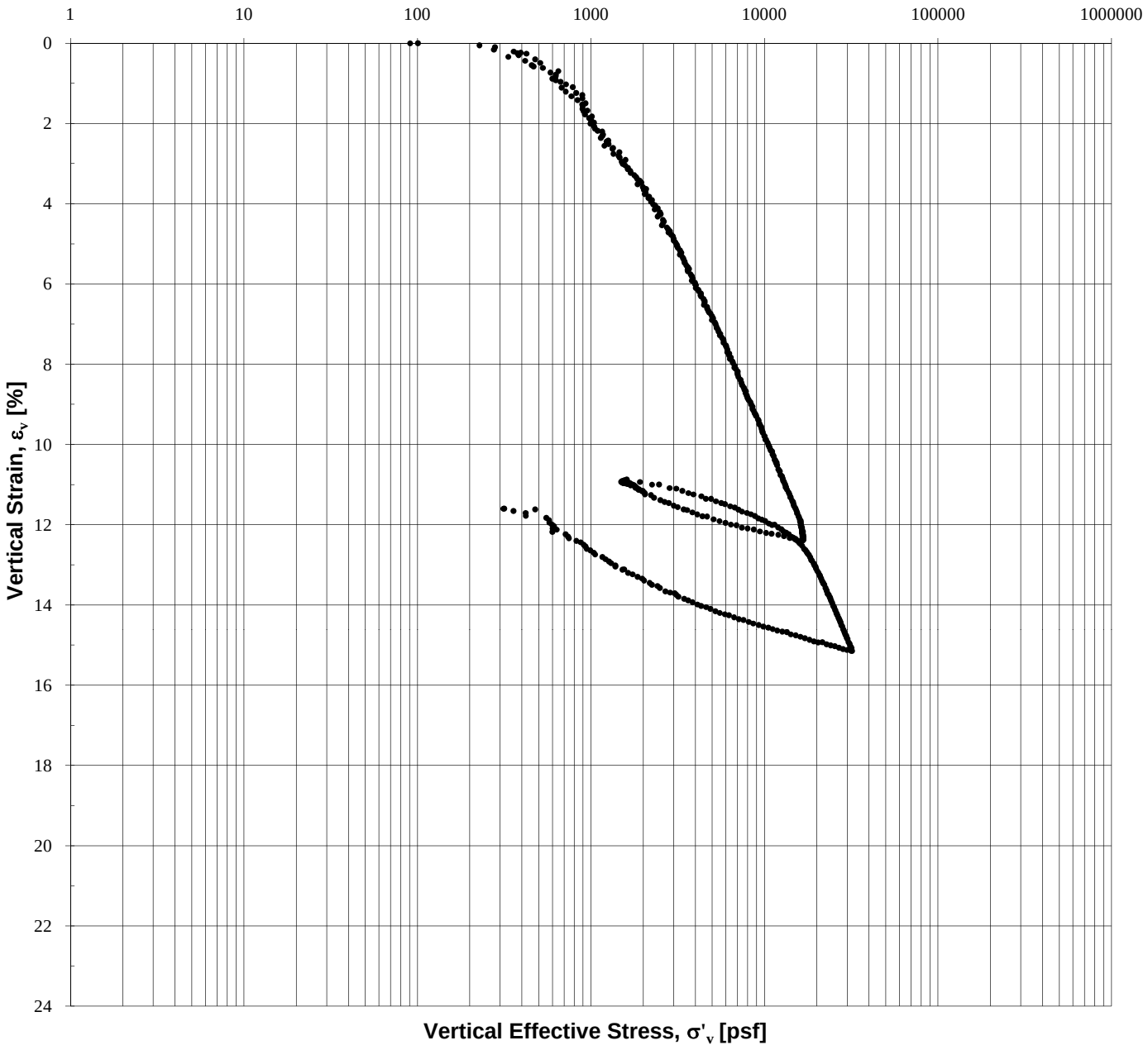
| | |
|---|---|
| **LL :** | 34 |
| **PL :** | 20 |
| **PI :** | 14 |

| | |
|---|---|
| **Consolidation Strain Rate (%/hr):** | 0.70 |
| **Final Back Pressure (psi):** | 60 |
| **Seating Pressure (psi):** | 2 |




**Notes:**
1. Consolidation test performed in accordance with ASTM D4186.
2. Value of Specific gravity Gs is assumed
(*) Reported final data are taken at maximum deformation

**Test Remarks:**




| | | | |
|---|---|---|---|
| **Exploration No:** | B-110 | **Preconsolidation Pressure (psf):** | 1,300 |
| **Sample No:** | U-1 | **Estimated In Situ Pressure (psf):** | 1,200 |
| **Depth (ft):** | 11 | **Compression Ratio, CR:** | 0.102 |
| **Sample Description:** | Lean Clay CL | **Recompression Ratio, RR:** | 0.022 |

| | | |
|---|---|---|
| **CDM Smith**<br>**Geotechnical Engineering Laboratory** | **Client:** TVA<br>**Project:** Watts Bar Fossil Plant<br>**Project No:** 95618-92016 | **CONSTANT RATE OF STRAIN CONSOLIDATION TEST**<br>**ASTM D4186** |

# CDM Smith Geotechnical Engineering Laboratory

## CRS CONSOLIDATION TEST SUMMARY - ASTM D4186

**Client:** TVA
**Project:** Watts Bar Fossil Plant
**Location:** Spring City, TN
**Project No:** 95618-92016

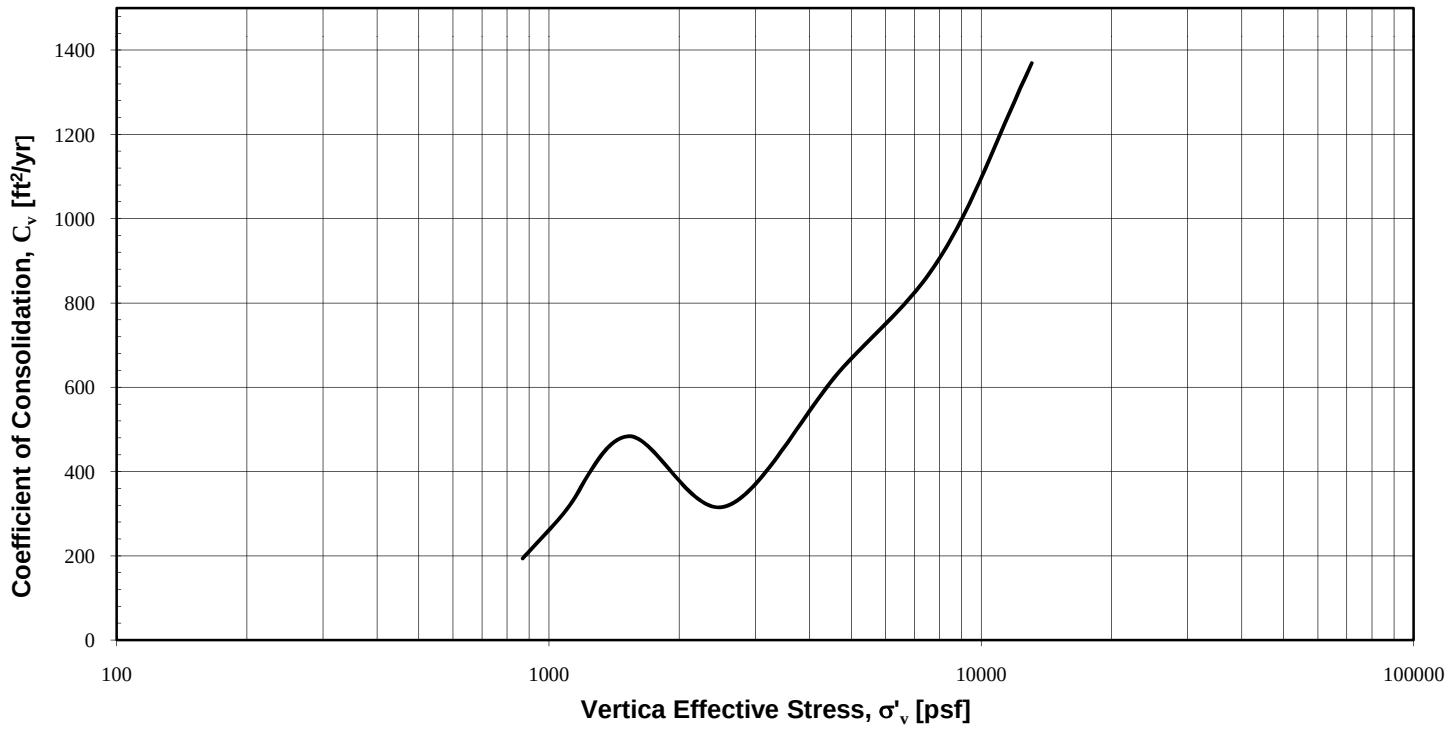
**Test Date:** 8/27/2012
**Exploration No:** B-110
**Sample No:** U-1
**Depth (ft):** 10.5
**Sample Description:** Black Ash

| | Initial | Final |
|---|---|---|
| **Wet Mass (g)** | 144.72 | 138.54 |
| **Dry Mass (g)** | 106.65 | 106.65 |
| **Moisture Content (%):** | 35.7 | - |
| **Moist Unit Weight (pcf):** | 112.1 | - |
| **Dry Unit Weight (pcf):** | 82.6 | - |
| **Diameter (in):** | 2.50 | - |
| **Height (in)(*):** | 1.00 | 0.86 |
| **Void Ratio (-)(*):** | 1.02 | 0.75 |
| **Saturation (%):** | 93.36 | 100.0 |
| **Moisture Content (Trim.%):** | 29.9 | |

**Atterberg Limits:**

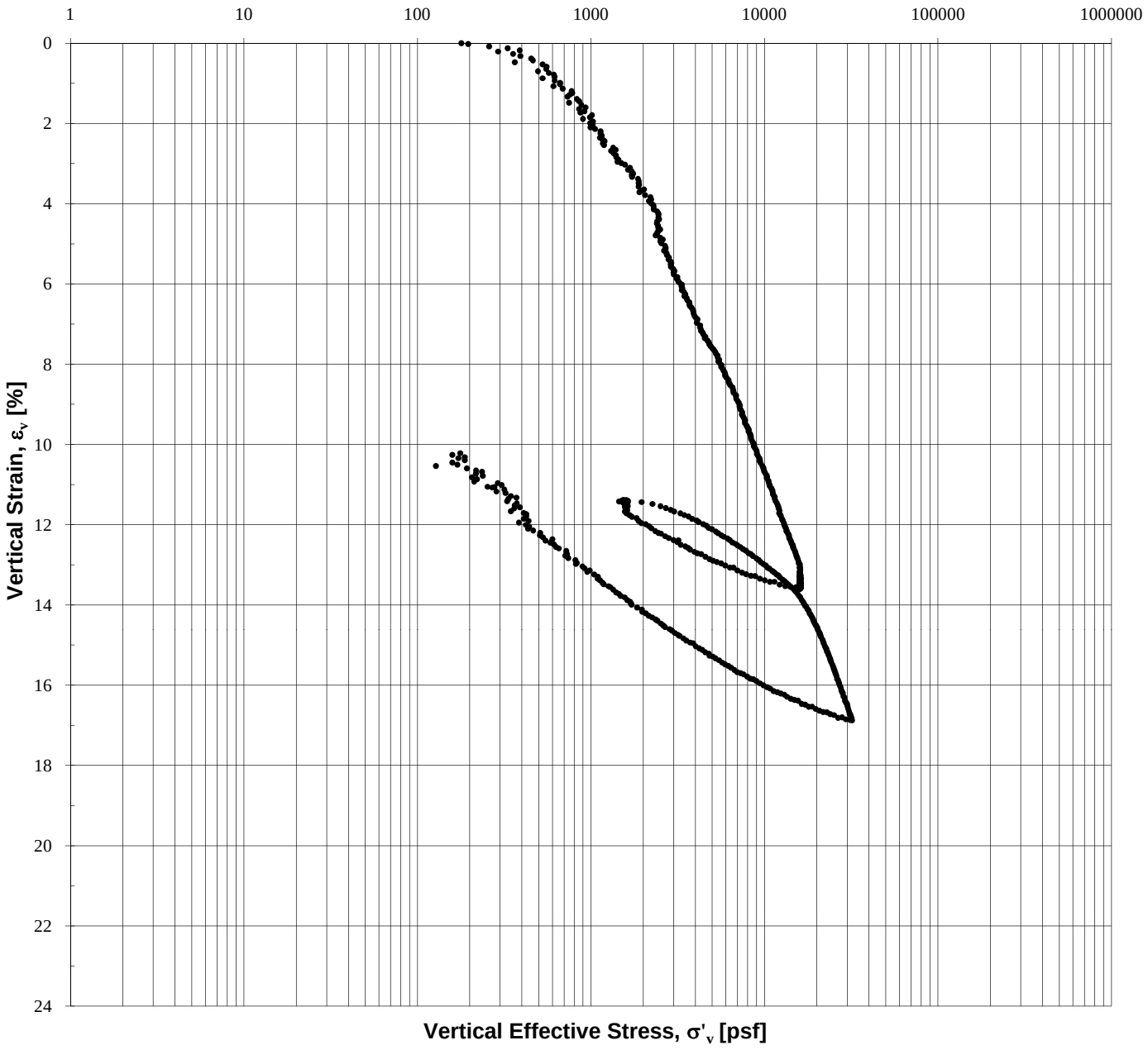
| | |
|---|---|
| **LL :** | 34 |
| **PL :** | 20 |
| **PI :** | 14 |

| | |
|---|---|
| **Consolidation Strain Rate (%/hr):** | 0.65 |
| **Final Back Pressure (psi):** | 59 |
| **Seating Pressure (psi):** | 2 |




**Notes:**
1. Consolidation test performed in accordance with ASTM D4186.
2. Value of Specific gravity Gs is assumed
(*) Reported final data are taken at maximum deformation

**Test Remarks:**




| | | | |
|---|---|---|---|
| **Exploration No:** | B-110 | **Preconsolidation Pressure (psf):** | 1,150 |
| **Sample No:** | U-1 | **Estimated In Situ Pressure (psf):** | 1,200 |
| **Depth (ft):** | 10.5 | **Compression Ratio, CR:** | 0.122 |
| **Sample Description:** | Black Ash | **Recompression Ratio, RR:** | 0.021 |

**CDM Smith**
**Geotechnical Engineering Laboratory**

**Client:** TVA
**Project:** Watts Bar Fossil Plant
**Project No:** 95618-92016

**CONSTANT RATE OF STRAIN CONSOLIDATION TEST**
**ASTM D4186**

# CDM Smith Geotechnical Engineering Laboratory

## CRS CONSOLIDATION TEST SUMMARY - ASTM D4186

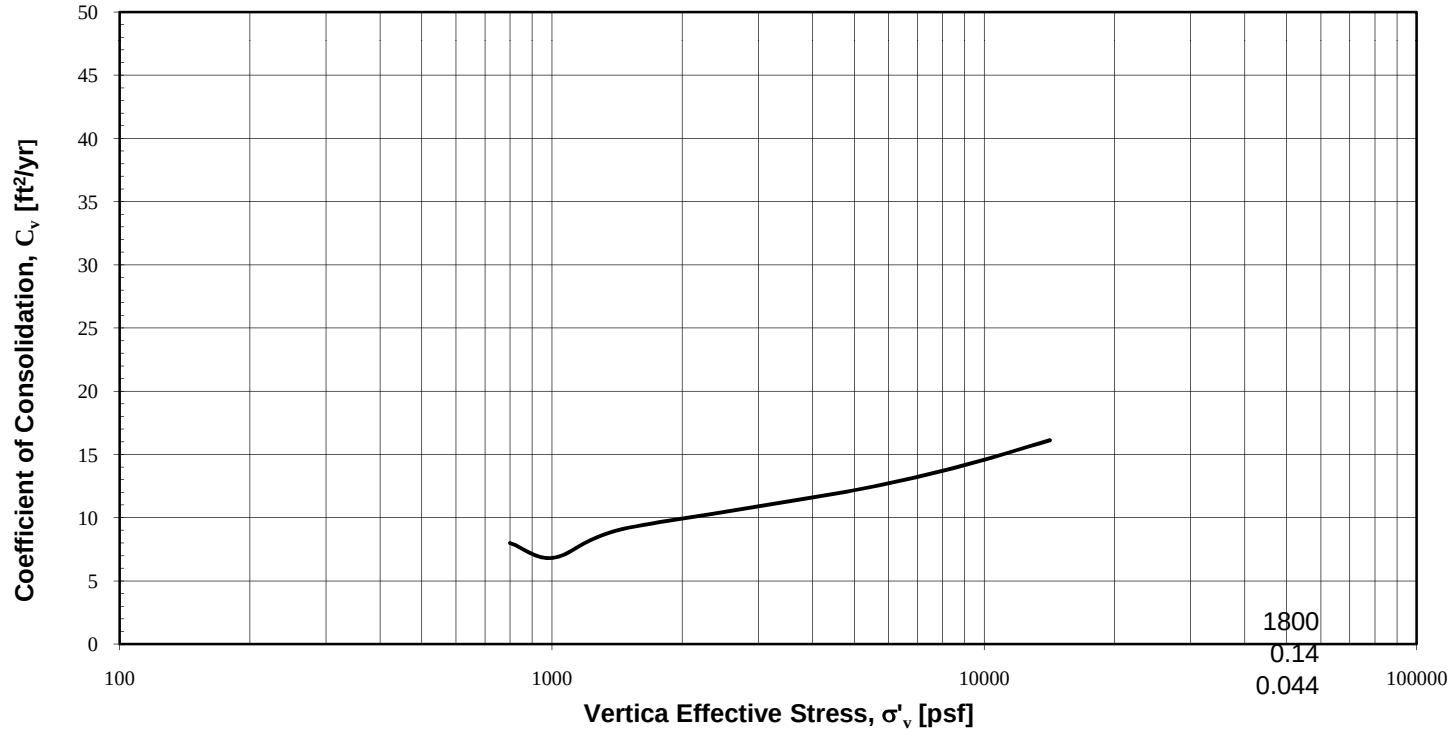
**Client:** TVA
**Project:** Watts Bar Fossil Plant
**Location:** Spring City, TN
**Project No:** 95618-92016

**Test Date:** 8/22/2012
**Exploration No:** B-111
**Sample No:** U-1
**Depth (ft):** 24
**Sample Description:** Lean Clay CL

| | Initial | Final |
|---|---|---|
| **Wet Mass (g)** | 155.32 | 148.12 |
| **Dry Mass (g)** | 119.90 | 119.90 |
| **Moisture Content (%):** | 29.5 | - |
| **Moist Unit Weight (pcf):** | 120.3 | - |
| **Dry Unit Weight (pcf):** | 92.9 | - |
| **Diameter (in):** | 2.50 | - |
| **Height (in)(*):** | 1.00 | 0.82 |
| **Void Ratio (-)(*):** | 0.80 | 0.47 |
| **Saturation (%):** | 98.84 | 100.0 |
| **Moisture Content (Trim.%):** | 28.0 | |

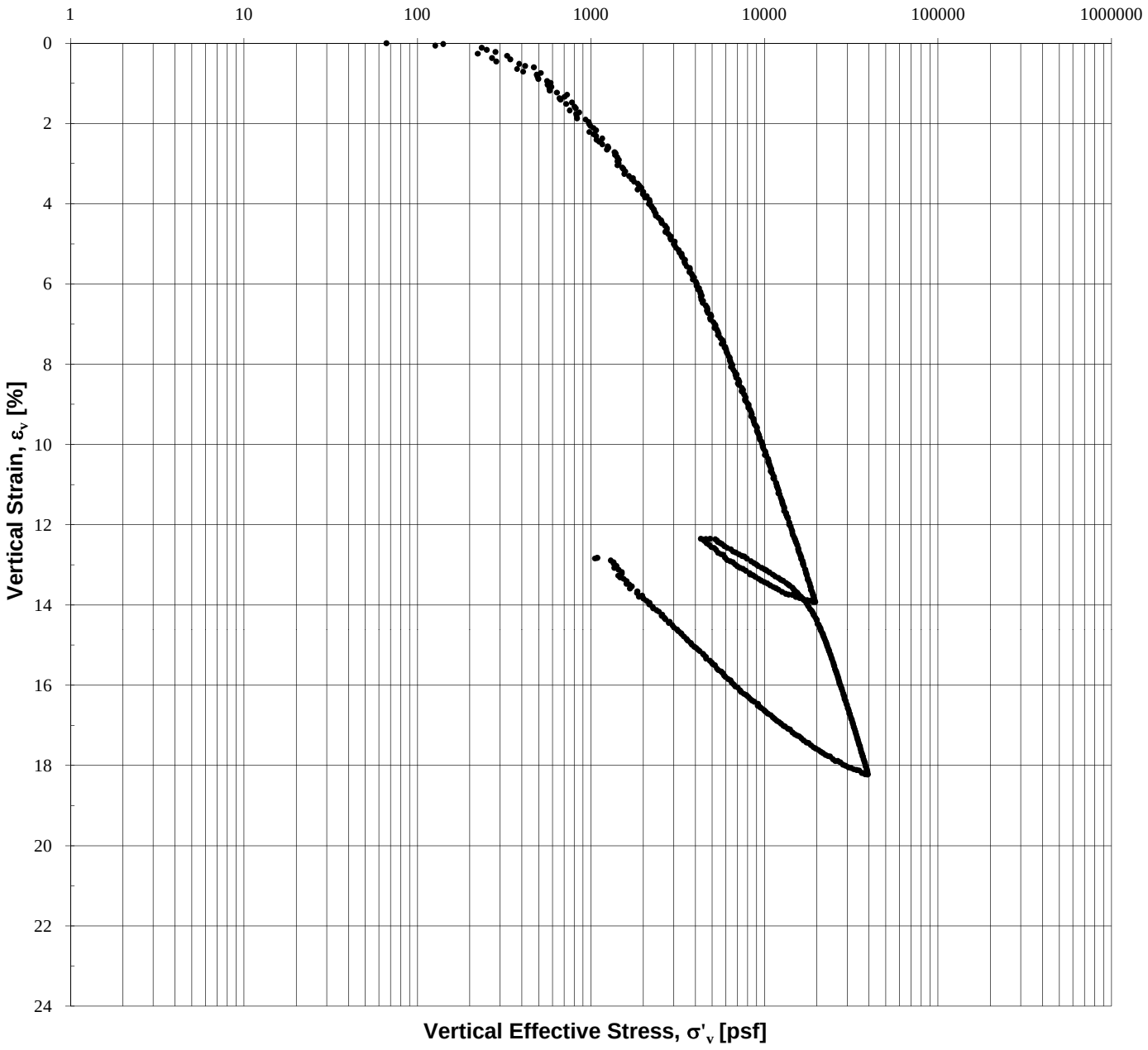
**Atterberg Limits:**
**LL :** 40
**PL :** 21
**PI :** 19

**Consolidation Strain Rate (%/hr):** 0.83
**Final Back Pressure (psi):** 90
**Seating Pressure (psi):** 2




**Notes:**
1. Consolidation test performed in accordance with ASTM D4186.
2. Value of Specific gravity Gs is assumed
(*) Reported final data are taken at maximum deformation

**Test Remarks:**




| | | | |
|---|---|---|---|
| **Exploration No:** | B-111 | **Preconsolidation Pressure (psf):** | 1,850 |
| **Sample No:** | U-1 | **Estimated In Situ Pressure (psf):** | 1,800 |
| **Depth (ft):** | 24 | **Compression Ratio, CR:** | 0.140 |
| **Sample Description:** | Lean Clay CL | **Recompression Ratio, RR:** | 0.044 |

| | | |
|---|---|---|
| **CDM Smith**<br>**Geotechnical Engineering Laboratory** | **Client:** TVA<br>**Project:** Watts Bar Fossil Plant<br>**Project No:** 95618-92016 | **CONSTANT RATE OF STRAIN CONSOLIDATION TEST**<br>**ASTM D4186** |

# CDM Smith Geotechnical Engineering Laboratory

## CRS CONSOLIDATION TEST SUMMARY - ASTM D4186

**Client:** TVA
**Project:** Watts Bar Fossil Plant
**Location:** Spring City, TN
**Project No:** 95618-92016

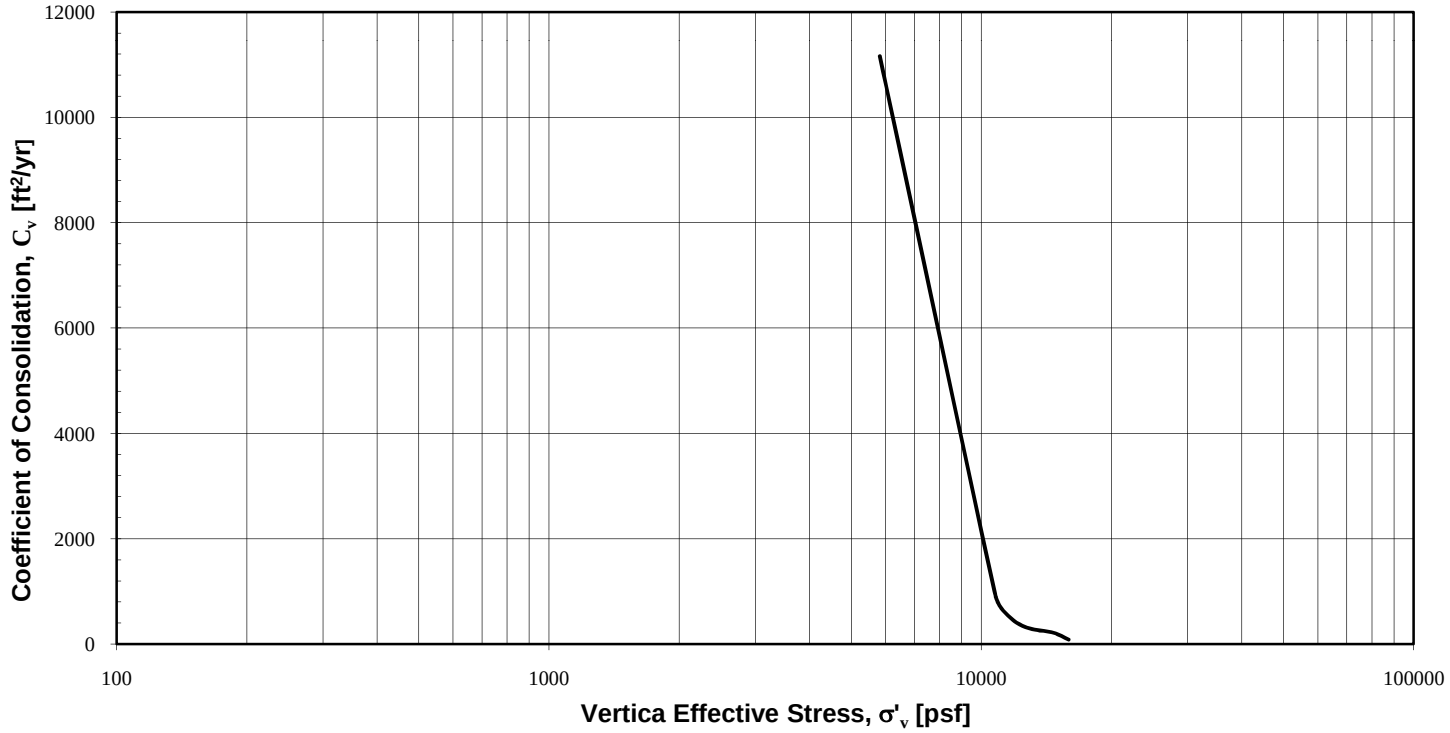
**Test Date:** 8/8/2012
**Exploration No:** B-105
**Sample No:** U-1
**Depth (ft):** 17
**Sample Description:** Lean Clay CL

| | Initial | Final |
|---|---|---|
| **Wet Mass (g)** | 161.97 | 168.11 |
| **Dry Mass (g)** | 130.80 | 130.80 |
| **Moisture Content (%):** | 23.8 | - |
| **Moist Unit Weight (pcf):** | 125.4 | - |
| **Dry Unit Weight (pcf):** | 101.3 | - |
| **Diameter (in):** | 2.50 | - |
| **Height (in)(*):** | 1.00 | 0.91 |
| **Void Ratio (-)(*):** | 0.65 | 0.50 |
| **Saturation (%):** | 98.12 | 100.0 |
| **Moisture Content (Trim.%):** | | - |

**Atterberg Limits:**

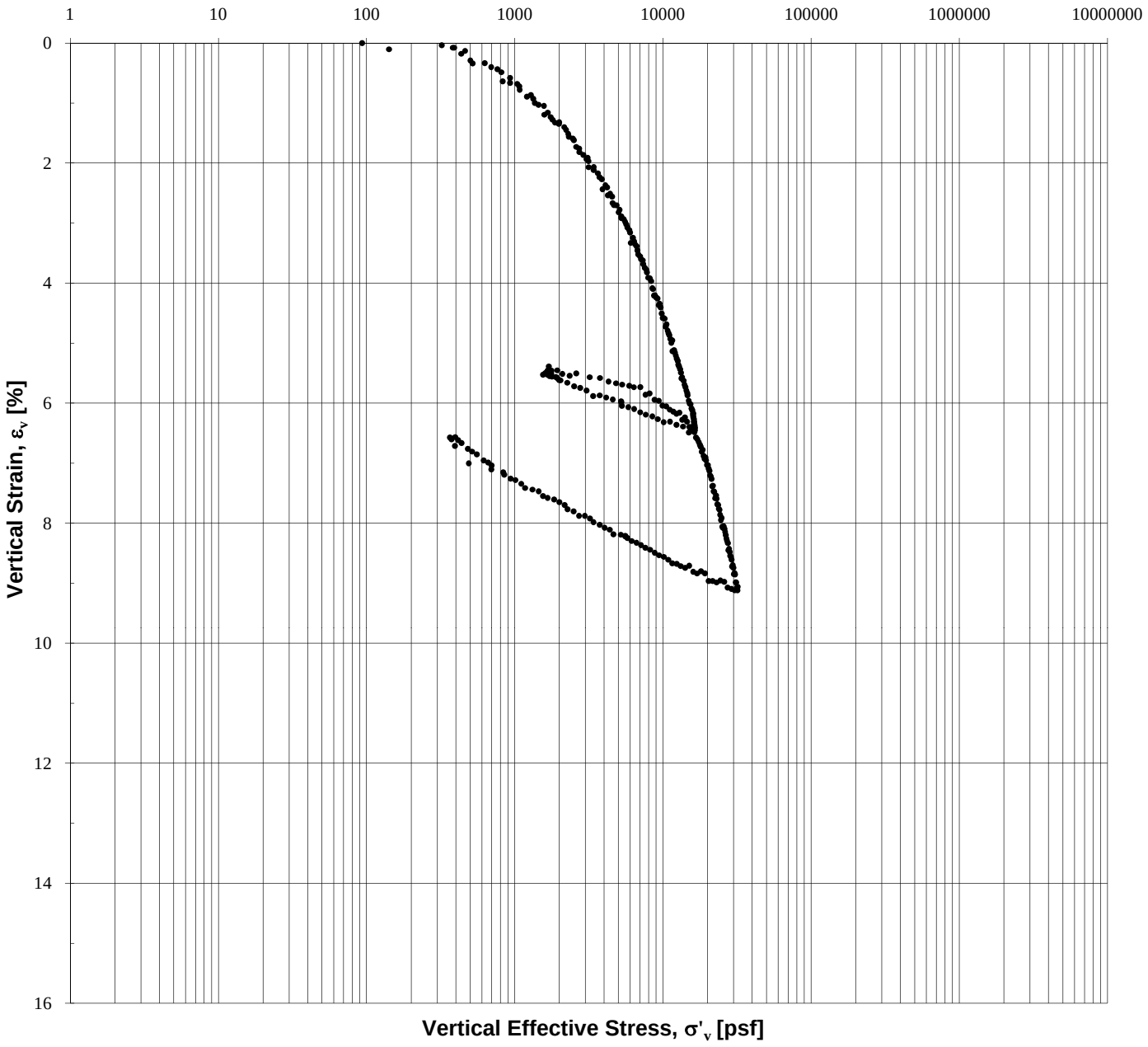
| | |
|---|---|
| **LL :** | 37 |
| **PL :** | 22 |
| **PI :** | 15 |

| | |
|---|---|
| **Consolidation Strain Rate (%/hr):** | 0.32 |
| **Final Back Pressure (psi):** | 60 |
| **Seating Pressure (psi):** | 2 |




**Notes:**
1. Consolidation test performed in accordance with ASTM D4186.
2. Value of Specific gravity Gs is assumed
(*) Reported final data are taken at maximum deformation

**Test Remarks:**




| | | | |
|---|---|---|---|
| **Exploration No:** | B-105 | **Preconsolidation Pressure (psf):** | 4,000 |
| **Sample No:** | U-1 | **Estimated In Situ Pressure (psf):** | 2,040 |
| **Depth (ft):** | 17 | **Compression Ratio, CR:** | 0.084 |
| **Sample Description:** | Lean Clay CL | **Recompression Ratio, RR:** | 0.009 |

**CDM Smith**
**Geotechnical Engineering Laboratory**

**Client:** TVA
**Project:** Watts Bar Fossil Plant
**Project No:** 95618-92016

**CONSTANT RATE OF STRAIN CONSOLIDATION TEST**
**ASTM D4186**