GEOTECHNICAL ENGINEERING STUDY

Possum Point Power Station Ash Pond ABC
Dominion Resources Services, Inc.
Prince William County, Virginia

Schnabel Reference 14221002.01
December 9, 2014

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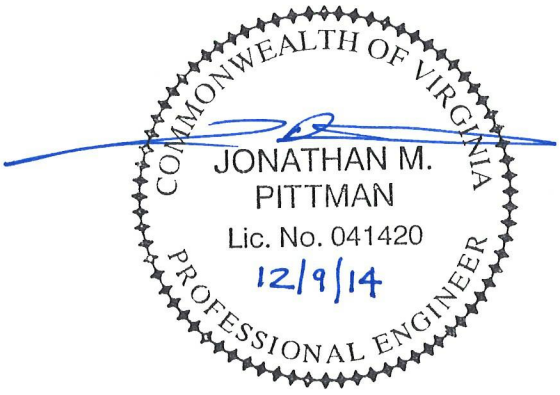

Jonathan M. Pittman, PE
Commonwealth of Virginia Professional Engineer No. 041420

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ENGINEERING SERVICES, DOMINION POSSUM POINT POWER STATION
GEOTECHNICAL ENGINEERING STUDY FOR ASH POND ABC
DOMINION RESOURCES SERVICES, INC.
POSSUM POINT POWER STATION
PRINCE WILLIAM COUNTY, VIRGINIA

CONTENTS

1 INTRODUCTION 1

1.1 Background 1
1.2 Site Description 2
1.3 Scope of Services 2
1.4 Elevation Datum 3
1.5 Terminology 3

2 GEOTECHNICAL EXPLORATION AND TESTING 4

2.1 Field Exploration 4
2.2 Soil Laboratory Testing 5

3 REGIONAL GEOLOGY AND SUBSURFACE CONDITIONS 6

3.1 Regional Geology 6
3.2 Generalized Subsurface Stratigraphy 6
3.3 Groundwater Levels 8

4 GEOTECHNICAL ENGINEERING ANALYSES 9

4.1 General 9
4.2 Soil Parameters 9
4.3 Embankment Slope Stability Analyses 10

5 ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS 12

5.1 Embankment Slope Repairs and Height Increase 12
5.2 Embankment Crest and Downstream Slope Maintenance 13

6 LIMITATIONS 14

7 REFERENCES 15

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LIST OF FIGURES

Figure 1: Site Vicinity Map
Figure 2: Field Exploration Plan
Figure 3: Regional Geologic Map

APPENDICES

Appendix A: Subsurface Exploration Data
Appendix B: Soil Laboratory Test Data
Appendix C: Slope Stability Analyses

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1 INTRODUCTION

1.1 Background

Schnabel has been retained by Dominion Resource Services, Inc. (Dominion) to evaluate the stability of the embankment for Ash Pond ABC at Possum Point Power Station in Prince William County, Virginia. Ash Pond ABC is located south and west of Possum Point Road about ½ mile west of the station. A site vicinity map is included as Figure 1.

The dam that impounds Ash Pond ABC is considered a single structure. However, there are three distinct areas within the pond that are referred to herein as Ash Pond A, Ash Pond B, and Ash Pond C in order to more accurately describe the location of existing features, etc.

Based on information provided by Dominion, Ash Pond ABC was constructed in the 1950s. Ash was sluiced to the pond until the late 1960s when the pond was generally filled with ash to within a few feet of the top of the embankment. Over 80% of the original impoundment capacity is filled with consolidated ash. Since that time, storm water runoff has resulted in embankment overtopping at three low areas. The overtopping flows have resulted in some erosion and head cutting of the embankment, most noticeably at an approximately 110-foot long section of the downstream slope of the embankment in the area of Ash Pond A.

The dam that impounds the pond is a vegetated earth embankment that has a maximum height of about 20 feet and an original total impoundment capacity of approximately 177,000 cubic yards (about 110 acre-feet). Despite the fact that the majority of the pond has been filled with consolidated ash, the dam meets the minimum height and storage requirements for a regulated impounding structure set forth in the *Commonwealth of Virginia Impounding Structure Regulations* (VA DCR, 2012) based on its height and original storage capacity. We understand that VA DCR Dam Safety now considers ash ponds to be significant hazard potential structures, at a minimum. The spillway design flood (SDF) for a significant hazard potential structure is ½ of the Probable Maximum Flood (PMF). VA DCR regulations allow for the possibility of reducing the SDF to the 100-year flood through an incremental damage analysis (IDA).

Schnabel has been retained by Dominion to provide the services required to obtain a regular Operation and Maintenance (O&M) Certificate from VA DCR Dam Safety and to design improvements to reduce the risk of overtopping of the embankment during future storm events. The evaluation of embankment slope stability is a part of this scope of services.

Our scope of services for obtaining a regular O&M Certificate from VA DCR Dam Safety also includes evaluating the hydraulic capacity of the existing spillway, determining the hazard potential classification of the dam, and preparing the associated breach inundation maps. The results of these analyses and the breach inundation maps are provided in Schnabel's "Dam Breach Analysis Report and Inundation Mapping" dated December 9, 2014 (Schnabel, 2014). Design documents and an erosion and sediment control plan are also being developed to support the implementation of the recommendations discussed in this report and the recommendations resulting from the additional analyses discussed above.

As indicated in the "Dam Breach Analysis Report and Inundation Mapping" (Schnabel, 2014), Schnabel is recommending that the SDF for Ash Pond ABC be reduced to the 100-year flood based on the results of the IDA. Despite this reduction in the SDF, the existing spillway does not have the capacity to pass the

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100-year flood without overtopping the embankment at its existing, minimum crest elevation. Therefore, Dominion intends to address the inadequate spillway capacity of Ash Pond ABC by diverting a portion of the watershed around the pond and raising the crest of the embankment to El 23.5, or by increasing the capacity of the existing spillway system through the removal of one or more stop logs. The analyses, conclusions, and recommendations included in this report are based on the option of diverting water around the pond and raising the crest of the embankment.

1.2 Site Description

As described above, Ash Pond ABC is impounded by a vegetated earth embankment constructed along a tributary to Quantico Creek. The embankment varies in height from a few feet to over 20 feet. The embankment is approximately 1,800 feet long and has an average crest elevation between El 21 and El 23 and an average crest width of about 15 feet. The embankment has upstream and downstream slope angles of approximately 2H:1V, although several sections of the downstream slope are slightly steeper than 2H:1V.

The spillway system for the ponds is located at the northwest corner of Ash Pond C. The spillway consists of a 4-foot by 4-foot reinforced concrete riser and 30-inch reinforced concrete outlet pipe that discharges into Quantico Creek at the downstream toe of the dam. Reinforced concrete and wood stop logs, placed in slots along the upstream face of the spillway riser, control the normal pool elevation of the ponds. The top of the stop logs is currently set at El 22.3. The top of the riser, which is at El 22.8, is open with a slotted metal grate across the opening.

Large trees and woody vegetation are present along the edges of the embankment crest and the downstream embankment slope. Tidal marshland, trees, and other woody vegetation are present throughout the majority of the ponds' watershed and along the majority of the downstream toe of the embankment.

In addition to addressing inadequate spillway capacity as mentioned previously, Dominion plans to repair the eroded areas of the embankment where the overtopping has occurred. Dominion also plans to remove the trees and woody vegetation from the embankment crest and slopes and 25 feet beyond the embankment limits in accordance with the *Commonwealth of Virginia Impounding Structure Regulations* (VA DCR, 2012).

We obtained the site information from the April 5, 2014 photogrammetric survey performed by Axis Geospatial, LLC of Easton, MD, through archival information provided by Dominion, and through our observations during recent site visits.

1.3 Scope of Services

Schnabel performed the following services for this project:

- Review of record drawings provided by Dominion,
- Coordination of project activities with Dominion personnel and subcontractors,
- Subcontracting with Fishburne Drilling, Inc. to perform test borings,
- Field engineering including boring stakeout, drilling observation, logging of the subsurface conditions (test borings and hand auger borings), and delivering split spoon and Shelby tube

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samples to our corporate laboratory for soil index testing, as well as triaxial and consolidation testing,
- Soil laboratory testing,
- Embankment slope stability analyses, and
- Preparation of a report to summarize the results of our field exploration, soil laboratory testing, and slope stability analyses.

1.4 Elevation Datum

Elevations in this report are in feet and referenced to the North American Vertical Datum of 1988 (NAVD88). The abbreviation “El” represents Elevation.

1.5 Terminology

Descriptive nomenclature for dams is based upon one looking downstream. The terms “right” and “left” are referenced in this manner. The reservoir side is known as “upstream” with the opposite side of the dam referred to as “downstream”.

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2 GEOTECHNICAL EXPLORATION AND TESTING

2.1 Field Exploration

The field exploration included:

- six (6) test borings with split-spoon sampling
- two (2) hand auger borings,
- multiple thin-wall Shelby tube samples collected in two of the test borings, and
- groundwater level measurements in the test borings and hand auger borings.

Drilling was performed by our subcontractor, Fishburne Drilling, Inc. of Ashland, Virginia, on July 30 and 31, 2014. The test borings were drilled with a CME-550X all-terrain rig. The coordinates of the test borings were located in the field by Schnabel personnel using a portable Trimble GPS unit.

The test borings were drilled in soil through the crest of the embankment to termination depths ranging from 20 feet to 45 feet below the existing ground surface (bgs). The test borings were advanced using open-hole mud-rotary drilling techniques. Bentonite drilling fluid was recirculated during drilling to maintain an open borehole and a 3½-inch OD (outside diameter) tri-cone roller bit was used to advance the borings. A 10-foot long, 4-inch ID (inner diameter) surface casing was also installed to facilitate this drilling technique. Additional information on the drilling and sampling techniques used is provided in Appendix A.

The Standard Penetration Test (SPT) was performed in the mud-rotary test borings continuously to a depth of 10 feet bgs, and then at 5-foot intervals thereafter. SPTs were performed using a 24-inch long, split-spoon sampler to collect soil samples and to measure the relative penetration resistance of the soils. The number of blows (blow count) of a 140 pound hammer falling 30 inches required to drive the split spoon sampler four consecutive 6-inch increments were recorded. The SPT N-value is defined as the sum of the second and third 6-inch blow count intervals. The SPTs were performed in general accordance with ASTM D1586.

Relatively undisturbed samples of the embankment fill soils and alluvial soils were collected in test borings B-02 and B-06 using 3-inch-ID thin-wall Shelby tubes. The Shelby tube sampling was performed in general accordance with ASTM D1587.

A Schnabel representative observed the field exploration, logged the test borings, and described the soils using the Unified Soil Classification System (ASTM D2488). The borings were backfilled with bentonite chips upon completion. The ground water level readings taken in the test borings are discussed in Section 3.3 of this report.

Schnabel personnel drilled two hand auger borings (HA-01 and HA-02) near the downstream toe of the embankment to collect data on the soils in these areas. Hand auger borings HA-01 and HA-02 were drilled to depths of 10 feet and 6 feet bgs, respectively, and were backfilled with soil cuttings upon completion.

The test boring logs and hand auger boring logs are included in Appendix A. The locations of the test borings and the hand auger borings are shown on the Field Exploration Plan in Figure 2.

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2.2 Soil Laboratory Testing

Geotechnical laboratory testing was performed by our Blacksburg, Virginia laboratory on selected soil samples obtained during the field exploration. Soil laboratory tests were performed to aid in the classification of soils, to provide data for use in the preparation of our stability analyses, and to aid in the development of our geotechnical recommendations. The followings numbers and types of tests were performed:

- sixteen (16) moisture content tests (ASTM D2216),
- seven (7) Atterberg limits tests (ASTM D4318),
- five (5) particle-size distribution tests (ASTM D422 and D1140),
- three (3) particle-size distribution tests with hydrometer (ASTM D422 and D1140),
- three (3) #200-sieve particle-size distribution tests (ASTM D422 and D1140),
- three (3) specific gravity tests (ASTM D854)
- three (3) unit weight determination tests (ASTM D7263),
- one (1) one-dimensional consolidation test with incremental loading (ASTM D2435), and
- two (2) series of consolidated-undrained triaxial compression tests with pore pressure measurements (ASTM D4767).

The results of the consolidation and shear strength testing are presented in Tables 1 and 2, respectively. The remaining laboratory test results are presented in Appendix B.

Table 1: Consolidation Testing Summary

Material	Recompression Ratio, Cεr	Virgin Compression Ratio, Cεc	Preconsolidation Pressure, σ_p' (tsf)	Coefficient of Vertical Consolidation, C_v, (ft^2/day)
Fine-Grained Embankment Fill Stratum A1	0.021	0.12	1.1	0.03 @ 2 tsf

Table 2: Shear Strength Testing Summary

Material	Total Stress Cohesion, c (psf)	Total Stress Friction Angle, φ (degrees)	Effective Stress Cohesion, c' (psf)	Effective Stress Friction Angle, φ' (degrees)
Fine-Grained Embankment Fill Stratum A1	290	14	230	23
Fine-Grained Alluvium Stratum B1	530	17	500	24

The total stress and effective stress shear strength parameters presented above were obtained from the Mohr's circles plotted at the maximum principal stress ratios.

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3 REGIONAL GEOLOGY AND SUBSURFACE CONDITIONS

3.1 Regional Geology

We reviewed existing geologic data and information in our files. Based on this review, the general geologic stratigraphy at the site consists of embankment fill over river terrace deposits of late Pleistocene age which are underlain by Cretaceous age sediments of the Potomac Group. The terrace deposits are alluvial soils that typically consist of a mixture of clay, silt, sand and gravel. These soils typically exhibit moderate strength and compressibility. Portions of the Pleistocene age alluvial deposits have been eroded and replaced with more recent alluvial soils deposited by Quantico Creek and its tributaries. The portion of the Geologic Map of the Quantico Quadrangle in Prince William County, Virginia where the site is located is included as Figure 3.

3.2 Generalized Subsurface Stratigraphy

The embankment fill soils range in thickness from a few feet near the abutments to about 22 feet at test borings B-02 and B-06. The fill soils are underlain by fine to coarse-grained alluvial soils varying in thickness from less than three feet in B-05 to 15 feet in B-02. Coarse-grained terrace deposits were encountered below the alluvial soils. Where encountered, the terrace deposits ranged in thickness from 5 feet in B-02 to 26 feet in B-05. Borings B-02, B-05, and B-06 extended through the terrace deposits and were terminated within the fine-grained Cretaceous age soils. Test boring and hand auger logs are presented in Appendix A. Our interpretation of the generalized subsurface stratigraphy is presented in the following paragraphs:

Ground Cover:

Approximately one to two inches of grass, rootmat, and topsoil were encountered at the ground surface in each of the test borings performed through the crest of the embankment (B-01 through B-06). Approximately four inches of rootmat and topsoil were encountered at the ground surface in the hand auger borings (HA-01 and HA-02) performed near the downstream toe of the embankment.

Stratum A1: Fine-Grained Embankment Fill

These materials likely exist on the site as a result of embankment construction and associated earth-moving and construction activities. The fine-grained fill materials encountered on the site generally consist of lean clays (CL) and fat clays (CH) with varying amounts of sand, and to a lesser extent, low-plasticity silts (ML) and elastic silts (MH). The fine-grained fill materials were generally moist and yellowish-brown to gray in color. These soils had low to high plasticity with liquid limits ranging from 28 to 60 and plasticity limits ranging from 19 to 55 (plasticity indices (PI) of 9 to 37). The natural moisture contents of these soils ranged from 14 to 30 percent, which is about 1 to 8 percent above their plastic limits. The fine-grained fill materials were observed in all of the test borings, at depths ranging from 0 to 22 feet bgs. Fine-grained fill materials were also encountered in hand auger HA-01 at depths ranging from just below the ground surface to the termination depth of the boring at 10 feet bgs. The SPT N-values recorded when sampling in the fine-grained fill materials ranged from 1 to 22 blows per foot (bpf) with an average of 8 bpf. Blow counts from samples that crossed strata interfaces were not included when calculating the average N-value for the fine-grained fill materials.

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Stratum A2: Coarse-Grained Embankment Fill

These materials likely exist on the site as a result of embankment construction and associated earth-moving and construction activities. The coarse-grained fill materials encountered on the site generally consist of fine to coarse-grained silty sands (SM) and clayey sands (SC) with varying amounts of gravel. The coarse-grained fill materials were generally moist to wet and brown to gray in color. The coarse-grained fill materials were observed in test borings B-04, B-05, and B-06. The coarse-grained fill materials were inter-layered with the fine-grained fill materials of Stratum A1 from depths of 0 to 22 feet bgs. The SPT N-values recorded when sampling in the coarse-grained fill materials ranged from 3 to 13 bpf with an average of 7 bpf. Blow counts from samples that crossed strata interfaces were not included when calculating the average N-value for the coarse-grained fill materials.

Stratum B1: Fine-Grained Alluvium

Fine-grained alluvial soils consisting of lean clay (CL), fat clay (CH), low-plasticity silt (ML), and organic silt (OL) were encountered below the fill in all the test borings except B-06, In B-01, the fine-grained alluvium was overlying coarse-grained alluvium (stratum B2) while in B-03 and B-04 the fine-grained alluvial soils were encountered below layers of coarse-grained alluvium. The inorganic alluvial soils were generally moist and gray to light brown in color. The organic silt (OL) was moist and dark blackish gray in color and was only encountered as a 4-foot-thick layer beneath the fill in B-02. The fine-grained alluvial soils were observed at depths ranging from 9 to 35 feet bgs. The SPT N-values recorded when sampling in the fine-grained alluvial soils ranged from 2 to 9 bpf with an average of 5 bpf. Atterberg limits were performed on one sample of fine grained alluvium (CL) indicating a liquid limit of 49, plastic limit of 19, and a plasticity index of 30. The natural moisture content of the sample was 30 percent, approximately 11 percent above its plastic limit.

Stratum B2: Coarse-Grained Alluvium

Coarse-grained alluvial soils consisting of fine to medium-grained silty sands (SM) and clayey sand (SC) were generally encountered below the fill in test borings B-01, B-03, B-04 and B-06, These soils were interlayered with fine-grained alluvium (stratum B1) in B-01, B-03, and B-04. The coarse-grained soils were observed at depths ranging from 8 to 28 feet bgs. These soils occasionally contained fine quartz gravel and were generally moist and grayish-brown in color. The SPT N-values recorded when sampling in the coarse-grained alluvial soils ranged from 4 to 11 bpf with an average of 7 bpf.

Stratum C1 Coarse-Grained Pleistocene Terrace

The coarse-grained terrace deposits encountered at the site primarily consist of poorly-graded sands with silt (SP-SM), and to a lesser extent, silty sands (SM). The coarse-grained terrace deposits were generally moist and light gray to light brown in color. The coarse-grained terrace deposits were observed in test borings B-02, B-04, B-05 and B-06 at depths ranging from 17 to 42 feet bgs. These soils were found underlying the fine- and/or coarse-grained alluvial soils. Coarse-grained terrace deposits were also encountered in hand auger HA-02 from a depth of 2 feet bgs to the termination depth of the boring at 6 feet bgs. The SPT N-values recorded when

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sampling in the coarse-grained terrace deposits ranged from 10 bpf to greater than 50 bpf with an average of 30 bpf.

Stratum D Cretaceous Age Sediments

The Cretaceous age sediments of the Potomac Group were encountered in test borings B-02, B-05, and B-06 directly below the coarse-grained terrace deposits at depths ranging from 39 to 42 feet bgs. These sediments generally consist of low- to medium-plasticity lean clay (CL) with sand, medium- to high-plasticity fat clay (CH), and high-plasticity elastic silt (MH). The cretaceous age sediments were generally moist and light greenish gray to dark grayish green in color. SPT N-values recorded while sampling these sediments ranged from 17 to 26 bpf with an average of 22 bpf. Atterberg limits were performed on one sample of the cretaceous age sediments indicating a liquid limit of 55 and plasticity index of 22. The natural moisture content of the sample was 35, approximately 2 percent above the plastic limit.

3.3 Groundwater Levels

Groundwater level readings taken during and after drilling are recorded on the boring logs. These levels may or may not represent stabilized water level readings. The test borings were performed using bentonite mud rotary techniques, and as a result, water level data recorded on the logs may not be indicative of actual ground water levels due to the presence of bentonite drilling fluid in the boreholes.

Groundwater levels in open boreholes were observed at depths of 4 to 6.6 feet bgs, El 19 to El 15.5. Multiple readings were taken in borings B-01 through B-04 at time of drilling and up to 16 hours after drilling. Water level readings in test borings B-05 and B-06 were recorded only at time of drilling. The groundwater level in hand auger HA-02 was observed at 2.7 feet bgs (El 11.3) after drilling. Groundwater was not encountered in HA-01.

Some of the higher groundwater levels recorded on the logs may represent a perched groundwater condition or the effects of drilling with fluid. Perched groundwater is relatively common in stratified soils similar to those observed in our field exploration and generally occurs when a lower permeability layer retards surface water infiltration. Perched groundwater could occur at other locations on site and at higher elevations than those recorded on the logs.

The ground water levels on the logs show our estimate of the water table at the time the borings and hand augers were drilled. Fluctuations in the water table should be anticipated depending on variations in precipitation, surface runoff, pumping, evaporation, leaking utilities, pond levels, and similar factors.

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4 GEOTECHNICAL ENGINEERING ANALYSES

4.1 General

The geotechnical engineering analyses were performed to support the evaluation of the embankment slope stability and the design of measures to address the pond's inadequate spillway capacity. As described in Schnabel's "Dam Breach Analysis Report and Inundation Mapping" (Schnabel, 2014), the design of improvements to Ash Pond ABC includes diverting a portion of the watershed around the pond and raising the dam crest to El 23.5 along its entirety such that the existing spillway can safely pass the 100-year flood with up to 0.4 feet of freeboard.

Slope stability analyses were performed for two sections of the embankment under various loading conditions. Our slope stability analyses were based on the information collected during our subsurface exploration and soil laboratory testing programs.

The embankment was modeled with the proposed increase in crest elevation to El 23.5 feet. Raising the crest of the embankment to El 23.5 will require the placement of up to three feet of soil fill with an average of less than 12 inches of soil fill across the approximately 1,800-foot long embankment crest. The analyses presented in this report are based the proposed stormwater diversion system being in-place and an embankment crest elevation of El 23.5 feet.

4.2 Soil Parameters

The design strength parameters used for the embankment and foundation soils in our slope stability analyses were selected based on the results of our laboratory testing, soil type and SPT N-value correlations (McGregor and Duncan, 1998; Duncan et al., 1980) and our past experience with similar materials. The following table presents the soil properties used in our analyses.

Table 3: Summary of Design Shear Strength Parameters

Material	Total Stress		Effective Stress		Moist Unit Weight (pcf)	Saturated Unit Weight (pcf)
	c (psf)	φ (degrees)	c' (psf)	φ' (degrees)		
Fine-Grained Fill, Stratum A1	290	14	230	23	120	123
Coarse-Grained Fill, Stratum A2	300	18	200	30	125	128
Fine-Grained Alluvium, Stratum B1	530	17	500	24	120	125
Coarse-Grained Alluvium, Stratum B2	300	18	200	32	120	125
Terrace Deposits, Stratum C1	-	-	0	36	--	135
Cretaceous Sediments, Stratum D	3,000	0	300	34	--	130

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4.3 Embankment Slope Stability Analyses

Schnabel performed limit-equilibrium slope stability analyses of the downstream slope of the embankment using the computer software SLOPE/W (GeoStudio 2012). Two static load cases and one pseudostatic load case were analyzed for two sections of the embankment with moderate variations in subsurface stratigraphy and embankment geometry. The embankment cross-sections selected for analysis were chosen based on multiple criteria including embankment height, steepness of the downstream slope, and proximity to areas of past overtopping and erosion. During our field exploration, access to portions of the Ash Pond A embankment crest was limited due to the presence of sandbags along the crest in this area. Therefore, this potentially critical section of the embankment was not analyzed for stability. The locations of the sections analyzed, near test borings B-02 and B-06, are shown on Figure 2. The following load cases were considered:

Load Case 1: Normal pool level (approx. El 22.3) with pore pressures calculated from an assumed phreatic line through the embankment under steady-state seepage conditions.

Load Case 2: Design surcharge pool (El 23.1) with pore pressures calculated from an assumed phreatic line through the embankment that is slightly elevated above normal pool steady-state seepage conditions.

Load Case 3: Normal pool level and seismic loading conditions using the Peak Horizontal Ground Acceleration (PHGA) for the 2,500-year recurrence interval earthquake at the site.

A rapid drawdown analysis was not performed since a sudden drawdown of the pond level is highly unlikely to occur since the ponds have essentially been filled with ash.

The phreatic surfaces modeled in our stability analyses were based on the water levels encountered in the borings. The normal pool level (El 22.3) was conservatively selected as the spillway inlet elevation (i.e., the top of the stop logs). Actual water levels in the ponds are commonly below the spillway inlet elevation as a result of leakage through the stop logs. The design surcharge pool level of El 23.1 is based on anticipated water levels corresponding to the 100-year flood event.

For Load Cases 1 and 2, the strength envelopes used for the embankment fill soils and foundation soils were modeled using drained shear strengths and effective stress parameters. For Load Case 3, total stress strength parameters were assigned to fill and foundation soils located below the phreatic line while effective stress (drained strength) parameters were assigned to soils located above the phreatic line. The coarse-grained terrace deposits are expected to behave in a drained manner during seismic loading and therefore were assigned effective stress parameters for Load Case 3. The terrace deposits and Cretaceous age sediments are relatively deep and significantly stiffer than the overlying alluvial soils and embankment fill, and are, therefore, unlikely to influence the stability of the slope for any of the load cases considered.

For Load Case 3, we performed a pseudo-static stability analysis using a seismic coefficient equivalent to the peak horizontal ground acceleration (PHGA) corresponding to the 2,500-year recurrence interval

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earthquake at the site. Based on our experience, the 2,500-year recurrence interval earthquake represents the typical seismic design event for dams of this size and hazard potential that are located in this region of the eastern United States. The 2014 update to the USGS United States National Seismic Hazard Maps (Petersen et al, 2014) was used to estimate this PHGA at 'firm rock' (shear wave velocity of 760 meters per second). Amplification of the ground motions in the embankment fill and foundation soils at the site was ignored for this analysis. To account for ignoring amplification, we conservatively estimated a PHGA of 0.10g for the site. A PHGA of 0.10g represents the higher bound of the range of PHGA for the 2,500-year recurrence interval earthquake as indicated on the 2014 USGS seismic hazard map for the site.

Table 4 presents the results of our stability analyses for each cross section and load case analyzed. The stability analysis results, including embankment section geometries, soil strata, and critical failure planes, are presented in Appendix C. The calculated factors of safety for Load Cases 1 through 3 at the sections analyzed meet US Army Corps of Engineers criteria for embankment slope stability (USACE, 2003).

Table 4: Stability Analysis Results

Section	Load Case Analyzed	Minimum Calculated Factor of Safety	USACE Factor of Safety Criteria for Embankment Slope Stability
Section at B-02	1	2.0	1.5
Section at B-02	2	1.8	1.4
Section at B-02	3	1.5	N/A*
Section at B-06	1	1.7	1.5
Section at B-06	2	1.6	1.4
Section at B-06	3	1.4	N/A*

*USACE slope stability criteria for seismic loading are based on anticipated embankment deformations. Our analysis resulted in factors of safety of 1.4 and 1.5 under pseudostatic seismic loading for the 2,500-year recurrence interval earthquake. Therefore, we do not anticipate appreciable embankment deformation to occur during the design earthquake.

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5 ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS

5.1 Embankment Slope Repairs and Height Increase

Based on our site observations and the results of our field exploration, laboratory testing, and slope stability analyses, the embankment with the crest elevation raised to El 23.5 is considered stable for the loading conditions analyzed.

The results of the hydrologic and hydraulic analyses presented in the "Dam Breach Analysis Report and Inundation Mapping" (Schnabel, 2014) demonstrate that the embankment crest will need to be raised to a minimum elevation of El 23.5 to safely pass the spillway design flood while maintaining a small amount of freeboard (0.4 feet). Existing grades shown on the recent topographic survey provided by Dominion indicate that increasing the embankment crest elevation to El 23.5 feet will require the placement of up to 3 feet of fill, with the majority of the embankment requiring between 6 and 12 inches of fill placement to achieve the proposed crest elevation. Increased embankment loading due to raising the crest to El 23.5 may induce up to one inch of settlement in the underlying embankment and foundation soils. As the majority of the embankment requires 12 inches or less of fill placement, average settlements are anticipated to be less than ½ inch, which is considered acceptable given the 0.4 feet (4.8 inches) of freeboard provided for the 100-year flood event. If embankment settlements exceed anticipated amounts, placement of additional fill may be required in the future to maintain adequate freeboard.

In addition to raising the embankment crest, the embankment slope areas that have been damaged by overtopping during storm events should be repaired. Continued overtopping in these areas will result in increased erosion possibly leading to seepage and stability issues and/or failure of the embankment. Compacted structural fill should be placed in these areas to restore the original slope angle of 2H:1V.

Compacted structural fill for re-grading the embankment slopes and crest should consist of material classifying SC, SM, SP-SM, or SP-SC per ASTM D2487. The on-site, sloughed soils from the downstream slope are not expected to meet these criteria. In general, finer-grained fill materials should be used on the crest, while coarser-grained fill should be used to re-grade the embankment slopes. Structural fill materials must be compatible with the underlying embankment fill soils to prevent finer particles from migrating out of the embankment. The structural fill should also have a higher permeability than the underlying embankment fill soils to reduce the risk of localized slope saturation and shallow slope instability during wet periods. Structural fill materials should not contain particles larger than 3 inches.

Compacted structural fill should be placed in maximum eight-inch thick horizontal, loose lifts and should be compacted to at least 95 percent of maximum dry density per ASTM D698, Standard Proctor. Soil moisture contents at the time of compaction should be 2 percent below to 2 percent above the soils' optimum moisture content per ASTM D2216. Additional material and placement requirements will be provided in the technical specifications.

Subgrades to receive compacted structural fill should be stripped of vegetation, topsoil, and organic matter. The removal of several feet of soft and wet soils will also be required prior to the placement of compacted structural fill in the embankment slope repair areas. When excavation of unsuitable materials is required, it should be performed in a manner to limit disturbance of the underlying suitable material.

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The excavation should be performed under the observation of the Engineer to evaluate required excavation depths.

The fill soils at this site primarily consist of moderately- to highly-plastic clays. These soils are moisture sensitive, and will readily become disturbed by construction traffic on exposed surfaces of wet subgrades. We recommend avoiding site preparation and grading activities during wet weather. If wet weather work is performed, the quantities of disturbed soils to be excavated should be expected to increase.

Grading activities for the slope repairs may encounter perched groundwater. The Contractor will likely need to provide temporary dewatering such as trenching and/or pumping from sumps to control surface and groundwater levels to maintain dry work areas.

Following completion of grading, the site should be permanently stabilized through the installation of topsoil and permanent seeding in accordance with the requirements of the Virginia Erosion and Sediment Control Handbook. Erosion control matting should also be placed on disturbed and/or re-graded sections of the embankment slopes.

5.2 Embankment Crest and Downstream Slope Maintenance

Large portions of the embankment crest and downstream slope are covered with large trees and woody growth. Dominion has informed Schnabel that they intend to remove the trees and woody growth from the embankment and 25 feet beyond the limits of the embankment in accordance with the *Commonwealth of Virginia Impounding Structure Regulations* (VA DCR, 2012). We concur with the proposed clearing plan and recommend continued maintenance of the embankment and downstream area to allow for easier identification of conditions such as seepage, embankment cracking and sloughing, animal burrows, and other conditions that could be indicative of potential embankment dam safety issues.

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6 LIMITATIONS

We based the analyses and recommendations submitted in this report on the conditions encountered during our field exploration. We attempted to provide for normal contingencies, but the possibility remains that unexpected conditions may be encountered during construction.

We have endeavored to complete the services identified herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied, is included or intended, and no warranty or guarantee is included or intended in this report, or any other instrument of service.

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FIGURES

Figure 1, Site Vicinity Map

Figure 2, Field Exploration Plan

Figure 3, Regional Geologic Map

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Source: ESRI World Imagery Service (http://goto.arcgisonline.com/maps/World_Imagery)
ESRI MediaKit 2010

Projection: NAD 1983 StatePlane Virginia North FIPS 4501 Feet

400 200 0 400 Feet

Scale: 1:4,800

Schnabel ENGINEERING

POSSUM POINT POWER STATION ASH POND ABC
DOMINION RESOURCES SERVICES, INC
PRINCE WILLIAM COUNTY, VA
PROJECT NO. 14221002.01

SITE VICINITY MAP

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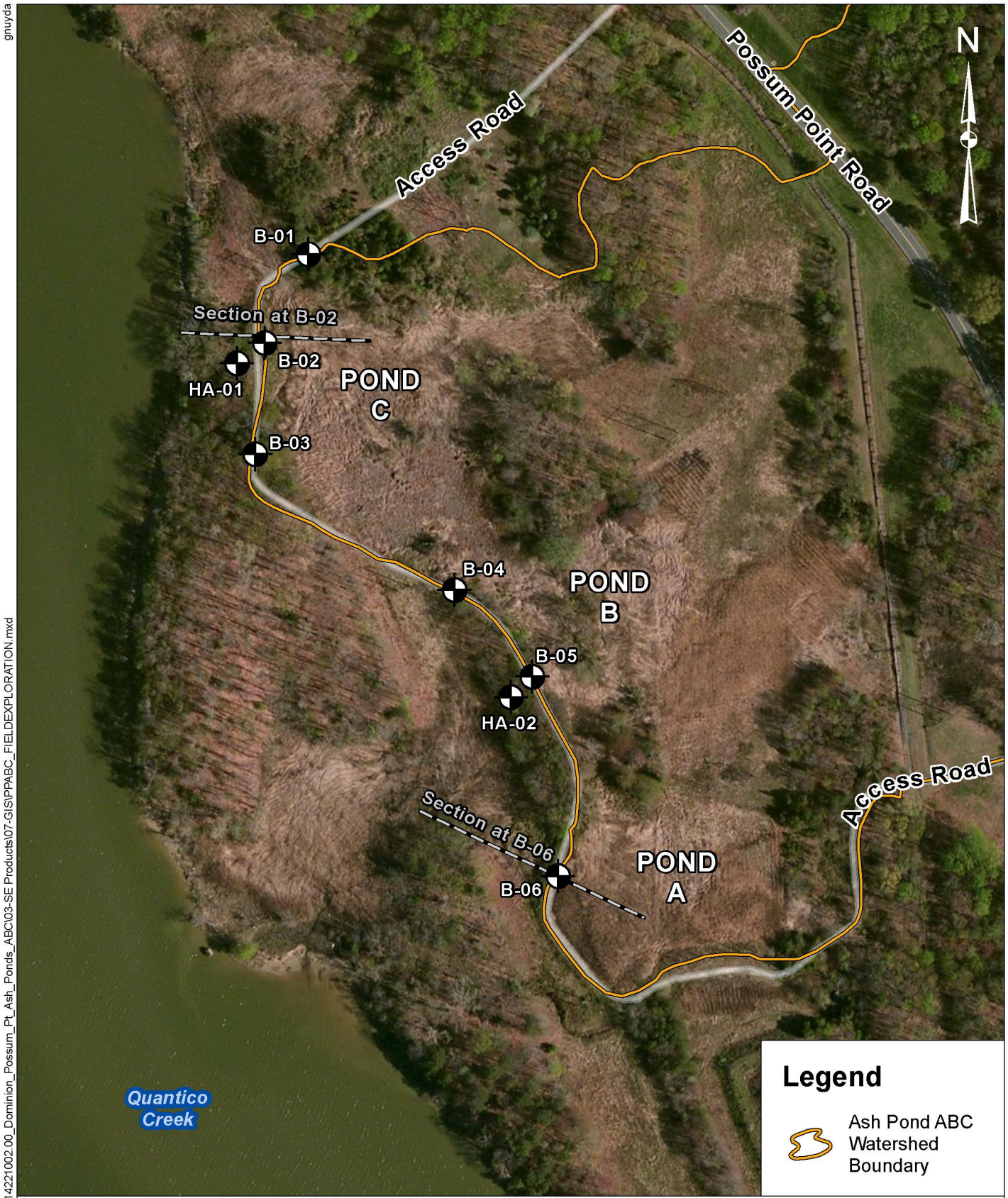

Source: ESRI World Imagery Service (http://goto.arcgisonline.com/maps/World_Imagery)
ESRI MediaKit 2010

Projection: NAD 1983 StatePlane Virginia North FIPS 4501 Feet

200 100 0 200 Feet

Scale: 1:2,400

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POSSUM POINT POWER STATION ASH POND ABC
DOMINION RESOURCES SERVICES, INC
PRINCE WILLIAM COUNTY, VA
PROJECT NO. 14221002.01

FIELD EXPLORATION PLAN

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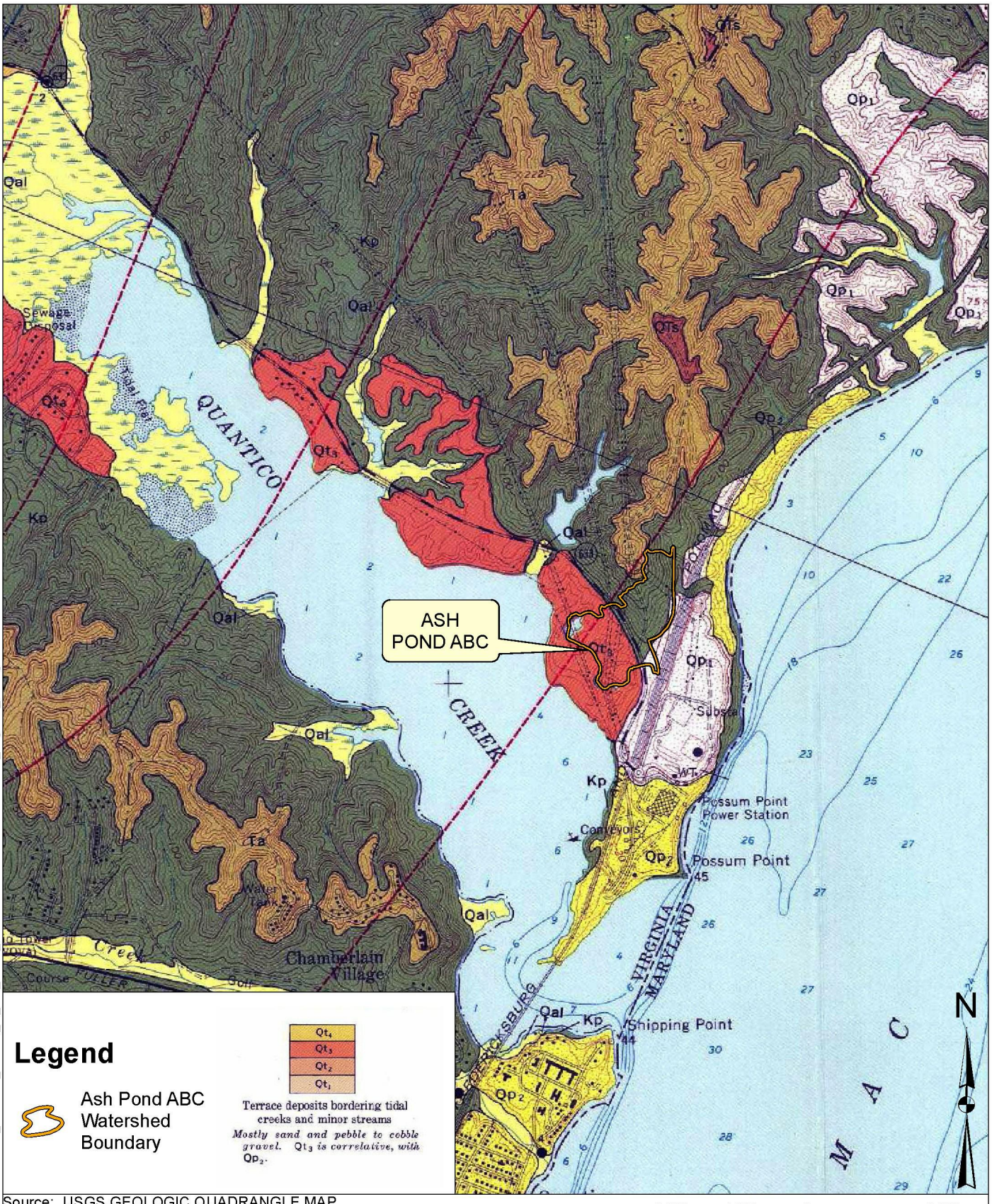

Legend

Ash Pond ABC Watershed Boundary

Qt4
Qt3
Qt2
Qt1

Terrace deposits bordering tidal creeks and minor streams
Mostly sand and pebble to cobble gravel. Qt3 is correlative, with Qp2.

Source: USGS GEOLOGIC QUADRANGLE MAP
- QUANTICO QUADRANGLE, VA-MD (GQ-1044)

2,000 1,000 0 2,000 Feet

Scale: 1:24,000

Projection: NAD 1983 StatePlane Virginia North FIPS 4501 Feet

Schnabel ENGINEERING

POSSUM POINT POWER STATION ASH POND ABC
DOMINION RESOURCES SERVICES, INC
PRINCE WILLIAM COUNTY, VA
PROJECT NO. 14221002.01

REGIONAL GEOLOGIC MAP

lshearin

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APPENDIX A

SUBSURFACE EXPLORATION DATA

Subsurface Exploration Procedures (1 sheet)
General Notes for Subsurface Exploration Logs (1 sheet)
Identification of Soil (1 sheet)

Test Boring Logs, B-01 through B-06 (19 sheets)
Hand Auger Logs, HA-01 and HA-02 (2 sheets)

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SUBSURFACE EXPLORATION PROCEDURES

Test Borings

The test borings were drilled using mud-rotary drilling techniques. Bentonite drilling mud was recirculated to maintain an open bore hole. The hole was advanced by using a nominal 3-1/2 inch O.D. tri-cone roller bit. A 10-foot-long, 4-inch ID surface casing 10-feet long was used. At the designated depths, drillers removed the roller bit and performed the Standard Penetration Test (SPT). Water level data indicated on the logs may not be indicative of actual ground water levels because of the presence of drilling fluid in the borehole.

Relatively undisturbed, 3-inch diameter Shelby Tube samples were obtained by using the hydraulic drive system on the drill rig to apply downward pressure on the drill rods and thin-wall tube sampler. The tube sampler was advanced at a constant pressure, and slow rotated prior to withdrawal to shear the end of the sample. A GUS sampler was used with the thin-wall tube sampler. After sampler withdrawal, the top and bottom of the sample was sealed in the tube with wax, and sand packing material was placed between the wax seals and the caps at the ends of the tube.

Standard Penetration Test Results

The numbers in the Sampling Data column of the boring logs represent SPT results. Each number represents the blows needed to drive a two-inch O.D., 1⅜ inch I.D. split-spoon sampler six inches, using a 140-pound hammer falling 30 inches. The sampler is typically driven a total of 18 or 24 inches. The first six inch interval usually represents a seating interval. The total of the number of blows for the second and third six-inch intervals is the SPT "N value." When the blow count reaches 100 before the full driving distance, we determine the SPT N value based on extrapolation of the blows recorded. The SPT is conducted according to ASTM D1586.

The SPT samples were obtained using an automatic trip hammer (ATH). The energy applied to the split-spoon sampler using the ATH was estimated at about 80%. The drilling subcontractor did not provide hammer calibration results. The hammer blows recorded on the boring logs are uncorrected blow counts. However, we have considered the higher energy associated with the ATH hammer in our evaluation of the geotechnical engineering parameters used in our analyses, and have normalized the blow count values to standardized N_{60} and $N_{1,60}$ values as applicable.

Hand Augers

Our personnel drilled the hand augers using a three-inch O.D. auger. Disturbed soil samples were collected from the open barrel of the auger.

Soil Classification Criteria

The group symbols on the logs represent the Unified Soil Classification System Group Symbols (ASTM D2487) based on visual observation and limited laboratory testing of the samples. Criteria for visual identification of soil samples are included in this appendix. Some variation may be expected between samples visually classified and samples classified in the laboratory.

Boring and Hand Auger Locations and Elevations

Our personnel located the borings and hand augers using a portable Trimble GPS unit. Figure 2 shows the approximate boring and hand auger locations. Approximate surface elevations at the boring and hand auger locations were estimated based on topographic data shown on the site plan provided by Dominion. Project planning should consider these locations and elevations no more accurate than the methods and plans used to obtain them.

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GENERAL NOTES FOR SUBSURFACE EXPLORATION LOGS

1. Numbers in sampling data column next to Standard Penetration Test (SPT) symbols indicate blows required to drive a 2-inch O.D., 1⅜-inch I.D. sampling spoon 6 inches using a 140 pound hammer falling 30 inches. The Standard Penetration Test (SPT) N value is the number of blows required to drive the sampler 12 inches, after a 6 inch seating interval. The Standard Penetration Test is performed in general accordance with ASTM D1586.

2. Visual classification of soil is in accordance with terminology set forth in "Identification of Soil." The ASTM D2487 group symbols (e.g., CL) shown in the classification column are based on visual observations.

3. Estimated ground water levels indicated on the logs are only estimates from available data and may vary with precipitation, porosity of the soil, site topography, and other factors.

4. Refusal at the surface of rock, boulder, or other obstruction is defined as an SPT resistance of 100 blows for 2 inches or less of penetration.

5. The logs and related information depict subsurface conditions only at the specific locations and at the particular time when drilled or excavated. Soil conditions at other locations may differ from conditions occurring at these locations.

6. The stratification lines represent the approximate boundary between soil and rock types as obtained from the subsurface exploration. Some variation may also be expected vertically between samples taken. The soil profile, water level observations and penetration resistances presented on these logs have been made with reasonable care and accuracy and must be considered only an approximate representation of subsurface conditions to be encountered at the particular location.

7. Key to symbols and abbreviations:

	S-1, SPT	- Sample No., Standard Penetration Test
	5+10+1	- Number of blows in each 6-in increment
	UD-1, UNDIST	- Sample No., 2" or 3" Undisturbed Tube Sample
	REC=24", 100%	- Recovery in inches, Percent Recovery
	C-1, CORE	- Core No., Rock Core
	Run = 5.0 ft	- Run Length in feet
	REC = 60" 100%	- Recovery in inches, Percent Recovery
	RQD = 60" 100%	- RQD in inches, Percent RQD
	MC	- Moisture Content
	PP	- Pocket Penetrometer Reading (tsf)
	FID	- Flame Ionization Detector Reading (ppm)
	PID	- Photoionization Detector Reading (ppm)
	GP	- Geostick Penetration Reading (inches)
	LL	- Liquid Limit
	PL	- Plastic Limit
	TPH	- Total Petroleum Hydrocarbons

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IDENTIFICATION OF SOIL

I. DEFINITION OF SOIL GROUP NAMES (adapted from ASTM D2487)

			SYMBOL	GROUP NAME
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels – More than 50% of coarse fraction retained on No. 4 sieve Coarse, ¾" to 3" Fine, No. 4 to ¾"	Clean Gravels Less than 5% fines	GW	WELL GRADED GRAVEL
			GP	POORLY GRADED GRAVEL
		Gravels with fines More than 12% fines	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	Sands – 50% or more of coarse Fraction passes No. 4 sieve Coarse, No. 10 to No. 4 Medium, No. 40 to No. 10 Fine, No. 200 to No. 40	Clean Sands Less than 5% fines	SW	WELL GRADED SAND
			SP	POORLY GRADED SAND
		Sands with fines More than 12% fines	SM	SILTY SAND
			SC	CLAYEY SAND
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays – Liquid Limit less than 50 Low to medium plasticity	Inorganic	CL	LEAN CLAY
			ML	SILT
		Organic	OL	ORGANIC CLAY
				ORGANIC SILT
	Silts and Clays – Liquid Limit 50 or more Medium to high plasticity	Inorganic	CH	FAT CLAY
			MH	ELASTIC SILT
		Organic	OH	ORGANIC CLAY
				ORGANIC SILT
Highly Organic Soils	Primarily organic matter, dark in color and organic odor		PT	PEAT

II. DEFINITION OF SOIL COMPONENT PROPORTIONS (ASTM D2487)

			Examples
Adjective Form	GRAVELLY SANDY	>30% to <50% coarse grained component in a fine-grained soil	GRAVELLY LEAN CLAY
	CLAYEY SILTY	>12% to <50% fine grained component in a coarse-grained soil	SILTY SAND
"With"	WITH GRAVEL WITH SAND	>15% to <30% coarse grained component in a fine-grained soil	FAT CLAY WITH GRAVEL
	WITH GRAVEL WITH SAND	>15% to <50% coarse grained component in a coarse-grained soil	POORLY GRADED GRAVEL WITH SAND
	WITH SILT WITH CLAY	>5% to <12% fine grained component in a coarse-grained soil	POORLY GRADED SAND WITH SILT

III. GLOSSARY OF MISCELLANEOUS TERMS

SYMBOLS ..... Unified Soil Classification Symbols are shown above as group symbols. A dual symbol "-" indicates the soil belongs to two groups. A borderline symbol "/" indicates the soil belongs to two possible groups.

FILL..... Man-made deposit containing soil, rock and often foreign matter.

PROBABLE FILL..... Soils which contain no visually detected foreign matter but which are suspect with regard to origin.

DISINTEGRATED ROCK (DR)..... Residual materials with a standard penetration resistance (SPT) between 60 blows per foot and refusal. Refusal is defined as a SPT of 100 blows for 2" or less penetration.

PARTIALLY WEATHERED ROCK (PWR)..... Residual materials with a standard penetration resistance (SPT) between 100 blows per foot and refusal. Refusal is defined as a SPT of 100 blows for 2" or less penetration.

BOULDERS & COBBLES..... Boulders are considered rounded pieces of rock larger than 12 inches, while cobbles range from 3 to 12 inch size.

LENSES..... 0 to ½ inch seam within a material in a test pit.

LAYERS..... ½ to 12 inch seam within a material in a test pit.

POCKET..... Discontinuous body within a material in a test pit.

MOISTURE CONDITIONS..... Wet, moist or dry to indicate visual appearance of specimen.

COLOR..... Overall color, with modifiers such as light to dark or variation in coloration.

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Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-01** Contract Number: 14221002.01 Sheet: 1 of 2

Contractor: Fishburne Drilling, Inc.
Chesapeake, Virginia

Contractor Foreman: Tim Donohue

Schnabel Representative: Sue Buchanan

Equipment: CME-550X

Method: 4" Mud Rotary, Tricone Roller Bit

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/14 **Finished:** 7/30/14

North: 321867 ft **East:** 2347275 ft

Coordinate System: VA State Plane (N)

Plunge: -90 **Bearing:**

Ground Surface Elevation: 23± (ft) **Total Depth:** 20.0 ft

Water Level Observations

	Date	Time	Depth	Casing	Caved
After Drilling	7/30/14	3:56 PM	3.3'	---	---
After Drilling	7/30/14	5:49 PM	4.6'	---	---
After Drilling	7/31/14	8:12 AM	6.6'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	0.0 - 4.0 ft: FILL, sampled as sandy lean clay; moist, orangish brown and gray, estimated 30 - 45% fine grained sand, low to medium plasticity	FILL				S-1, SPT 5+5+6+8 REC=16", 67% S-2, SPT 6+5+7+7 REC=15", 63%		
4.0	4.0 - 6.0 ft: FILL, sampled as lean clay with sand; moist, orangish brown, estimated 15 - 25% fine grained sand, low to medium plasticity	FILL	18.5		5	S-3, SPT 4+6+7+9 REC=14", 58%		
6.0	6.0 - 9.0 ft: FILL, sampled as fat clay; moist, orangish brown and gray, medium to high plasticity	FILL	16.5			S-4, SPT 3+5+6+10 REC=16", 67% S-5, SPT 3+3+4+5 REC=18", 75%	MC = 28.3%	
9.0	9.0 - 18.5 ft: SILT WITH SAND; moist, gray and light brown, estimated 15 - 25% fine grained sand, probable ALLUVIAL material	ML	13.5					

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-01** Contract Number: 14221002.01 Sheet: 2 of 2

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	9.0 - 18.5 ft: SILT WITH SAND; moist, gray and light brown, estimated 15 - 25% fine grained sand, probable ALLUVIAL material *(continued)*	ML			15	S-6, SPT 1+1+2+3 REC=20", 83%	MC = 29.3%	
18.5	18.5 - 20.0 ft: SILTY SAND, fine to coarse grained sand; moist, gray, estimated 15 - 25% fines, probable ALLUVIAL material	SM	4.0		20	S-7, SPT 2+2+2+2 REC=11", 46%		
20.0			2.5					

Bottom of Boring at 20.0 ft.
Boring terminated at selected depth.
Boring backfilled with bentonite upon completion.

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-02** Contract Number: 14221002.01 Sheet: 1 of 4

Contractor: Fishburne Drilling, Inc.
Chesapeake, Virginia

Contractor Foreman: Tim Donohue

Schnabel Representative: Sue Buchanan

Equipment: CME-550X

Method: 4" Mud Rotary, Tricone Roller Bit

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/14 **Finished:** 7/30/14

North: 321748 ft **East:** 2347229 ft

Coordinate System: VA State Plane (N)

Plunge: -90 **Bearing:**

Ground Surface Elevation: 22± (ft) **Total Depth:** 45.0 ft

Water Level Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30/14	4:21 PM	4.0'	---	---
After Drilling	7/30/14	5:50 PM	3.1'	---	---
After Drilling	7/31/14	8:15 AM	6.5'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	0.0 - 3.5 ft: FILL, sampled as sandy elastic silt; moist, reddish brown to gray, estimated 30 - 45% fine to medium sand, contains organics, low plasticity	FILL				S-1, SPT 2+4+5+7 REC=14", 58% S-2, SPT 3+2+3+3 REC=14", 58%		
3.5	3.5 - 9.0 ft: FILL, sampled as sandy lean clay; moist, dark reddish gray and orange, estimated 30 - 45% fine grained sand, low to medium plasticity 4.0 ft: Change: gray and brown		18.8			S-3, SPT 2+2+3+2 REC=14", 58%		
	6.0 ft: Change: gray and light brown, estimated 15 - 25% sand, contains roots	FILL			5	S-4, SPT 2+2+3+2 REC=15", 63% S-5, SPT 1/12"+1/12" REC=16", 67%	LL = 43 PL = 22 MC = 30.3% % Passing #200 = 87.6	
9.0	9.0 - 10.0 ft: FILL, sampled as silt with sand; moist, dark blackish gray, contains roots, contains fine gravel, organic odor	FILL	13.3					

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-02** Contract Number: 14221002.01 Sheet: 2 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
10.0	10.0 - 22.0 ft: FILL, sampled as fat clay; moist, light gray and light brown, contains sand, medium plasticity		12.3			UD-1, UNDIST REC=18", 75%	LL = 60 PL = 23 MC = 24.0% % Passing #200 = 97.9	
						UD-2, UNDIST REC=19", 79%	MC = 27.2%	
					15	S-6, SPT 2+1+2+2 REC=15", 63%		
		FILL						
	17.0 ft: Change: estimated 15 - 25% fine grained sand							
					20	S-7, SPT 1+1+2+2 REC=12", 50%	LL = 52 PL = 23 MC = 29.0%	
22.0	22.0 - 26.0 ft: ORGANIC SILT WITH SAND; moist, dark blackish gray, estimated 15 - 25% fine to medium sand, contains roots, organic odor, probable ALLUVIAL material	OL	0.3			S-8, SPT 1+2+2+3 REC=21", 88%		

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-02** Contract Number: 14221002.01 Sheet: 3 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	22.0 - 26.0 ft: ORGANIC SILT WITH SAND; moist, dark blackish gray, estimated 15 - 25% fine to medium sand, contains roots, organic odor, probable ALLUVIAL material *(continued)*	OL			25	UD-3, UNDIST REC=21", 88%		
26.0	26.0 - 37.0 ft: SANDY LEAN CLAY; moist, light gray and light brown, estimated 30 - 45% fine to medium sand, contains fine gravel, probable ALLUVIAL material, fine gravel consists of rounded quartz rock fragments		-3.7		UD	UD-4, UNDIST REC=24", 100%	LL = 49 PL = 19 MC = 30.3% % Passing #200 = 52.4	
					UD			
					30	S-9, SPT 2+2+3+2 REC=18", 75%		
		CL						
	32.0 ft: Change: with streaks of light brown							
					35	S-10, SPT 2+3+3+5	MC = 27.1% % Passing #200 = 51.4	

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-02** Contract Number: 14221002.01 Sheet: 4 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
37.0	37.0 - 42.0 ft: SILTY SAND WITH GRAVEL, fine to coarse grained sand; wet, light gray, estimated 30 - 45% fines, estimated 15 - 25% fine gravel, probable TERRACE material, fine gravel consists of rounded quartz rock fragments	SM	-14.7		40	S-11, SPT 3+5+7+5 REC=9", 38%		
42.0	42.0 - 45.0 ft: LEAN CLAY WITH SAND; moist, light greenish gray, estimated 15 - 25% fine grained sand, low to medium plasticity, probable COASTAL material	CL	-19.7		45	S-12, SPT 6+12+14+11 REC=20", 83%		
45.0			-22.7					

Bottom of Boring at 45.0 ft.
Boring terminated at selected depth.
Boring backfilled with bentonite upon completion.

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-03** Contract Number: 14221002.01 Sheet: 1 of 3

Contractor: Fishburne Drilling, Inc.
Chesapeake, Virginia

Contractor Foreman: Tim Donohue

Schnabel Representative: Sue Buchanan

Equipment: CME-550X

Method: 4" Mud Rotary, Tricone Roller Bit

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/31/14 **Finished:** 7/31/14

North: 321595 ft **East:** 2347203 ft

Coordinate System: VA State Plane (N)

Plunge: -90 **Bearing:**

Ground Surface Elevation: 23± (ft) **Total Depth:** 35.0 ft

Water Level Observations

	Date	Time	Depth	Casing	Caved
After Drilling	7/31/14	9:30 AM	4.8'	---	---
After Drilling	7/31/14	12:15 PM	5.5'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	0.0 - 2.0 ft: FILL, sampled as lean clay; moist, orangish brown and yellowish brown, low plasticity	FILL				S-1, SPT 3+6+7+8 REC=17", 71%		
2.0	2.0 - 22.0 ft: FILL, sampled as sandy lean clay; moist, orangish brown and grayish brown, estimated 30 - 45% fine grained sand, low to medium plasticity		21.0			S-2, SPT 5+6+6+8 REC=12", 50%		
	3.5 ft: Change: estimated 15 - 25% fine grained sand					S-3, SPT 7+6+6+7 REC=17", 71%		
					5			
		FILL				S-4, SPT 5+6+8+8 REC=17", 71%		
	8.0 ft: Change: estimated 15 - 25% fine grained sand, contains organics					S-5, SPT 3+5+5+10 REC=15", 63%		

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-03** Contract Number: 14221002.01 Sheet: 2 of 3

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	2.0 - 22.0 ft: FILL, sampled as sandy lean clay; moist, orangish brown and grayish brown, estimated 30 - 45% fine grained sand, low to medium plasticity *(continued)*							
						S-6, SPT 2+3+3+5 REC=24", 100%		
					15			
		FILL						
	17.0 ft: Change: grayish brown and blackish gray, contains roots							
						S-7, SPT 1+1+1+1 REC=17", 71%		
					20			
22.0	22.0 - 33.8 ft: CLAYEY SAND, fine to coarse grained sand; moist, grayish brown, estimated 30 - 45% fines, probable ALLUVIAL material	SC	1.0					
						S-8, SPT 3+3+4+5 REC=18", 75%		

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-03** Contract Number: 14221002.01 Sheet: 3 of 3

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	22.0 - 33.8 ft: CLAYEY SAND, fine to coarse grained sand; moist, grayish brown, estimated 30 - 45% fines, probable ALLUVIAL material *(continued)*							
					25			
	28.0 ft: Change: grayish brown and orangish brown, contains fine gravel	SC				S-9, SPT 3+4+4+4 REC=20", 83%	MC = 19.7% % Passing #200 = 40.1	
					30			
						S-10, SPT 3+4+5+5 REC=18", 75%		
33.8	33.8 - 35.0 ft: FAT CLAY; moist, grayish brown with streaks of orangish brown, medium to high plasticity, probable ALLUVIAL material	CH	-10.8					
35.0			-12.0		35			

Bottom of Boring at 35.0 ft.
Boring terminated at selected depth.
Boring backfilled with bentonite upon completion.

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-04** Contract Number: 14221002.01 Sheet: 1 of 2

Contractor: Fishburne Drilling, Inc.
Chesapeake, Virginia

Contractor Foreman: Tim Donohue

Schnabel Representative: Sue Buchanan

Equipment: CME-550X

Method: 4" Mud Rotary, Tricone Roller Bit

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/31/14 **Finished:** 7/31/14

North: 321386 ft **East:** 2347492 ft

Coordinate System: VA State Plane (N)

Plunge: -90 **Bearing:**

Ground Surface Elevation: 24± (ft) **Total Depth:** 20.0 ft

Water Level Observations

	Date	Time	Depth	Casing	Caved
After Drilling	7/31/14	10:56 AM	3.4'	---	---
After Drilling	7/31/14	12:54 PM	5.5'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	0.0 - 1.5 ft: FILL, sampled as lean clay with sand; moist, grayish brown, estimated 15 - 25% fine grained sand, low plasticity	FILL				S-1, SPT 3+5+5+5 REC=18", 75%		
1.5	1.5 - 2.0 ft: FILL, sampled as silty sand, fine grained sand; moist, grayish brown, estimated 30 - 45% fines	FILL	22.5					
2.0	2.0 - 4.0 ft: FILL, sampled as lean clay with sand; moist, grayish brown with streaks of orangish brown, estimated 15 - 25% fine grained sand, contains organics, contains fine gravel, low to medium plasticity	FILL	22.0			S-2, SPT 3+4+5+5 REC=15", 63%		
4.0	4.0 - 8.0 ft: FILL, sampled as fat clay; moist, grayish brown, medium to high plasticity	FILL	20.0		5	S-3, SPT 9+12+10+10 REC=16", 67% S-4, SPT 3+6+10+7 REC=18", 75%		
8.0	8.0 - 12.0 ft: SILTY SAND, fine to coarse grained sand; moist, grayish brown and orangish brown, estimated 15 - 25% fines, probable ALLUVIAL material	SM	16.0			S-5, SPT 3+5+6+3 REC=19", 79%		

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-04** Contract Number: 14221002.01 Sheet: 2 of 2

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	8.0 - 12.0 ft: SILTY SAND, fine to coarse grained sand; moist, grayish brown and orangish brown, estimated 15 - 25% fines, probable ALLUVIAL material *(continued)*	SM						
12.0	12.0 - 17.0 ft: SILT WITH SAND; moist, grayish brown, estimated 15 - 25% fine grained sand, contains fine gravel, probable ALLUVIAL material	ML	12.0		15	S-6, SPT 1+1+1+2 REC=15", 63%	MC = 28.2% % Passing #200 = 88.0	
17.0	17.0 - 20.0 ft: SILTY SAND, fine grained sand; moist, grayish brown and orangish brown, estimated 30 - 45% fines, contains fine gravel, probable TERRACE material, fine gravel consists of rounded quartz rock fragments	SM	7.0		20	S-7, SPT 7+10+7+6 REC=14", 58%		
20.0			4.0					

Bottom of Boring at 20.0 ft.
Boring terminated at selected depth.
Boring backfilled with bentonite upon completion.

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-05** Contract Number: 14221002.01 Sheet: 1 of 4

Contractor: Fishburne Drilling, Inc.
Chesapeake, Virginia

Contractor Foreman: Tim Donohue

Schnabel Representative: Sue Buchanan

Equipment: CME-550X

Method: 4" Mud Rotary, Tricone Roller Bit

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/31/14 **Finished:** 7/31/14

North: 321262 ft **East:** 2347608 ft

Coordinate System: VA State Plane (N)

Plunge: -90 **Bearing:**

Ground Surface Elevation: 23± (ft) **Total Depth:** 45.0 ft

Water Level Observations

	Date	Time	Depth	Casing	Caved
After Drilling ▽	7/31/14	12:49 PM	4.4'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	0.0 - 2.0 ft: FILL, sampled as lean clay; moist, grayish brown and orangish brown, contains organics, low plasticity, contains lenses of fine grained Clayey Sand (SC) with fine gravel	FILL				S-1, SPT 3+5+3+4 REC=16", 67%		
2.0	2.0 - 6.0 ft: FILL, sampled as silty sand, fine to medium grained sand; moist, grayish brown and orangish brown, estimated 30 - 45% fines, contains fine gravel, fine gravel consists of rounded quartz rock fragments	FILL	21.0			S-2, SPT 3+6+7+6 REC=16", 67%	MC = 14.2% % Passing #200 = 23.7	
	▽					S-3, SPT 4+5+5+5 REC=14", 58%		
					5			
6.0	6.0 - 13.5 ft: FILL, sampled as clayey sand, fine grained sand; moist, grayish brown with speckles of orangish brown, estimated 30 - 45% fines		17.0			S-4, SPT 2+3+3+3 REC=19", 79%		
	8.0 ft: Change: estimated 15 - 25% fine gravel, contains organics, fine gravel consists of rounded quartz rock fragments	FILL				S-5, SPT 2+2+2+1 REC=14", 58%		

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-05** Contract Number: 14221002.01 Sheet: 2 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	6.0 - 13.5 ft: FILL, sampled as clayey sand, fine grained sand; moist, grayish brown with speckles of orangish brown, estimated 30 - 45% fines *(continued)*	FILL						
13.5	13.5 - 16.0 ft: LEAN CLAY WITH SAND; moist, grayish brown, estimated 15 - 25% fine grained sand, contains organics, low to medium plasticity, probable ALLUVIAL material	CL	9.5			S-6, SPT 1+2+3+6 REC=18", 75%		
					15			
16.0	16.0 - 42.0 ft: POORLY GRADED SAND WITH SILT, fine to medium grained sand; moist, light gray, estimated 5 - 10% fines, contains fine gravel, probable TERRACE material, fine gravel consists of rounded quartz rock fragments	SP-SM	7.0			S-7, SPT 8+9+11+13 REC=18", 75%		
					20			
	23.0 ft: Change: fine to coarse grained sand; estimated 15 - 25% fines					S-8, SPT 6+9+14+14 REC=19", 79%	MC = 24.0% % Passing	

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-05** Contract Number: 14221002.01 Sheet: 3 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	16.0 - 42.0 ft: POORLY GRADED SAND WITH SILT, fine to medium grained sand; moist, light gray, estimated 5 - 10% fines, contains fine gravel, probable TERRACE material, fine gravel consists of rounded quartz rock fragments *(continued)*						#200 = 15.4	
					25			
	28.0 ft: Change: no fine gravel					S-9, SPT 11+20+36+34 REC=22", 92%		
					30			
		SP-SM						
	33.0 ft: Change: light gray and orangish brown					S-10, SPT 12+19+24+27 REC=20", 83%		
					35			

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-05** Contract Number: 14221002.01 Sheet: 4 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	16.0 - 42.0 ft: POORLY GRADED SAND WITH SILT, fine to medium grained sand; moist, light gray, estimated 5 - 10% fines, contains fine gravel, probable TERRACE material, fine gravel consists of rounded quartz rock fragments *(continued)*	SP-SM			40	S-11, SPT 16+30+32+37 REC=24", 100%		
42.0	42.0 - 45.0 ft: FAT CLAY; moist, light greenish gray with mottles of orangish brown, medium to high plasticity, probable COASTAL material	CH	-19.0		45	S-12, SPT 6+9+16+16 REC=21", 88%		
45.0			-22.0					

Bottom of Boring at 45.0 ft.
Boring terminated at selected depth.
Boring backfilled with bentonite upon completion.

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-06** Contract Number: 14221002.01 Sheet: 1 of 4

Contractor: Fishburne Drilling, Inc.
Chesapeake, Virginia

Contractor Foreman: Tim Donohue

Schnabel Representative: Sue Buchanan

Equipment: CME-550X

Method: 4" Mud Rotary, Tricone Roller Bit

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/14 **Finished:** 7/30/14

North: 320965 ft **East:** 2347643 ft

Coordinate System: VA State Plane (N)

Plunge: -90 **Bearing:**

Ground Surface Elevation: 23± (ft) **Total Depth:** 45.0 ft

Water Level Observations

	Date	Time	Depth	Casing	Caved
Encountered ▽	7/30/14	2:15 PM	4.0'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	0.0 - 2.0 ft: FILL, sampled as clayey sand, fine grained sand; moist, light grayish brown, estimated 30 - 45% fines, contains organics	FILL				S-1, SPT 4+3+4+494 REC=11", 46%		
2.0	2.0 - 7.7 ft: FILL, sampled as sandy lean clay; moist, light grayish brown with mottles of orangish brown, estimated 30 - 45% fine grained sand, contains fine gravel, low to medium plasticity, contains lenses of fine grained clayey sand	FILL	21.0			S-2, SPT 3+2+2+3 REC=15", 63%	LL = 28 PL = 19 MC = 22.4% % Passing #200 = 60.5	
	▽					S-3, SPT 2+2+3+3 REC=10", 42%		
					5			
						S-4, SPT 2+3+4+4 REC=11", 46%		
7.7	7.7 - 11.0 ft: FILL, sampled as clayey sand, fine to medium grained sand; moist, light grayish brown with mottles of orange, estimated 30 - 45% fines, contains fine gravel	FILL	15.3			S-5, SPT 2+2+1+2 REC=4", 17%		

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-06** Contract Number: 14221002.01 Sheet: 2 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	7.7 - 11.0 ft: FILL, sampled as clayey sand, fine to medium grained sand; moist, light grayish brown with mottles of orange, estimated 30 - 45% fines, contains fine gravel *(continued)*	FILL				UD-1, UNDIST REC=14", 58%		
11.0	11.0 - 22.0 ft: FILL, sampled as fat clay; moist, light grayish brown with mottles of orange, estimated 15 - 25% fine grained sand, contains fine gravel, medium to high plasticity		12.0			UD		
						UD-2, UNDIST REC=19", 79%	LL = 55 PL = 25 MC = 25.4% % Passing #200 = 85.9	
						UD		
					15	S-6, SPT 1+2+2+3 REC=12", 50%		
		FILL						
						S-7, SPT 1+1+1+2 REC=20", 83%		
					20			
22.0	22.0 - 28.5 ft: CLAYEY SAND, fine to medium grained sand; moist, light grayish brown with mottles of orange, estimated 30 - 45% fines, contains fine gravel, probable ALLUVIAL material	SC	1.0			S-8, SPT 2+3+3+3 REC=24", 100%		

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-06** Contract Number: 14221002.01 Sheet: 3 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	22.0 - 28.5 ft: CLAYEY SAND, fine to medium grained sand; moist, light grayish brown with mottles of orange, estimated 30 - 45% fines, contains fine gravel, probable ALLUVIAL material *(continued)*							
	25.0 ft: Change: light gray	SC			25	UD-3, UNDIST REC=21", 88%		
						S-9, SPT 1+1+1+1 REC=5", 21%		
28.5	28.5 - 39.0 ft: POORLY GRADED SAND WITH SILT, fine to medium grained sand; moist, light gray with speckles of white, estimated 5 - 10% fines, contains fine to coarse gravel, probable TERRACE material, fine to coarse gravel consists of rounded quartz rock fragments		-5.5			S-10, SPT 3+6+8+9 REC=14", 58%		
					30			
		SP-SM				S-11, SPT 13+17+21+22 REC=21", 88%	MC = 22.6% % Passing #200 = 14.5	
					35			

(continued)

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	TEST BORING LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Boring Number: **B-06** Contract Number: 14221002.01 Sheet: 4 of 4

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	28.5 - 39.0 ft: POORLY GRADED SAND WITH SILT, fine to medium grained sand; moist, light gray with speckles of white, estimated 5 - 10% fines, contains fine to coarse gravel, probable TERRACE material, fine to coarse gravel consists of rounded quartz rock fragments *(continued)*	SP-SM				S-12, SPT 7+4+6+10 REC=22", 92%		
39.0	39.0 - 45.0 ft: ELASTIC SILT; moist, dark grayish green and bluish gray, high plasticity, probable COASTAL material		-16.0		40			
		MH				S-13, SPT 4+6+11+12 REC=24", 100%	LL = 55 PL = 33 MC = 34.7%	
45.0			-22.0		45			

Bottom of Boring at 45.0 ft.
Boring terminated at selected depth.
Boring backfilled with bentonite upon completion.

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	HAND AUGER LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Hand Auger Number: **HA-01** Contract Number: 14221002.01 Sheet: 1 of 1

Contractor: Not Applicable

Contractor Foreman: Not Applicable

Schnabel Representative: K. Megginson

Equipment:

Method: Hand Auger

Dates Started: 7/31/14 **Finished:** 7/31/14

North: 321738 ft **East:** 2347175 ft

Coordinate System: VA State Plane (N)

Plunge: -90 **Bearing:**

Ground Surface Elevation: 9± (ft) **Total Depth:** 10.1 ft

Water Level Observations

	Date	Time	Depth	Casing	Caved
Completion	7/31/14	11:30 AM	Dry	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.3	0.0 - 0.3 ft: Forest litter, rootmat and topsoil		8.6			GRAB		
	0.3 - 1.3 ft: FILL, sampled as lean clay with sand; moist, dark yellowish brown, estimated 15 - 25% sand, contains roots	FILL						
1.3			7.6			GRAB		
	1.3 - 3.0 ft: FILL, sampled as fat clay; moist, dark yellowish brown and light gray, estimated 5 - 10% sand, medium plasticity	FILL						
3.0			5.9			GRAB		
	3.0 - 6.4 ft: FILL, sampled as sandy fat clay; moist, dark yellowish brown and light gray, estimated 30 - 45% sand, contains mica, medium plasticity	FILL						
	4.8 ft: Change: contains Clayey Sand (SC) layers to 5.3 feet				5	GRAB		
6.4			2.5			GRAB		
	6.4 - 10.1 ft: FILL, sampled as fat clay; moist, dark yellowish brown and light gray, estimated 5 - 10% sand, contains mica, medium plasticity							
	7.7 ft: Change: contains Sandy Fat Clay (CH) layers to 8.2 feet	FILL				GRAB		
10.1			-1.2		10			

Bottom of Hand Auger at 10.1 ft.
Boring terminated at selected depth.
Boring backfilled with bentonite upon completion.

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

Schnabel ENGINEERING	HAND AUGER LOG	Project: Dominion Possum Point Ash Ponds ABC Prince William County Virginia	Hand Auger Number: **HA-02** Contract Number: 14221002.01 Sheet: 1 of 1

Contractor: Not Applicable

Contractor Foreman: Not Applicable

Schnabel Representative: K. Megginson

Equipment:

Method: Hand Auger

Dates Started: 7/31/14 **Finished:** 7/31/14

North: 321244 ft **East:** 2347582 ft

Coordinate System: VA State Plane (N)

Plunge: -90 **Bearing:**

Ground Surface Elevation: 14± (ft) **Total Depth:** 6.0 ft

Water Level Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/31/14	12:40 PM	1.0'	---	---
Completion	7/31/14	1:00 PM	2.7'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.3	0.0 - 0.3 ft: Forest litter, rootmat and topsoil		13.9			GRAB		
2.2	0.3 - 2.2 ft: SILTY SAND, fine to coarse grained sand; moist, dark yellowish gray and dark orangish brown, estimated 30 - 45% fines, contains roots, probable ALLUVIAL material, contains Clayey Sand (SC) pockets 1.0 ft: Change: wet 1.5 ft: Change: estimated 5 - 10% fine gravel	SM	12.0			GRAB		
5.0	2.2 - 5.0 ft: POORLY GRADED SAND WITH SILT, fine to medium grained sand; wet, dark yellowish brown and grayish brown, estimated 5 - 10% fines, probable TERRACE material	SP-SM	9.2		5			
6.0	5.0 - 6.0 ft: POORLY GRADED SAND, fine to medium grained sand; wet, gray, estimated <5% fines, probable TERRACE material	SP	8.2					

Bottom of Hand Auger at 6.0 ft.
Boring terminated at selected depth.
Boring backfilled with bentonite upon completion.
Continuous cave in below 5 feet.

TEST BORING LOG 14221002.01 POSSUM POINT 2014-08-01.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 10/7/14

APPENDIX B

SOIL LABORATORY TEST DATA

Summary of Laboratory Tests (2 sheets)

Gradation Curves (8 sheets)

One-Dimensional Consolidation Test with Incremental Loading (4 sheets)

Consolidated-Undrained (CU) Triaxial Compression Tests (10 sheets)

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Summary Of Laboratory Tests

Project Number: 14221002.01

Boring No.	Sample Depth ft / Elevation ft	Sample Type	Description of Soil Specimen	Wet Natural Density (pcf)	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	Percent Clay	% Passing No. 200 Sieve	% Passing No. 40 Sieve	% Passing No. 10 Sieve	% Retained No. 4 Sieve	Specific Gravity
B-02	6.0 - 8.0	Jar	LEAN CLAY (CL), contains sand and mica, brown	--	30.3	43	22	21	--	87.6	--	--	--	--
B-02	10.0 - 12.0	Tube	FAT CLAY (CH), contains sand, mottled light gray and light brown	123.2	24.0	60	23	37	42.6	97.9	98.9	100.0	0.0	2.73
B-02	12.0 - 14.0	Tube	FAT CLAY (CH), contains sand, mottled light gray and light brown (Visual Classification)	122.3	27.2	--	--	--	--	--	--	--	--	--
B-02	18.0 - 20.0	Jar	FAT CLAY (CH), contains sand, mottled light gray and light brown (Visual Classification)	--	29.0	52	23	29	--	--	--	--	--	--
B-02	27.0 - 29.0	Tube	SANDY LEAN CLAY (CL), contains gravel, blue gray	123.1	30.3	49	19	30	--	52.4	76.5	97.9	1.2	--
B-02	33.0 - 35.0	Jar	SANDY LEAN CLAY (CL), contains gravel and mica, brown (Visual Classification)	--	27.1	--	--	--	17.4	51.4	92.4	98.6	0.8	2.68
B-03	28.0 - 30.0	Jar	CLAYEY SAND (SC), fine to medium, contains gravel, brown (Visual Classification)	--	19.7	--	--	--	--	40.1	73.8	97.9	0.9	--

Notes:
1. Soil tests in general accordance with ASTM standards.
2. Soil classifications are in general accordance with ASTM D2487(as applicable), based on testing indicated and visual classification.
3. Key to abbreviations: NP=Non-Plastic; -- indicates no test performed

Schnabel ENGINEERING

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

DYNAMIC LAB SUMMARY 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008 04 22.GDT 9/4/14

Summary Of Laboratory Tests

Project Number: 14221002.01

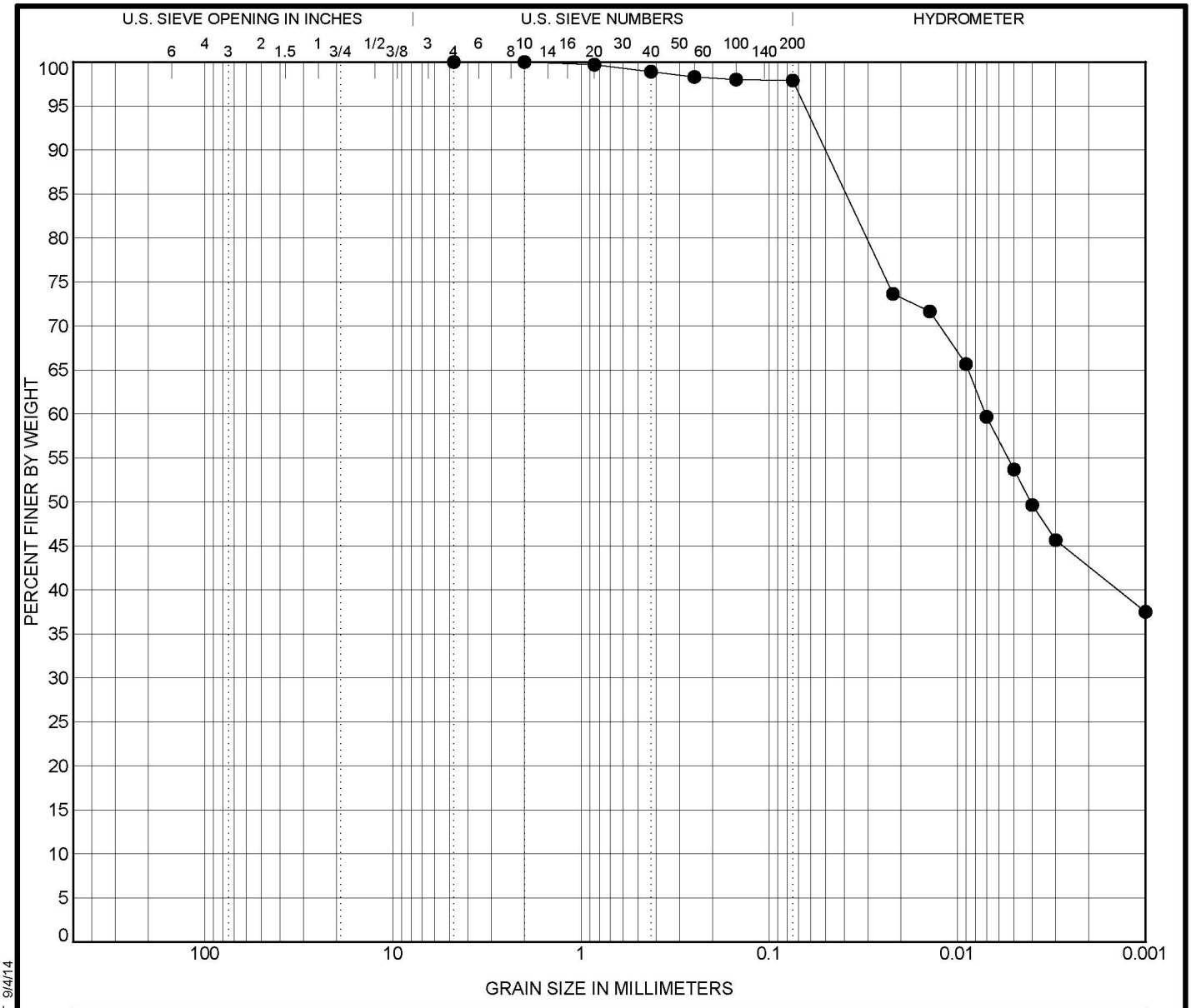
Boring No.	Sample Depth ft / Elevation ft	Sample Type	Description of Soil Specimen	Wet Natural Density (pcf)	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	Percent Clay	% Passing No. 200 Sieve	% Passing No. 40 Sieve	% Passing No. 10 Sieve	% Retained No. 4 Sieve	Specific Gravity
B-04	13.0 - 15.0	Jar	LEAN CLAY (CL), contains sand, gravel and mica, light gray (Visual Classification)	--	28.2	--	--	--	--	88.0	96.7	99.8	0.1	--
B-05	2.0 - 4.0	Jar	SILTY SAND (SM), fine to medium, contains gravel and mica, light brown (Visual Classification)	--	14.2	--	--	--	--	23.7	--	--	--	--
B-05	23.0 - 25.0	Jar	SILTY SAND (SM), fine to medium, contains gravel, light brown (Visual Classification)	--	24.0	--	--	--	--	15.4	41.0	99.3	0.3	--
B-06	2.0 - 4.0	Jar	SANDY LEAN CLAY (CL), contains gravel and mica, tan	--	22.4	28	19	9	--	60.5	--	--	--	--
B-06	12.5 - 14.5	Tube	FAT CLAY (CH), contains sand and gravel, gray brown	124.5	25.4	55	25	30	37.5	85.9	93.8	99.7	0.2	2.69
B-06	33.0 - 35.0	Jar	SILTY SAND (SM), fine to medium, contains gravel, light gray and light brown (Visual Classification)	--	22.6	--	--	--	--	14.5	35.7	100.0	0.0	--
B-06	43.0 - 45.0	Jar	ELASTIC SILT (MH), contains sand, blue gray (Visual Classification)	--	34.7	55	33	22	--	--	--	--	--	--

Notes:
1. Soil tests in general accordance with ASTM standards.
2. Soil classifications are in general accordance with ASTM D2487(as applicable), based on testing indicated and visual classification.
3. Key to abbreviations: NP=Non-Plastic; -- indicates no test performed

Schnabel ENGINEERING

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

DYNAMIC LAB SUMMARY 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008 04 22.GDT 9/4/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI		
● B-02	10.0 ft	**FAT CLAY (CH), contains sand, mottled light gray and light brown**	**60**	**23**	**37**		

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D422	**2**	**0.007**			**0.0**	**2.1**	**55.3**	**42.6**

Percent Finer

Sieve Size	No. 200	No. 100	No. 60	No. 40	No. 20	No. 10	No. 4
% Finer	97.9	98.0	98.3	98.9	99.7	100.0	100.0

Tested By	Tested Date	Reviewed By	Calc By
MJF	8/15/14	TTM	MJF

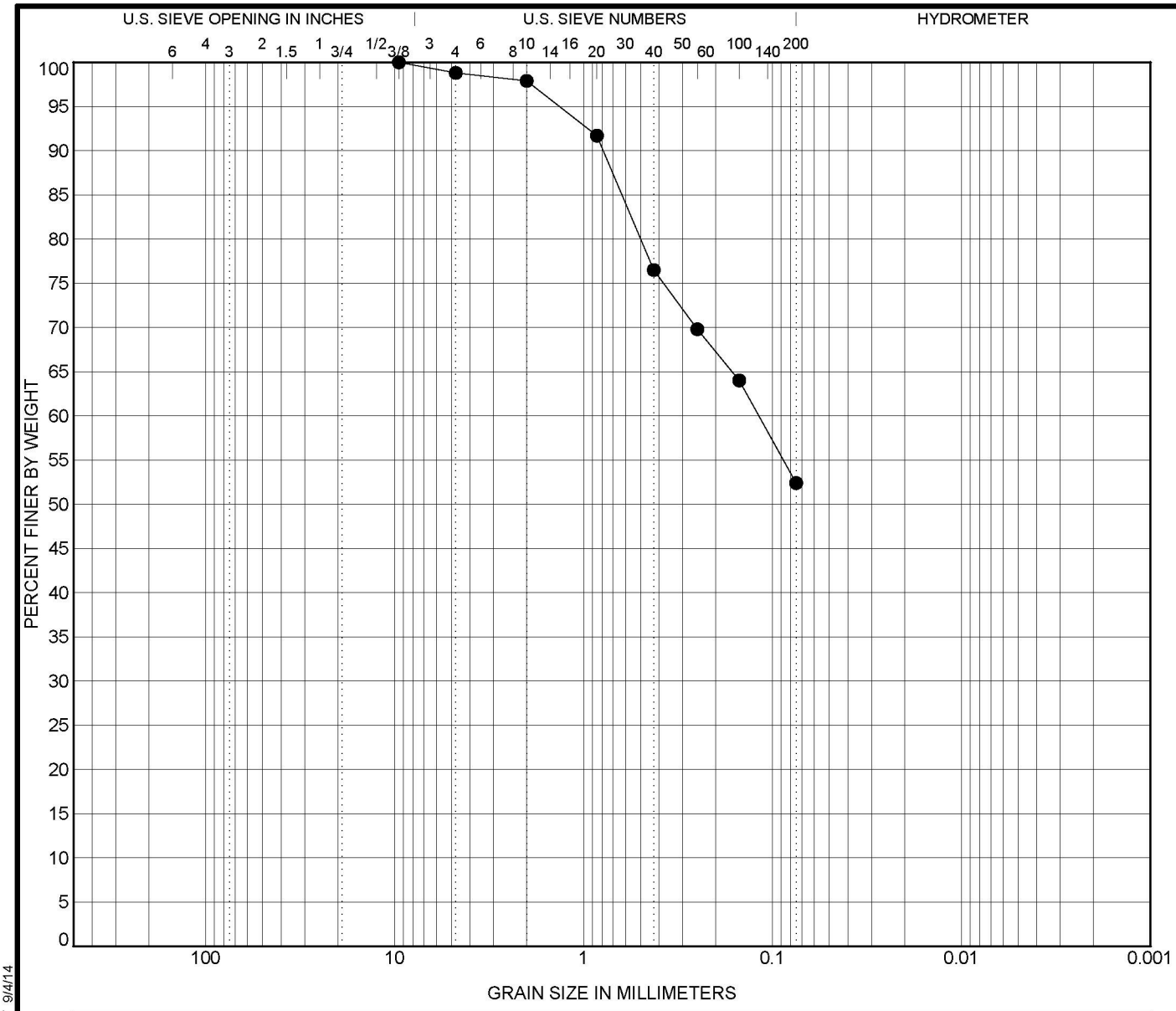
Schnabel ENGINEERING

GRADATION CURVE

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Contract: 14221002.01

SIEVE 1/SHEET 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008_04_22.GDT 9/4/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI		
● B-02	27.0 ft	**SANDY LEAN CLAY (CL), contains gravel, blue gray**	**49**	**19**	**30**		

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D422	**9.5**	**0.118**			**1.2**	**46.4**	**52.4**	

Percent Finer

Sieve Size	No. 200	No. 100	No. 60	No. 40	No. 20	No. 10	No. 4	3/8 in.
% Finer	52.4	64.0	69.8	76.5	91.7	97.9	98.8	100.0

Tested By	Tested Date	Reviewed By	Calc By
DWC/MJF	8/15/14	TTM	MJF

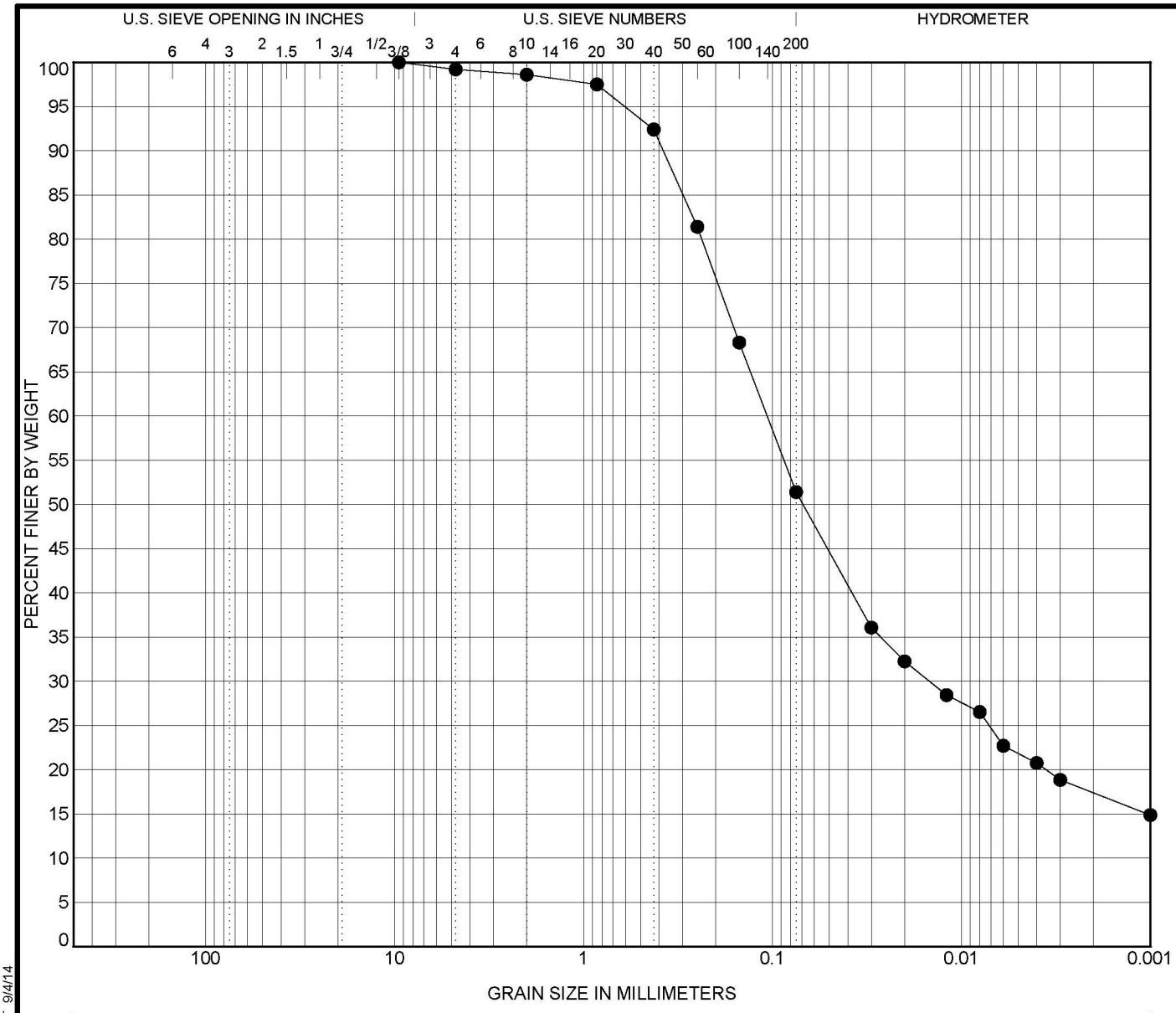
Schnabel ENGINEERING

GRADATION CURVE

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Contract: 14221002.01

SIEVE 1/SHEET 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008_04_22.GDT 9/4/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI
B-02	33.0 ft	**SANDY LEAN CLAY (CL), contains gravel and mica, brown (Visual Classification)**	--	--	--

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D422	**9.5**	**0.107**	**0.015**		**0.8**	**47.8**	**34.0**	**17.4**

Percent Finer

Sieve Size	No. 200	No. 100	No. 60	No. 40	No. 20	No. 10	No. 4	3/8 in.
% Finer	51.4	68.3	81.4	92.4	97.5	98.6	99.2	100.0

Tested By	Tested Date	Reviewed By	Calc By
MJF	8/15/14	TTM	MJF

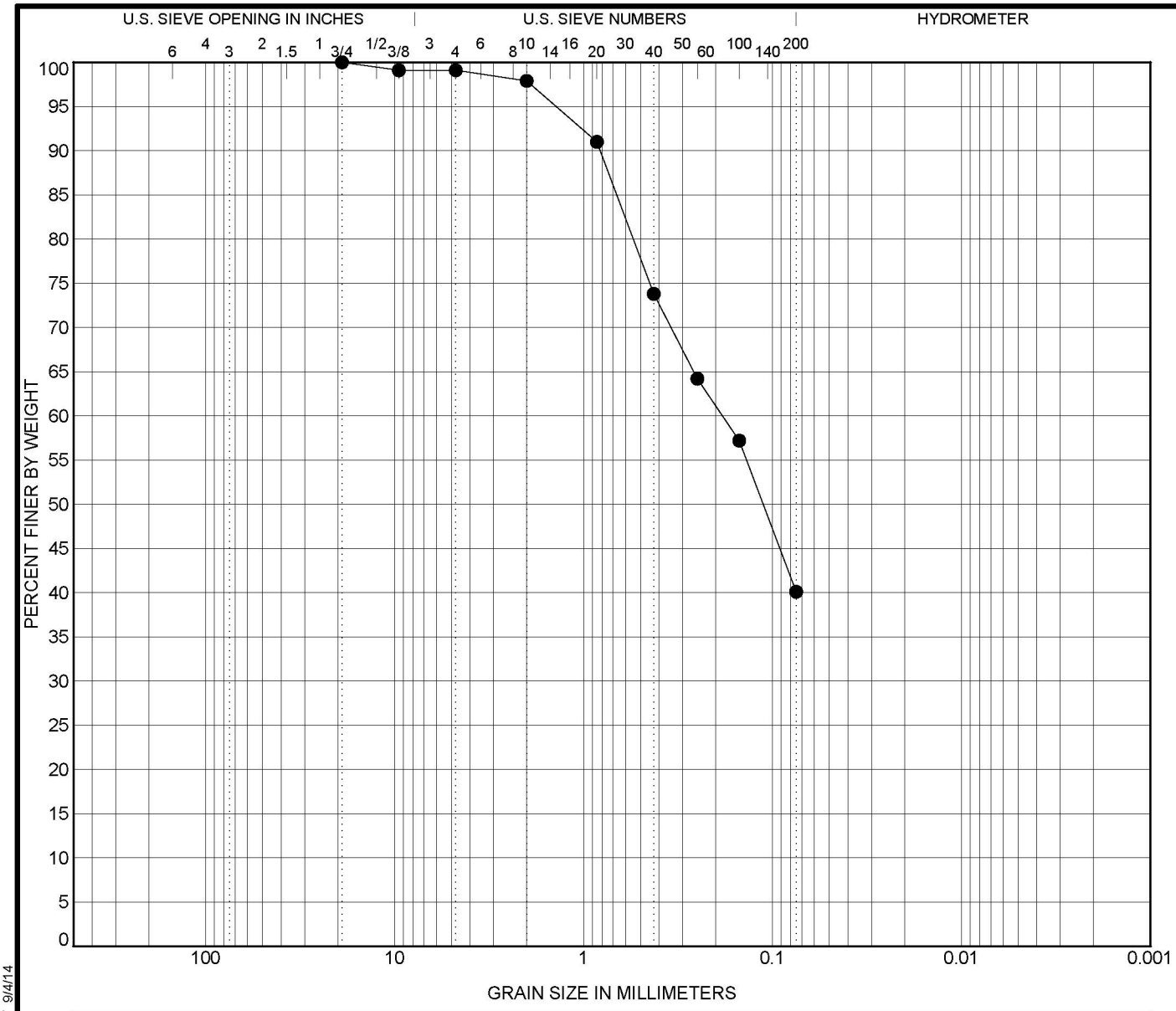
Schnabel ENGINEERING

GRADATION CURVE

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Contract: 14221002.01

SIEVE 1/SHEET 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008_04_22.GDT 9/4/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI
● B-03	28.0 ft	**CLAYEY SAND (SC), fine to medium, contains gravel, brown (Visual Classification)**	--	--	--

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D422	**19**	**0.184**			**0.9**	**59.0**	**40.1**	

Percent Finer

Sieve Size	No. 200	No. 100	No. 60	No. 40	No. 20	No. 10	No. 4	3/8 in.	3/4 in.
% Finer	40.1	57.2	64.2	73.8	91.0	97.9	99.1	99.1	100.0

Tested By	Tested Date	Reviewed By	Calc By
MJF	8/12/14	TTM	MJF

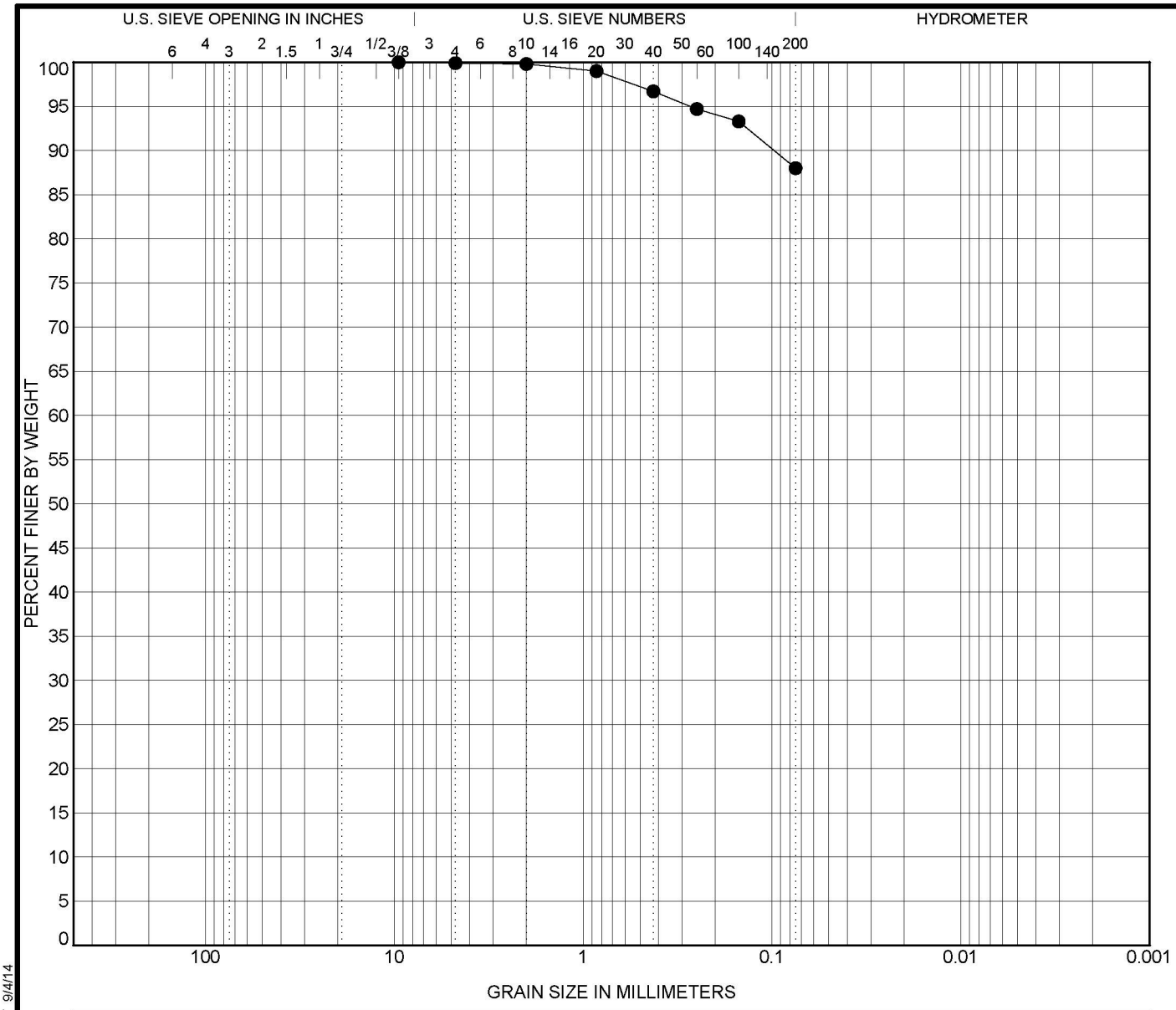
Schnabel ENGINEERING

GRADATION CURVE

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Contract: 14221002.01

SIEVE 1/SHEET 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008_04_22.GDT 9/4/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI
● B-04	13.0 ft	**LEAN CLAY (CL), contains sand, gravel and mica, light gray (Visual Classification)**	--	--	--

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D422	**9.5**				**0.1**	**11.9**	**88.0**	

Percent Finer

Sieve Size	No. 200	No. 100	No. 60	No. 40	No. 20	No. 10	No. 4	3/8 in.
% Finer	88.0	93.3	94.7	96.7	99.0	99.8	99.9	100.0

Tested By	Tested Date	Reviewed By	Calc By
MJF	8/12/14	TTM	MJF

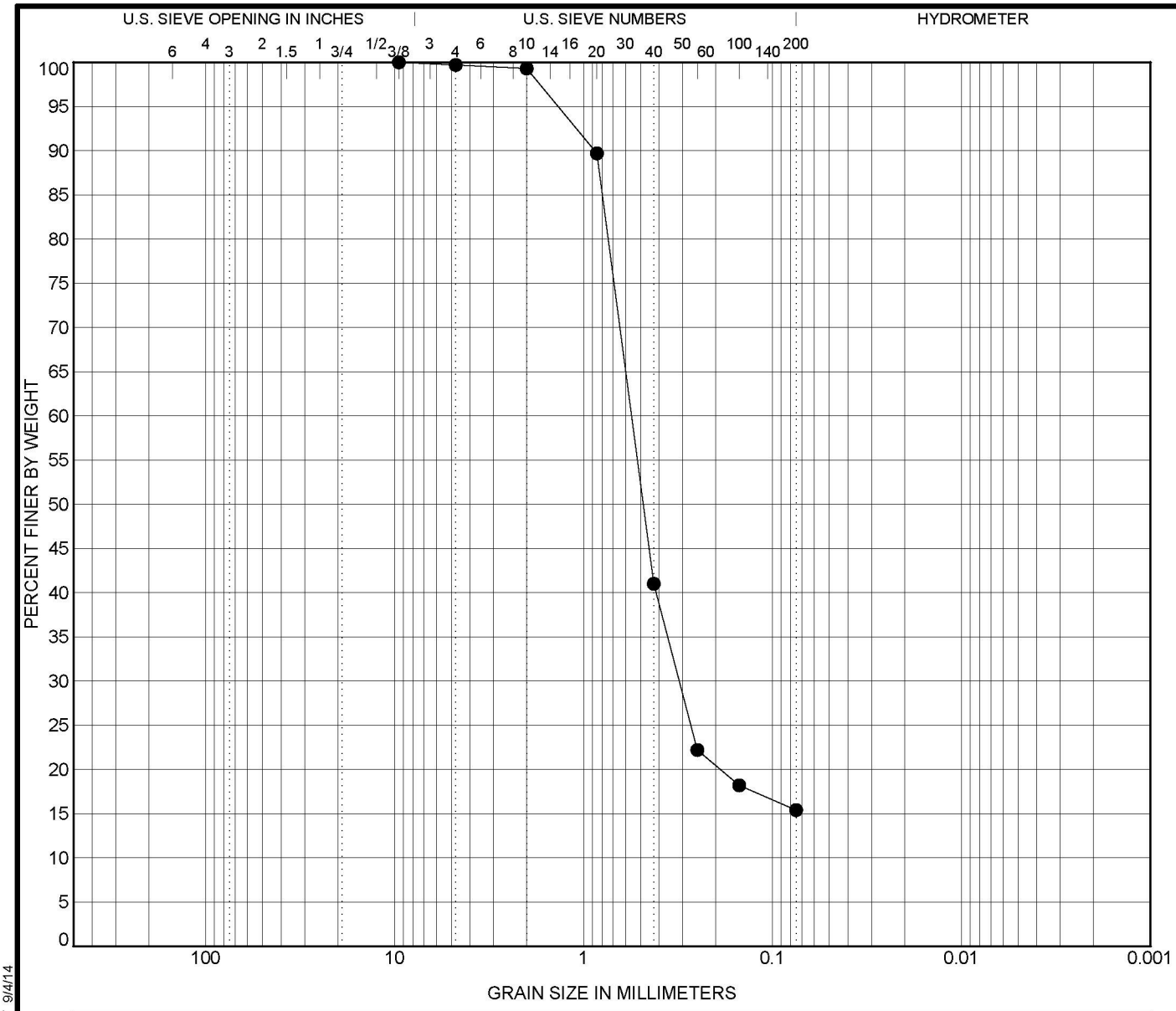
Schnabel ENGINEERING

GRADATION CURVE

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Contract: 14221002.01

SIEVE 1/SHEET 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008_04_22.GDT 9/4/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI
● B-05	23.0 ft	**SILTY SAND (SM), fine to medium, contains gravel, light brown (Visual Classification)**	--	--	--

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D422	**9.5**	**0.557**	**0.312**		**0.3**	**84.3**	**15.4**	

Percent Finer

Sieve Size	No. 200	No. 100	No. 60	No. 40	No. 20	No. 10	No. 4	3/8 in.
% Finer	15.4	18.2	22.2	41.0	89.7	99.3	99.7	100.0

Tested By	Tested Date	Reviewed By	Calc By
MJF	8/12/14	TTM	MJF

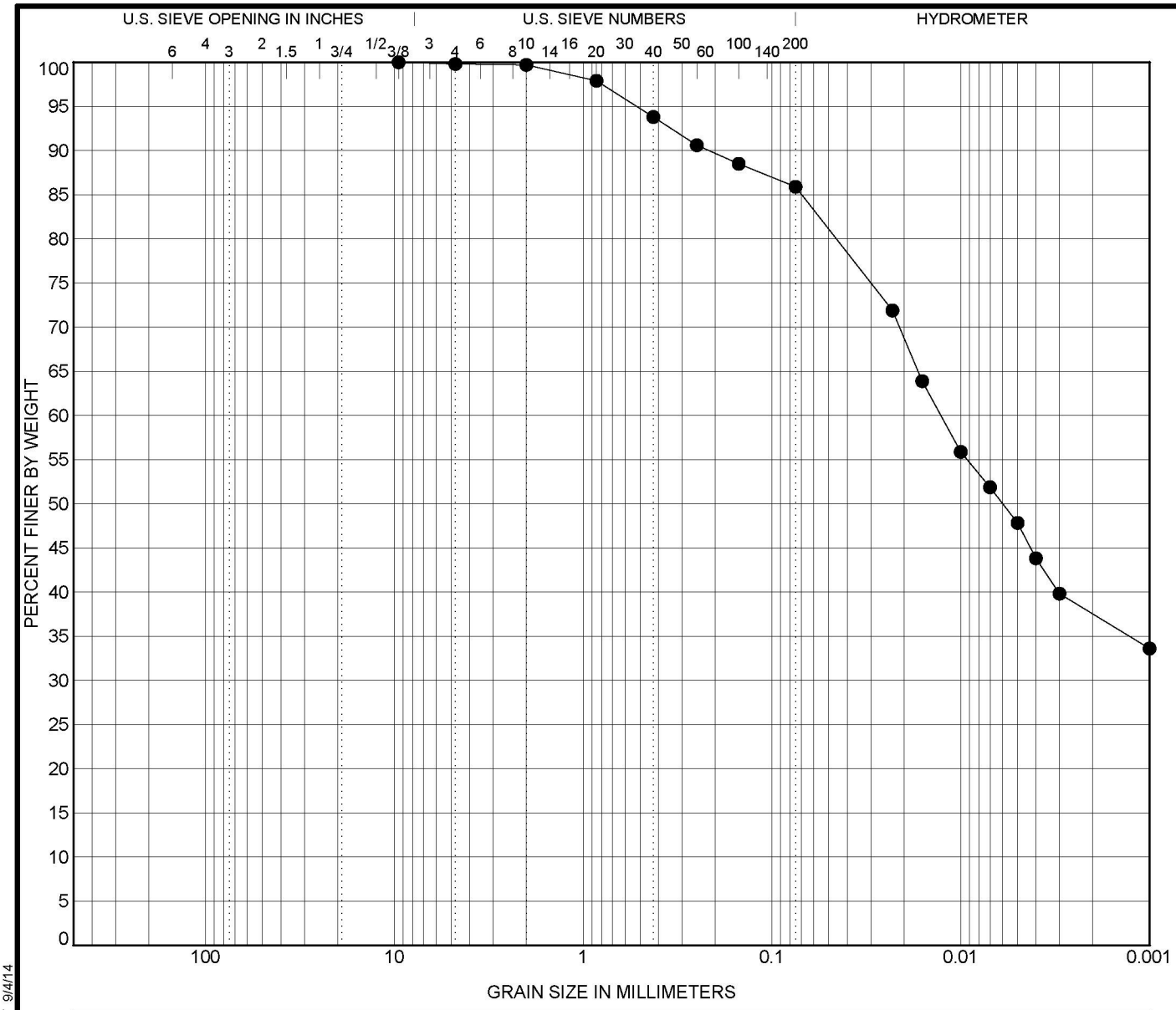
Schnabel ENGINEERING

GRADATION CURVE

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Contract: 14221002.01

SIEVE 1/SHEET 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008_04_22.GDT 9/4/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI		
● B-06	12.5 ft	**FAT CLAY (CH), contains sand and gravel, gray brown**	**55**	**25**	**30**		

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D422	**9.5**	**0.013**			**0.2**	**13.9**	**48.4**	**37.5**

Percent Finer

Sieve Size	No. 200	No. 100	No. 60	No. 40	No. 20	No. 10	No. 4	3/8 in.
% Finer	85.9	88.5	90.6	93.8	97.9	99.7	99.8	100.0

Tested By	Tested Date	Reviewed By	Calc By
MJF	8/15/14	TTM	MJF

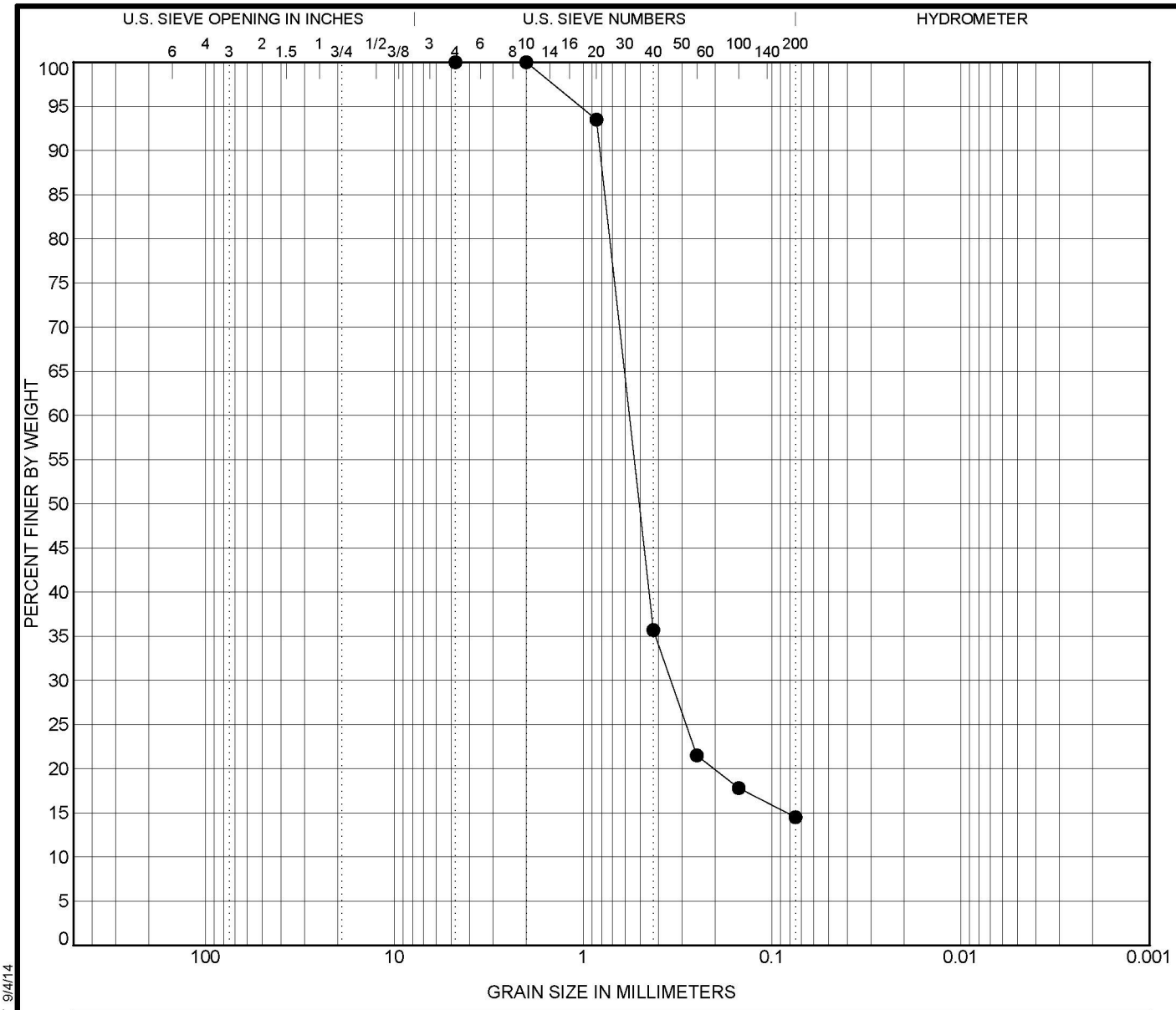
Schnabel ENGINEERING

GRADATION CURVE

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Contract: 14221002.01

SIEVE 1/SHEET 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008_04_22.GDT 9/4/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI
● B-06	33.0 ft	**SILTY SAND (SM), fine to medium, contains gravel, light gray and light brown (Visual Classification)**	--	--	--

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D422	**2**	**0.569**	**0.343**		**0.0**	**85.5**	**14.5**	

Percent Finer

Sieve Size	No. 200	No. 100	No. 60	No. 40	No. 20	No. 10	No. 4
% Finer	14.5	17.8	21.5	35.7	93.5	100.0	100.0

Tested By	Tested Date	Reviewed By	Calc By
MJF	8/12/14	TTM	MJF

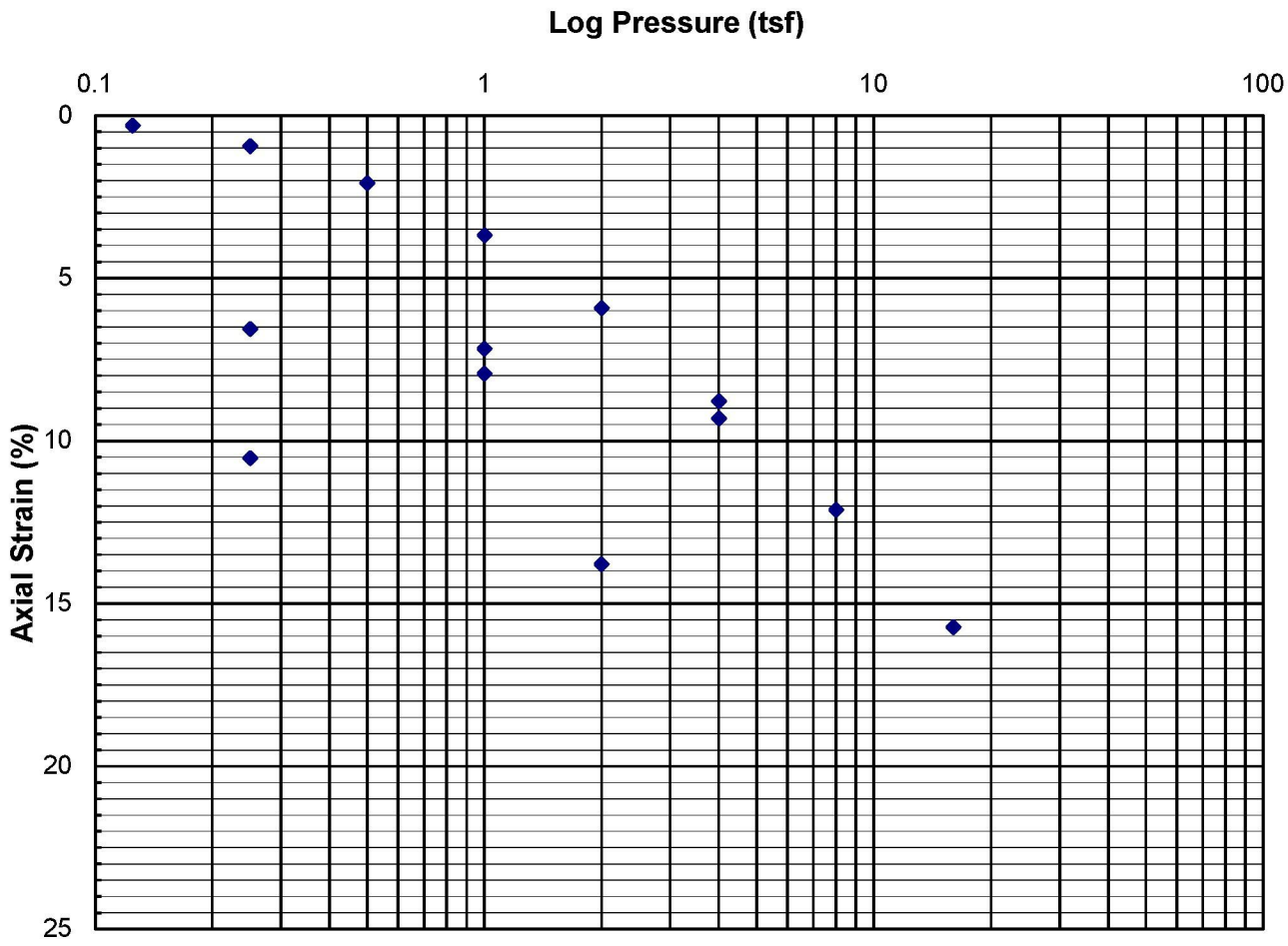
Schnabel ENGINEERING

GRADATION CURVE

Project: Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Contract: 14221002.01

SIEVE 1/SHEET 14221002.01 POSSUM POINT.GPJ SCHNABEL DATA TEMPLATE 2008_04_22.GDT 9/4/14



Probable Preconsolidation Pressure (Pp), tsf:	*1.1*	**Recompression Ratio (Cεr):**	*0.021*
Type of Specimen:	*Tube Sample*	**Compression Ratio (Cεc):**	*0.120*

Description: *FAT CLAY (CH), contains sand, mottled light gray and light brown*

LL: *60*	**PI:** *37*	**Gs:** *2.73*	**P_o' (tsf):** *0.47*
% < No. 200: *97.9*		**Test Method:** *ASTM D2435 Method A*	
Test Condition: *Inundated @ 0.05 tsf*			

	Initial	Final
Water Content, %	*31.4*	*24.4*
Void Ratio	*0.85*	*0.66*
Saturation, %	*100*	*100*
Dry Unit Weight, pcf	*91.9*	*102.7*

Remarks:

Average Water Content of Trimmings, %: *29.1*

Schnabel ENGINEERING

Project: Dominion - Possum Point Ash Ponds ABC - Phase 2

Location *Prince William County, Virginia*

Boring:	*B-02*	**Schnabel No.:**	*14221002.01*
Depth:	*10-12 ft.*	**Elevation:**	*12 to 10 ft.*
Date:	*9/30/2014*	**Reviewed by:**	*CJS*

Consolidation Test Report

Consol 5/2007 Rev. 6

Consolidation Test Data Sheet

Consolidometer ID: 2 9/30/14

Schnabel Contract: 14221002.01

Test Method: *ASTM D2435 Method A*

Test Condition: *Inundated @ 0.05 tsf*

Seating Press. (tsf): 0.05

Initial Height of Specimen (H_o), in.: 0.7499

Height of Solids (H_s), in.: 0.4045

Initial Dial Gauge Reading (D_o), in.: 0.0000

Final Height Differential (Hd), in.: -0.0025

Project: *Dominion - Possum Point Ash Ponds ABC - Phase 2*

Boring No.: *B-02*

Depth: *10-12 ft.*

Reviewed by: CJS

Pressure, P (tsf)	TimeReadings Required	Date Load Applied	Time Load Applied	Load Applied By	A: Final[1] Dial Reading, D_{fi} x 10^{-4} in.	B: Apparatus Correction[2], D_{ci} x 10^{-4} in.	C: Cumulative Change in Height[3], ΔH_i in.	D: Height of Voids[4], H_{vi} in.	Vertical Strain[5], ε_i (%)	Void Ratio[6], e_i
0.125		8/14/2014	9:00	DWC	21	-2	0.0023	0.3431	0.31	0.848
0.25		8/15/2014	9:00	DWC	70	-1	0.0071	0.3383	0.95	0.836
0.5		8/16/2014	9:00	DWC	158	2	0.0156	0.3298	2.08	0.815
1		8/18/2014	9:00	DWC	282	6	0.0276	0.3178	3.68	0.786
2		8/19/2014	9:00	DWC	454	10	0.0444	0.3010	5.92	0.744
4		8/20/2014	9:00	DWC	673	15	0.0658	0.2796	8.78	0.691
1		8/21/2014	9:00	DWC	601	6	0.0595	0.2859	7.93	0.707
0.25		8/22/2014	9:00	DWC	491	-1	0.0492	0.2962	6.56	0.732
1		8/23/2014	9:00	DWC	543	6	0.0537	0.2917	7.16	0.721
4		8/25/2014	9:00	DWC	713	15	0.0698	0.2756	9.31	0.681
8		8/26/2014	9:00	DWC	932	23	0.0909	0.2545	12.12	0.629
16		8/27/2014	9:00	DWC	1211	32	0.1179	0.2275	15.72	0.562
2		8/28/2014	9:00	DWC	1044	10	0.1034	0.2420	13.79	0.598
0.25		8/29/2014	9:00	DWC	788	-1	0.0789	0.2665	10.52	0.659

Notes:
1. "Final" based on test method; 24 hrs for Method A, end of primary for Method B.
2. Correction value, for the current pressure, from the consolidometer's calibration curve.
3. $\Delta H = D_{fi} - D_o - D_{ci}$ = Col. A - D_o - Col. B
4. $H_{vi} = (H_o - H_s) - \Delta H$
5. $\varepsilon_i = (\Delta H / H_o) \times 100$ = (Col. C / H_o) x 100
6. $e_i = H_{vi}$ / Hs = Col. D / Hs

Consol 5/2007 Rev. 6

Schnabel ENGINEERING

Load Time Readings

9/30/14

Project: Dominion - Possum Point
Schnabel Contract: 14221002.01
Boring No.: B-02 Depth: 10-12 ft.

Consol. ID: 2 Reviewed by: CJS

Test Drainage Conditions: Double

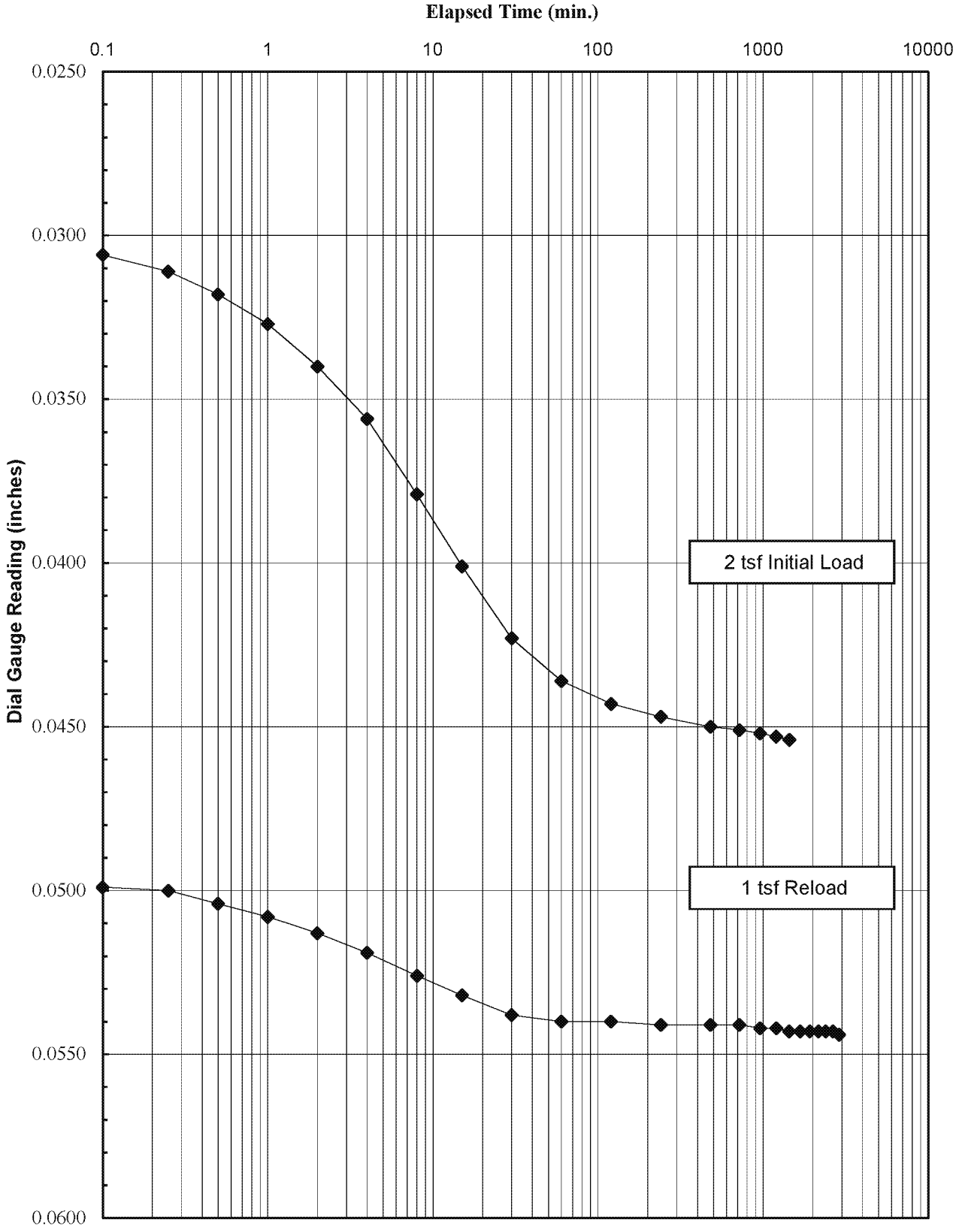
Elapsed Time (min.)	Dial Gauge Readings (inches)					
	2 tsf Initial Load 8/19/2014	1 tsf Reload 8/23/2014				
0.1	0.0306	0.0499				
0.25	0.0311	0.0500				
0.5	0.0318	0.0504				
1	0.0327	0.0508				
2	0.0340	0.0513				
4	0.0356	0.0519				
8	0.0379	0.0526				
15	0.0401	0.0532				
30	0.0423	0.0538				
60	0.0436	0.0540				
120	0.0443	0.0540				
240	0.0447	0.0541				
480	0.0450	0.0541				
720	0.0451	0.0541				
960	0.0452	0.0542				
1200	0.0453	0.0542				
1440	0.0454	0.0543				
1680		0.0543				
1920		0.0543				
2160		0.0543				
2400		0.0543				
2640		0.0543				
2880		0.0544				

Consol 5/2007 Rev. 6

Consolidation Time Curves

9/30/14

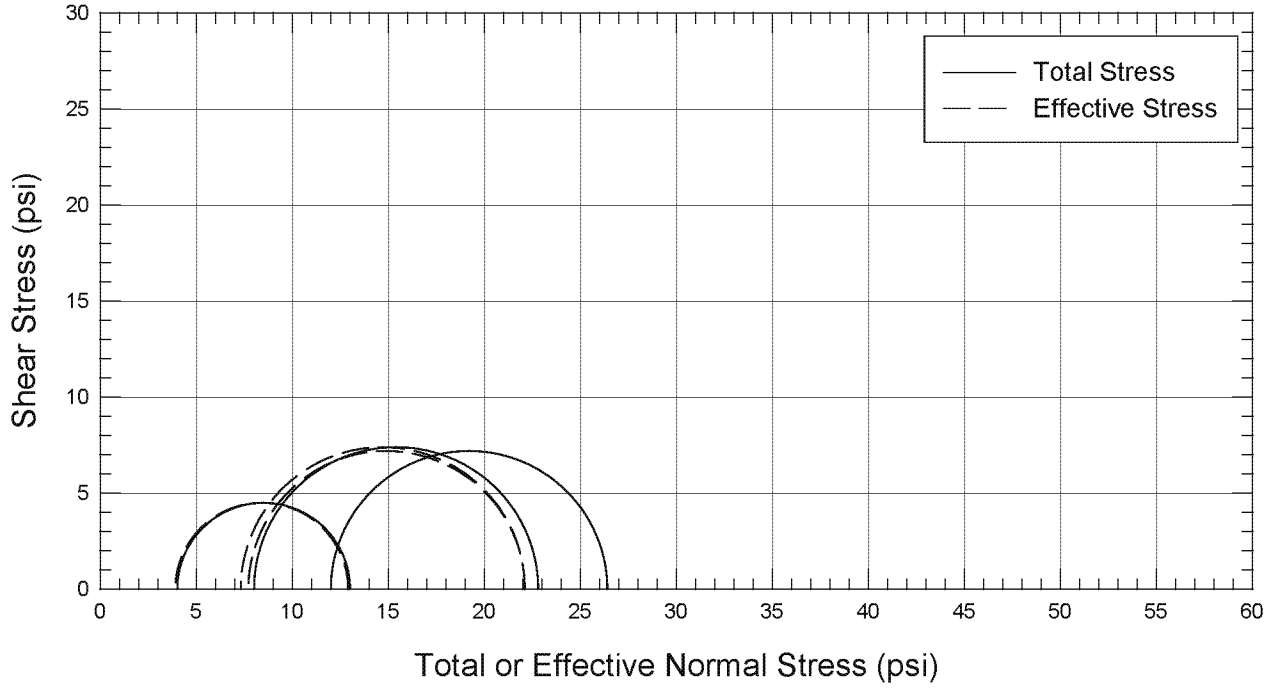
Project: Dominion - Possum Point
Schnabel Contract: 14221002.01
Boring No.: B-02 Depth: 10-12 ft.
Reviewed by: CJS Test Drainage Conditions: Double



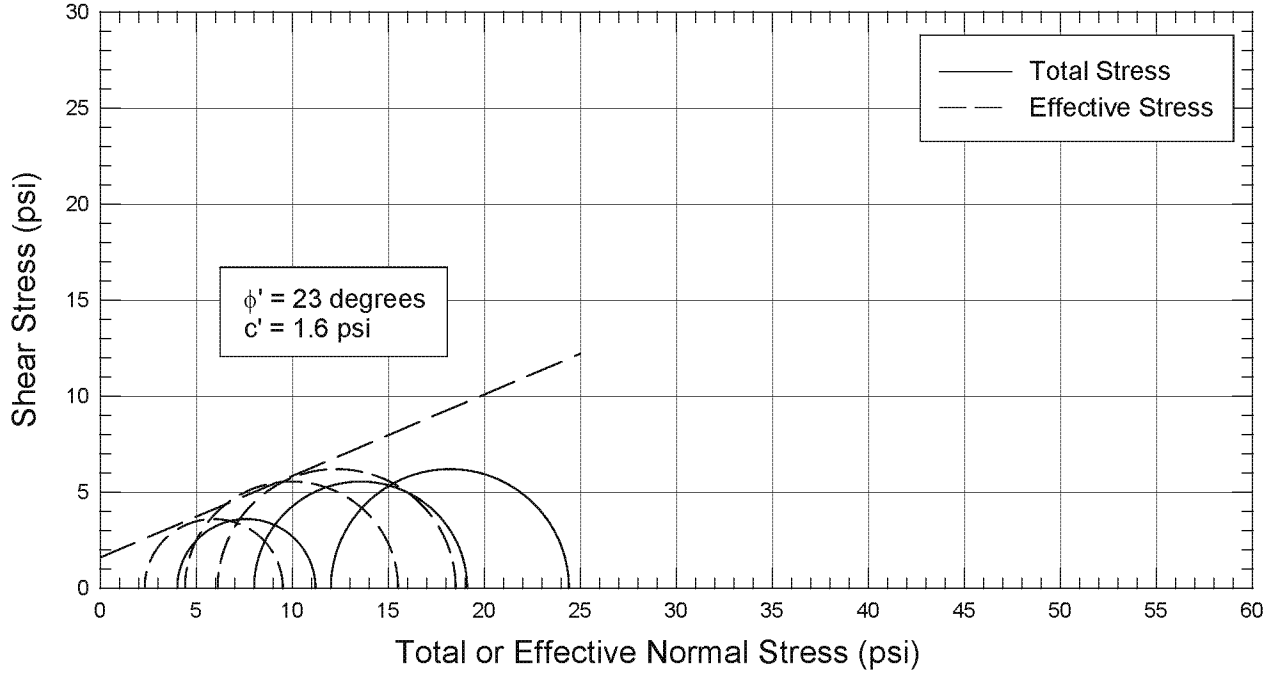
Consol 5/2007 Rev. 6

Consolidated Undrained (CU) Triaxial Shear (ASTM D4767)

Mohr Stress Circles at Maximum Deviator Stress Criterion



Mohr Stress Circles at Maximum Principal Stress Ratio Criterion



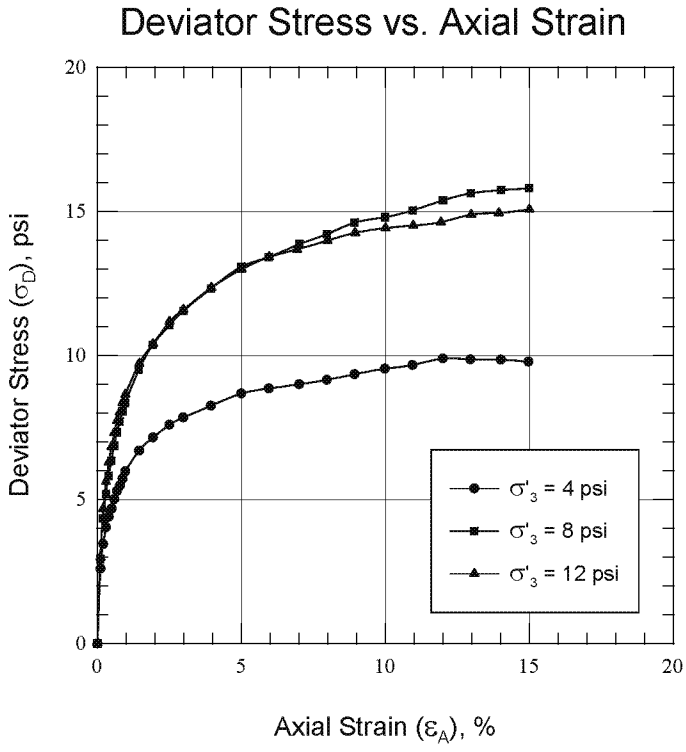
Boring No.: *B-02* Depth: *10-14 ft* Elevation: *12 to 8 ft* SE Contract: *14221002.01* Date: *9/30/14*

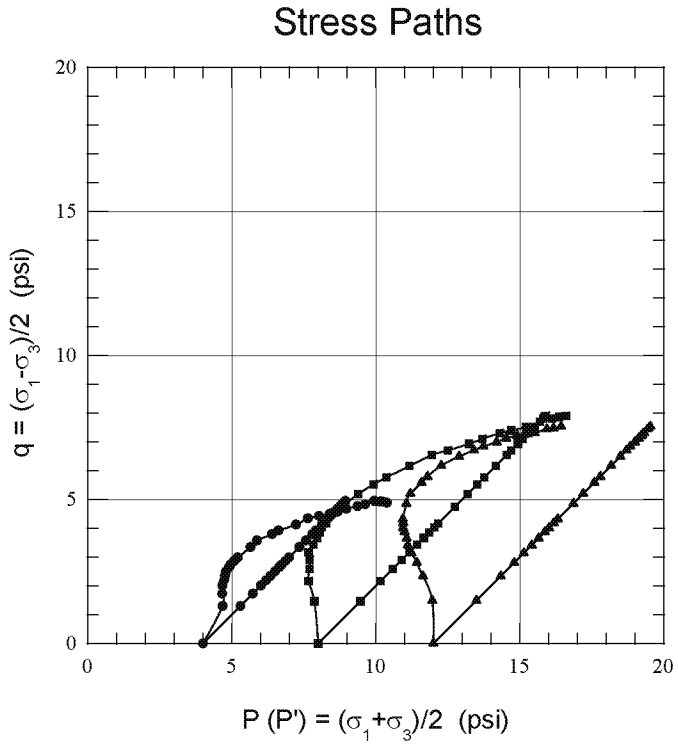
Sample Description: *FAT CLAY (CH), contains sand, mottled light gray and light brown* Reviewed By: *CJS*

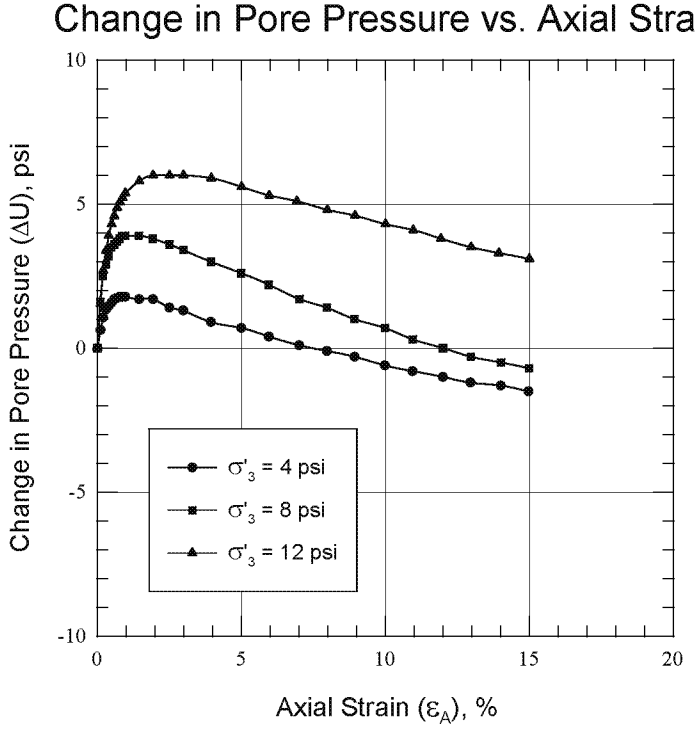
Specimen Type: *Tube Sample* Gs: *2.70 (assumed)* LL: *60* PI: *37* %<200: *97.9*

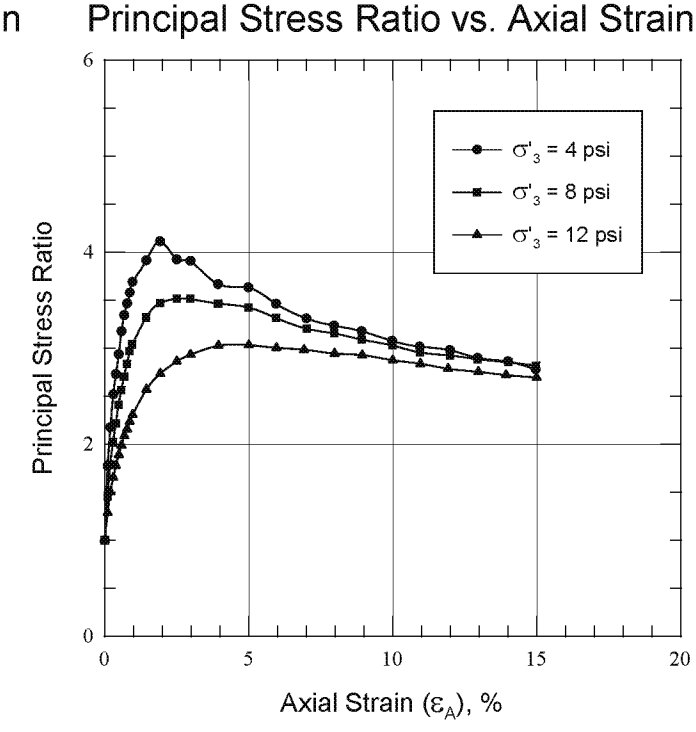
Schnabel ENGINEERING

Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia









Boring No.: *B-02* Depth: *10-14 ft* Elevation: *12 to 8 ft* SE Contract: *14221002.01* Date: *9/30/14*

Sample Description: *FAT CLAY (CH), contains sand, mottled light gray and light brown* Reviewed By: *CJS*

Specimen Type: *Tube Sample* Gs: *2.70 (assumed)* LL: *60* PI: *37* %<200: *97.9*

Schnabel ENGINEERING

Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Schnabel ENGINEERING

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Dominion - Possum Point*
Ash Ponds ABC - Phase 2
Location: *Prince William County, Virginia*

Schnabel Contract: *14221002.01*
Boring No.: *B-02*
Depth: *12-14 ft.*
Elevation: *10 to 8 ft.*
Confining Stress (psi): *4.0*

Date: *9/30/2014*
Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.878	2.87
Height (in)	5.798	5.80
Area (in^2)	6.51	6.48
Moisture (%)	27.2	
W_{solids} (lbs)	2.09	
ρ_{wet} (pcf)	122.0	
ρ_{dry} (pcf)	95.9	96.3
Void Ratio	0.78	0.77
Saturation, %	96	100

Shear Testing Conditions	
Cell Pressure (psi):	13.0
Back Pressure (psi):	9.0
Eff. Confining Stress (psi):	4.0
Final B check	0.97
t_{50} (min.):	20.8
Rate of Strain (%/min):	0.0193

Filter strips used? *YES*

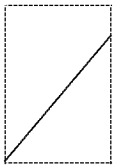
Specimen Type: *Tube Sample*

Soil Description: *FAT CLAY (CH), contains sand, mottled light gray and light brown (Visual Classification)*

Liquid Limit: --
Plasticity Index: --
% finer that No. 200: --
Specific Gravity: *2.73*

Remarks: *Gs assumed.*

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	9.0	0.0	6.48	4.0	4.0	4.0	4.0	0.0	1.00	0.00	4.0	4.0	0.0
1	17.0	16.9	0.006	0.10	9.6	0.6	6.49	6.6	4.0	6.0	3.4	2.6	1.77	0.24	5.3	4.7	1.3
2	22.7	22.5	0.012	0.20	10.1	1.1	6.50	7.5	4.0	6.4	2.9	3.5	2.18	0.31	5.7	4.7	1.7
3	26.6	26.2	0.017	0.30	10.3	1.3	6.50	8.0	4.0	6.7	2.7	4.0	2.52	0.33	6.0	4.7	2.0
4	29.1	28.6	0.023	0.39	10.5	1.5	6.51	8.4	4.0	6.9	2.5	4.4	2.73	0.33	6.2	4.7	2.2
5	31.1	30.5	0.028	0.49	10.6	1.6	6.51	8.7	4.0	7.1	2.4	4.7	2.93	0.34	6.3	4.8	2.3
6	33.3	32.7	0.034	0.58	10.7	1.7	6.52	9.0	4.0	7.3	2.3	5.0	3.18	0.34	6.5	4.8	2.5
7	35.4	34.6	0.039	0.68	10.7	1.7	6.53	9.3	4.0	7.6	2.3	5.3	3.34	0.33	6.6	4.9	2.6
8	36.7	35.8	0.045	0.77	10.8	1.8	6.53	9.5	4.0	7.7	2.2	5.5	3.46	0.32	6.7	5.0	2.7
9	38.5	37.4	0.050	0.87	10.8	1.8	6.54	9.7	4.0	7.9	2.2	5.7	3.58	0.31	6.9	5.1	2.9
10	40.3	39.1	0.056	0.97	10.8	1.8	6.55	10.0	4.0	8.2	2.2	6.0	3.69	0.30	7.0	5.2	3.0
11	45.8	44.1	0.084	1.45	10.7	1.7	6.58	10.7	4.0	9.0	2.3	6.7	3.91	0.25	7.3	5.6	3.3
12	49.6	47.3	0.112	1.92	10.7	1.7	6.61	11.2	4.0	9.5	2.3	7.2	4.11	0.24	7.6	5.9	3.6
13	53.0	50.5	0.145	2.50	10.4	1.4	6.65	11.6	4.0	10.2	2.6	7.6	3.92	0.18	7.8	6.4	3.8
14	55.0	52.4	0.173	2.98	10.3	1.3	6.68	11.8	4.0	10.5	2.7	7.8	3.91	0.17	7.9	6.6	3.9
15	58.5	55.7	0.228	3.94	9.9	0.9	6.75	12.3	4.0	11.4	3.1	8.3	3.66	0.11	8.1	7.2	4.1
16	62.3	59.2	0.289	4.99	9.7	0.7	6.82	12.7	4.0	12.0	3.3	8.7	3.63	0.08	8.3	7.6	4.3
17	64.3	61.1	0.345	5.95	9.4	0.4	6.89	12.9	4.0	12.5	3.6	8.9	3.46	0.05	8.4	8.0	4.4
18	66.2	62.8	0.406	7.00	9.1	0.1	6.97	13.0	4.0	12.9	3.9	9.0	3.31	0.01	8.5	8.4	4.5
19	68.2	64.5	0.462	7.96	8.9	-0.1	7.04	13.2	4.0	13.3	4.1	9.2	3.23	-0.01	8.6	8.7	4.6
20	70.4	66.6	0.517	8.92	8.7	-0.3	7.12	13.3	4.0	13.6	4.3	9.3	3.17	-0.03	8.7	9.0	4.7
21	72.8	68.7	0.578	9.98	8.4	-0.6	7.20	13.5	4.0	14.1	4.6	9.5	3.07	-0.06	8.8	9.4	4.8
22	74.7	70.4	0.634	10.93	8.2	-0.8	7.28	13.7	4.0	14.5	4.8	9.7	3.01	-0.08	8.8	9.6	4.8
23	77.4	72.9	0.695	11.99	8.0	-1.0	7.37	13.9	4.0	14.9	5.0	9.9	2.98	-0.10	8.9	9.9	4.9
24	78.2	73.5	0.750	12.95	7.8	-1.2	7.45	13.9	4.0	15.1	5.2	9.9	2.90	-0.12	8.9	10.1	4.9
25	79.3	74.3	0.812	14.00	7.7	-1.3	7.54	13.9	4.0	15.2	5.3	9.9	2.86	-0.13	8.9	10.2	4.9
26	79.8	74.6	0.867	14.96	7.5	-1.5	7.62	13.8	4.0	15.3	5.5	9.8	2.78	-0.15	8.9	10.4	4.9

Notes:
1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

CU 8/2006 Rev. 1

Schnabel ENGINEERING

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Dominion - Possum Point*
Ash Ponds ABC - Phase 2
Location: *Prince William County, Virginia*

Schnabel Contract: *14221002.01*
Boring No.: *B-02*
Depth: *12-14 ft.*
Elevation: *10 to 8 ft.*
Confining Stress (psi): *8.0*

Date: *9/30/2014*
Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.878	2.87
Height (in)	5.806	5.79
Area (in^2)	6.51	6.46
Moisture (%)	25.5	
W_{solids} (lbs)	2.16	
ρ_{wet} (pcf)	124.3	
ρ_{dry} (pcf)	99.0	100.1
Void Ratio	0.72	0.70
Saturation, %	97	100

Shear Testing Conditions	
Cell Pressure (psi):	23.0
Back Pressure (psi):	15.0
Eff. Confining Stress (psi):	8.0
Final B check	0.97
t_{50} (min.):	17.8
Rate of Strain (%/min):	0.0224

Filter strips used? *YES*

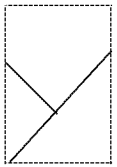
Specimen Type: *Tube Sample*

Soil Description: *FAT CLAY (CH), contains sand, mottled light gray and light brown (Visual Classification)*

Liquid Limit: --
Plasticity Index: --
% finer that No. 200: --
Specific Gravity: *2.73*

Remarks: *Gs assumed.*

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	15.0	0.0	6.46	8.0	8.0	8.0	8.0	0.0	1.00	0.00	8.0	8.0	0.0
1	19.1	19.0	0.006	0.10	16.6	1.6	6.46	10.9	8.0	9.3	6.4	2.9	1.46	0.55	9.5	7.9	1.5
2	28.3	28.1	0.011	0.19	17.5	2.5	6.47	12.3	8.0	9.8	5.5	4.3	1.79	0.58	10.2	7.7	2.2
3	34.0	33.7	0.017	0.29	17.9	2.9	6.48	13.2	8.0	10.3	5.1	5.2	2.02	0.56	10.6	7.7	2.6
4	38.2	37.8	0.022	0.38	18.2	3.2	6.48	13.8	8.0	10.6	4.8	5.8	2.21	0.55	10.9	7.7	2.9
5	41.7	41.1	0.028	0.48	18.5	3.5	6.49	14.3	8.0	10.8	4.5	6.3	2.41	0.55	11.2	7.7	3.2
6	45.3	44.6	0.033	0.58	18.6	3.6	6.49	14.9	8.0	11.3	4.4	6.9	2.56	0.52	11.4	7.8	3.4
7	48.5	47.7	0.039	0.67	18.7	3.7	6.50	15.3	8.0	11.6	4.3	7.3	2.71	0.50	11.7	8.0	3.7
8	51.0	50.1	0.044	0.77	18.8	3.8	6.51	15.7	8.0	11.9	4.2	7.7	2.83	0.49	11.9	8.1	3.9
9	53.5	52.5	0.050	0.86	18.9	3.9	6.51	16.1	8.0	12.2	4.1	8.1	2.97	0.48	12.0	8.1	4.0
10	55.6	54.5	0.056	0.96	18.9	3.9	6.52	16.4	8.0	12.5	4.1	8.4	3.04	0.47	12.2	8.3	4.2
11	64.0	62.3	0.083	1.44	18.9	3.9	6.55	17.5	8.0	13.6	4.1	9.5	3.32	0.41	12.8	8.9	4.8
12	70.6	68.3	0.111	1.92	18.8	3.8	6.58	18.4	8.0	14.6	4.2	10.4	3.47	0.37	13.2	9.4	5.2
13	75.8	73.3	0.144	2.50	18.6	3.6	6.62	19.1	8.0	15.5	4.4	11.1	3.51	0.33	13.5	9.9	5.5
14	79.5	76.9	0.172	2.98	18.4	3.4	6.65	19.6	8.0	16.2	4.6	11.6	3.51	0.29	13.8	10.4	5.8
15	85.6	82.8	0.228	3.94	18.0	3.0	6.72	20.3	8.0	17.3	5.0	12.3	3.47	0.24	14.2	11.2	6.2
16	91.9	88.9	0.289	4.99	17.6	2.6	6.80	21.1	8.0	18.5	5.4	13.1	3.42	0.20	14.5	11.9	6.5
17	95.4	92.1	0.344	5.95	17.2	2.2	6.87	21.4	8.0	19.2	5.8	13.4	3.31	0.16	14.7	12.5	6.7
18	99.8	96.3	0.406	7.01	16.7	1.7	6.94	21.9	8.0	20.2	6.3	13.9	3.20	0.12	14.9	13.2	6.9
19	103.4	99.7	0.461	7.97	16.4	1.4	7.02	22.2	8.0	20.8	6.6	14.2	3.15	0.10	15.1	13.7	7.1
20	107.5	103.6	0.517	8.93	16.0	1.0	7.09	22.6	8.0	21.6	7.0	14.6	3.09	0.07	15.3	14.3	7.3
21	110.3	106.2	0.578	9.98	15.7	0.7	7.17	22.8	8.0	22.1	7.3	14.8	3.03	0.05	15.4	14.7	7.4
22	113.4	109.1	0.633	10.94	15.3	0.3	7.25	23.0	8.0	22.7	7.7	15.0	2.95	0.02	15.5	15.2	7.5
23	117.4	112.9	0.694	12.00	15.0	0.0	7.34	23.4	8.0	23.4	8.0	15.4	2.92	0.00	15.7	15.7	7.7
24	120.7	116.0	0.750	12.96	14.7	-0.3	7.42	23.6	8.0	23.9	8.3	15.6	2.88	-0.02	15.8	16.1	7.8
25	123.2	118.2	0.811	14.01	14.5	-0.5	7.51	23.7	8.0	24.2	8.5	15.7	2.85	-0.03	15.9	16.4	7.9
26	125.2	120.0	0.867	14.97	14.3	-0.7	7.59	23.8	8.0	24.5	8.7	15.8	2.82	-0.04	15.9	16.6	7.9

Notes: 1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

CU 8/2006 Rev. 1

Schnabel ENGINEERING

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Dominion - Possum Point*
Ash Ponds ABC - Phase 2
Location: *Prince William County, Virginia*

Schnabel Contract: *14221002.01*
Boring No.: *B-02*
Depth: *10-12 ft.*
Elevation: *12 to 10 ft.*
Confining Stress (psi): *12.0*

Date: *9/30/2014*
Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.876	2.85
Height (in)	5.823	5.78
Area (in^2)	6.50	6.37
Moisture (%)	24.0	
W_{solids} (lbs)	2.18	
ρ_{wet} (pcf)	123.3	
ρ_{dry} (pcf)	99.5	102.3
Void Ratio	0.71	0.67
Saturation, %	92	100

Shear Testing Conditions	
Cell Pressure (psi):	21.0
Back Pressure (psi):	9.0
Eff. Confining Stress (psi):	12.0
Final B check	0.97
t_{50} (min.):	13.4
Rate of Strain (%/min):	0.0298

Filter strips used? *YES*

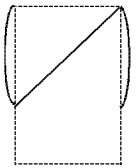
Specimen Type: *Tube Sample*

Soil Description: *FAT CLAY (CH), contains sand, mottled light gray and light brown*

Liquid Limit: *60*
Plasticity Index: *37*
% finer that No. 200: *97.9*
Specific Gravity: *2.73*

Remarks:

Failure Sketch



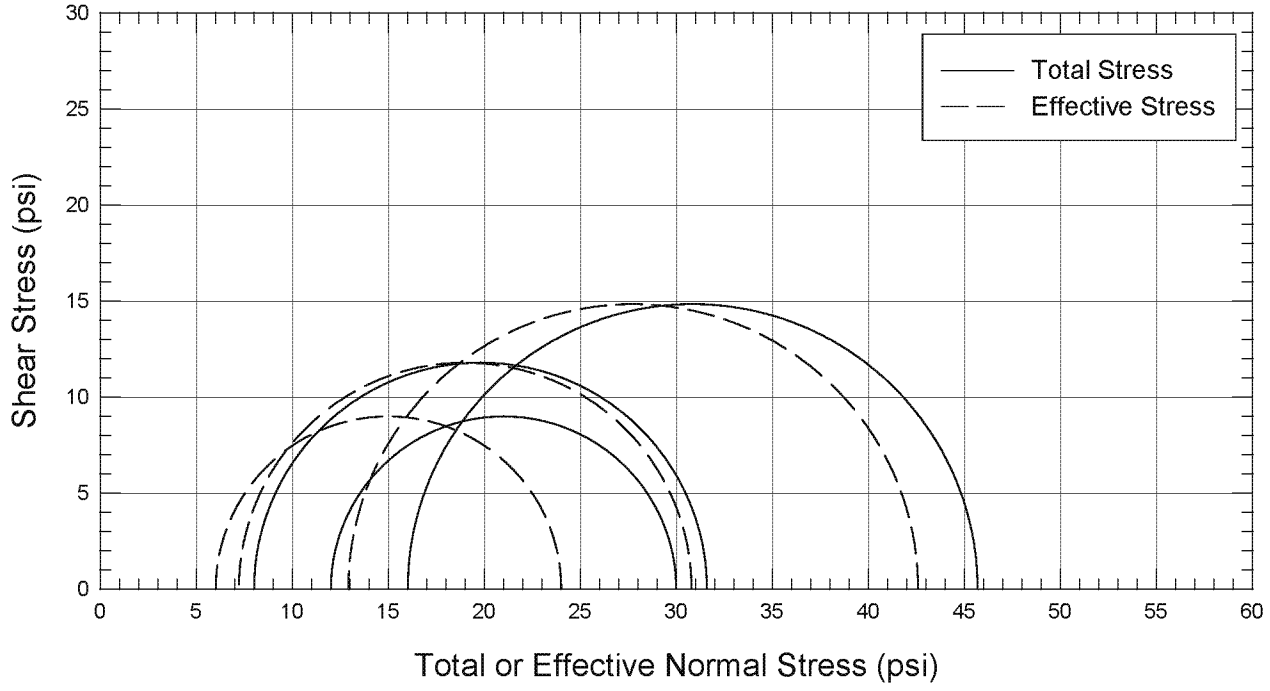
Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	9.0	0.0	6.37	12.0	12.0	12.0	12.0	0.0	1.00	0.00	12.0	12.0	0.0
1	19.2	19.1	0.006	0.10	10.5	1.5	6.37	15.0	12.0	13.5	10.5	3.0	1.29	0.51	13.5	12.0	1.5
2	30.1	29.9	0.012	0.20	11.7	2.7	6.38	16.7	12.0	14.0	9.3	4.7	1.50	0.58	14.3	11.6	2.3
3	36.3	35.9	0.017	0.30	12.4	3.4	6.39	17.6	12.0	14.2	8.6	5.6	1.65	0.60	14.8	11.4	2.8
4	40.7	40.2	0.023	0.39	12.9	3.9	6.39	18.3	12.0	14.4	8.1	6.3	1.78	0.62	15.1	11.2	3.1
5	44.3	43.8	0.028	0.49	13.3	4.3	6.40	18.8	12.0	14.5	7.7	6.8	1.89	0.63	15.4	11.1	3.4
6	47.5	46.8	0.034	0.58	13.6	4.6	6.40	19.3	12.0	14.7	7.4	7.3	1.99	0.63	15.7	11.1	3.7
7	50.4	49.6	0.039	0.68	13.9	4.9	6.41	19.7	12.0	14.9	7.1	7.7	2.08	0.63	15.9	11.0	3.9
8	52.4	51.5	0.045	0.78	14.1	5.1	6.42	20.0	12.0	15.0	6.9	8.0	2.16	0.63	16.0	10.9	4.0
9	54.8	53.7	0.050	0.87	14.2	5.2	6.42	20.4	12.0	15.1	6.8	8.4	2.23	0.62	16.2	11.0	4.2
10	56.8	55.6	0.056	0.97	14.4	5.4	6.43	20.7	12.0	15.3	6.6	8.7	2.31	0.62	16.3	10.9	4.3
11	64.6	62.8	0.084	1.45	14.8	5.8	6.46	21.7	12.0	15.9	6.2	9.7	2.57	0.60	16.9	11.1	4.9
12	69.8	67.5	0.112	1.93	15.0	6.0	6.49	22.4	12.0	16.4	6.0	10.4	2.73	0.58	17.2	11.2	5.2
13	75.5	73.0	0.145	2.51	15.0	6.0	6.53	23.2	12.0	17.2	6.0	11.2	2.86	0.54	17.6	11.6	5.6
14	78.7	76.1	0.173	2.99	15.0	6.0	6.56	23.6	12.0	17.6	6.0	11.6	2.93	0.52	17.8	11.8	5.8
15	84.7	81.9	0.228	3.95	14.9	5.9	6.63	24.4	12.0	18.5	6.1	12.4	3.03	0.48	18.2	12.3	6.2
16	90.1	87.1	0.289	5.00	14.6	5.6	6.70	25.0	12.0	19.4	6.4	13.0	3.03	0.43	18.5	12.9	6.5
17	94.1	90.9	0.345	5.96	14.3	5.3	6.77	25.4	12.0	20.1	6.7	13.4	3.00	0.39	18.7	13.4	6.7
18	97.1	93.6	0.400	6.93	14.1	5.1	6.84	25.7	12.0	20.6	6.9	13.7	2.98	0.37	18.8	13.7	6.8
19	100.5	96.8	0.462	7.98	13.8	4.8	6.92	26.0	12.0	21.2	7.2	14.0	2.94	0.34	19.0	14.2	7.0
20	103.6	99.7	0.517	8.94	13.6	4.6	6.99	26.3	12.0	21.7	7.4	14.3	2.93	0.32	19.1	14.5	7.1
21	106.2	102.1	0.578	10.00	13.3	4.3	7.07	26.4	12.0	22.1	7.7	14.4	2.87	0.30	19.2	14.9	7.2
22	108.1	103.8	0.634	10.96	13.1	4.1	7.15	26.5	12.0	22.4	7.9	14.5	2.84	0.28	19.3	15.2	7.3
23	110.3	105.8	0.689	11.92	12.8	3.8	7.23	26.6	12.0	22.8	8.2	14.6	2.78	0.26	19.3	15.5	7.3
24	113.7	109.0	0.750	12.98	12.5	3.5	7.32	26.9	12.0	23.4	8.5	14.9	2.75	0.24	19.4	15.9	7.4
25	115.6	110.6	0.806	13.94	12.3	3.3	7.40	27.0	12.0	23.7	8.7	15.0	2.72	0.22	19.5	16.2	7.5
26	118.1	112.9	0.867	15.00	12.1	3.1	7.49	27.1	12.0	24.0	8.9	15.1	2.69	0.21	19.5	16.4	7.5

Notes: 1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

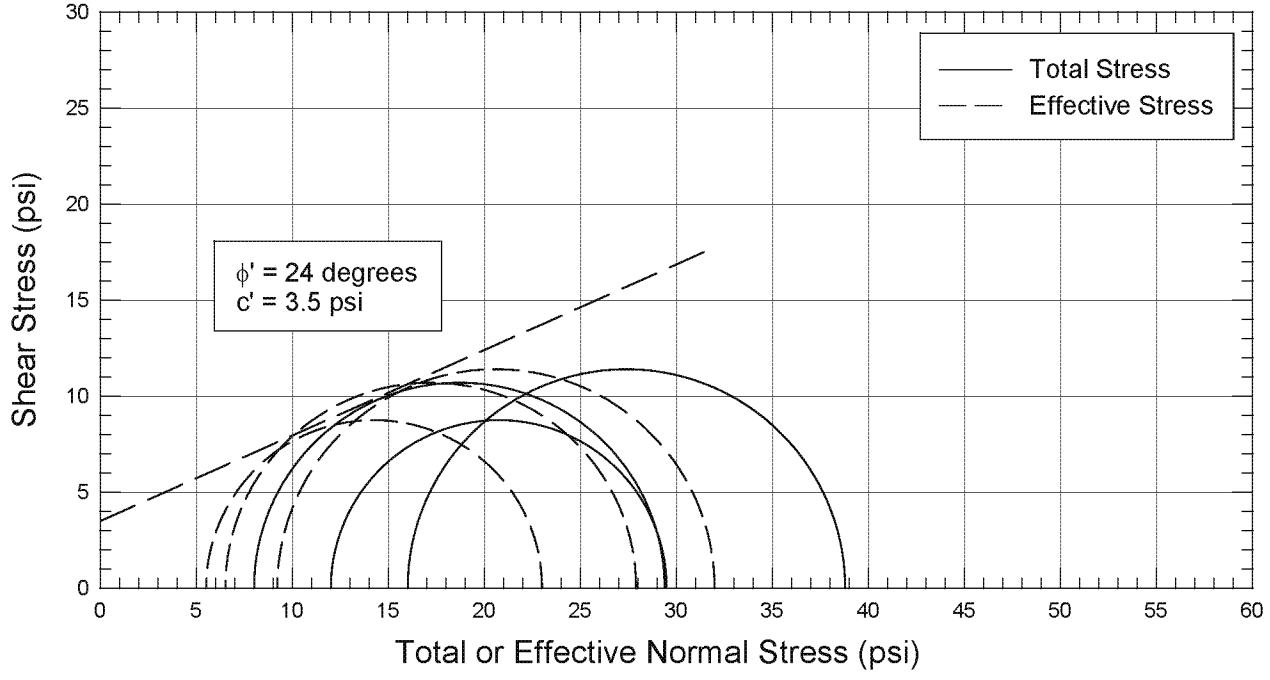
CU 8/2006 Rev. 1

Consolidated Undrained (CU) Triaxial Shear (ASTM D4767)

Mohr Stress Circles at Maximum Deviator Stress Criterion



Mohr Stress Circles at Maximum Principal Stress Ratio Criterion



Boring No.: *B-02* Depth: *27-29 ft* Elevation: *-5 to -7 ft* SE Contract: *14221002.01* Date: *9/30/14*

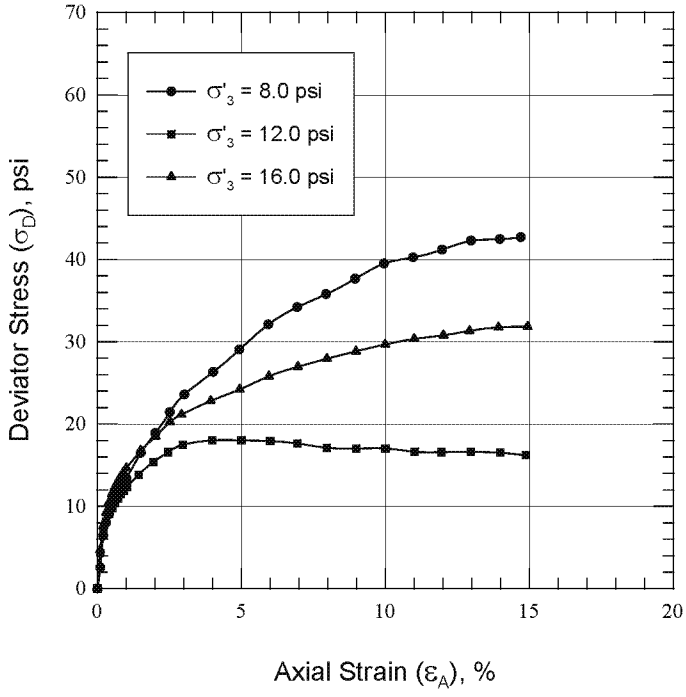
Sample Description: *SANDY LEAN CLAY (CL), contains gravel, blue gray* Reviewed By: *CJS*

Specimen Type: *Tube Sample* Gs: *2.70 (assumed)* LL: *49* PI: *30* %<200: *52.4*

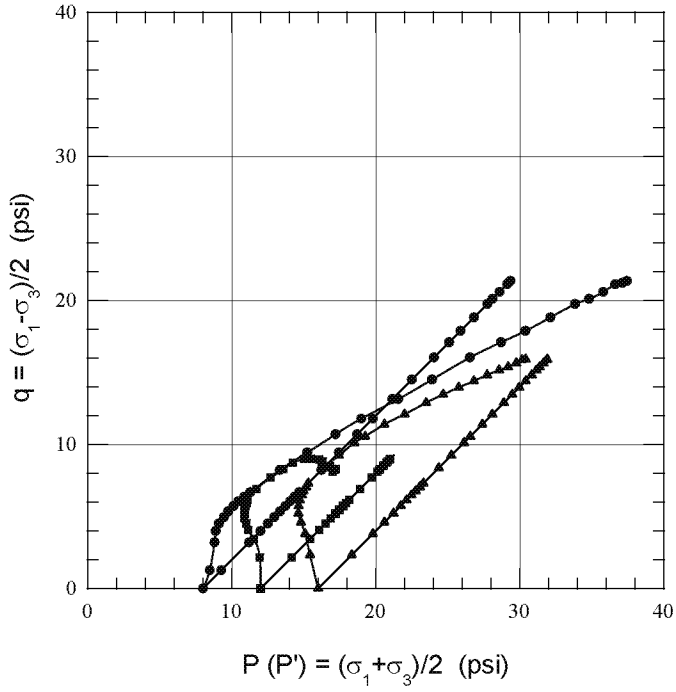
Schnabel ENGINEERING

Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

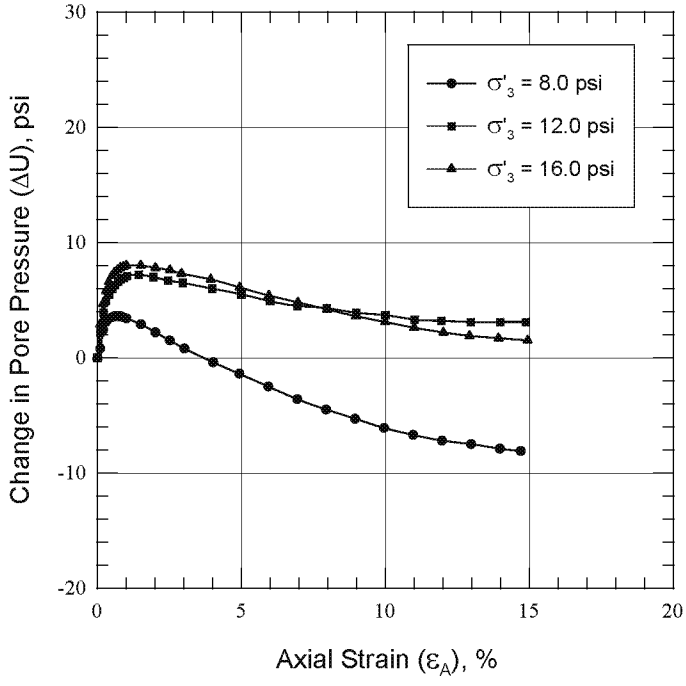
Deviator Stress vs. Axial Strain



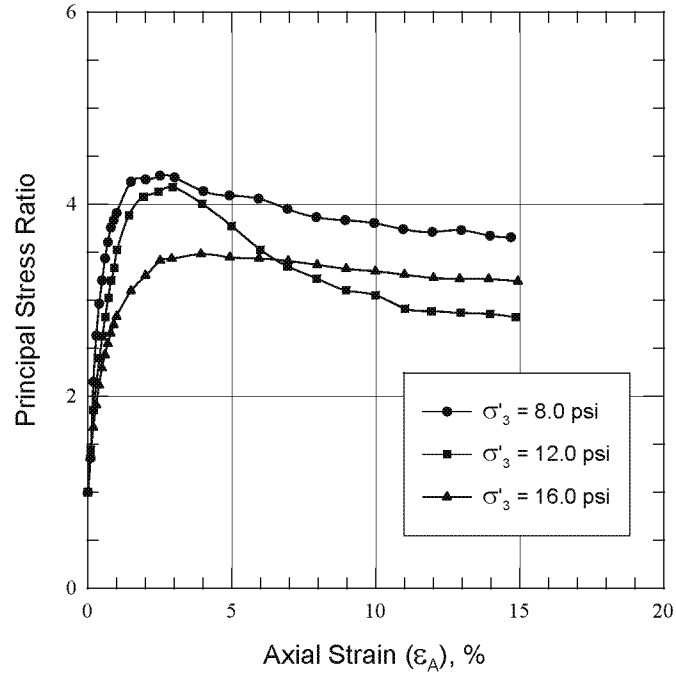
Stress Paths



Change in Pore Pressure vs. Axial Strain



Principal Stress Ratio vs. Axial Strain



Boring No.: *B-02* Depth: *27-29 ft* Elevation: *-5 to -7 ft* SE Contract: *14221002.01* Date: *9/30/14*

Sample Description: *SANDY LEAN CLAY (CL), contains gravel, blue gray* Reviewed By: *CJS*

Specimen Type: *Tube Sample* Gs: *2.70 (assumed)* LL: *49* PI: *30* %<200: *52.4*

Schnabel ENGINEERING

Dominion - Possum Point
Ash Ponds ABC - Phase 2
Prince William County, Virginia

Schnabel ENGINEERING

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Dominion - Possum Point*
Ash Ponds ABC - Phase 2
Location: *Prince William County, Virginia*

Schnabel Contract: *14221002.01*
Boring No.: *B-02*
Depth: *27-29 ft.*
Elevation: *-5 to -7 ft*
Confining Stress (psi): *8.0*

Date: *9/30/2014*
Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.878	2.87
Height (in)	5.812	5.81
Area (in^2)	6.51	6.47
Moisture (%)	24.1	
W_{solids} (lbs)	2.18	
ρ_{wet} (pcf)	123.5	
ρ_{dry} (pcf)	99.5	100.2
Void Ratio	0.69	0.68
Saturation, %	94	95

Shear Testing Conditions	
Cell Pressure (psi):	33.0
Back Pressure (psi):	25.0
Eff. Confining Stress (psi):	8.0
Final B check	0.98
t_{50} (min.):	0.6
Rate of Strain (%/min):	0.0208

Filter strips used? *NO*

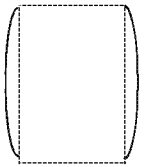
Specimen Type: *Tube Sample*

Soil Description: *SANDY LEAN CLAY (CL), contains gravel, blue gray*

Liquid Limit: *49*
Plasticity Index: *30*
% finer that No. 200: *52.4*
Specific Gravity: *2.70*

Remarks: *Gs assumed.*

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	25.0	0.0	6.47	8.0	8.0	8.0	8.0	0.0	1.00	0.00	8.0	8.0	0.0
1	16.5	16.5	0.006	0.10	25.8	0.8	6.48	10.5	8.0	9.7	7.2	2.5	1.35	0.31	9.3	8.5	1.3
2	41.7	41.7	0.012	0.20	27.4	2.4	6.48	14.4	8.0	12.0	5.6	6.4	2.15	0.37	11.2	8.8	3.2
3	51.9	51.8	0.017	0.30	28.1	3.1	6.49	16.0	8.0	12.9	4.9	8.0	2.63	0.39	12.0	8.9	4.0
4	58.7	58.6	0.023	0.40	28.4	3.4	6.50	17.0	8.0	13.6	4.6	9.0	2.96	0.38	12.5	9.1	4.5
5	64.6	64.5	0.029	0.50	28.5	3.5	6.50	17.9	8.0	14.4	4.5	9.9	3.20	0.35	13.0	9.5	5.0
6	69.8	69.7	0.035	0.60	28.6	3.6	6.51	18.7	8.0	15.1	4.4	10.7	3.43	0.34	13.4	9.8	5.4
7	74.8	74.6	0.041	0.70	28.6	3.6	6.52	19.4	8.0	15.8	4.4	11.4	3.60	0.31	13.7	10.1	5.7
8	79.2	79.1	0.047	0.80	28.6	3.6	6.52	20.1	8.0	16.5	4.4	12.1	3.75	0.30	14.1	10.5	6.1
9	83.4	83.2	0.052	0.90	28.5	3.5	6.53	20.7	8.0	17.2	4.5	12.7	3.83	0.27	14.4	10.9	6.4
10	87.6	87.4	0.058	1.00	28.4	3.4	6.54	21.4	8.0	18.0	4.6	13.4	3.91	0.25	14.7	11.3	6.7
11	108.6	108.3	0.087	1.51	27.9	2.9	6.57	24.5	8.0	21.6	5.1	16.5	4.23	0.18	16.2	13.3	8.2
12	125.1	124.7	0.117	2.01	27.2	2.2	6.60	26.9	8.0	24.7	5.8	18.9	4.26	0.12	17.4	15.2	9.4
13	142.8	142.2	0.146	2.51	26.5	1.5	6.64	29.4	8.0	27.9	6.5	21.4	4.30	0.07	18.7	17.2	10.7
14	158.1	157.4	0.175	3.01	25.8	0.8	6.67	31.6	8.0	30.8	7.2	23.6	4.28	0.03	19.8	19.0	11.8
15	178.3	177.4	0.233	4.02	24.6	-0.4	6.74	34.3	8.0	34.7	8.4	26.3	4.13	-0.02	21.2	21.6	13.2
16	198.7	197.6	0.286	4.92	23.6	-1.4	6.81	37.0	8.0	38.4	9.4	29.0	4.09	-0.05	22.5	23.9	14.5
17	222.0	220.7	0.344	5.93	22.5	-2.5	6.88	40.1	8.0	42.6	10.5	32.1	4.06	-0.08	24.0	26.5	16.0
18	239.3	237.8	0.403	6.93	21.4	-3.6	6.95	42.2	8.0	45.8	11.6	34.2	3.95	-0.11	25.1	28.7	17.1
19	253.2	251.5	0.461	7.94	20.5	-4.5	7.03	43.8	8.0	48.3	12.5	35.8	3.86	-0.13	25.9	30.4	17.9
20	269.5	267.5	0.519	8.95	19.7	-5.3	7.11	45.6	8.0	50.9	13.3	37.6	3.83	-0.14	26.8	32.1	18.8
21	286.0	283.9	0.578	9.95	18.9	-6.1	7.19	47.5	8.0	53.6	14.1	39.5	3.80	-0.15	27.7	33.8	19.7
22	294.8	292.4	0.636	10.96	18.3	-6.7	7.27	48.2	8.0	54.9	14.7	40.2	3.74	-0.17	28.1	34.8	20.1
23	305.3	302.7	0.695	11.96	17.8	-7.2	7.35	49.2	8.0	56.4	15.2	41.2	3.71	-0.17	28.6	35.8	20.6
24	317.1	314.3	0.753	12.97	17.5	-7.5	7.44	50.3	8.0	57.8	15.5	42.3	3.73	-0.18	29.1	36.6	21.1
25	322.3	319.3	0.811	13.97	17.1	-7.9	7.52	50.4	8.0	58.3	15.9	42.4	3.67	-0.19	29.2	37.1	21.2
26	327.1	323.9	0.853	14.70	16.9	-8.1	7.59	50.7	8.0	58.8	16.1	42.7	3.65	-0.19	29.3	37.4	21.3

Notes: 1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

CU 8/2006 Rev. 1

Schnabel ENGINEERING

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Dominion - Possum Point*
Ash Ponds ABC - Phase 2
Location: *Prince William County, Virginia*

Schnabel Contract: *14221002.01*
Boring No.: *B-02*
Depth: *27-29 ft.*
Elevation: *-5 to -7 ft*
Confining Stress (psi): *12.0*

Date: *9/30/2014*
Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.887	2.87
Height (in)	5.762	5.72
Area (in^2)	6.55	6.46
Moisture (%)	27.0	
W_{solids} (lbs)	2.11	
ρ_{wet} (pcf)	122.5	
ρ_{dry} (pcf)	96.5	98.6
Void Ratio	0.75	0.71
Saturation, %	98	97

Shear Testing Conditions	
Cell Pressure (psi):	37.0
Back Pressure (psi):	25.0
Eff. Confining Stress (psi):	12.0
Final B check	1.00
t_{50} (min.):	60.0
Rate of Strain (%/min):	0.00667

Filter strips used? *NO*

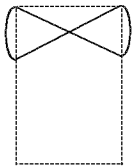
Specimen Type: *Tube Sample*

Soil Description: *SANDY LEAN CLAY (CL), contains gravel, blue gray*

Liquid Limit: *49*
Plasticity Index: *30*
% finer that No. 200: *52.4*
Specific Gravity: *2.70*

Remarks: *Gs assumed.*

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	25.0	0.0	6.46	12.0	12.0	12.0	12.0	0.0	1.00	0.00	12.0	12.0	0.0
1	27.9	27.8	0.006	0.10	27.2	2.2	6.46	16.3	12.0	14.1	9.8	4.3	1.44	0.51	14.2	12.0	2.2
2	44.7	44.7	0.012	0.20	28.9	3.9	6.47	18.9	12.0	15.0	8.1	6.9	1.85	0.56	15.5	11.6	3.5
3	52.6	52.5	0.018	0.31	29.9	4.9	6.48	20.1	12.0	15.2	7.1	8.1	2.14	0.60	16.1	11.2	4.1
4	58.8	58.7	0.023	0.41	30.5	5.5	6.48	21.1	12.0	15.6	6.5	9.1	2.39	0.61	16.5	11.0	4.5
5	63.4	63.3	0.029	0.51	31.0	6.0	6.49	21.8	12.0	15.8	6.0	9.8	2.63	0.62	16.9	10.9	4.9
6	67.7	67.6	0.035	0.61	31.3	6.3	6.50	22.4	12.0	16.1	5.7	10.4	2.83	0.61	17.2	10.9	5.2
7	71.3	71.1	0.041	0.71	31.6	6.6	6.50	22.9	12.0	16.3	5.4	10.9	3.03	0.60	17.5	10.9	5.5
8	74.8	74.7	0.047	0.82	31.8	6.8	6.51	23.5	12.0	16.7	5.2	11.5	3.21	0.59	17.7	10.9	5.7
9	77.8	77.6	0.053	0.92	31.9	6.9	6.52	23.9	12.0	17.0	5.1	11.9	3.33	0.58	18.0	11.1	6.0
10	80.9	80.6	0.058	1.02	32.1	7.1	6.52	24.4	12.0	17.3	4.9	12.4	3.52	0.57	18.2	11.1	6.2
11	90.9	90.6	0.082	1.43	32.2	7.2	6.55	25.8	12.0	18.6	4.8	13.8	3.88	0.52	18.9	11.7	6.9
12	101.7	101.3	0.111	1.94	32.0	7.0	6.58	27.4	12.0	20.4	5.0	15.4	4.08	0.45	19.7	12.7	7.7
13	110.2	109.7	0.140	2.45	31.7	6.7	6.62	28.6	12.0	21.9	5.3	16.6	4.13	0.40	20.3	13.6	8.3
14	116.9	116.2	0.169	2.96	31.5	6.5	6.65	29.5	12.0	23.0	5.5	17.5	4.18	0.37	20.7	14.2	8.7
15	122.0	121.1	0.228	3.98	31.0	6.0	6.72	30.0	12.0	24.0	6.0	18.0	4.00	0.33	21.0	15.0	9.0
16	123.5	122.4	0.286	5.00	30.5	5.5	6.80	30.0	12.0	24.5	6.5	18.0	3.77	0.31	21.0	15.5	9.0
17	124.4	123.1	0.343	6.00	29.9	4.9	6.87	29.9	12.0	25.0	7.1	17.9	3.53	0.27	21.0	16.1	9.0
18	123.8	122.3	0.397	6.94	29.5	4.5	6.94	29.6	12.0	25.1	7.5	17.6	3.35	0.26	20.8	16.3	8.8
19	121.8	120.1	0.455	7.96	29.3	4.3	7.01	29.1	12.0	24.8	7.7	17.1	3.22	0.25	20.6	16.3	8.6
20	122.6	120.6	0.514	8.98	28.9	3.9	7.09	29.0	12.0	25.1	8.1	17.0	3.10	0.23	20.5	16.6	8.5
21	124.3	122.1	0.572	10.00	28.7	3.7	7.17	29.0	12.0	25.3	8.3	17.0	3.05	0.22	20.5	16.8	8.5
22	123.1	120.7	0.630	11.02	28.3	3.3	7.26	28.6	12.0	25.3	8.7	16.6	2.91	0.20	20.3	17.0	8.3
23	124.1	121.6	0.683	11.93	28.2	3.2	7.33	28.6	12.0	25.4	8.8	16.6	2.88	0.19	20.3	17.1	8.3
24	126.0	123.2	0.741	12.95	28.1	3.1	7.42	28.6	12.0	25.5	8.9	16.6	2.87	0.19	20.3	17.2	8.3
25	126.9	123.9	0.800	13.97	28.1	3.1	7.50	28.5	12.0	25.4	8.9	16.5	2.85	0.19	20.3	17.2	8.3
26	126.1	122.9	0.851	14.87	28.1	3.1	7.58	28.2	12.0	25.1	8.9	16.2	2.82	0.19	20.1	17.0	8.1

Notes: 1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

CU 8/2006 Rev. 1

Schnabel ENGINEERING

Consolidated Undrained Triaxial Compression Test

ASTM D4767

Project: *Dominion - Possum Point*
Ash Ponds ABC - Phase 2
Location: *Prince William County, Virginia*

Schnabel Contract: *14221002.01*
Boring No.: *B-02*
Depth: *27-29 ft.*
Elevation: *-5 to -7 ft*
Confining Stress (psi): *16.0*

Date: *9/30/2014*
Reviewed by: *CJS*

	Specimen Conditions	
	Initial	Consolidated
Diameter (in)	2.877	2.83
Height (in)	5.815	5.78
Area (in^2)	6.50	6.31
Moisture (%)	23.9	
W_{solids} (lbs)	2.22	
ρ_{wet} (pcf)	125.9	
ρ_{dry} (pcf)	101.6	105.3
Void Ratio	0.66	0.60
Saturation, %	98	99

Shear Testing Conditions	
Cell Pressure (psi):	41.0
Back Pressure (psi):	25.0
Eff. Confining Stress (psi):	16.0
Final B check	0.98
t_{50} (min.):	2.4
Rate of Strain (%/min):	0.0208

Filter strips used? *NO*

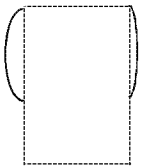
Specimen Type: *Tube Sample*

Soil Description: *SANDY LEAN CLAY (CL), contains gravel, blue gray*

Liquid Limit: *49*
Plasticity Index: *30*
% finer that No. 200: *52.4*
Specific Gravity: *2.70*

Remarks: *Gs assumed.*

Failure Sketch



Reading No.	Deviator Load (lbs)	Corrected[1] Dev. Load (lbs.)	Axial Deformation (in.)	Axial Strain (%)	Pore Pressure (psi)	Change in Pore Press. (psi)	Corrected Area[2] (in^2)	σ_1 (psi)	σ_3 (psi)	σ'_1 (psi)	σ'_3 (psi)	Deviator Stress (psi)	Principal Stress Ratio	A_{bar}	P (psi)	P' (psi)	q (psi)
Zero	0.0	0.0	0.000	0.00	25.0	0.0	6.31	16.0	16.0	16.0	16.0	0.0	1.00	0.00	16.0	16.0	0.0
1	29.6	29.6	0.005	0.09	27.9	2.9	6.32	20.7	16.0	17.8	13.1	4.7	1.36	0.62	18.3	15.4	2.3
2	48.1	48.1	0.011	0.19	29.7	4.7	6.32	23.6	16.0	18.9	11.3	7.6	1.67	0.62	19.8	15.1	3.8
3	58.5	58.4	0.017	0.29	30.8	5.8	6.33	25.2	16.0	19.4	10.2	9.2	1.90	0.63	20.6	14.8	4.6
4	66.5	66.4	0.023	0.40	31.6	6.6	6.34	26.5	16.0	19.9	9.4	10.5	2.11	0.63	21.2	14.6	5.2
5	73.0	72.8	0.029	0.50	32.1	7.1	6.34	27.5	16.0	20.4	8.9	11.5	2.29	0.62	21.7	14.6	5.7
6	78.3	78.0	0.035	0.60	32.4	7.4	6.35	28.3	16.0	20.9	8.6	12.3	2.43	0.60	22.1	14.7	6.1
7	82.8	82.5	0.040	0.70	32.6	7.6	6.35	29.0	16.0	21.4	8.4	13.0	2.54	0.59	22.5	14.9	6.5
8	86.6	86.3	0.046	0.80	32.8	7.8	6.36	29.6	16.0	21.8	8.2	13.6	2.65	0.58	22.8	15.0	6.8
9	90.3	89.9	0.052	0.90	32.9	7.9	6.37	30.1	16.0	22.2	8.1	14.1	2.74	0.56	23.1	15.2	7.1
10	93.7	93.3	0.058	1.00	33.0	8.0	6.37	30.6	16.0	22.6	8.0	14.6	2.83	0.55	23.3	15.3	7.3
11	108.1	107.5	0.087	1.51	33.0	8.0	6.41	32.8	16.0	24.8	8.0	16.8	3.10	0.48	24.4	16.4	8.4
12	120.0	119.1	0.116	2.01	32.8	7.8	6.44	34.5	16.0	26.7	8.2	18.5	3.26	0.42	25.3	17.5	9.3
13	132.2	131.1	0.145	2.52	32.6	7.6	6.47	36.3	16.0	28.7	8.4	20.3	3.41	0.38	26.1	18.5	10.1
14	138.7	137.5	0.169	2.92	32.3	7.3	6.50	37.1	16.0	29.8	8.7	21.1	3.43	0.35	26.6	19.3	10.6
15	151.5	149.8	0.227	3.93	31.8	6.8	6.57	38.8	16.0	32.0	9.2	22.8	3.48	0.30	27.4	20.6	11.4
16	162.8	160.7	0.286	4.94	31.1	6.1	6.64	40.2	16.0	34.1	9.9	24.2	3.45	0.25	28.1	22.0	12.1
17	175.6	173.1	0.344	5.95	30.4	5.4	6.71	41.8	16.0	36.4	10.6	25.8	3.43	0.21	28.9	23.5	12.9
18	185.8	182.9	0.402	6.96	29.8	4.8	6.78	43.0	16.0	38.2	11.2	27.0	3.41	0.18	29.5	24.7	13.5
19	195.0	191.5	0.461	7.97	29.2	4.2	6.86	43.9	16.0	39.7	11.8	27.9	3.37	0.15	30.0	25.8	14.0
20	203.8	199.9	0.519	8.98	28.6	3.6	6.93	44.8	16.0	41.2	12.4	28.8	3.33	0.12	30.4	26.8	14.4
21	212.3	208.0	0.577	9.99	28.1	3.1	7.01	45.7	16.0	42.6	12.9	29.7	3.30	0.10	30.8	27.7	14.8
22	219.8	215.1	0.636	11.00	27.6	2.6	7.09	46.3	16.0	43.7	13.4	30.3	3.26	0.09	31.2	28.6	15.2
23	225.9	220.7	0.694	12.01	27.2	2.2	7.17	46.8	16.0	44.6	13.8	30.8	3.23	0.07	31.4	29.2	15.4
24	232.5	227.0	0.747	12.92	26.9	1.9	7.25	47.3	16.0	45.4	14.1	31.3	3.22	0.06	31.7	29.8	15.7
25	238.7	232.7	0.805	13.93	26.7	1.7	7.33	47.7	16.0	46.0	14.3	31.7	3.22	0.05	31.9	30.2	15.9
26	242.5	236.2	0.863	14.93	26.5	1.5	7.42	47.8	16.0	46.3	14.5	31.8	3.20	0.05	31.9	30.4	15.9

Notes:
1. Deviator load corrected for membrane and filter cage (if applicable) effects.
2. Right Cylinder Correction Method

CU 8/2006 Rev. 1

APPENDIX C

SLOPE STABILITY ANALYSES

GeoStudio 2012, SLOPE/W Embankment Sections with Results

Section at Test Boring B-02

Normal Pool Static Stability
Design Surcharge Pool Static Stability
Normal Pool Pseudostatic Seismic Stability

Section at Test Boring B-06

Normal Pool Static Stability
Design Surcharge Pool Static Stability
Normal Pool Pseudostatic Seismic Stability

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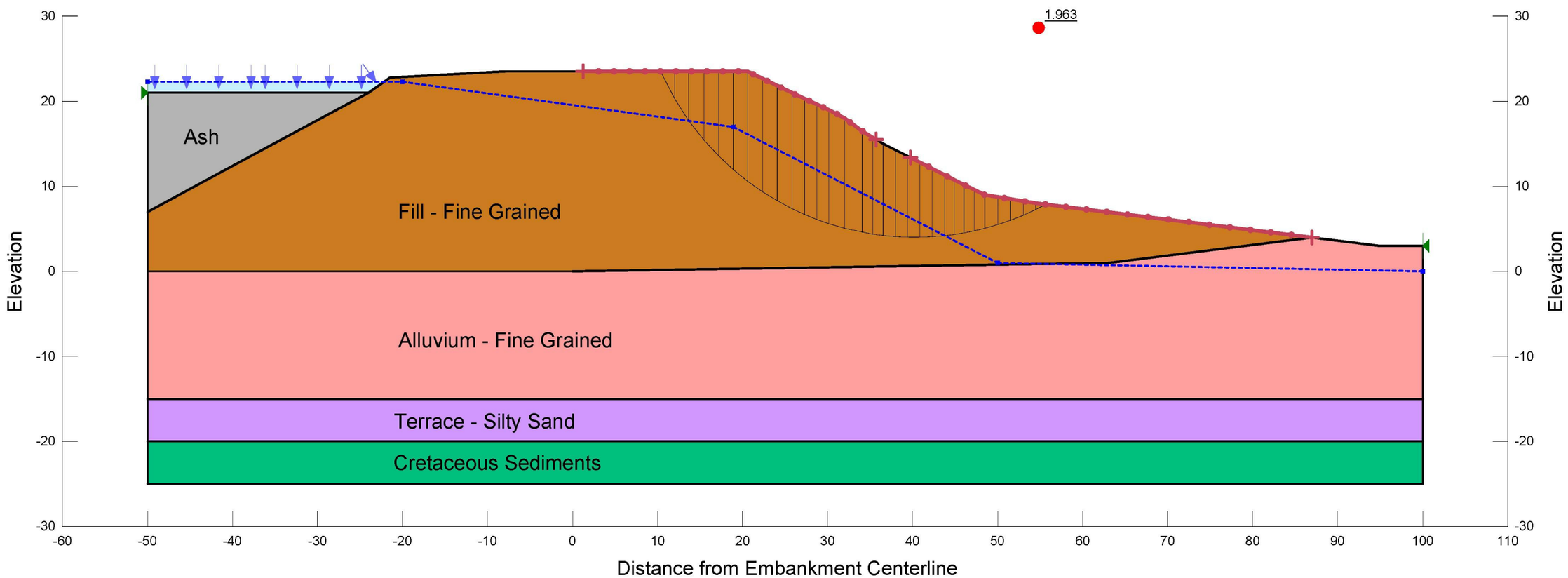
Dominion Power - Possum Point Ash Ponds A, B, & C
Project No. 14221002.01
Embankment Section at Boring B-2

File: Possum Point ABC Slope - B-2_ Proposed - Rev2.gsz
Analysis Name: a - NP - Static Normal Pool
Method: Morgenstern-Price

Horz Seismic Coef.:

Normal Pool Level: El 22.3

Materials:
Name: Sluiced Ash Model: S=f(overburden) Unit Weight: 110 pcf Tau/Sigma Ratio: 0.3 Minimum Strength: 100 Piezometric Line: 1
Name: Alluvium - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 500 psf Phi': 24 ° Phi-B: 0 ° Piezometric Line: 1
Name: Terrace - Silty Sand Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Phi-B: 0 ° Piezometric Line: 1
Name: FILL - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 123 pcf Cohesion': 230 psf Phi': 23 ° Phi-B: 0 ° Piezometric Line: 1
Name: Cretaceous Sediments (effective stress) Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 300 psf Phi': 34 ° Phi-B: 0 ° Piezometric Line: 1



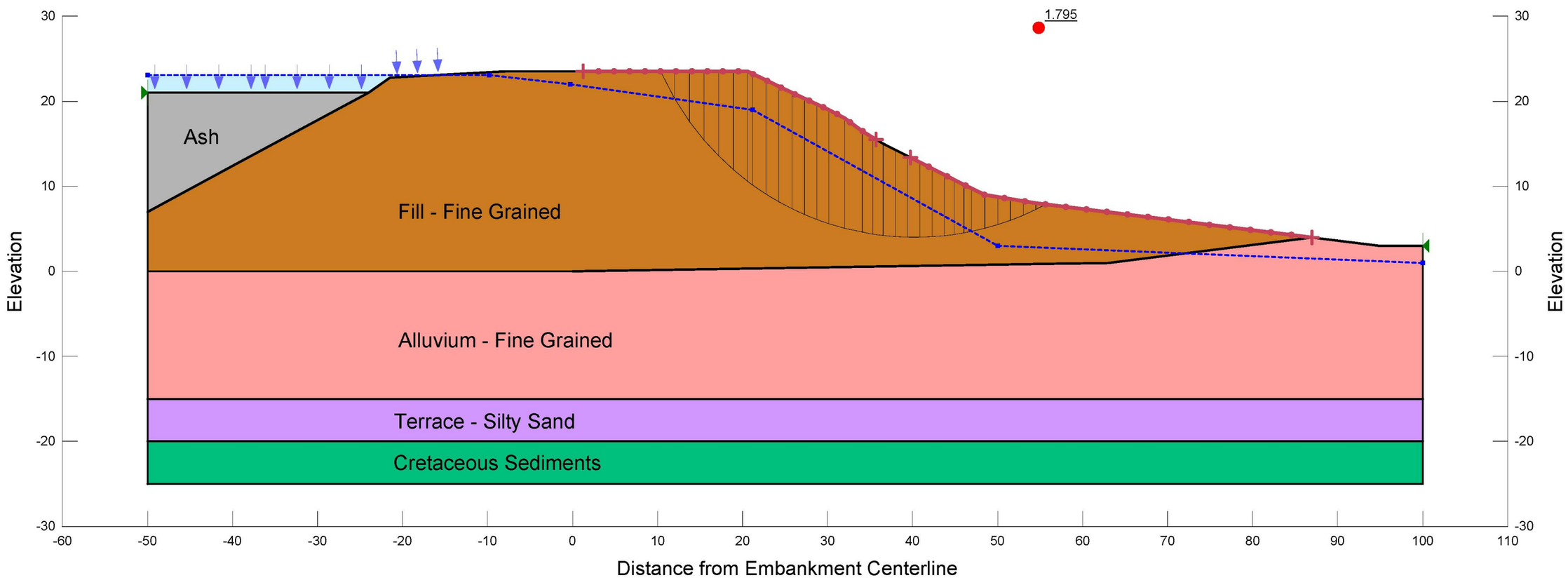
Dominion Power - Possum Point Ash Ponds A, B, & C
Project No. 14221002.01
Embankment Section at Boring B-2

File: Possum Point ABC Slope - B-2_ Proposed - Rev2.gsz
Analysis Name: b - DSP - Static Design Surcharge Pool
Method: Morgenstern-Price

Horz Seismic Coef.:

Design Surcharge Pool Level: El 23.1

Materials:
Name: Sluiced Ash Model: S=f(overburden) Unit Weight: 110 pcf Tau/Sigma Ratio: 0.3 Minimum Strength: 100 Piezometric Line: 1
Name: Alluvium - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 500 psf Phi': 24 ° Phi-B: 0 ° Piezometric Line: 1
Name: Terrace - Silty Sand Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Phi-B: 0 ° Piezometric Line: 1
Name: FILL - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 123 pcf Cohesion': 230 psf Phi': 23 ° Phi-B: 0 ° Piezometric Line: 1
Name: Cretaceous Sediments (effective stress) Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 300 psf Phi': 34 ° Phi-B: 0 ° Piezometric Line: 1



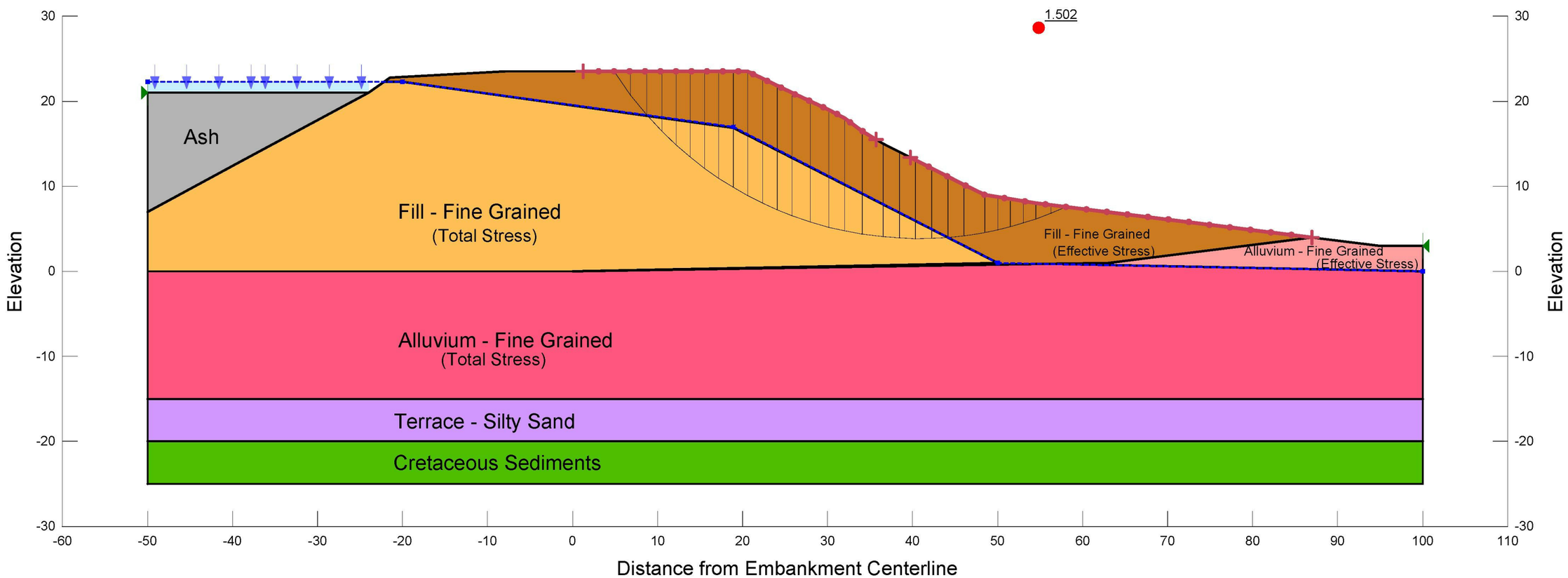
Dominion Power - Possum Point Ash Ponds A, B, & C
Project No. 14221002.01
Embankment Section at Boring B-2

File: Possum Point ABC Slope - B-2_ Proposed - Rev2.gsz
Analysis Name: c - NP - Pseudostatic Normal Pool
Method: Morgenstern-Price

Horz Seismic Coef.: 0.1

Normal Pool Level: El 22.3

Materials:
Name: Sluiced Ash Model: S=f(overburden) Unit Weight: 110 pcf Tau/Sigma Ratio: 0.3 Minimum Strength: 100 Piezometric Line: 1
Name: Cretaceous Sediments (total stress) Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 3,000 psf Phi': 0 ° Phi-B: 0 °
Name: Alluvium - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 500 psf Phi': 24 ° Phi-B: 0 °
Name: Terrace - Silty Sand Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Phi-B: 0 ° Piezometric Line: 1
Name: FILL - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 123 pcf Cohesion': 230 psf Phi': 23 ° Phi-B: 0 °
Name: FILL - Fine Grained (total stress) Model: Mohr-Coulomb Unit Weight: 123 pcf Cohesion': 290 psf Phi': 14 ° Phi-B: 0 °
Name: Alluvium - Fine Grained (total stress) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 530 psf Phi': 17 ° Phi-B: 0 °



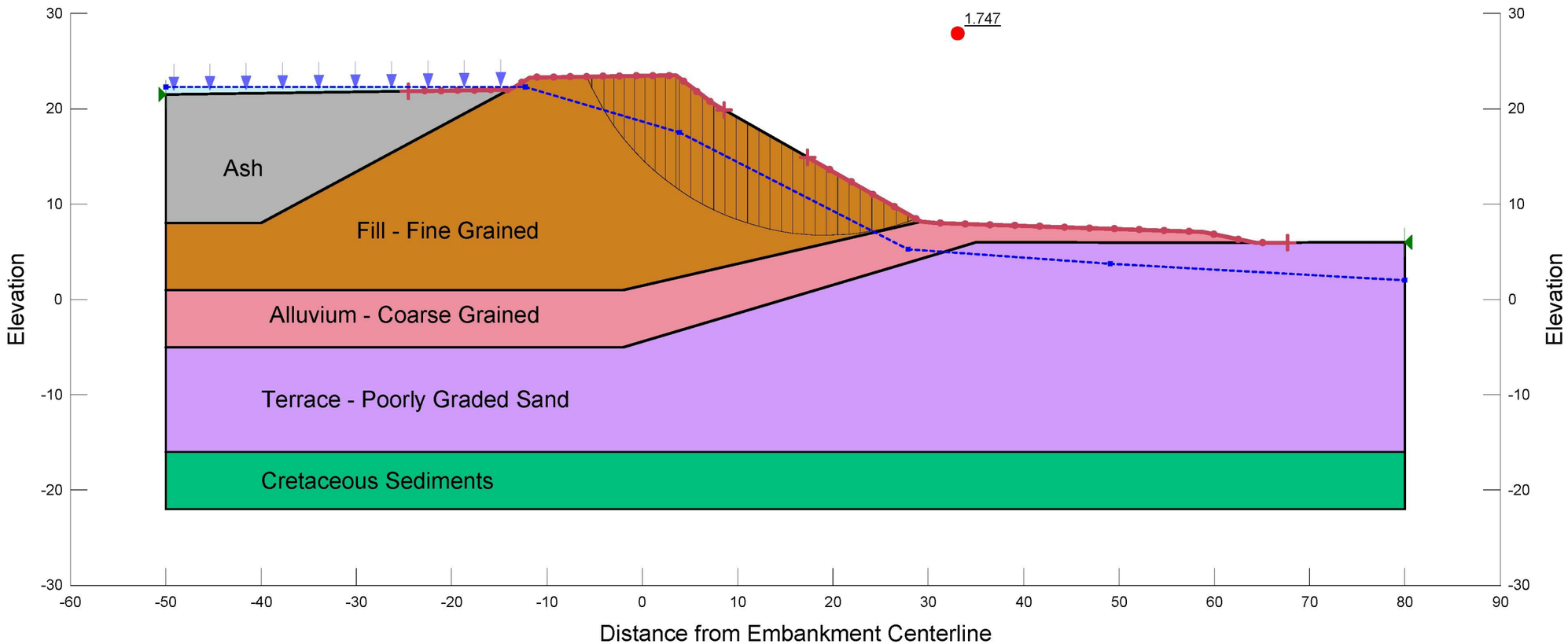
Dominion Power - Possum Point Ash Ponds A, B, & C
Project No. 14221002.01
Embankment Section at Boring B-6

File Name: Possum Point ABC Slope - B-6_ Proposed - Rev2.gsz
Name: a - NP - Static Normal Pool
Method: Morgenstern-Price

Horz Seismic Coef.:

Normal Pool Level: El 22.3

Name: Sluiced Ash Model: S=f(overburden) Unit Weight: 110 pcf Tau/Sigma Ratio: 0.3 Minimum Strength: 100 Piezometric Line: 1
Name: FILL - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 123 pcf Cohesion': 230 psf Phi': 23 ° Phi-B: 0 ° Piezometric Line: 1
Name: Cretaceous Sediments (effective stress) Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 300 psf Phi': 34 ° Phi-B: 0 ° Piezometric Line: 1
Name: Terrace - Poorly Graded Sand Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Phi-B: 0 ° Piezometric Line: 1
Name: Alluvium - Coarse Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 200 psf Phi': 32 ° Phi-B: 0 ° Piezometric Line: 1



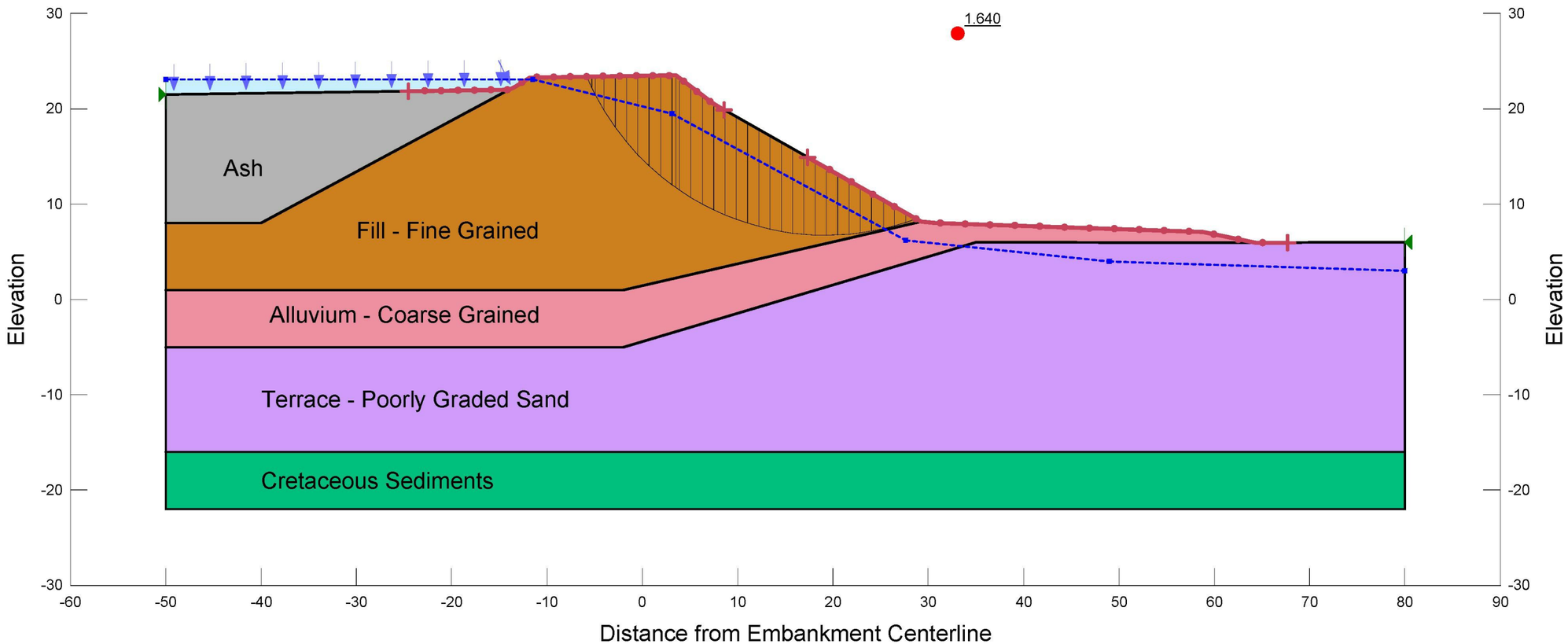
Dominion Power - Possum Point Ash Ponds A, B, & C
Project No. 14221002.01
Embankment Section at Boring B-6

File Name: Possum Point ABC Slope - B-6_ Proposed - Rev2.gsz
Name: b - DSP - Static Design Surcharge Pool
Method: Morgenstern-Price

Horz Seismic Coef.:

Design Surcharge Pool Level: El 23.1

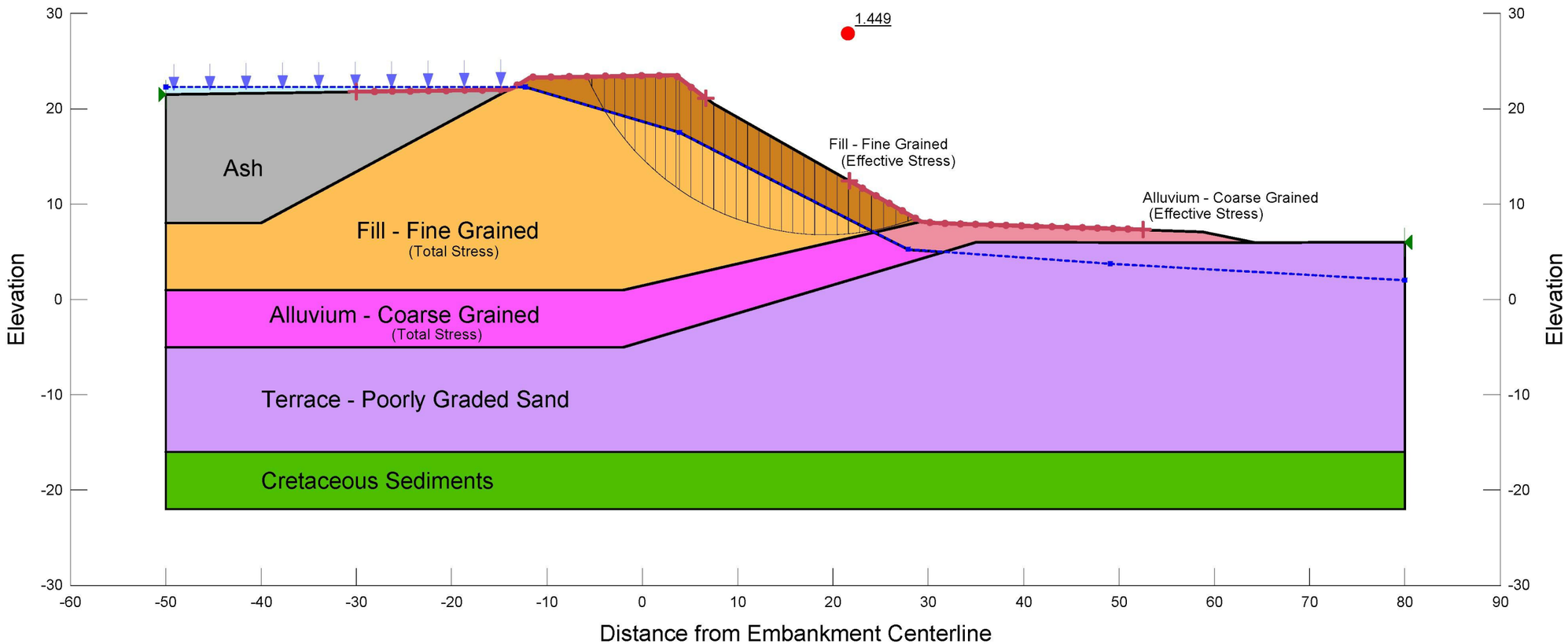
Name: Sluiced Ash Model: S=f(overburden) Unit Weight: 110 pcf Tau/Sigma Ratio: 0.3 Minimum Strength: 100 Piezometric Line: 1
Name: FILL - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 123 pcf Cohesion': 230 psf Phi': 23 ° Phi-B: 0 ° Piezometric Line: 1
Name: Cretaceous Sediments (effective stress) Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 300 psf Phi': 34 ° Phi-B: 0 ° Piezometric Line: 1
Name: Terrace - Poorly Graded Sand Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Phi-B: 0 ° Piezometric Line: 1
Name: Alluvium - Coarse Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 200 psf Phi': 32 ° Phi-B: 0 ° Piezometric Line: 1



Dominion Power - Possum Point Ash Ponds A, B, & C
Project No. 14221002.01
Embankment Section at Boring B-6

File Name: Possum Point ABC Slope - B-6_ Proposed - Rev2.gsz
Name: c - NP - Pseudostatic Normal Pool
Method: Morgenstern-Price

Horz Seismic Coef.: 0.1

Normal Pool Level: El 22.3

Name: Sluiced Ash Model: S=f(overburden) Unit Weight: 110 pcf Tau/Sigma Ratio: 0.3 Minimum Strength: 100 Piezometric Line: 1
Name: FILL - Fine Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 123 pcf Cohesion': 230 psf Phi': 23 ° Phi-B: 0 °
Name: Terrace - Poorly Graded Sand Model: Mohr-Coulomb Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Phi-B: 0 ° Piezometric Line: 1
Name: Alluvium - Coarse Grained (effective stress) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 200 psf Phi': 32 ° Phi-B: 0 °
Name: FILL - Fine Grained (total stress) Model: Mohr-Coulomb Unit Weight: 123 pcf Cohesion': 290 psf Phi': 14 ° Phi-B: 0 °
Name: Alluvium - Coarse Grained (total stress) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 300 psf Phi': 18 ° Phi-B: 0 °
Name: Cretaceous Sediments (total stress) Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion': 3,000 psf Phi': 0 ° Phi-B: 0 °