APPENDIX G –
CCR MATERIAL INVESTIGATIONS

APPENDIX G.1

TECHNICAL EVALUATION OF GEOTECHNICAL AND CCR MATERIAL CHARACTERISTICS DATA

Stantec

Appendix G.1 - Technical Evaluation of Geotechnical and CCR Material Characteristics Data

TDEC Commissioner's Order:
Environmental Assessment Report
Cumberland Fossil Plant
Cumberland, Tennessee

August 14, 2023

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

TVA TENNESSEE VALLEY AUTHORITY

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Sign-off Sheet

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Abbreviations

CCR	Coal Combustion Residuals
CCR Rule	Title 40, Code of Federal Regulations, Part 257
CFR	Code of Federal Regulations
CH	Fat Clay with Gravel
CL	Lean Clay
cm/sec	Centimeters per Second
CPT	Cone Penetration Test
CUF Plant	Cumberland Fossil Plant
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EI	Environmental Investigation
EIP	Environmental Investigation Plan
ERI	Electrical Resistivity Imaging
EXD	Exploratory Drilling
FS	Factor of Safety
GC	Clayey Gravel
GW	Well Graded Gravel
GSL	Groundwater Screening Level
IP	Induced Polarization
mg/L	Milligrams per Liter
NTU	Nephelometric Turbidity Unit
ORP	Oxidation / Reduction Potential
%	Percent
PFM	Process Flow Management
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RQD	Rock Quality Designation
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SP	Poorly Graded Sand
SPLP	Synthetic Precipitation Leaching Procedure
SW	Well Graded Sand
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TVA	Tennessee Valley Authority
USGS	United States Geological Survey
VWP	Vibrating Wire Piezometer
µS/cm	Microsiemens per Centimeter

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec), on behalf of the Tennessee Valley Authority (TVA), has prepared this technical evaluation appendix to summarize applicable historical and recent geotechnical information and coal combustion residuals (CCR) material characteristics data at TVA's Cumberland Fossil Plant (CUF Plant) in Cumberland City, Tennessee. This appendix provides a detailed evaluation of these data to support information provided in the Environmental Assessment Report (EAR) to fulfil the requirements for the Tennessee Department of Environment and Conservation (TDEC) Commissioner's Order OGC15-0177 (TDEC Order) Program (TDEC 2015).

2.0 GEOTECHNICAL INVESTIGATION

The purpose of the geotechnical investigation was to further characterize and evaluate subsurface conditions for three CCR management units at the CUF Plant, including the Stilling Pond (including Retention Pond), Dry Ash Stack and Gypsum Storage Area. For this investigation, TVA reviewed information from previous representative studies and assessments, completed an exploratory drilling (EXD) field program, and conducted evaluations for slope stability, structural integrity, and structural stability (bedrock) as part of the TDEC Order Environmental Investigation (EI).

The following sections summarize the previous studies and present overall geotechnical investigation and evaluation findings based on data obtained during previous studies and the EI for the CUF Plant CCR management units. Elevations reported herein are referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).

2.1 EXPLORATORY DRILLING

2.1.1 Previous Representative Studies and Assessments

Through the various information requests, as well as TDEC comments on the Environmental Investigation Plan (EIP; TVA 2018), a need was identified for an evaluation of existing geotechnical data (borings, piezometric data, laboratory data, material parameters, analyses, etc.). The Evaluation of Existing Geotechnical Data (Appendix F of the EIP) was prepared to review the existing (at the time the EIP was written) data and evaluate its adequacy with respect to responding to the various TDEC information requests. Additionally, since the EIP was approved in 2018, several additional explorations have been performed at the CUF Plant CCR management units and these data have been evaluated for the EAR. Evaluating the adequacy of existing data, in accordance with the *Quality Assurance Project Plan (QAPP)* (Environmental Standards 2018), depends on both the type of data and its intended use. Where applicable, existing geotechnical data were used to support the subjects addressed throughout the EAR.

Stilling Pond (including Retention Pond)

From 1986 to 2017, several geotechnical explorations were performed at the Stilling Pond (including Retention Pond) for various objectives. Over 90 borings were performed, some of which included rock coring, monitoring well or piezometer installation. Geotechnical laboratory testing was often performed on recovered soil samples. Cone penetration tests (CPTs) and surface geophysics were also performed along portions of the perimeter dike system. As would be expected for an impoundment, most of the previous boring locations were focused on the perimeter of the unit because they were often related to perimeter dike design, construction, slope stability assessment, and/or performance monitoring. This includes the divider dike common to the perimeter of the Retention Pond and the Dry Ash Stack. Boring locations are shown on Exhibit G.1-1. Refer to the Evaluation of Existing Geotechnical Data (Appendix F in the EIP; Stantec 2018c) for more detailed descriptions of the individual explorations, including evaluations of their adequacy for responding to the various information requests.

Since the EIP was published in 2018, several additional non-TDEC Order explorations have been performed related to two construction projects to close the Stilling Pond (including Retention Pond) (now jointly referred to as the Main Ash Pond) and repurpose the unit with two process water basins. These projects are the Main Ash Pond Repurposing Project and the Process Flow Management (PFM) project. For example, 10 borings were advanced, 15 CPTs were conducted, and 12 piezometers were installed within the Main Ash Pond to gather soil strength data and to monitor pore water pressure changes during construction and operation of the Temporary Lined Basin (Stantec 2019a). Removal of free water and earthwork activities have allowed some limited access for borings in the interior portions of the unit. Other recent Main Ash Pond geotechnical explorations include Stantec (2018a), Stantec (2018e), and Stantec (2019c). Boring locations are also shown on Exhibit G.1-1.

Dry Ash Stack

From 1986 to 2017, several geotechnical explorations were performed at the Dry Ash Stack for various objectives. Over 110 borings were performed, some of which included rock coring, monitoring well or piezometer installation. Geotechnical laboratory testing was often performed on recovered soil samples. CPTs and surface geophysics were also performed along portions of the unit perimeter. As would be expected for an impoundment which was later converted to a landfill, most of the previous boring locations were focused on the perimeter of the unit because they were often related to perimeter dike and/or landfill slope design, construction, seepage assessment, slope stability assessment, and/or performance monitoring. This includes the divider dike common to the Retention Pond and the Dry Ash Stack, and the drainage ditch separating the Dry Ash Stack from the Gypsum Storage Area. Boring locations are shown on Exhibit G.1-1. Refer to the Evaluation of Existing Geotechnical Data (Appendix F in the EIP; Stantec 2018c) for more detailed descriptions of the individual explorations, including evaluations of their adequacy for responding to the various information requests.

Since the EIP was published in 2018, several additional non-TDEC Order explorations have been performed at the Dry Ash Stack related to seismic stability assessments (Geocomp 2020a), piezometer installation, and slope inclinometer installation (Stantec 2018b). Boring locations are also shown on Exhibit G.1-1.

Gypsum Storage Area

From 1986 to 2017, several geotechnical explorations were performed at the Gypsum Storage Area for various objectives. Over 130 borings were performed, some of which included rock coring, monitoring well, or piezometer installation. Geotechnical laboratory testing was often performed on recovered soil samples. CPTs and surface geophysics were also performed along portions of the unit perimeter. As would be expected for an impoundment which was later converted to a landfill, most of the previous boring locations were focused on the perimeter of the unit because they were often related to perimeter dike and/or landfill slope design, construction, seepage assessment, slope stability assessment, and/or performance monitoring. This includes the drainage ditch separating the Dry Ash Stack from the Gypsum Storage Area. Boring locations are shown on Exhibit G.1-1. Refer to the Evaluation of Existing Geotechnical Data (Appendix F in the EIP; Stantec 2018c) for more detailed descriptions of the individual explorations, including evaluations of their adequacy for responding to the various information requests.

Since the EIP was published in 2018, several additional non-TDEC Order explorations have been performed related to seismic stability assessments (Geocomp 2020b), piezometer installation, and slope inclinometer installation (Stantec 2018b). An exploration was also performed for a proposed wastewater treatment facility adjacent to the northeast perimeter of the Gypsum Storage Area (Stantec 2019a). Boring locations are also shown on Exhibit G.1-1.

<u>Bottom Ash Pond</u>

From 1986 to 2016, there were no geotechnical explorations specifically targeting the Bottom Ash Pond, although there were several borings performed at the Dry Ash Stack and Gypsum Storage Area immediately adjacent to the Bottom Ash Pond. A 1993 exploration was also performed for dry ash handling infrastructure adjacent to the northeast perimeter of the Bottom Ash Pond (United Engineers and Constructors 1993). The relatively small number of borings performed at the Bottom Ash Pond prior to 2016 is likely due to the small footprint of the unit and because most of its perimeter is incised into the ground, as opposed to elevated by a perimeter dike. In 2016, two explorations (borings and CPTs) were performed to support the United States Environmental Protection Agency Final Rule on Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule) safety factor demonstrations for the Bottom Ash Pond (Geocomp 2016a; Stantec 2016b). Refer to the Evaluation of Existing Geotechnical Data (Appendix F in the EIP; Stantec 2018c) for more detailed descriptions of the individual explorations, including evaluations of their adequacy for responding to the various information requests. Boring locations are also shown on Exhibit G.1-1.

2.1.2 TDEC Order Environmental Investigation Activities

<u>Objectives and Scope</u>

The primary objective of the EXD, conducted pursuant to the *EXD Sampling and Analysis Plan* (SAP) (Stantec 2018d), was to perform borings, install temporary wells, install piezometers, and perform surface and downhole geophysics to further characterize subsurface conditions at the CUF Plant, in response to the TDEC Order. The EXD SAP included activities at three CCR management units: Dry Ash Stack, Gypsum Storage Area, and Stilling Pond (including Retention Pond). EI field activities were performed in general accordance with the *EXD SAP* and the *QAPP,* including TVA- and TDEC-approved programmatic and project-specific changes that were made after approval of the EIP. Exploration location selection, collection methodology, analyses, and quality assurance/quality control completed for the investigation are provided in the *Exploratory Drilling Sampling and Analysis Report* (EXD SAR) included in Appendix G.2.

The scope of work of the EXD consisted of the following tasks:

- Drilling borings and advancing CPT soundings
- Collecting disturbed and undisturbed soil samples and rock cores for lithologic information
- Performing downhole testing in rock at select boring locations
- Installing temporary wells, constructing surface protections, and developing the wells

- Installing vibrating wire piezometers (VWPs)
- Conducting slug tests in temporary wells
- Performing geotechnical laboratory testing
- Performing surface geophysics
- Performing supplemental geotechnical borings at identified geophysical anomalies
- Surveying boring, CPT sounding, and temporary well locations.

Boring and CPT locations and surface geophysical survey layouts are shown on Exhibits G.1-2 and G.1-3. For additional details on the objectives and scope, refer to the EXD SAR provided as Appendix G.2.

2.1.3 Results

Stilling Pond (including Retention Pond)

Three geotechnical borings, one on the divider dike (CUF-B11) between the Stilling Pond and the Retention Pond and two (CUF-B12 and CUF-B13) on the east perimeter of the Stilling Pond, were advanced for geotechnical data. The uppermost foundation soil at these three borings varies from lean clay (CL) to fat clay with gravel (CH).

Rock core was also obtained in borings CUF-B11 through CUF-B13 (discussed in Section 2.4.3) and downhole testing in rock (pressure testing and borehole geophysics) was conducted. Note that soil-filled features in rock could not be pressure tested, so the results are not representative of the complete rock profile in each boring. Refer to the EXD SAR (Appendix G.2) for the individual downhole testing results, and to Appendix H.1 for data interpretation as it relates to hydrogeology.

Ten CPTs and three geotechnical borings were advanced and surface geophysics were performed along the west perimeter to characterize the dike and foundation soil type(s) near the former Wells Creek alignment and are discussed below in the section entitled Potential Preferential Seepage Pathways.

Dry Ash Stack

Four geotechnical borings were drilled on the interior of the Dry Ash Stack along the historical alignment of Wells Creek. Multiple VWPs were installed within each of these four borings. Three temporary well borings were drilled on the interior of the Dry Ash Stack, one of which (CUF-TW07) was also along the historical alignment of Wells Creek. Temporary wells were installed above the base of CCR materials in each temporary well boring. The uppermost foundation soil was CL in the three temporary well borings and CUF-B17, CH in CUF-B16, silt in CUF-B15, and clayey gravel (GC) in CUF-B14. Based on the elevation of the CCR materials/foundation soil interface, one (CUF-B14) of the five Wells Creek alignment borings did not actually intercept the creek alignment, or earth fill had been placed within the creek alignment prior to CCR materials placement. The interface elevation at CUF-B14 was about 18 feet higher than in the other creek borings. The location of CUF-B14 may have missed the creek alignment due to uncertainty in matching the historical mapping to the current topography, or about 18 feet of additional earth fill could have been placed at this location.

The seven borings on the interior of the Dry Ash Stack also provided information on the underdrain system that was installed on top of the existing sluiced ash, followed by placement of stacked ash. At three of the locations, the underdrain layer consisted of coarse-grained CCR materials (classifying as poorly graded sand [SP], well graded sand [SW], and well graded gravel [GW]), had a bottom elevation ranging from 384.7 to 385.8 feet, and thickness ranging from 2.5 to 4.5 feet. A geotextile was encountered directly beneath the underdrain layer at an elevation of 384.8 feet in CUF-B15. At another three of the locations, the underdrain layer consisted of non-CCR gravel fill (GW, GP-GM), had a bottom elevation ranging from 384.3 to 386.9 feet, and thickness ranging from 1.5 to 2.0 feet. At CUF-TW09, no obvious underdrain layer was identified.

Rock core was obtained in the seven Dry Ash Stack interior borings and is discussed in Section 2.4.3. Downhole testing in rock (pressure testing and borehole geophysics) was conducted in six borings at the Dry Ash Stack. Refer to the EXD SAR for the individual downhole testing results, and to Appendix H.1 for data interpretation as it relates to hydrogeology.

23 CPTs and three geotechnical borings were advanced and surface geophysics were performed along the west perimeter to characterize the dike and foundation soil type(s) near the former Wells Creek alignment and are discussed below in the section entitled Potential Preferential Seepage Pathways.

Gypsum Storage Area

Six temporary well borings were drilled on the interior of the Gypsum Storage Area. Temporary wells were installed above the base of CCR materials in three of the temporary well borings (CUF-TW01, CUF-TW03, and CUF-TW05). Three additional, shallower temporary wells were to be screened in gypsum, just above the underdrain layer/sluiced CCR materials interface. However, upon reaching the planned termination criteria, water levels in borings CUF-TW02, CUF-TW04, and CUF-TW06 were monitored (per the TDEC-approved plan) and were found to have insufficient depth of water to facilitate pore water sampling within CCR materials. Therefore, these three temporary wells were not installed, and the borings were backfilled per the EXD SAP.

The uppermost foundation soil was CH in CUF-TW01 and CUF-TW03 and CL in CUF-TW05.

The six borings on the interior of the Gypsum Storage Area also provided information on the underdrain system that was installed on top of the existing sluiced ash, followed by placement of gypsum. Borings were performed in closely spaced pairs, due to the original objective to install shallow (screened in gypsum) and deep (screened in sluiced ash) temporary wells. At all six of the locations, the underdrain layer consisted of non-CCR gravel fill (classifying as GC, GP, GM, and GP-GM), had a bottom elevation ranging from 398.9 to 401.5 feet, and thickness ranging from 0.6 to 1.9 feet. A geotextile was encountered directly above the underdrain layer at CUF-TW01, CUF-TW02, and CUF-TW06.

Rock core was obtained in the three Gypsum Storage Area interior borings and two Gypsum Storage Area perimeter borings (CUF-B18 and CUF-B19) and is discussed in Section 2.4.3. Downhole testing in rock (pressure testing and borehole geophysics) was conducted in these five borings at the Gypsum

Storage Area. Refer to the EXD SAR for the individual downhole testing results, and to Appendix H.1 for data interpretation as it relates to hydrogeology.

Bottom Ash Pond

No borings were drilled at the Bottom Ash Pond during the EXD field activities.

Potential Preferential Seepage Pathways

As documented in the EXD SAR, 33 CPTs were advanced along the perimeters of the Dry Ash Stack and Stilling Pond (including Retention Pond). These CPTs were performed to better characterize the uppermost foundation soils in the immediate vicinity of the mapped, pre-construction channels of Wells Creek and in an area of historical foundation grouting. At both stream crossing locations along the perimeter dike system, a series of closely spaced CPT soundings was performed and then correlated to existing nearby boring logs to differentiate relatively sandy (i.e., more pervious) foundation soils, if present. The CPTs resulted in many shallow refusals within the dike fill (or perhaps on riprap on the inboard face of the starter dike), which prevented evaluation of the foundation soils using CPT in these areas.

As a follow up to the CPTs, surface geophysical surveys were conducted to better characterize the foundation soils. The intent was to conduct electrical resistivity imaging (ERI) and multichannel analysis of surface waves surveys in two areas of interest. As part of the ERI surveys, induced polarization (IP) surveys were also performed. The “North Area” is along a portion of the west perimeter of the Stilling Pond (including Retention Pond), and the “South Area” is along the southwest perimeter of the Dry Ash Stack.

Upon receipt of the final report from the subcontractor (ARM Group Inc.) for the surface geophysical surveys, Stantec reviewed the results and considered whether targeted geotechnical borings were recommended to correlate to buried stream channels or other geophysical anomalies identified in the soil. The number and locations of supplemental borings (shown on Exhibit G.1-3) were approved by TDEC based on review of the geophysical results, and are as follows:

- To supplement the surface geophysics in the North Area, three borings were performed. The purpose of two borings (CUF-B20 and CUF-B21) was to characterize the dike and foundation soil type(s) in or near the historical stream alignment. The purpose of the third boring (CUF-B22) was to characterize the dike and foundation soil type(s) at an anomaly observed in the geophysical results.

- To supplement the surface geophysics in the South Area, three borings were performed. The purpose of two borings (CUF-B23 and CUF-B24) was to characterize the dike and foundation soil type(s) at anomalies observed in the geophysical results. The purpose of the third boring (CUF-B25) was to characterize the dike and foundation soil type(s) in or near the historical stream alignment.

Considering the information obtained from the surface geophysics and the supplemental geotechnical borings, the major findings are as follows:

- In the North Area, the three borings were drilled from the lower bench (i.e., remnant crest of the starter dike). Exhibit G.1-4 shows the boring locations superimposed on profiles of the surface geophysics results. CUF-B20 was drilled along the northern side of the stream alignment and CUF-B21 was drilled along the stream alignment. In both borings, clayey fill was encountered over clayey foundation soils, and the base of the fill agreed with the pre-construction topography. CUF-B22 was installed to characterize a conductive anomaly above the foundation soils. The boring encountered clayey fill with limestone, chert, and shale fragments within the fill.
- In the South Area, CUF-B23 was drilled from the crest of the raised dike (i.e., from the current perimeter road), while CUF-B24 and CUF-B25 were drilled from the lower bench. Exhibits G.1-5 (crest) and G.1-6 (lower bench) show the boring locations superimposed on profiles of the surface geophysics results. CUF-B23 was drilled to characterize a high-velocity anomaly (pinnacle) above the foundation soils. The boring encountered clayey fill underlain by CCR materials, which was underlain by clayey gravel fill, with possible boulders/concrete within the clayey fill. CUF-B24 was drilled to characterize the foundation soils in an area of historical foundation grouting. The boring encountered interbedded clayey, sandy, and clayey gravelly foundation soils. CUF-B25 was drilled along the historical stream alignment. The boring encountered clayey fill underlain by interbedded clayey, sandy, and gravelly foundation soils. The base of the fill in CUF-B25 agreed with the pre-construction topography in the historical stream alignment.

In both the North and South Areas, the geophysical anomalies targeted by TVA and TDEC were successfully explored with the supplemental borings. No significant preferential seepage pathways were identified beneath the perimeter dike system, whether they be pervious foundation soils or layers of pervious rockfill.

For slope stability analyses that preceded the above geotechnical investigations, the findings of those investigations did not necessitate any updates to the analyses. The slope stability analyses referenced in Tables G.1-1 (static load cases) and G.1-2 (seismic load cases) are still judged to be representative of the specified geometry/conditions.

Similarly, the 2019 surface geophysics did not necessitate any updates to the slope stability analyses. The surface geophysics were specifically intended to better characterize the foundation soils in the immediate vicinity of the mapped, pre-construction channels of Wells Creek and in an area of historical grouting. The geophysics were not intended to evaluate soil strengths, and the data do not replace or supersede the higher quality drilling data and laboratory testing data already used to support the referenced slope stability analyses. Comparison of the measured shear wave velocities (see Exhibits G.1-4 through G.1-6) to standard penetration test (SPT) blowcounts from supplemental borings CUF-B20 through CUF-B25 and penetration resistance of the Phase 1 EXD CPTs show that relatively low velocities are not indicative of low strength soils.

2.1.4 Discussion

Stantec completed the EXD at the CUF Plant in accordance with the EXD SAP as documented in the EXD SAR. The data collected during the EXD are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP.

At each boring location, the uppermost foundation soil was predominantly lean to fat clay, with single occurrences of clayey gravel, clayey sand, or silt. This is generally consistent with historical borings across the CCR management units.

The underdrain system at the Dry Ash Stack was encountered where expected, with the exception of one boring where no obvious underdrain layer was identified. However, the materials and thickness of the underdrain were not fully consistent with the available historical information. The material in three borings was coarse-grained CCR materials as expected but was non-CCR gravel fill in three other borings. The underdrain layer was thinner (2.5 to 4.5 feet) than suggested in the Operations Manual (TVA 2003) (4 to 7.5 feet). The presence of a geotextile beneath the underdrain layer was not expected but was encountered in one boring.

The underdrain system at the Gypsum Storage Area was encountered where expected. However, the materials and thickness of the underdrain were not fully consistent with the available historical information. The material in all six borings was non-CCR gravel fill as expected, but geotextiles were only encountered in three of the borings and a layer of coarse sand was not encountered in any of the borings. The layer was thinner (0.6 to 1.9 feet) than suggested in the Operations Manual (TVA 2003) (at least 2.5 feet).

These findings do not imply that the Dry Ash Stack and/or Gypsum Storage Area underdrain layers are deficient. When assessing the performance of the underdrain layers, it is more informative to consider how pore water is transmitted through or along the layers. For more information on CCR management unit performance, refer to Section 2.2 regarding slope stability, Appendix H.1 and Section 3.1.4 regarding groundwater and pore water flow, and EAR Chapter 4.3 for material quantity modeling.

At the Gypsum Storage Area, three shallower temporary wells were to be screened in gypsum, just above the underdrain/sluiced CCR materials interface. The purpose was to allow for pore water sampling within the gypsum. However, upon reaching the planned termination criteria, water levels in these borings were found to have insufficient depth of water to facilitate pore water sampling. Therefore, temporary wells were not installed in these three borings. Refer to Section 3.1.4 for additional temporary well and piezometer water level data in each CCR management unit.

In the two perimeter areas of pre-construction channels of Wells Creek and in an area of historical foundation grouting, the geophysical anomalies targeted by TVA and TDEC were successfully explored with the supplemental borings. Based on historical information and the results of surface geophysics and borings, no significant preferential seepage pathways were identified beneath the perimeter dike system.

Refer to Appendix H.1 for interpretation of EXD bedrock data, such as pressure testing and downhole geophysics, as it relates to hydrogeology.

2.2 SLOPE STABILITY

The load cases evaluated in the stability analyses are based on conventional practice and appropriate industry standards for landfills and surface impoundments, as applicable. The load cases are as follows:

- Static, long-term (i.e., normal operation conditions) global stability
- Static, long-term veneer (i.e., final cover) stability
- Seismic, pseudostatic global stability
- Seismic, pseudostatic veneer stability
- Seismic, post-earthquake global stability (includes a preceding liquefaction triggering assessment).

As described in the EIP, including the Evaluation of Existing Geotechnical Data (Appendix F of the EIP; Stantec 2018c), the existing data are sufficient to establish appropriate shear strengths and stability results for static and seismic load cases. The summaries of existing geotechnical data (plus other analyses completed after the EIP was published) demonstrate that existing data are representative and suitable to support the stability analyses. For the CUF Plant, a Stability SAP was not necessary because no new analyses were required within the scope of the EIP.

2.2.1 Previous Representative Studies and Assessments

Through the various information requests, as well as TDEC comments on the EIP, a need was identified for an evaluation of existing slope stability analyses (geometry, pore water pressures, material parameters, seismic inputs, analysis methods, results, etc.). As an appendix of the EIP (Appendix F), the Evaluation of Existing Geotechnical Data (Stantec 2018c) was prepared to review the existing analyses and evaluate their adequacy with respect to responding to the various information requests. Evaluating the adequacy of existing data depends on both the type of data and its use. Where applicable, existing geotechnical data were used to support the subjects addressed throughout the EAR. For a summary of historical slope stability analyses utilized to address the required load cases, see Tables G.1-1 and G.1-2 in Section 2.2.3.

As described in the Evaluation of Existing Geotechnical Data (Stantec 2018c), existing data that were considered for evaluating stability of the waste fill and side-slope berms included:

- Slope stability analyses of existing conditions
- Slope stability analyses of future (i.e., permitted, “build-out”, or closed) conditions
- Structural stability assessments performed for CCR Rule compliance.

For stability of the waste fill and side-slope berms, the basis for evaluating the adequacy of each type of data listed above was similar:

- Representative coverage with stability analysis cross-sections
- Representative cross-section geometry and subsurface characterization
- Representative material parameters and phreatic conditions
- Representative loads (static loads, seismic loads, etc.)
- Appropriate stability analysis methods
- Potential for relevant changes in conditions since analyses were performed.

For evaluating CCR and soil material parameters, including shear strengths, existing data that were considered included:

- Parameters based on *in situ* testing
- Parameters based on laboratory testing
- Parameters based on published values for similar materials.

For stability of the waste fill and side-slope berms, the basis for evaluating the adequacy of each type of data listed above was similar:

- Locations of *in situ* tests and/or samples for each material
- Suitability of methods used to perform *in situ* testing, to collect samples, and to perform laboratory testing. Suitability is judged qualitatively, based on how well the methods obtain the necessary data and compare to the current standard of practice.
- Potential for relevant changes in subsurface conditions since *in situ* testing and/or sampling were performed.

<u>Stilling Pond (including Retention Pond)</u>

TVA performed a static safety factor assessment (Stantec 2016a) as required by the CCR Rule (Title 40, Code of Federal Regulations [40 CFR] Part 257.73[e]) for the Stilling Pond (including Retention Pond). This assessment was for the operating conditions as they existed in 2016. Based on recent geotechnical explorations, topographic survey data, and bathymetric survey data, two critical cross-sections (P-P', Q-Q') were developed for slope stability analysis. Static slope stability was analyzed for long-term, drained conditions (normal pool). The slope stability assessments were focused on the potential for slope failures of significant mass, which could directly influence potential release of water and CCR materials from the Stilling Pond (including Retention Pond). Based upon these criteria, the Stilling Pond (including Retention Pond) meets the minimum factor of safety (FS) required by the CCR Rule for static slope stability.

TVA performed a seismic safety factor assessment (Geocomp 2016b), as required by 40 CFR Part 257.73(e), for the CUF Stilling Pond (including Retention Pond). This assessment was for the operating conditions as they existed in 2016. The analyses included the seismic FS (i.e., pseudostatic slope stability) and liquefaction FS (i.e., post-earthquake slope stability, considering liquefaction) for the Stilling Pond (including Retention Pond). As part of the CCR Rule requirements, a site-specific seismic study was conducted on the design response spectra developed by the United States Geological Survey (USGS). Site-specific two-dimensional amplification analyses were performed to model the seismic response of cross-section R-R’. This cross-section was developed previously based on a subsurface exploration and laboratory testing by Geocomp (2016c).

The minimum FS correspond to slip surfaces that could potentially result in the release of water and CCR materials from within the impoundment. Based upon the analysis performed for the Stilling Pond (including Retention Pond), the impoundment meets the FS criteria for both seismic FS and liquefaction FS.

TVA is in the process of undertaking two construction projects to close the Stilling Pond (including Retention Pond) (now jointly referred to as the Main Ash Pond) and repurpose the unit with two process water basins. These projects are the Main Ash Pond Repurposing Project and the PFM project. Stability of the perimeter dike, which was lowered approximately 15 feet, was evaluated for static, long-term operational conditions (geosynthetic-lined process water basin filled with water) for both inboard and outboard stability (Stantec 2020e). Based upon the analysis performed for the Main Ash Pond, the impoundment meets the FS criteria for long-term, static stability. Although seismic stability was not analyzed for the design condition, it can be inferred that FS would be adequate given that Geocomp (2016b) analyses of the Stilling Pond (including Retention Pond) were adequate and the Main Ash Pond Repurposing Project design geometry is more stable.

When constructed along the inboard side of the lowered perimeter dike, the geosynthetic-lined process water basin will not contain CCR material-laden water and will not be constructed over CCR material. Therefore, any amount of seismic deformation of this perimeter dike would not result in a release of CCR material. After completion of the Main Ash Pond Repurposing Project, the only portion of the original Main Ash Pond footprint to have CCR material remaining is the southeastern sector that includes the footprint of the Temporary Lined Basin. The configuration of this sector will be surrounded by the Dry Ash Stack (south), Process Water Basin 1 (west), Process Water Basin 2 (north), and by higher ground for plant access roads/parking/switchyard (east). A stability related release of CCR material is not feasible due to the higher surrounding grades to the south and east, flat grading, and containment to the west and north by the process water basins.

Dry Ash Stack

The Dry Ash Stack is currently an active CCR management unit. For purposes of the EAR, TVA, and TDEC agreed that the referenced historical analyses are adequate, knowing that future additional analyses will be performed when closure design is defined. Given that the closure configurations have yet to be determined, TVA and TDEC agreed not to address this case in the EAR but to defer the evaluations until the CARA or the closure design. The closure design would meet the same slope stability acceptance criteria applied for the TDEC Order.

TVA performed a static and seismic global stability assessment (Geocomp 2019a) for the Dry Ash Stack (two cross sections). The Dry Ash Stack was analyzed for operating conditions as they existed in 2019, as well as for two future CCR material stacking scenarios. The two future scenarios/geometries are termed “Marketable Future Conditions,” in which a portion of the ash generated (over the next 10 years) is moved offsite and less ash is placed on the Dry Ash Stack, and “Non-Marketable Future Conditions,” in which all ash generated (over the next 10 years) is placed onto the Dry Ash Stack. For purposes of this EAR, TVA and TDEC agreed that the results for the “Non-Marketable Future Conditions” (i.e., the more conservative loading scenario) would be reported herein.

The analyses included two-dimensional non-linear ground amplification analyses as well as static, pseudostatic, liquefaction triggering, and post-earthquake slope stability analyses. Seismic inputs from Geocomp (2016b) were used for the pseudostatic stability and liquefaction triggering analyses. As part of the CCR Rule requirements, a site-specific seismic study was conducted on the design response spectra developed by the USGS. Site-specific two-dimensional amplification analyses were performed to model the seismic response of cross-sections C-C’ and F-F’. These cross-sections had been developed previously based on a subsurface exploration and laboratory testing by Geocomp (2013) and were updated based on subsequent geotechnical explorations and the assumed future conditions.

The minimum FS correspond to slip surfaces that could potentially result in the release of CCR materials from within the landfill. Based upon the analysis performed for the Dry Ash Stack, the landfill meets the FS criteria for long-term, static conditions but not for the pseudostatic FS or post-earthquake FS. This applies for the conditions analyzed at that time, which were later improved as outlined in the next paragraph.

In 2020, TVA completed the Dry Ash Stack Perimeter Access Road project to improve the global stability of the Dry Ash Stack side slopes, while also improving drainage patterns and travel routes around its periphery (Stantec 2021a). Geocomp and Stantec coordinated to develop a grading plan (including adding a buttress and cutting back some slopes) that resulted in global stability analyses meeting the target FS for short-term, static conditions (Geocomp 2019b, 2020c). In 2023, TVA updated these analyses to quantify the improvement in seismic global stability for the Dry Ash Stack due to the as-built buttress and regrading, and also account for the future geometry of the “Non-Marketable Future Conditions” (Geocomp 2023; provided for reference as Attachment G.1-A). Based upon the updated analysis performed for the Dry Ash Stack, the landfill meets the FS criteria for both pseudostatic FS and post-earthquake FS.

To support potential future partial closure of the Dry Ash Stack and Gypsum Storage Area, Stantec (2017) performed static and seismic veneer analyses to design the final cap system. The critical cross-section was selected as the longest length for the proposed partial closure slope configuration. The results indicated the minimum required interface shear strength, which was used to develop a performance-based specification for construction. Laboratory tests of project-specific materials at site-specific conditions will be performed to verify that the minimum strength requirements are achieved.

As part of the design for the Dry Ash Stack Perimeter Access Road project, Stantec (2021c) performed static veneer stability analysis for the interface of the cover soil and geosynthetic cap. The results indicated the minimum required interface shear strength, which was used to develop a performance-based specification for construction. Laboratory tests of project-specific materials at site-specific conditions were performed to verify that the minimum strength requirements were achieved (Stantec 2021a).

Gypsum Storage Area

The Gypsum Storage Area is currently an active CCR management unit. For purposes of the EAR, TVA, and TDEC agreed that the referenced historical analyses are adequate, knowing that future additional analyses will be performed when closure design is defined. Given that the closure configurations have yet to be determined, TVA and TDEC agreed not to address this case in the EAR but to defer the evaluations until the CARA or the closure design. The closure design would meet the same slope stability acceptance criteria applied for the TDEC Order.

TVA performed a static and seismic stability assessment (Geocomp 2019a) for the Gypsum Storage Area (three cross sections). The Gypsum Storage Area was analyzed for operating conditions as they existed in 2019. For purposes of this EAR, TVA and TDEC agreed that the results for the existing conditions scenario would be reported herein.

The analyses included two-dimensional non-linear ground amplification analyses as well as static, pseudostatic, liquefaction triggering, and post-earthquake slope stability analyses. Seismic inputs from Geocomp (2016b) were used for the pseudostatic stability and liquefaction triggering analyses. Site-specific two-dimensional amplification analyses were performed to model the seismic response of cross-sections H-H’, K-K’, and N-N’. These cross-sections had been developed previously based on a subsurface exploration and laboratory testing by Geocomp (2013) and were updated based on subsequent geotechnical explorations.

The minimum FS correspond to slip surfaces that could potentially result in the release of CCR materials from within the landfill. Based upon the analysis performed for the Gypsum Storage Area, the landfill meets the FS criteria for long-term, static conditions but not for pseudostatic FS or post-earthquake FS. This applies for the conditions analyzed at that time, which were later improved as outlined in the next paragraph.

In 2020, TVA prepared a plan for adjusting CCR management unit operations within the Gypsum Storage Area (Stantec 2020a). Planned operations for gypsum handling will include harvesting of material from the Gypsum Storage Area for processing and beneficial use applications (primarily Georgia-Pacific wallboard operations, but other applications may be used if these become available). These operations will support desired improvements to the Gypsum Storage Area embankment by reducing its overall height and facilitating planned capital drainage improvements prior to closure. The goal is to harvest gypsum suitable for beneficial use applications from the Gypsum Storage Area prior to closure. Although final closure design has not yet been performed, reducing the overall height of the embankment should improve the long-term static and seismic stability of the unit. In 2023, TVA updated these analyses to quantify the improvements in seismic global stability for the Gypsum Storage Area due to recent surface water management improvements (lining perimeter ditches to reduce infiltration, regrading on top of the stack to promote positive drainage) and future targeted gypsum harvesting in critical areas. This targeted harvesting includes cutting back (i.e., flattening) the outslope of the uppermost perimeter dike, Dike 3 (Geocomp 2023; Attachment G.1-A). As stated in Geocomp (2023): “At [Gypsum Storage Area] after the completion of the proposed regrading of Dike 3 and improved pore water pressure conditions, the resulting factors of safety for global stability meet or exceed all required minimum values." Based upon the updated analysis performed for the Gypsum Storage Area, the landfill meets the FS criteria for both pseudostatic FS and post-earthquake FS.

To support potential future partial closure of the Dry Ash Stack and Gypsum Storage Area, Stantec (2017) performed static and seismic veneer analyses to design the final cap system. The critical cross-section was selected as the longest length for the proposed partial closure slope configuration. The results indicated the minimum required interface shear strength, which was used to develop a performance-based specification for construction. Laboratory tests of project-specific materials at site-specific conditions will be performed to verify that the minimum strength requirements are achieved.

Bottom Ash Pond

TVA performed a static safety factor assessment (Stantec 2016b) as required by 40 CFR Part 257.73(e) for the Bottom Ash Pond. This assessment was for the operating conditions as they existed in 2016. Based on recent geotechnical explorations and topographic survey data, one critical cross-section (Cross-Section 2) was developed for slope stability analysis. Static slope stability was analyzed for long-term, drained conditions (normal pool). The slope stability assessments were focused on the potential for slope failures of significant mass, which could directly influence potential release of water and CCR materials from the Bottom Ash Pond. Based upon these criteria, the Bottom Ash Pond meets the FS criteria required by the CCR Rule for static slope stability.

TVA performed a seismic safety factor assessment (Geocomp 2016a) as required by 40 CFR Part 257.73(e) for the Bottom Ash Pond. This assessment was for the operating conditions as they existed in 2016. The analyses included the seismic FS (i.e., pseudostatic slope stability) and liquefaction FS (i.e., post-earthquake slope stability, considering liquefaction) for the Bottom Ash Pond. As part of the CCR Rule requirements, a site-specific seismic study was conducted on the design response spectra developed by the USGS. Site-specific two-dimensional amplification analyses were performed to model the seismic response of cross-section BAshP-BAshP'. This cross-section was developed previously based on a subsurface exploration and laboratory testing by Geocomp (2016c).

The minimum FS correspond to slip surfaces that could potentially result in the release of water and CCR materials from within the impoundment. Based upon the analysis performed for the Bottom Ash Pond, the impoundment meets the FS criteria for both seismic FS and liquefaction FS.

2.2.2 TDEC Order Environmental Investigation Activities

As described in Section 2.2.1 above, as well as in the CUF EIP, the existing data are sufficient to establish appropriate shear strengths and stability results for static and seismic load cases. The summaries of existing geotechnical data (plus other analyses completed after the EIP was published) demonstrate that existing data are representative and suitable to support the stability analyses. For the CUF Plant, a Stability SAP was not necessary because no new analyses were required within the scope of the EIP.

2.2.3 Results

The global stability results presented (and compared to the acceptance criteria) are those in which the critical failure surface intercepts the contained CCR materials within the CCR management unit (unless otherwise noted). The global stability analysis models and critical failure surfaces are shown in the referenced historical documents. Calculations for the veneer stability results presented below are included in the referenced historical documents.

Static Stability

The static, long-term, global stability was analyzed for each cross section listed in Table G.1-1. The cross section locations for these global stability analyses are shown on Exhibit G.1-7. The static, long-term, veneer stability was analyzed for the typical geometry of the cover system (unless otherwise noted). The results of the static stability analyses, with the minimum required FS, are summarized in Table G.1-1. The static, long-term, global stability for the cross sections and the static, long-term, veneer stability for the typical sections meets the established FS criteria for the static load cases.

Table G.1-1 Long-Term, Static Stability Results at CUF Plant

CCR Management Unit	Analysis Type	Cross Section	FS Required	FS Sliding	Reference
Stilling Pond (including Retention Pond) (2016 Operating Condition)	Global (outboard)	P-P’	≥ 1.5	2.2	Stantec (2016a)
	Global (outboard)	Q-Q’	≥ 1.5	2.0	Stantec (2016a)
Main Ash Pond (future operating condition)	Global (outboard)	16+00	≥ 1.5	1.9	Stantec (2020)
	Global (inboard)	16+00	≥ 1.5	3.6	Stantec (2020)
Dry Ash Stack (future, “non-marketable” scenario without Perimeter Access Road)	Global	F-F’	≥ 1.5	2.0	Geocomp (2019a)
Dry Ash Stack (Perimeter Access Road + future, “non-marketable” scenario)	Global	F-F’	≥ 1.5	2.2	Geocomp (2023)
Dry Ash Stack (future, closed condition)	Veneer	Typical	≥ 1.5	1.5	Stantec (2017b)
Dry Ash Stack (Perimeter Access Road)	Veneer	Typical	≥ 1.5	1.5	Stantec (2021c)
Gypsum Storage Area (2019 Operating Condition)	Global	H-H’	≥ 1.5	2.2	Geocomp (2019a)
	Global	K-K’	≥ 1.5	1.7	Geocomp (2019a)
	Global	N-N’	≥ 1.5	2.6	Geocomp (2019a)
Gypsum Storage Area (future, targeted harvesting)	Global	JK-JK’	≥ 1.5	1.7	Geocomp (2023)
Gypsum Storage Area (future, closed condition)	Veneer	Typical	≥ 1.5	1.5	Stantec (2017)
Bottom Ash Pond (2016 Operating Condition)	Global	2	≥ 1.5	1.5	Stantec (2016b)

Seismic Stability

The pseudostatic, global stability and post-earthquake, global stability were analyzed for each cross section listed in Table G.1-2. The cross section locations for these global stability analyses are shown on

Exhibit G.1-7. The pseudostatic, veneer stability was analyzed for the typical geometry of the cover system (unless otherwise noted). The results of the seismic stability analyses, with the minimum required FS for each case, are summarized in Table G.1-2.

Table G.1-2 Seismic Stability Results at CUF Plant

CCR Management Unit	Analysis Type	Cross Section	FS Required	FS Sliding	Reference
Stilling Pond (including Retention Pond) (2016 Operating Condition)	Pseudostatic, Global (outboard)	R-R’	≥ 1.0	1.1	Geocomp (2016b)
	Post-Earthquake Global (outboard)	R-R’	≥ 1.0	1.2	Geocomp (2016b)
Dry Ash Stack (future, “non-marketable” scenario without Perimeter Access Road)	Pseudostatic, Global	F-F’	≥ 1.0	0.9	Geocomp (2019a)
	Post-Earthquake Global	F-F’	≥ 1.0	0.9	Geocomp (2019a)
Dry Ash Stack (Perimeter Access Road + future, “non-marketable” scenario)	Pseudostatic, Global	F-F’	≥ 1.0	1.2	Geocomp (2023)
	Post-Earthquake Global	F-F’	≥ 1.0	1.0	Geocomp (2023)
Dry Ash Stack (future, closed condition)	Pseudostatic, Veneer	Typical	≥ 1.0	> 1.0	Stantec (2017)
Gypsum Storage Area (2019 Operating Condition)	Pseudostatic, Global	H-H’	≥ 1.0	1.4	Geocomp (2019a)
	Post-Earthquake Global	H-H’	≥ 1.0	1.2	Geocomp (2019a)
	Pseudostatic, Global	K-K’	≥ 1.0	0.9	Geocomp (2019a)
	Post-Earthquake Global	K-K’	≥ 1.0	0.6	Geocomp (2019a)
	Pseudostatic, Global	N-N’	≥ 1.0	1.1	Geocomp (2019a)
	Post-Earthquake Global	N-N’	≥ 1.0	0.9	Geocomp (2019a)
Gypsum Storage Area (2022 Operating Condition)	Post-Earthquake Global	N-N’	≥ 1.0	1.0	Geocomp (2023)
Gypsum Storage Area (future, targeted harvesting)	Pseudostatic, Global	JK-JK’	≥ 1.0	1.4	Geocomp (2023)
	Post-Earthquake Global	JK-JK’	≥ 1.0	1.1	Geocomp (2023)
Gypsum Storage Area (future, closed condition)	Pseudostatic, Veneer	Typical	≥ 1.0	> 1.0	Stantec (2017)
Bottom Ash Pond (2016 Operating Condition)	Pseudostatic, Global	BAshP-BashP’	≥ 1.0	1.2	Geocomp (2016a)
	Post-Earthquake Global	BashP-BashP’	≥ 1.0	1.3	Geocomp (2016a)

The pseudostatic, global stability for the cross sections meets the established FS criteria, except for the future geometry of the Dry Ash Stack at cross section F-F’ (without the benefit of the Perimeter Access

Road project) and the 2019 geometry of the Gypsum Storage Area at cross section K-K'. The post-earthquake, global stability for the cross sections meets the established FS criteria, except for the future geometry of the Dry Ash Stack at cross section F-F' (without the benefit of the Perimeter Access Road project) and the 2019 geometry of the Gypsum Storage Area at cross sections K-K' and N-N'.

As discussed in Section 2.2.1, the implementation of the Dry Ash Stack Perimeter Access Road project, which included the buttress and regrading, improved future long-term seismic global stability at cross section F-F'. In 2023, TVA updated these analyses to quantify the improvement in seismic global stability for the Dry Ash Stack due to the as-built buttress and regrading, and also account for the future geometry of the "Non-Marketable Future Conditions" (Geocomp 2023). Based upon the updated analysis performed for the Dry Ash Stack, the landfill meets the FS criteria for both pseudostatic FS and post-earthquake FS. The future closure will be designed such that it meets the same slope stability acceptance criteria applied for the TDEC Order.

Similarly for the Gypsum Storage Area, in 2023, TVA updated analyses to quantify the improvements in seismic global stability for the Gypsum Storage Area due to recent surface water management improvements and future targeted gypsum harvesting in critical areas (Geocomp 2023). Based upon the updated analysis performed for the Gypsum Storage Area, the landfill meets the FS criteria for both pseudostatic FS and post-earthquake FS. The future closure will be designed such that it meets the same slope stability acceptance criteria applied for the TDEC Order. Although final closure design has not yet been performed, TVA's plan to reduce the overall height of the embankment should improve the long-term static and seismic stability of the Gypsum Storage Area.

2.2.4 Discussion

The static and seismic stability results for the CUF Plant are summarized and compared to criteria in Table G.1-1 and Table G.1-2, respectively. The global stability and the veneer stability for each analyzed section meet the established FS criteria for the static and seismic load cases.

For purposes of the EAR, TVA and TDEC agreed that the referenced historical analyses are adequate, knowing that future additional analyses will be performed when closure design is defined. Given that the closure configurations have yet to be determined, TVA and TDEC agreed not to address this case in the EAR but to defer the evaluations until the CARA or the closure design. The closure design would meet the same slope stability acceptance criteria applied for the TDEC Order.

2.3 STRUCTURAL INTEGRITY

Per the CUF EIP, TDEC requested that TVA discuss how the structural integrity of the entire area of CCR materials disposal (surface impoundment(s), landfill(s) and non-registered sites) will be determined. Further, TVA included the methods and models in the EIP that it will use to evaluate structural integrity as discussed in 40 CFR 257.73(d) and (e).

For purposes of this section of the EAR, "structural integrity" considers structural potential failure modes that could lead to a release of CCR materials, other than slope stability (addressed in Section 2.2) and structural stability of bedrock (addressed in Section 2.4).

For the CUF Plant CCR management units, the EIP summarized historical reports that could be leveraged to address structural integrity. After the EIP was approved by TDEC, several recent design and construction projects at the CUF Plant also provided information regarding structural integrity, and those are referenced below. There was no SAR specifically required under the TDEC Order program to address this subject.

2.3.1 Previous Representative Studies and Assessments

<u>Stilling Pond (including Retention Pond)</u>

TVA has recently performed structural stability assessments as required by 40 CFR Part 257.73(d) and (e) for the CUF Plant surface impoundments (Stantec 2016d, 2016e). The scope of work for those assessments is provided below. TVA further promotes structural integrity of the CCR management units by performing routine inspections and by evaluating proper abandonment of hydraulic structures and pipe penetrations through the unit perimeter. A summary of the structural evaluations is also provided below. Additionally, the stability program described in Section 2.2 considers the safety factor aspects of the CCR Rule, 40 CFR Part 257.73(e), such as static and seismic stability.

As part of TVA's ongoing efforts to comply with the CCR Rule, a structural stability assessment was performed for the Stilling Pond (including Retention Pond) (Stantec 2016d). With respect to stability of the waste fill and side slope berms, this assessment considered the following aspects:

- Foundation and abutment conditions (cracking, settlement, deformation, erosion, and heave due to seepage): Based on annual site inspections from 1972 to 2015, no signs of tension cracking, settlement, depressions, erosion, and/or deformations at the crest, slope and toe of the perimeter dike were documented. Following construction of the Spillway Improvement Project in 2013, seepage analyses were performed to reflect the lower normal pool level within the pond (Stantec 2013). The updated analyses for the perimeter dike indicated that the FS for piping/heave met the acceptance criteria.

- Slope protection: Site inspection reports from 1972 to 2015 generally indicate appropriate maintenance of slope protection features of the perimeter dike, in accordance with the procedures outlined in the *TVA Operations Support Document* (TVA 2011). The use of riprap as wave wash protection along the interior of the perimeter dike appears appropriate to address concerns of erosive wave action.

- Embankment dike compaction: TVA Drawings 10N212 and 10N213 provide documentation of compaction requirements related to the construction of the perimeter dike. Later subsurface explorations confirm that the earth fill used for the perimeter dike was appropriately compacted. Construction criteria related to dike embankment materials and dike compaction as noted on these drawings include:

    - Embankments were to be constructed from earth fill from approved borrow sources in accordance with standard TVA construction specifications

    - Dike embankments were to be compacted with sheepsfoot rollers

  - Construction monitoring was to include two field moisture-density tests per day to achieve a minimum 95 percent (%) of standard Proctor maximum density as determined by the TVA Materials Laboratory. The earth fill moisture content was not to exceed 3% above optimum moisture content.

- Vegetation of slopes: Annual site inspections were conducted and documented regularly following construction of the perimeter dike. The vegetation along the slopes of the perimeter dike of the Stilling Pond (including Retention Pond) was found to be adequate, and any deficiencies were identified for repair.

- Spillway condition and capacity: The Inflow Design Flood Control System Plan (Stantec 2016e) for the Stilling Pond (including Retention Pond) demonstrates the primary spillway and emergency spillway systems meet the capacity requirements outlined in §257.73(d)(1)(v) of the CCR Rule. Also, the primary spillway riser structures and the emergency spillway structures comply with applicable stability and strength acceptance criteria.

- Sudden drawdown assessment (slope stability): The outboard slope of the perimeter dike was assessed for sudden drawdown for slope failures of significant mass, which could directly impact potential release of water and CCR materials from the Stilling Pond (including Retention Pond). The analyses indicated that the FS met the acceptance criteria.

TVA is in the process of undertaking two construction projects to close the Stilling Pond (including Retention Pond) (now jointly referred to as the Main Ash Pond) and repurpose the unit with two process water basins. These projects are the Main Ash Pond Repurposing Project and the PFM project. These projects address structural integrity as follows:

- Slope protection: Construction plans (Stantec 2020c) include riprap armoring on the inboard face of the perimeter dike system for the process water basins

- Embankment dike compaction: Construction specifications (Stantec 2020d) include an earthwork specification that governs embankment dike compaction, including subgrade surface inspection and modifications, backfill, structural fill, soil moisture control, compaction requirements, and field quality control

- Spillway condition and capacity: hydrologic and hydraulic analysis (Stantec 2020b) was performed for the PFM project, to demonstrate that stormwater and process water are adequately conveyed through existing spillways

- Proper abandonment of hydraulic structures and pipe penetrations through the Stilling Pond (including Retention Pond) perimeter: Construction plans (Stantec 2020a) include removal of the existing emergency spillway, as well as excavation of the surrounding perimeter dike (to be lowered approximately 15 feet).

In 2020, a formal (five-year) inspection of the CUF Plant CCR Facilities and Ponds was performed (Stantec 2020f). For the Main Ash Pond, the inspection report included documents review for evaluation of unit design and construction, operations and maintenance, instrumentation, potential failure modes, and historical inspection reports. The report also documented a field inspection, which included general conditions, interior slopes, exterior slopes, dike toe areas, dike crests, and spillways/outlets. There were no observed deficiencies identified at the Main Ash Pond during inspection that required immediate attention, monitoring, or maintenance.

Dry Ash Stack

Due to TVA's construction of the CUF Plant landfills on top of a closed CCR surface impoundment, the CCR Rule requires TVA to demonstrate that "good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted." Because the Dry Ash Stack is an existing landfill, TVA performed an evaluation (Stantec 2018f) to demonstrate compliance with the CCR Rule "Unstable Areas" location restriction (40 CFR Part 257.64). The scope of work for the assessment is provided below.

TVA further promotes structural integrity of the units by performing routine inspections and by evaluating proper abandonment of hydraulic structures and pipe penetrations through the Dry Ash Stack perimeter. A summary of the structural evaluations is also provided below.

The Unstable Areas Demonstration for the Dry Ash Stack (Stantec 2018f) considered three categories of factors that could contribute to instability:

- Onsite or local soil conditions that may result in significant differential settling
- Onsite or local geologic or geomorphic features
- Onsite or local human-made features or events (both surface and subsurface).

With respect to local soil conditions, the demonstration included a review of inspection reports, United States Department of Agriculture soil surveys, geotechnical data reports, construction drawings, construction field notes, and geotechnical analyses. The demonstration concluded that significant differential settlement was unlikely, and that the CCR Rule criteria had been met.

The demonstration considered local geologic or geomorphologic features that could contribute to instability, such as karst features (sinkholes, caves, springs, etc.). The demonstration also included a review of published topographic and geologic mapping, inspection reports, geotechnical data reports, construction drawings, construction field notes, and digital elevation models. The demonstration concluded that although potential karstic conditions have been identified in the vicinity of the CUF Plant, there is sufficient evidence to demonstrate that the Dry Ash Stack is not located in an area of unstable karstic conditions, and that the CCR Rule criteria had been met.

Lastly, the demonstration considered local human-made features or events (surface or subsurface) that could contribute to instability, such as routine operations, previously mined or quarried areas, excessive drawdown of groundwater, or old landfills. The demonstration included a review of inspection reports, routine operations manuals, instrumentation data, and maps showing nearby landfills, water wells, quarries, oil wells, and gas wells. The demonstration concluded that it is not expected that human events related to these industries or their operations pose a negative impact to the structural components of the

Dry Ash Stack or that would cause the unit to become unstable, and that the CCR Rule criteria had been met.

In 2020, TVA executed the Dry Ash Stack Perimeter Access Road project to improve the stability of the Dry Ash Stack side slopes, while also improving drainage patterns and travel routes around its periphery (Stantec 2021a). This project addresses structural integrity as follows:

- Slope protection: Construction plans (Stantec 2021b) include a geosynthetic cap system to close a portion of the west slope under regulatory framework established with the State and CCR Rule (Stantec 2021c). The material above the geosynthetics is cover soil and sod in some areas, and crushed stone and riprap in other areas.

- Fill compaction: Construction specifications (Stantec 2019b) include an earthwork specification that governs fill compaction, including subgrade surface inspection and modifications, proof roll, backfill, structural fill, soil moisture control, compaction requirements, and field quality assurance.

- Vegetation of slopes: Construction specifications (Stantec 2019b) include a soil preparation specification that governs vegetation support layer, interim soil cover, planting soil, and field quality control. There is also a turfs and grasses specification that governs vegetative cover preparation, soil amendments, sodding, and seeding.

- Drainage improvements: hydrologic and hydraulic analyses (Stantec 2021c) were performed for the proposed drainage pipes and ditches to demonstrate that stormwater is adequately conveyed to the Main Ash Pond. Also, the outlet pipes were installed in compacted backfill to protect the pipes from traffic loading.

In 2020, a formal (five-year) inspection of CUF Plant CCR Facilities and Ponds was performed (Stantec 2020f). For the Dry Ash Stack, the inspection report included documents review for evaluation of unit design and construction, operations and maintenance, instrumentation, potential failure modes, and historical inspection reports. The report also documented a field inspection, which included general conditions, exterior slopes, benches, and other features. There were no observed deficiencies identified at the Dry Ash Stack during the inspection that required immediate attention or monitoring. Minor maintenance items identified during the inspection were immediately repaired in accordance with TVA guidelines.

<u>Gypsum Storage Area</u>

As required by the CCR Rule for existing landfills (40 CFR Part 257.64) (see previous section for the Dry Ash Stack), TVA performed an evaluation for an Unstable Areas Demonstration (Stantec 2018g) for the Gypsum Storage Area. The scope of work for the assessment is provided below.

TVA further promotes structural integrity of the units by performing routine inspections and by evaluating proper abandonment of hydraulic structures and pipe penetrations through the Gypsum Storage Area perimeter. A summary of the structural evaluations is also provided below.

As done for the Dry Ash Stack, the Unstable Areas Demonstration for the Gypsum Storage Area (Stantec 2018g) considered three categories of factors that could contribute to instability:

- Onsite or local soil conditions that may result in significant differential settling
- Onsite or local geologic or geomorphic features
- Onsite or local human-made features or events (both surface and subsurface).

The demonstration for each of the categories above included the same reviews as conducted for the Dry Ash Stack (see previous section). The demonstration concluded that significant differential settlement was unlikely, and that the CCR Rule criteria had been met.

The demonstration concluded that although potential karstic conditions have been identified in the vicinity of the CUF Plant, there is sufficient evidence to demonstrate that Gypsum Storage Area is not located in an area of unstable karstic conditions, and that the CCR Rule criteria had been met.

Lastly, the demonstration concluded that it is not expected that human events related to specified industries or their operations pose a negative impact to the structural components of the Gypsum Storage Area or that would cause the unit to become unstable, and that the CCR Rule criteria had been met.

In 2020, a formal (five-year) inspection of CUF Plant CCR Facilities and Ponds was performed (Stantec 2020f) for the Gypsum Storage Area and included document reviews and a field inspection, as conducted for the Dry Ash Stack, to prepare an inspection report. There were no observed deficiencies identified at the Gypsum Storage Area during the inspection that required immediate attention or monitoring. Minor maintenance items identified during the inspection were immediately repaired in accordance with TVA guidelines.

Bottom Ash Pond

TVA has recently performed structural stability assessments as required by 40 CFR Part 257.73(d) and (e) for the CUF Plant surface impoundments (Stantec 2016d, 2016e). The scope of work for those assessments is provided below. TVA further promotes structural integrity of the CCR management units by performing routine inspections and by evaluating proper abandonment of hydraulic structures and pipe penetrations through the unit perimeter. A summary of the structural evaluations is also provided below. Additionally, the stability program described in Section 2.2 considers the safety factor aspects of the CCR Rule, 40 CFR Part 257.73(e), such as static and seismic stability.

As part of TVA's ongoing efforts to comply with the CCR Rule, a structural stability assessment was performed for the Bottom Ash Pond (Stantec 2016c). With respect to stability of the waste fill and side slope berms, this assessment considered the following aspects:

- Foundation and abutment conditions (cracking, settlement, deformation, erosion, heave due to seepage): Based on annual site inspections from 1996 to 2015, no signs of tension cracking, settlement, depressions, erosion, and/or deformations at the crest, slope and toe of the perimeter dike were documented.

- Slope protection: Site inspection reports from 1996 to 2015 generally indicate appropriate maintenance of slope protection features of the perimeter dike, in accordance with the procedures outlined in the *TVA Operations Support Document* (TVA 2011). The use of riprap as wave wash protection along the interior of the perimeter dike appears appropriate to address concerns of erosive wave action. As part of a March 2016 site visit, Stantec personnel observed the riprap protection along the exterior slopes. The riprap was located along the exterior slope of the northern and eastern sections of the perimeter dike between the Bottom Ash Pond and the CUF Plant. The riprap above the water surface was continuous and performing well.

- Embankment dike compaction: TVA Drawings 10N212 and 10N213 provide documentation of compaction requirements related to the construction of the perimeter dike. Construction criteria related to dike embankment materials and dike compaction as noted on these drawings are as previously discussed for the Stilling Pond (including Retention Pond). Later subsurface explorations confirm that the earth fill used for the perimeter dike was appropriately compacted.

- Spillway condition and capacity: The Inflow Design Flood Control System Plan (Stantec 2016f) for the Bottom Ash Pond demonstrates the outflow pipes meet the capacity requirements outlined in §257.73(d)(1)(v) of the CCR Rule. Also, the outlet pipes were installed in compacted backfill to protect the pipes from traffic loading.

- Sudden drawdown assessment (slope stability): The exterior slope of the perimeter dike was assessed for sudden drawdown for slope failures of significant mass, which could directly impact potential release of water and CCR materials from the Bottom Ash Pond. The analyses indicated that the exterior slope will not become inundated during the design flood event; thus, the perimeter dike met the acceptance criteria.

In 2020, a formal (five-year) inspection of the CUF Plant CCR Facilities and Ponds was performed (Stantec 2020f). For the Bottom Ash Pond, the inspection report included documents review for evaluation of unit design and construction, operations and maintenance, instrumentation, potential failure modes, and historical inspection reports. The report also documented a field inspection, which included general conditions, interior slopes, exterior slopes, dike crests, and outlets. There were no observed deficiencies identified at the Bottom Ash Pond during inspection that required immediate attention, monitoring, or maintenance.

2.3.2 Discussion

For purposes of this section of the EAR, "structural integrity" considers structural potential failure modes that could lead to a release of CCR materials, other than slope stability (addressed in Section 2.2) and structural stability of bedrock (addressed in Section 2.4).

For the CUF Plant CCR management units, historical reports were leveraged to address structural integrity. Several recent design and construction projects at the CUF Plant also provided information regarding structural integrity. No significant deficiencies were identified with respect to structural integrity of the CCR management units. In addition, TVA further promotes structural integrity of the units by performing routine inspections and other compliance activities, in accordance with TVA policies, state regulations, and federal regulations.

2.4 STRUCTURAL STABILITY (BEDROCK)

Per the EIP, TDEC requested that TVA discuss the ability of the local geology to provide sufficient structural stability for the existing surface impoundments, landfills, and/or non-registered disposal areas at the CUF Plant as well as any disposal area considered for closure in place.

For purposes of this section of the EAR, "structural stability (bedrock)" considers stability of bedrock below fill areas. That is, the bedrock was evaluated with respect to voids/cavities and faults/joints of significant lateral or vertical extent that could be large enough to lead to loss of structural support and potential release of the overlying CCR materials.

For the CUF Plant CCR management units, the Evaluation of Existing Geotechnical Data (Appendix F of the EIP; Stantec 2018c), summarized historical reports that could be leveraged to address structural stability of the bedrock. In addition, the EXD SAR includes new information specifically required under the TDEC Order program to address this subject.

2.4.1 Previous Representative Studies and Assessments

Evaluating the adequacy of existing data depends on the type of data, its quality, and its intended use. For evaluating the stability of bedrock below fill areas, existing data that were considered included:

- Geotechnical data from borings that included rock coring
- Geophysical surveys that included data below the top of bedrock
- Routine visual observations of CCR management units, with respect to indicators of structural distress
- Geologic mapping and characterization of the site, including descriptions of the shallow rock formations.

For this subject, the basis for evaluating the adequacy of each type of data listed above were similar:

- Spatial coverage of borings, geophysical surveys, and visual observations
- Suitability of methods used to perform rock coring, geophysical surveys, and visual observations, and of the associated documentation. Suitability is evaluated qualitatively, based on how well the methods obtained the necessary data and how the methods compared to the current standard of practice.
- Potential for relevant changes in subsurface conditions since borings, surveys, or observations were performed.

Geotechnical Investigation
August 14, 2023

General

Ordovician age carbonate rocks of the Knox Group, Stones River Group, and Hermitage-Fernvale formations comprise bedrock beneath most of the CCR management units at the CUF Plant. An exception is the northwest perimeter of the Dry Ash Stack and the eastern perimeter of the Stilling Pond (including Retention Pond) where younger Silurian-Devonian-Mississippian age rocks are present. The limestones and dolomites which predominantly underlie the site are generally interbedded with clay, shale, and siltstone between soluble limestone strata that tend to limit fracture enlargement in the more soluble carbonate units.

The geologic area is identified as the Wells Creek Structure, an ancient meteorite impact crater. The plant is located just north of the center of the impact zone. The meteorite impact has produced large variations in both the top of bedrock surface and the bedrock type below the plant, as well as several mapped faults. The geologic characterization of the Wells Creek Structure has been extensively documented. The geologic mapping and characterization reports used to support the structural stability of the bedrock included:

- TVA (1958) – Described an investigation consisting of a widely spaced grid of rock core borings to determine the suitability of the foundation materials for the construction of the proposed CUF steam plant. The footprint of the future CCR management units was not explored. The report indicated that “the majority of the cavities encountered were near the top of rock and represented spaces between residual boulders above the actual bedrock surface.” To support a more detailed siting study, additional drilling was recommended with tighter spacing.

- Wilson and Stearns (1968) – Provided a detailed presentation of observations made on the geologic stratigraphy and interpretations of structural data defining the origin of the structure. Major topics presented were stratigraphy, structure, geological interpretation, structural fabric, shatter cones, brecciation, geophysics, and interpretation of origin. Also developed geologic maps and cross sections of the Wells Creek Basin.

- Ford, Orchiston, and Clendening (2012) – Reviewed the prior studies of the Wells Creek Structure and the consensus that the cause was a meteorite impact instead of a volcanic explosion. Detailed evidence included drilling results, extreme brecciation, shatter cones, and the lack of volcanic material.

- Stantec (2018h, 2018i) – Performed a fault area demonstration for CCR Rule compliance of the Stilling Pond (including Retention Pond) and the Bottom Ash Pond. The demonstration consisted of: (1) a review of available literature and published data related to the potential for faulting in the project vicinity and (2) a site specific neotectonics analysis. Based on these assessments, the Stilling Pond (including Retention Pond) and Bottom Ash Pond meet the requirements of the CCR Rule, 40 CFR. §257.62. The demonstration concludes that these units are not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in the Holocene geologic time period.

Stilling Pond (including Retention Pond)

The Stantec (2010a) geotechnical exploration included rock coring in four borings at depths up to about 12 feet into the bedrock. The rock was described as interbedded limestone (50 to 90%) and shale (10 to 50%). The limestone was light gray, hard, and thick bedded. The shale was light gray, calcareous, moderately hard and laminated. Core recovery ranged from 0 to 100% and rock quality designation (RQD) ranged from 0 to 67%. Some clay seams, water-stained zones, and fractures were noted within the limestone, but no voids were noted.

Dry Fly Ash Stack and Gypsum Storage Area

The Law (1992) geotechnical exploration included rock coring in four borings at depths up to about 84 feet into the bedrock. The rock was described as hard, medium gray to greenish-gray, dolomitic limestone. The limestone included characteristic brecciation features described in published reports about the Wells Creek Structure. Core recovery ranged from 9 to 100% and RQD ranged from 9 to 98%. Many recemented fractures were noted, but no voids were noted. Pressure tests were conducted within two borings where permeabilities ranged from impervious in unfractured sections of rock to 2.0×10^{-3} cm/sec in the fractured sections of the rock.

The Stantec (2010b) geotechnical exploration included rock coring in six borings, at depths up to about 10 feet into the bedrock. The rock was described as interbedded limestone (50 to 90%) and shale (10 to 50%). The limestone was light gray, hard, and thick bedded. The shale was light gray, calcareous, moderately hard and laminated. Core recovery ranged from 51 to 100% and RQD ranged from eight to 100%. No voids were noted.

The Stantec (2010c) geotechnical exploration included rock coring in two borings, at depths up to about seven feet into the bedrock. The rock was described as limestone that is gray, thin to medium bedded, and slightly weathered. Core recovery was 84 and 98%. RQD ranged from 32 and 92%. No voids were noted.

AECOM (2016) performed a surface geophysical survey using ERI to evaluate subsurface conditions around the CCR management unit perimeters adjacent to Wells Creek. Specifically, the objective was to explore the potential for preferential groundwater flow pathways such as bedrock fractures, karst topography, gravel layers, and relict stream beds.

The ERI data were correlated to select historical borings along the transects. The ERI results identified one potential bedrock discontinuity along alignment CUF-07, near the southeast corner of the Gypsum Storage Area. Refer to Section 2.4.3 for results of two rock core borings that explored this geophysical anomaly further. The ERI results also identified possible “float rocks” (i.e., boulders within the soil column) along alignment CUF-08, located at the northwest perimeter of the Stilling Pond (including Retention Pond). Refer to Section 2.1.3 results of three soil borings that were drilled in this vicinity. Otherwise, the ERI results did not indicate preferential pathways for groundwater flow within the bedrock or within relict stream beds related to the former Wells Creek alignment.

Bottom Ash Pond

United Engineers and Constructors performed nineteen borings with rock coring, at depths up to about 16 feet into the bedrock (TVA 1998). The rock was described as limestone, siltstone, or calcilutite. The limestone was dark gray, fresh to slightly weathered, and argillaceous. The siltstone was dark gray and calcareous. The calcilutite was dark gray, slightly weathered, and laminated. Core recovery ranged from 45 to 100%, and RQD ranged from 18 to 100%. No voids were noted.

AMEC Foster Wheeler (2017) performed a geotechnical exploration for a proposed bottom ash dewatering facility, located roughly 300 to 600 feet northeast of the Bottom Ash Pond (well outside the limits of the CCR management units). Eight borings with rock coring were performed at depths up to about 26 feet into the bedrock. The rock was described as limestone, light gray to gray, fresh, with shale stringers. Core recovery ranged from 0 to 100% and RQD ranged from 0 to 100%. Voids and clay-filled features, some up to several feet in thickness, were observed in seven of the borings.

Stantec (2019) performed a geotechnical exploration for a proposed wastewater treatment facility, just northeast of the Gypsum Storage Area. Seven borings with rock coring were performed, at depths up to about nine feet into the bedrock. The rock was described as limestone, light gray to dark gray, fresh to highly weathered. Core recovery ranged from 65 to 100% and RQD ranged from 50 to 100%. One rock core boring encountered a one-foot thick void and a 0.1-foot thick soil seam.

2.4.2 TDEC Order Environmental Investigation Activities

Per the CUF Plant EXD SAP, rock core samples were collected from select borings to characterize the rock strata type and structure. Rock core samples were collected from 15 borings and are summarized in Section 2.4.3 below.

Surface geophysics were conducted to better characterize the foundation soils in the immediate vicinity of the mapped, pre-construction channels of Wells Creek and in an area of historical foundation grouting. The “North Area” survey was along a portion of the west perimeter of the Stilling Pond (including Retention Pond), and the “South Area” survey was along the southwest perimeter of the Dry Ash Stack. Although characterizing the bedrock was not a primary objective of these surveys, they provide useful information in bedrock, as summarized below.

2.4.3 Results

Stilling Pond (including Retention Pond)

During the EXD activities, three borings with rock coring (minimum of 20 feet of rock core) were drilled within the Stilling Pond (including Retention Pond). Boring logs and results of surface geophysics are located in the EXD SAR.

The top of rock elevations in each of the three borings CUF-B11, CUF-B12, and CUF-B13 were 307.5 feet, 337.4 feet, and 368.2 feet, respectively. This wide variation is expected in this unique geologic setting and is generally consistent with historical borings in the vicinity.

- In boring CUF-B11, core recovery ranged from 85 to 100%. RQD ranged from 22 to 86%. The rock encountered was shale with minor percentages of limestone. No voids, soil-filled features, or solution features were observed.
- In boring CUF-B12, core recovery ranged from 96 to 100%. RQD ranged from 92 to 100%. The rock encountered was limestone with minor percentages of shale. No voids, soil-filled features, or solution features were observed.
- In boring CUF-B13, core recovery ranged from 8 to 100%. RQD ranged from 20 to 100%. The rock encountered was limestone, which was weathered, fractured (some fractures were open, others were calcite filled), and water-stained. One void (0.5 feet thick) was noted. Below the top of rock, multiple zones of clay infill ranging in thickness from 1 to 11.5 feet were observed. It is unclear if the borehole was following a near vertical, soil-filled crevice in the bedrock or if the borehole was drilling through an interbedded sequence of limestone boulders and clay infill.
- In the North Area surface geophysical survey, the depth to rock in the EXD borings and historical borings was typically deeper than would have been inferred using only the geophysical data. No obvious voids or similar bedrock anomalies were identified by the surface geophysics.

Dry Ash Stack

During the EXD activities, seven borings with rock coring (minimum of 20 feet of rock core) were drilled within the Dry Ash Stack. Boring logs and results of surface geophysics are located in the EXD SAR.

The top of rock elevations in each of the seven borings (CUF-B14, CUF-B15, CUF-B16, CUF-B17, CUF-TW07, CUF-TW08, and CUF-TW09) were 317.4 feet, 314.8 feet, 315.7 feet, 335.4 feet, 312.8 feet, 307.4 feet and 309.1 feet, respectively. This wide variation is expected in this unique geologic setting. Due to this variation and the lack of historical borings that advanced to rock in the interior of the Dry Ash Stack, it is difficult to compare these elevations with historical borings. Bedrock information from each of these borings is summarized below:

- In boring CUF-B14, core recovery ranged from 92 to 100%. RQD ranged from 60 to 82%. The rock encountered was limestone with shale stringers. No voids were observed; one clay seam (0.4 feet thick) was noted. The limestone encountered was continuous with no clay filled intervals.
- In boring CUF-B15, core recovery ranged from 36 to 100%. RQD ranged from 36 to 100%. The rock encountered was limestone, which was weathered, fractured (some fractures were clay filled), and water-stained. Below the top of rock, two zones of clay infill ranging in thickness from 7.3 to 13.2 feet were observed. The clay-filled zones were interpreted as near vertical, soil-filled crevices in the bedrock.
- In boring CUF-B16, core recovery ranged from 57 to 99%. RQD ranged from 10 to 95%. The rock encountered was limestone with shale. No voids, soil-filled features, or solution features were observed.

- In boring CUF-B17, core recovery ranged from 72 to 100%. RQD ranged from 0 to 50%. The rock encountered was limestone with shale. No voids, soil-filled features, or solution features were observed.
- In boring CUF-TW07, core recovery ranged from 60 to 94%. RQD ranged from 0 to 81%. The rock encountered was limestone with shale. No voids, soil-filled features, or solution features were observed.
- In boring CUF-TW08, core recovery was 100%. RQD ranged from 59 to 91%. The rock encountered was limestone with shale. No voids, soil-filled features, or solution features were observed.
- In boring CUF-TW09, core recovery ranged from 90 to 100%. RQD ranged from 0 to 100%. The rock encountered was limestone, which was weathered and fractured (some fractures were open, others were healed with calcite infill). No voids, soil-filled features, or solution features were observed.
- In the South Area surface geophysical survey, the depth to rock in the EXD borings and historical borings was typically deeper than would have been inferred using only the geophysical data. No obvious voids or similar bedrock anomalies were identified by the surface geophysics.

<u>Gypsum Storage Area</u>

During the EXD activities, five borings with rock coring (minimum of 20 feet of rock core) were drilled within the Gypsum Storage Area. Borings CUF-B18 and CUF-B19 were advanced deeper in the rock to elevations 300 feet and 275 feet, respectively. Boring logs are located in the EXD SAR.

The top of rock elevations in each of the five borings (CUF-B18, CUF-B19, CUF-TW01, CUF-TW03 and CUF-TW05) were 354.6 feet, 350.8 feet, 358.9 feet, 345.5 feet, and 348.0 feet, respectively. This variation is expected in this unique geologic setting. Due to this variation and the lack of historical borings that advanced to rock in the interior of the Dry Ash Stack, it is difficult to compare these elevations with historical borings. However, CUF-B18 and CUF-B19 were drilled along the Gypsum Storage Area perimeter, and the top of rock elevations compare well to nearby historical borings. Bedrock information from each of these borings is summarized below:

- In boring CUF-B18, core recovery ranged from 88 to 100%. RQD ranged from 45 to 100%. The rock encountered was limestone. No voids, soil-filled features, or solution features were observed.
- In boring CUF-B19, core recovery ranged from 95 to 100%. RQD ranged from 50 to 100%. The rock encountered included limestone, limestone with shale, and limestone with dolomite. No voids, soil-filled features, or solution features were observed.
- In boring CUF-TW01, core recovery ranged from 16 to 100%. RQD ranged from 0 to 64%. The rock encountered was limestone and limestone with shale. No voids, soil-filled features, or solution features were observed.

- In boring CUF-TW03, core recovery ranged from 81 to 100%. RQD ranged from 76 to 100%. The rock encountered was limestone with dolomite and limestone. Some healed fractures were noted. No voids, soil-filled features, or solution features were observed.
- In boring CUF-TW05, core recovery ranged from 99 to 100%. RQD ranged from 99 to 100%. The rock encountered was limestone. Some calcite-healed fractures were noted. No voids, soil-filled features, or solution features were observed.

As noted in Section 2.4.1, two geotechnical borings (CUF-B18 and CUF-B19) were advanced at the southeastern perimeter of the Gypsum Storage Area where a potential bedrock discontinuity was previously identified in the AECOM (2016) ERI survey. The top of rock elevation was 354.6 feet in CUF-B18 and 350.8 feet in CUF-B19; this modest difference is within the range of historical borings in the vicinity. Boring CUF-B18 was advanced to an elevation of 303.6 feet and obtained 50.4 feet of rock core and boring CUF-B19 was advanced to an elevation of 275.3 feet and obtained 74.2 feet of rock core. As noted above, the overall range of core recovery and RQD in the two borings are similar. The rock encountered in both borings was limestone, with some minor shale content in deeper intervals of CUF-B19. Based on the fracture mapping from the downhole geophysics, CUF-B18 had fracture set with strike of N79E and dip of 49SE. CUF-B19 had one fracture set with strike of N49W and dip of 73NE and a second fracture set with strike of N89E and dip of 70SE. The natural gamma logs from the downhole geophysics are fairly consistent in both borings. Overall, based on the similarities in the bedrock of CUF-B18 and CUF-B19, there does not appear to be a significant discontinuity in bedrock between the two locations.

Bottom Ash Pond

No borings were drilled at the Bottom Ash Pond during the EXD field activities.

2.4.4 Discussion

Overall, based on the similarities in the bedrock of CUF-B18 and CUF-B19, there does not appear to be a significant discontinuity in bedrock between the two locations.

For purposes of this section of the EAR, “structural stability (bedrock)” considers stability of bedrock below fill areas. That is, the bedrock was evaluated with respect to voids/cavities and faults/joints of significant lateral or vertical extent that could be large enough to lead to loss of structural support and potential release of the overlying CCR materials.

Given the geologic setting of the CUF Plant, within the Wells Creek Structure, the bedrock beneath the CCR management units is highly variable with respect to top of rock elevations, fractured and brecciated rock, and soil-filled features between large rock blocks/boulders. Limestone and dolomite, which can be subject to solutioning, underlies much of the CCR management unit footprint. However, based upon the site-specific geologic mapping, rock core borings, surface geophysics, and CCR management unit performance, there is no evidence of voids/cavities that could lead to loss of structural support and potential release of the overlying CCR materials. While there are a small number of borings that encountered voids, the vertical and lateral extent of such features appear to be localized.

3.0 CCR MATERIAL CHARACTERISTICS

The objective of the CCR material characterization was to assess the presence of constituents in and their susceptibility to leach from CCR material. Borings were advanced into the CCR management units at the CUF Plant for the collection and analysis of CCR solid matrix samples for total metals and synthetic precipitation leaching procedure (SPLP) metals, installation of temporary wells, and collection of pore water samples. Pore water is subsurface water that occurs in pore spaces in CCR material. In addition, CCR material samples were collected from geotechnical borings advanced in the Stilling Pond (including Retention Pond) because the proposed boring for this CCR management unit could not be installed as planned. TVA visually characterized the CCR material present at each of the boring locations using the Unified Soil Classification System, which classifies material by grain size distribution followed by the material's textural properties. Additional CCR material characterization completed during the investigation included hydraulic conductivity testing of the CCR material at the screened interval of six temporary wells. Exhibit G.1-8 shows the boring and temporary well locations.

TVA performed investigation sample and data collection activities in accordance with the *EIP* (TVA 2018a), *CCR Material Characteristics Sampling and Analysis Plan* (*SAP)* (Stantec 2018a), *QAPP* and TVA's Environmental Technical Instructions. Sample location selection, collection methodology, analyses, and Quality Assurance/Quality Control (QA/QC) completed for the investigation are provided in the *CCR Material Characteristics Investigation SAR* included in Appendix G.3.

As reported in the *CCR Material Characteristics Investigation SAR*, the data collected during these investigations were deemed usable for reporting and evaluation in this EAR because they met the objectives of the *EIP*.

The scope of work of the CCR material characteristics investigation consisted of the following tasks:

- Collecting CCR material samples and associated QC samples at multiple depths from the boring locations for laboratory analysis of CCR-related constituents listed in Appendices III and IV of the CCR Rule. In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with the TDEC compliance programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents are hereafter referred to as CCR Parameters. In addition, total organic carbon (TOC), iron, and manganese were added as specific parameters of interest to be analyzed per the *CCR Material Characteristics SAP*. SPLP analyses were performed for metals and radiological parameters.
- Identifying the interface between CCR material and underlying foundation soils
- Recording field measurements of CCR material pH
- Collecting pore water level measurements

- Collecting pore water samples and associated QC samples from the temporary wells for analysis of CCR Parameters, TOC, iron, manganese, and field water quality parameters per the *CCR Material Characteristics SAP*
- Collecting supplemental CCR material samples and associated QC samples from retained geotechnical samples.

The boring and temporary well locations are shown on Exhibit G.1-8.

Temporary monitoring wells were installed and completed above the foundation soils at six locations. Three of the nine planned temporary well locations (CUF-TW02, CUF-TW04 and CUF-TW06), advanced in the Gypsum Storage Area above an underdrain layer constructed prior to placement of gypsum, were dry. CCR material samples were collected for analysis, but temporary wells were not installed or sampled at these locations. Following well installation and development at the other six locations, the horizontal hydraulic conductivity of the CCR material interval intersected by the well screen was estimated by conducting slug tests. The calculated hydraulic conductivities of the CCR material ranged from 8.18×10^{-5} centimeters per second (cm/sec) at CUF-TW09 to 1.03×10^{-3} cm/sec at CUF-TW05. Temporary well construction details and hydraulic conductivity testing data are included in the *Exploratory Drilling SAR* (Appendix G.2).

Tabulated laboratory analytical data for the CCR material and pore water samples are provided in the *CCR Material Characteristics Investigation SAR* (Appendix G.3) and Table G.1-3 for pore water.

3.1.1 Physical Properties

Encountered CCR material predominantly consisted of silty clay- to coarse sand-sized materials. Minor gradational changes, such as silty sand grading to sandy silt, were common throughout the vertical profile of each CCR management unit. The CCR material in each of the units typically is gray in color, but brown, pink, and white shades were also described.

Lithologic descriptions of the encountered CCR material are provided in the temporary well boring logs provided in Appendix B.3.

3.1.2 Pore Water Field Parameters

TVA measured field water quality parameters, including pH, specific conductance, dissolved oxygen (DO), temperature, oxidation reduction potential (ORP), and turbidity during the collection of pore water samples at each temporary well. Measured pore water field parameter results are summarized in Table B.7 of the *CCR Material Characteristics Investigation SAR* (Appendix G.3)**.**

An evaluation of the field parameters showed that the general pore water quality conditions within the various CCR management units were similar. Pore water pH was observed to be alkaline, ranging from 8.52 to 10.90. DO concentrations ranged from 0.17 milligrams per liter (mg/L) to 0.40 mg/L, and ORP results suggested that pore water was mostly under reducing conditions based on generally negative ORP measurements. Measured pore water specific conductance values, which correlate with total dissolved solids (TDS) concentrations, ranged from 2,142 microsiemens per centimeter (µS/cm) to 4,148 µS/cm. Measured pore water turbidities were between five nephelometric turbidity units (NTUs) and 10 NTUs.

3.1.3 Analytical Results

TDEC requested that total metals and SPLP analyses be conducted to evaluate CCR material leaching potential. A summary of the findings from the CCR material analytical results is provided in the following subsections.

CCR Material Total Metals and SPLP Analyses

TVA collected and analyzed approximately 110 CCR material grab samples from discrete depth intervals at 19 boring locations from the surface to the base of the CCR management units. The resultant analytical dataset represents a vertical profile of total and SPLP concentrations at each boring location. Laboratory analytical data for the CCR material samples are tabulated in the *CCR Material Characteristics Investigation SAR* (Appendix G.3).

Descriptive statistics of the CCR material analytical results were developed and are provided in Appendix E.2. The statistical summaries are provided for each CCR Parameter and for each CCR management unit. A graphical comparison of the representative concentration ranges at each boring are presented as side-by-side concentration box plots. The box plots were also used to compare the relative differences in constituent concentrations between samples collected from the gypsum and the underlying CCR material in the Gypsum Storage Area.

A similar descriptive statistics summary of the SPLP results for each CCR material sample is provided in Appendix E.2. For each CCR material sample, statistical analyses were conducted on data where CCR Parameters were detected in greater than 50% of the samples in both the SPLP and CCR material datasets. The purpose of the analysis was to evaluate whether the total concentrations of metals in CCR material could be used as reliable predictors of potential leachable concentrations as represented by the SPLP results. Scatter plots with best fit regression lines and Pearson's correlation coefficients were constructed to compare SPLP to total metal concentrations.

The statistical relationships between SPLP concentrations and CCR material concentrations were inconsistent and highly variable. One would expect SPLP concentrations to increase with increasing CCR constituent concentrations in CCR material (i.e., exhibit a regression line with a positive slope). However, this relationship was inconsistent between different CCR constituents and between CUF Plant CCR management units. In some cases, even when there was a statistically significant correlation (e.g., boron), the wide range of variability around the regression line limited the predictive value of the relationship.

Pore Water/SPLP Comparison

In June 2019, one pore water sample was collected at each of the six temporary wells (CUF-TW01, CUF-TW03, CUF-TW05, CUF-TW07, CUF-TW08, CUF-TW09) for CCR Parameters, iron, manganese, and TOC analysis following well installation and development to complete the scope of the EI. Samples were collected for analysis of dissolved and total metals. The samples collected for dissolved metals were filtered to remove suspended solids prior to laboratory analysis. The samples collected for total metals were not filtered prior to laboratory analysis. Comparison of the reported concentrations of dissolved and total metals provides an indication of the effect that suspended solids included in the sample may have had on the reported concentrations for total metals analyses. Pore water analytical data are tabulated in Table G.1-3. Descriptive statistics of the pore water analytical results were developed and are provided in Appendix E.2. Two other pore water sampling events were conducted as part of other investigations. The analytical results of those sampling events are included in the discussion of pore water quality below.

TVA compared pore water analytical results to the SPLP results for the CCR material to evaluate whether the SPLP methodology could be used to predict pore water concentrations (see Appendix E.2) for CCR constituents. In general, the CCR constituent concentrations using SPLP methodology underestimated CCR constituent concentrations observed in pore water. For CCR constituents that have been detected in groundwater samples at concentrations above groundwater screening levels (GSLs), the general findings were:

- The mean concentrations and concentration ranges of arsenic, lithium, and molybdenum in pore water were consistently higher than their respective SPLP concentrations from the CCR material; this indicates that the SPLP methodology is not a reliable predictor of pore water concentrations for these constituents.

- The range of cobalt concentrations for SPLP results was greater than concentrations observed for pore water, but the mean concentrations were similar; however, comparison of total cobalt concentrations in the CCR material to the SPLP results indicates that there is no correlation between the results, and the SPLP methodology is not a reliable predictor of pore water concentrations for cobalt.

The results indicate that direct measurement of pore water concentrations is the most accurate way of characterizing potential leachability of CCR constituents from CCR material.

In addition to total metals concentrations for pore water, descriptive statistics were also produced for dissolved metals concentrations for pore water (see Appendix E.2). The detected minimum, maximum, and mean concentrations were similar for arsenic, cobalt, lithium, and molybdenum, indicating that suspended solids in the samples analyzed for total metals did not materially affect the reported concentrations in the total metals analyses.

3.1.4 Phreatic Surface Levels

TVA measured pore water levels within the temporary wells monthly for six months. In addition, the wells were gauged during bi-monthly groundwater sampling events. This information was combined with available information from other instruments to develop maps of the phreatic surfaces for the Dry Ash Stack and Gypsum Storage Area at the time of gauging. The phreatic surface is the surface of pore water at which pressure is atmospheric and below which CCR material may be saturated with pore water. The use of the term “saturated” or references to the moisture content of CCR material does not imply that the pore water is readily separable from the CCR material. Saturated CCR material can have a range of moisture contents based on the characteristics of the material. Exhibit G.1-9 provides a representative phreatic surface map for Event #2 conducted in July 2019. Table G.1-4 provides a summary of the pore water gauging data for the July 2019 sampling event. The data for other gauging events can be found in Table 4.1 of the EAR and Appendices H.3, H.5, H.6, H.7 and H.8. Normal pool elevations for the Stilling Pond (including Retention Pond), which has been decanted, and Bottom Ash Pond, which has been temporarily filled with soil, are provided on Exhibit D-3 (Appendix D).

Pore water levels reported herein may not represent long-term conditions or correspond to a closed condition if the CCR management units were to be closed with CCR material in place, nor do they reflect recent pumping activities to facilitate safe construction as part of the Stilling Pond (including Retention Pond) repurposing, or other recent operational changes near the CCR management units. The phreatic surfaces would be expected to decrease in elevation after improving storm water drainage near or capping of CCR management units if the units were to be closed with CCR material in place.

The effects on pore water levels due to the decanting, pumping of temporary wells screened within both CCR material and the sand and gravel layer, and other construction activities in the Stilling Pond (including Retention Pond) are illustrated in Exhibits D-2 and D-3. As is expected, the decreases in pore water levels were greater closer to the construction activities and pumping wells. The effects on pore water levels were more modest for the Dry Ash Stack and even less so for the Gypsum Storage Area. These projects may have both short-term (i.e., temporary) and long-term effects on the pore water in the CCR management units. TVA is continuing to monitor the pore water levels, as they relate to current conditions and potential future conditions. Additional evaluation of the effect of pumping on pore water levels is provided in Appendix H.1.

3.1.5 Pore Water Quality Evaluation

This section provides a discussion of the analytical results for pore water samples collected from temporary wells installed as part of the EI. Pore water samples were collected from the temporary wells during three sampling events. The first sampling event was conducted as part of the EI. The second and third sampling events were conducted as part of activities associated with other investigations at the CUF Plant.

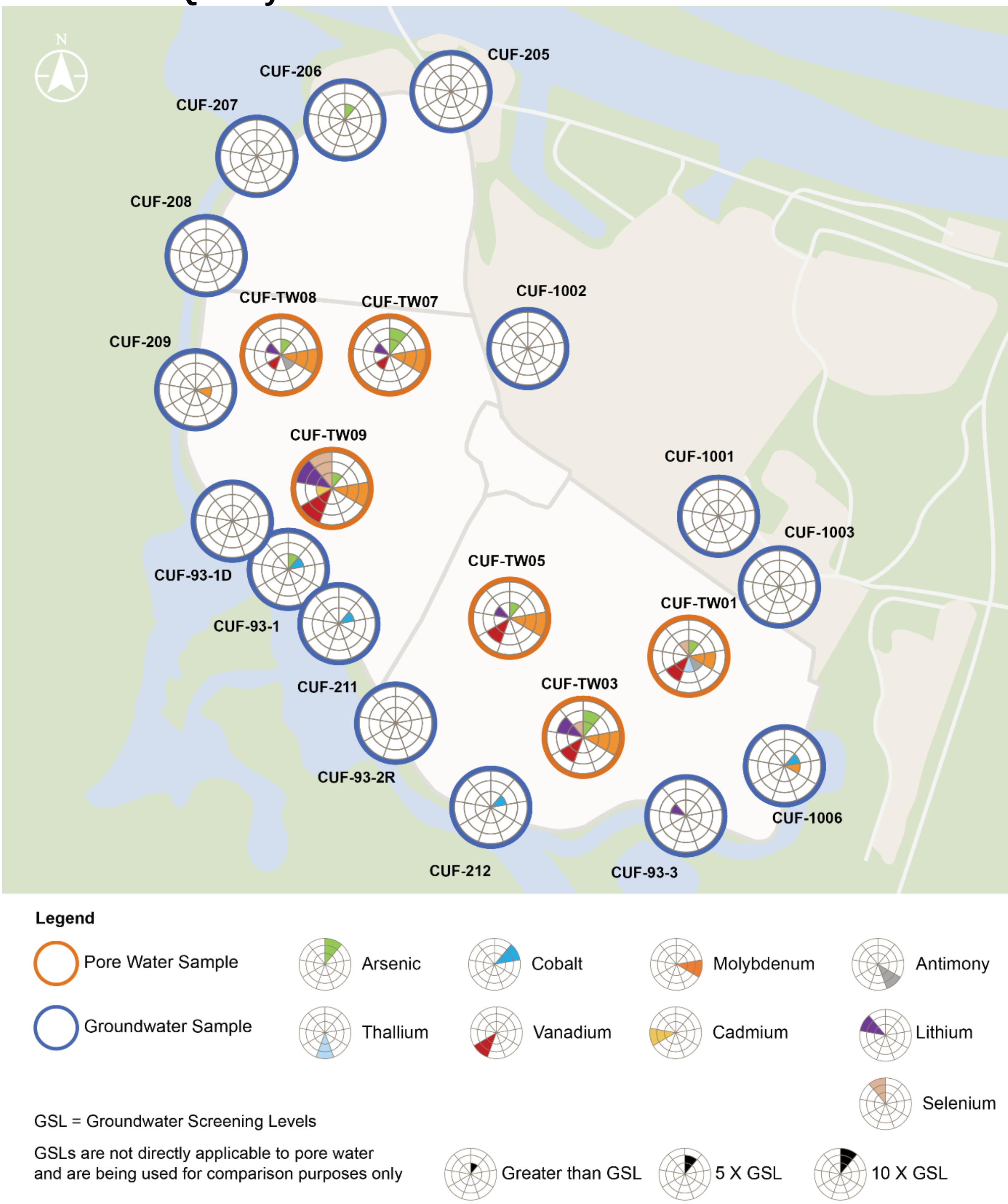
Table G.1-3 provides a summary of pore water analytical results from the following sampling events.

- June 2019 (CUF-TW01, CUF-TW03, CUF-TW05, CUF-TW07, CUF-TW08, CUF-TW09)
- March 2021 (CUF-TW01, CUF-TW03, CUF-TW05, CUF-TW07, CUF-TW08, CUF-TW09)
- April 2021 (CUF-TW01, CUF-TW03, CUF-TW05, CUF-TW07, CUF-TW08, CUF-TW09).

The pore water characterization evaluation is based on a comparison of pore water concentrations to groundwater concentrations and GSLs across the CUF Plant. GSLs are not applicable to pore water. The comparison to GSLs provides a basis to identify CCR constituents that have the potential to be detected in groundwater downgradient of the CCR management units at concentrations above a GSL if pore water were to impact groundwater. Comparison of pore water to GSLs was conducted for constituents listed in Appendix I of TDEC Rule 0400-11-01-.04 (TDEC Appendix I) and Appendix IV of the CCR Rule because these are the constituents that would require corrective measures to remediate groundwater.

Eight TDEC Appendix I or CCR Rule Appendix IV constituents (antimony, arsenic, cadmium, lithium, molybdenum, selenium, thallium, and vanadium) had reported concentrations in one or more pore water samples above a GSL. Of these, four constituents (arsenic, cadmium, lithium, and molybdenum) had statistically significant concentrations in groundwater above a GSL. The figure below provides a summary of reported pore water analytical results and a comparison of them to reported groundwater analytical results. The locations of temporary pore water wells are shown as symbols with an orange outer ring. The colored slices in each symbol indicate CCR constituents detected in pore water above a GSL in each temporary pore water well. The number of colored sections within each slice represents the magnitude of the reported concentrations relative to the GSL. The legend on the exhibit provides further explanation of the colors and sections.

Pore Water Quality



Groundwater monitoring wells are represented by symbols with a blue outer ring. The seven groundwater monitoring wells that had statistically significant concentrations above a GSL are represented by colored slices in the symbols. The colors and number of colored sections have the same meanings as for the pore water symbols discussed above.

In addition, Attachment G.1-B provides graphs that show the results of the pore water samples over time for constituent-well pairs with one or more reported concentrations above a GSL. Analytical results for total and dissolved fractions of samples are plotted adjacent to one another for each sampling event. The difference between total and dissolved metals results provides an indication of whether suspended solids materially affect the reported concentrations in the total metals analyses. In addition, the GSL was added to the graphs to illustrate the differences between pore water and the GSL. Observations about the graphs follow:

- Antimony, cadmium, and thallium had concentrations above the GSL in the initial sampling event, but less than the GSL in the second and third events
- Except for samples collected from CUF-TW07, lithium and vanadium had mixed results over time with the results from some wells decreasing, some stable, and other increasing
- Molybdenum and selenium generally had stable concentrations over time, except for samples collected from CUF-TW07
- Arsenic generally had the lowest reported concentrations in the initial sampling event, except for samples collected from CUF-TW07
- TW-07, which is located between the Bottom Ash Pond and the Stilling Pond (including Retention Pond) may have been affected by operational changes that included cessation of sluicing and process water flows to the Bottom Ash Pond and decanting of the Stilling Pond (including Retention Pond)
- Generally, total and dissolved results were similar, which indicates that suspended solids did not materially affect the reported concentrations for the total metals analyses.

In summary, there is a distinct difference between pore water and groundwater quality. Eight CCR Rule Appendix IV or TDEC Appendix I constituents had reported concentrations in pore water above a GSL. Of these, four constituents had statistically significant concentrations in groundwater above a GSL. Generally, suspended solids did not materially affect reported concentrations for total metal analyses.

3.1.6 Summary

The objective of the CCR material characterization was to assess both the presence of CCR constituents within CCR material and their potential to leach from CCR material. TVA evaluated the usefulness of total metals and SPLP analyses as a predictor of CCR constituent concentrations in pore water. In addition, TVA compared the SPLP analytical results to the pore water sample results. The evaluations found that total concentrations of metals in CCR material are not reliable predictors of the magnitude of the potentially leached concentrations using SPLP, and SPLP analysis of CCR material does not reliably predict pore water concentrations. The results indicated that direct measurement of pore water concentrations is the most accurate way of characterizing potential leachability of CCR constituents from CCR material.

Pore water levels reported herein may not represent long-term conditions or correspond to a closed condition if the CCR management units were to be closed with CCR material in place. The phreatic surface would be expected to decrease in elevation after improving storm water drainage near or capping of CCR management units if the units were to be closed with CCR material in place.

TVA evaluated analytical results for pore water based on data collected under the EI and for other investigations. In summary, there is a distinct difference between pore water and groundwater quality. Eight CCR Rule Appendix IV or TDEC Appendix I constituents had reported concentrations in pore water above a GSL. Of these, four constituents had statistically significant concentrations in groundwater above a GSL. Generally, pore water concentrations were stable over the sampling period, and suspended solids did not materially affect reported concentrations for total metal analyses.

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TABLES

Table G.1-3 - Pore Water Analytical Results
Cumberland Fossil Plant

Sample Location		CUF-TW01						CUF-TW03				
Sample Date		5-Jun-19	5-Jun-19	2-Mar-21	2-Mar-21	13-Apr-21	13-Apr-21	4-Jun-19	4-Jun-19	4-Jun-19	2-Mar-21	2-Mar-21
Sample ID		CUF-PW-TW01-20190605	CUF-PW-TW01-20190605	CUF-PW-TW01-03022021	CUF-PW-TW01-03022021	CUF-PW-TW01-04132021	CUF-PW-TW01-04132021	CUF-PW-TW03-20190604	CUF-PW-TW03-20190604	CUF-PW-TW03-20190604	CUF-PW-TW03-03022021	CUF-PW-TW03-03022021
Parent Sample ID												
Sample Depth		51.3 ft	51.3 ft	51.3 ft	51.3 ft	51.3 ft	51.3 ft	66.3 ft	66.3 ft	66.3 ft	66.3 ft	66.3 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final-Verified	Final QC Review	Validated	Final QC Review	Final-Verified	Final QC Review	Final-Verified	Validated	Final QC Review	Validated
Total Metals												
Aluminum	ug/L	-	-	-	237	-	257	-	-	-	-	1,010
Antimony	ug/L	-	11.2	-	4.09	-	3.95	-	-	3.92 J	-	0.800 J
Arsenic	ug/L	-	23.9	-	43.1	-	40.6	-	-	21.6 J	-	53.3
Barium	ug/L	-	45.5	-	32.8	-	32.0	-	-	88.4	-	51.3
Beryllium	ug/L	-	0.456 U*	-	<0.182	-	0.211 J	-	-	0.155 UJ	-	<0.182
Boron	ug/L	-	13,200	-	39,200	-	42,000	-	-	3,530 J	-	7,310
Cadmium	ug/L	-	0.210 J	-	<0.217	-	<0.217	-	-	1.80 J	-	1.59
Calcium	ug/L	-	575,000	-	642,000	-	660,000	-	-	349,000 J	-	232,000
Chromium	ug/L	-	2.29 U*	-	<1.53	-	<1.53	-	-	1.53 UJ	-	<1.53
Cobalt	ug/L	-	0.527	-	<0.134	-	<0.134	-	-	0.152 J	-	<0.134
Copper	ug/L	-	1.15 U*	-	0.952 J	-	<0.627	-	-	0.895 U*	-	0.667 J
Iron	ug/L	-	113	-	<19.5	-	28.2 J	-	-	30.4 J	-	240
Lead	ug/L	-	0.182 U*	-	<0.128	-	0.180 J	-	-	0.176 U*	-	0.264 J
Lithium	ug/L	-	17.8 U*	-	9.96	-	10.3	-	-	80.8 J	-	279
Magnesium	ug/L	-	-	-	6,000	-	5,670	-	-	-	-	321 J
Manganese	ug/L	-	198	-	28.7	-	28.1	-	-	25.2 J	-	7.10
Mercury	ug/L	-	<0.101	-	<0.130	-	<0.130	-	-	<0.101	-	<0.130
Molybdenum	ug/L	-	485	-	636 J	-	624	-	-	8,990 J	-	15,500 J
Nickel	ug/L	-	0.803 J	-	0.346 J	-	0.412 J	-	-	5.75 J	-	6.45
Potassium	ug/L	-	-	-	40,300	-	41,900	-	-	-	-	265,000
Selenium	ug/L	-	54.2	-	16.4	-	12.5	-	-	68.7 J	-	101
Silicon	ug/L	-	-	-	1,990	-	2,060	-	-	-	-	6,950
Silver	ug/L	-	<0.121	-	<0.177	-	<0.177	-	-	0.121 UJ	-	<0.177
Sodium	ug/L	-	-	-	69,500	-	51,600	-	-	-	-	182,000
Thallium	ug/L	-	2.21	-	0.794 J	-	1.18	-	-	0.834 U*	-	<0.148
Vanadium	ug/L	-	94.7	-	463	-	497	-	-	426 J	-	69.8
Zinc	ug/L	-	<3.22	-	93.9	-	<3.22	-	-	3.22 UJ	-	<3.22
Dissolved Metals												
Aluminum	ug/L	-	-	-	221	-	226	-	-	-	-	843
Antimony	ug/L	-	10.7	-	3.92	-	3.89	-	-	3.46 J	-	0.787 J
Arsenic	ug/L	-	22.9	-	41.1	-	43.0	-	-	24.2 J	-	50.8
Barium	ug/L	-	44.6	-	31.1	-	31.6	-	-	95.1	-	46.5
Beryllium	ug/L	-	0.299 U*	-	0.231 J	-	<0.182	-	-	<0.155	-	<0.182
Boron	ug/L	-	13,100	-	36,500	-	42,700	-	-	3,900	-	6,830
Cadmium	ug/L	-	0.144 J	-	<0.217	-	<0.217	-	-	1.96 J	-	1.61
Calcium	ug/L	-	568,000	-	623,000	-	660,000	-	-	397,000 J	-	219,000
Chromium	ug/L	-	2.16 U*	-	<1.53	-	<1.53	-	-	1.53 UJ	-	<1.53
Cobalt	ug/L	-	0.450 J	-	<0.134	-	<0.134	-	-	0.145 J	-	<0.134
Copper	ug/L	-	1.05 U*	-	0.927 U*	-	<0.627	-	-	0.627 UJ	-	<0.627
Iron	ug/L	-	37.2 J	-	<19.5	-	<19.5	-	-	14.1 UJ	-	105
Lead	ug/L	-	<0.128	-	0.236 J	-	<0.128	-	-	<0.128	-	<0.128
Lithium	ug/L	-	16.8 U*	-	10.7	-	9.83	-	-	92.7 J	-	265
Magnesium	ug/L	-	-	-	5,760	-	5,750	-	-	-	-	291 J
Manganese	ug/L	-	194	-	28.1	-	27.6	-	-	20.2 J	-	2.64 J
Mercury	ug/L	-	<0.101	-	<0.130	-	<0.130	-	-	<0.101	-	<0.130
Molybdenum	ug/L	-	470	-	617 J	-	628	-	-	10,400 J	-	14,700 J
Nickel	ug/L	-	0.724 U*	-	0.416 J	-	<0.336	-	-	6.79 J	-	6.07
Potassium	ug/L	-	-	-	39,000	-	42,600	-	-	-	-	248,000
Selenium	ug/L	-	42.0	-	10.5	-	11.6	-	-	75.3 J	-	94.4
Silicon	ug/L	-	-	-	1,940	-	1,970	-	-	-	-	6,410
Silver	ug/L	-	<0.121	-	<0.177	-	<0.177	-	-	0.121 UJ	-	<0.177
Sodium	ug/L	-	-	-	53,800	-	51,100	-	-	-	-	172,000
Thallium	ug/L	-	2.02	-	1.00	-	0.588 J	-	-	0.706 U*	-	<0.148
Vanadium	ug/L	-	89.8	-	441	-	495	-	-	464 J	-	59.3
Zinc	ug/L	-	<3.22	-	<3.22	-	3.22 J	-	-	3.22 UJ	-	<3.22
Radiological Parameters												
Radium-226	pCi/L	-	0.155 +/-(0.210)UJ	-	0.206 +/-(0.456)U	-	0.199 +/-(0.318)U	-	0.356 +/-(0.127)	-	-	0.422 +/-(0.338)U
Radium-228	pCi/L	-	-0.152 +/-(0.333)U	-	0.0874 +/-(0.335)U	-	0.0161 +/-(0.249)U	-	-0.0110 +/-(0.248)U	-	-	0.766 +/-(0.455)
Radium-226+228	pCi/L	-	0.155 +/-(0.394)UJ	-	0.293 +/-(0.566)U	-	0.215 +/-(0.404)U	-	0.356 +/-(0.279)J	-	-	1.19 +/-(0.566)J
Anions												
Chloride	mg/L	-	17.2	-	26.1	-	26.2	-	-	73.2	-	99.8
Fluoride	mg/L	-	3.81	-	0.912	-	0.874	-	-	0.506	-	0.238 J
Sulfate	mg/L	-	1,670	-	1,490	-	1,560	-	-	1,850	-	964
General Chemistry												
Alkalinity, Bicarbonate	mg/L	-	-	-	<5.00	-	<5.00	-	-	-	-	<5.00
Alkalinity, Carbonate	mg/L	-	-	-	109	-	147	-	-	-	-	69.2
Alkalinity, Total as CaCO3	mg/L	-	-	-	150	-	174	-	-	-	-	101
Ammonia Nitrogren	mg/L	-	-	-	0.183	-	0.196	-	-	-	-	3.60
Carbon, dissolved organic	mg/L	-	-	-	2.35	-	2.26	-	-	-	-	15.2
Depth to Water	ft	40.45	-	40.62	-	41.34	-	28.86	-	-	29.43	-
Dissolved Oxygen	%	3.6	-	9.4	-	3.3	-	4.2	-	-	5.3	-
Dissolved Oxygen	mg/L	0.32	-	0.95	-	0.33	-	0.36	-	-	0.53	-
Ethane	ug/L	-	-	-	0.394 J	-	0.315 J	-	-	-	-	2.07
Ferrous Iron - Field	mg/L	-	-	<0.5	-	<0.5	-	-	-	-	<0.5	-
Flow Rate	mL/min	-	-	100	-	100	-	-	-	-	100	-
Methane	ug/L	-	-	-	0.748 U*	-	0.601 J	-	-	-	-	126
Nitrate-Nitrite	mg/L	-	-	-	<0.0650	-	<0.0650	-	-	-	-	0.0900 J
ORP	mV	-118.8	-	80.2	-	-93.5	-	-44.1	-	-	-211.4	-
pH (field)	SU	8.52	-	9.49	-	9.39	-	9.56	-	-	11.01	-
Propane	ug/L	-	-	-	<0.380	-	<0.380	-	-	-	-	6.98
Specific Cond. (Field)	uS/cm	2,551	-	2,549	-	2,596	-	2,881	-	-	2,513	-
Sulfide	mg/L	-	-	-	<2.09	-	<1.34	-	-	-	-	4.37 U*
Temperature, Water (C)	DEG C	21.1	-	13.8	-	16.2	-	22.0	-	-	15.0	-
Total Dissolved Solids	mg/L	-	2,000	-	2,380	-	2,030	-	-	3,340	-	1,870
Total Organic Carbon	mg/L	-	10.5	-	2.43	-	2.19	-	-	85.9	-	15.1
Turbidity, field	NTU	2.24	-	1.13	-	0.84	-	2.45	-	-	2.69	-

See last page for notes.

Table G.1-3 - Pore Water Analytical Results
Cumberland Fossil Plant

Sample Location		CUF-TW03			CUF-TW05							
Sample Date		13-Apr-21	13-Apr-21	13-Apr-21	4-Jun-19	4-Jun-19	4-Jun-19	3-Mar-21	3-Mar-21	3-Mar-21	14-Apr-21	14-Apr-21
Sample ID		CUF-PW-TW03-04132021	CUF-PW-TW03-04132021	CUF-PW-FD-04132021	CUF-PW-TW05-20190604	CUF-PW-TW05-20190604	CUF-PW-TW05-20190604	CUF-PW-TW05-03032021	CUF-PW-TW05-03032021	CUF-PW-FD-03032021	CUF-PW-TW05-04142021	CUF-PW-TW05-04142021
Parent Sample ID				CUF-PW-TW03-04132021						CUF-PW-TW05-03032021		
Sample Depth		66.3 ft	66.3 ft		56.3 ft	56.3 ft	56.3 ft	56.3 ft	56.3 ft		56.3 ft	56.3 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final-Verified	Final-Verified	Final QC Review	Final-Verified	Validated	Final QC Review	Final-Verified	Final-Verified	Final QC Review	Final-Verified
Total Metals												
Aluminum	ug/L	-	504	519	-	-	-	-	784	801	-	740
Antimony	ug/L	-	0.783 J	0.838 J	-	-	1.46 U*	-	2.20	2.33	-	2.24
Arsenic	ug/L	-	47.1	49.0	-	-	17.1 J	-	17.3	17.3	-	16.4
Barium	ug/L	-	55.3	56.9	-	-	141	-	93.6	94.9	-	92.6
Beryllium	ug/L	-	<0.182	<0.182	-	-	<0.155	-	<0.182	<0.182	-	<0.182
Boron	ug/L	-	7,190	7,780	-	-	12,700	-	26,300	26,100	-	25,900
Cadmium	ug/L	-	1.48	1.50	-	-	0.400 J	-	<0.217	<0.217	-	<0.217
Calcium	ug/L	-	332,000	353,000	-	-	900,000	-	769,000	779,000	-	754,000
Chromium	ug/L	-	<1.53	<1.53	-	-	<1.53	-	<1.53	<1.53	-	<1.53
Cobalt	ug/L	-	<0.134	<0.134	-	-	<0.0750	-	<0.134	<0.134	-	<0.134
Copper	ug/L	-	<0.627	<0.627	-	-	<0.627	-	<0.627	<0.627	-	<0.627
Iron	ug/L	-	151	152	-	-	125	-	30.8 J	34.0 J	-	<19.5
Lead	ug/L	-	0.201 J	0.198 J	-	-	0.355 U*	-	<0.128	<0.128	-	<0.128
Lithium	ug/L	-	271	278	-	-	129	-	112	115	-	123
Magnesium	ug/L	-	349 J	374 J	-	-	-	-	1,890	1,940	-	1,900
Manganese	ug/L	-	7.69	7.87	-	-	3.13 J	-	2.65 J	2.70 J	-	2.18 J
Mercury	ug/L	-	<0.130	<0.130	-	-	<0.101	-	<0.130	<0.130	-	<0.130
Molybdenum	ug/L	-	14,800	15,600	-	-	1,300 J	-	1,580	1,580	-	1,480
Nickel	ug/L	-	6.12	6.16	-	-	1.93	-	1.68	1.62	-	1.52
Potassium	ug/L	-	274,000	275,000	-	-	-	-	74,500	75,800	-	76,900
Selenium	ug/L	-	82.7	83.5	-	-	13.5 J	-	11.7	12.0	-	11.1
Silicon	ug/L	-	6,030	6,000	-	-	-	-	3,800	3,790	-	3,500
Silver	ug/L	-	<0.177	<0.177	-	-	0.121 UJ	-	<0.177	<0.177	-	<0.177
Sodium	ug/L	-	183,000	187,000	-	-	-	-	64,600	64,000	-	64,600
Thallium	ug/L	-	<0.148	<0.148	-	-	0.577 U*	-	0.960 J	0.999 J	-	0.819 J
Vanadium	ug/L	-	22.6	23.4	-	-	267	-	485	497	-	470
Zinc	ug/L	-	<3.22	<3.22	-	-	3.22 J	-	<3.22	<3.22	-	<3.22
Dissolved Metals												
Aluminum	ug/L	-	502	538	-	-	-	-	739	760	-	721
Antimony	ug/L	-	0.716 J	0.736 J	-	-	1.22 U*	-	2.15	2.16	-	2.13
Arsenic	ug/L	-	46.0	47.7	-	-	16.0 J	-	16.1	16.9	-	15.9
Barium	ug/L	-	53.5	53.6	-	-	129	-	91.4	90.5	-	91.9
Beryllium	ug/L	-	<0.182	<0.182	-	-	0.212 U*	-	<0.182	<0.182	-	<0.182
Boron	ug/L	-	7,240	7,430	-	-	12,100	-	25,200	26,100	-	24,700
Cadmium	ug/L	-	1.51	1.48	-	-	0.309 J	-	<0.217	<0.217	-	<0.217
Calcium	ug/L	-	316,000	318,000	-	-	840,000 J	-	732,000	749,000	-	744,000
Chromium	ug/L	-	<1.53	<1.53	-	-	1.53 UJ	-	<1.53	<1.53	-	<1.53
Cobalt	ug/L	-	<0.134	<0.134	-	-	0.0750 UJ	-	<0.134	<0.134	-	<0.134
Copper	ug/L	-	<0.627	<0.627	-	-	0.627 UJ	-	<0.627	<0.627	-	<0.627
Iron	ug/L	-	96.5	80.1	-	-	14.1 UJ	-	<19.5	<19.5	-	<19.5
Lead	ug/L	-	<0.128	<0.128	-	-	<0.128	-	<0.128	<0.128	-	<0.128
Lithium	ug/L	-	277	287	-	-	122	-	111	112	-	121
Magnesium	ug/L	-	375 J	376 J	-	-	-	-	1,840	1,870	-	1,860
Manganese	ug/L	-	4.62 J	4.71 J	-	-	1.35 UJ	-	2.03 J	2.21 J	-	2.44 J
Mercury	ug/L	-	<0.130	<0.130	-	-	<0.101	-	<0.130	<0.130	-	<0.130
Molybdenum	ug/L	-	14,400	14,900	-	-	1,230 J	-	1,510	1,540	-	1,520
Nickel	ug/L	-	5.62	5.84	-	-	1.86 U*	-	1.58	1.50	-	1.57
Potassium	ug/L	-	272,000	273,000	-	-	-	-	72,500	74,000	-	75,900
Selenium	ug/L	-	84.4	85.9	-	-	12.5 J	-	11.4	12.0	-	11.5
Silicon	ug/L	-	6,010	5,950	-	-	-	-	3,520	3,760	-	3,430
Silver	ug/L	-	<0.177	<0.177	-	-	0.121 UJ	-	<0.177	<0.177	-	<0.177
Sodium	ug/L	-	181,000	185,000	-	-	-	-	62,400	63,800	-	63,300
Thallium	ug/L	-	<0.148	<0.148	-	-	1.73 U*	-	0.822 J	0.820 J	-	0.862 J
Vanadium	ug/L	-	23.5	23.5	-	-	260 J	-	442	454	-	450
Zinc	ug/L	-	<3.22	<3.22	-	-	3.22 UJ	-	<3.22	<3.22	-	<3.22
Radiological Parameters												
Radium-226	pCi/L	-	0.292 +/-(0.415)U	0.613 +/-(0.552)U	-	0.157 +/-(0.0825)	-	-	0.345 +/-(0.352)U	0.227 +/-(0.326)U	-	-0.0962 +/-(0.245)U
Radium-228	pCi/L	-	0.189 +/-(0.332)U	-0.118 +/-(0.297)U	-	-0.0655 +/-(0.232)U	-	-	0.770 +/-(0.606)U	0.273 +/-(0.466)U	-	0.273 +/-(0.404)U
Radium-226+228	pCi/L	-	0.482 +/-(0.532)U	0.613 +/-(0.627)U	-	0.157 +/-(0.246)J	-	-	1.12 +/-(0.701)U	0.500 +/-(0.569)U	-	0.273 +/-(0.473)U
Anions												
Chloride	mg/L	-	107	107	-	-	781	-	587	606	-	579
Fluoride	mg/L	-	0.261	0.230 J	-	-	0.198 J	-	0.0781 J	0.0730 J	-	0.0738 J
Sulfate	mg/L	-	966	1,010	-	-	1,100	-	1,160	1,240	-	1,150
General Chemistry												
Alkalinity, Bicarbonate	mg/L	-	31.4	32.3	-	-	-	-	<5.00	<5.00	-	<5.00
Alkalinity, Carbonate	mg/L	-	40.0	37.6	-	-	-	-	97.9	91.3	-	75.5
Alkalinity, Total as CaCO3	mg/L	-	70.4	69.9	-	-	-	-	159	156	-	146
Ammonia Nitrogren	mg/L	-	4.28	4.10	-	-	-	-	1.73	1.71	-	1.74
Carbon, dissolved organic	mg/L	-	16.8	15.9	-	-	-	-	1.90	1.83	-	2.19
Depth to Water	ft	29.40	-	-	30.92	-	-	32.30	-	-	33.49	-
Dissolved Oxygen	%	0.2	-	-	4.3	-	-	9.4	-	-	1.8	-
Dissolved Oxygen	mg/L	0.21	-	-	0.40	-	-	0.95	-	-	0.18	-
Ethane	ug/L	-	3.72	3.77	-	-	-	-	6.42	6.33	-	6.16
Ferrous Iron - Field	mg/L	<0.5	-	-	-	-	-	<0.5	-	-	<0.5	-
Flow Rate	mL/min	140	-	-	-	-	-	100	-	-	200	-
Methane	ug/L	-	104	113	-	-	-	-	133	131	-	106
Nitrate-Nitrite	mg/L	-	<0.0650	0.0650 J	-	-	-	-	<0.0650	<0.0650	-	<0.0650
ORP	mV	-294.0	-	-	52.4	-	-	-10.4	-	-	-56.3	-
pH (field)	SU	10.47	-	-	10.90	-	-	10.70	-	-	10.59	-
Propane	ug/L	-	9.07	9.67	-	-	-	-	21.0	20.3	-	21.0
Specific Cond. (Field)	uS/cm	3,040	-	-	4,148	-	-	3,515	-	-	3,480	-
Sulfide	mg/L	-	9.24	9.17	-	-	-	-	<1.34	<1.34	-	<1.34
Temperature, Water (C)	DEG C	17.3	-	-	18.9	-	-	14.8	-	-	15.8	-
Total Dissolved Solids	mg/L	-	2,010	1,870	-	-	3,130	-	2,900	2,870	-	2,970
Total Organic Carbon	mg/L	-	17.9	18.1	-	-	3.53	-	1.79	1.77	-	1.99
Turbidity, field	NTU	2.22	-	-	4.23	-	-	1.13	-	-	0.32	-

See last page for notes.

Stantec

Table G.1-3 - Pore Water Analytical Results
Cumberland Fossil Plant

Sample Location		CUF-TW07						CUF-TW08					
Sample Date		6-Jun-19	6-Jun-19	4-Mar-21	4-Mar-21	15-Apr-21	15-Apr-21	6-Jun-19	6-Jun-19	4-Mar-21	4-Mar-21	14-Apr-21	14-Apr-21
Sample ID		CUF-PW-TW07-20190606	CUF-PW-TW07-20190606	CUF-PW-TW07-03042021	CUF-PW-TW07-03042021	CUF-PW-TW07-04152021	CUF-PW-TW07-04152021	CUF-PW-TW08-20190606	CUF-PW-TW08-20190606	CUF-PW-TW08-03042021	CUF-PW-TW08-03042021	CUF-PW-TW08-04142021	CUF-PW-TW08-04142021
Parent Sample ID													
Sample Depth		93.3 ft	93.3 ft	93.3 ft	93.3 ft	93.3 ft	93.3 ft	83.3 ft	83.3 ft	83.3 ft	83.3 ft	83.3 ft	83.3 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final-Verified	Final QC Review	Final-Verified	Final QC Review	Final-Verified	Final QC Review	Final-Verified	Final QC Review	Final-Verified	Final QC Review	Final-Verified
Total Metals													
Aluminum	ug/L	-	-	-	235	-	1,490	-	-	-	796	-	634
Antimony	ug/L	-	4.70 U*	-	1.21 J	-	2.43	-	6.19	-	3.27	-	3.83
Arsenic	ug/L	-	71.0	-	12.7	-	45.8	-	18.7	-	39.5	-	46.8
Barium	ug/L	-	73.2	-	53.7	-	68.5	-	167	-	68.9	-	135
Beryllium	ug/L	-	0.233 U*	-	<0.182	-	<0.182	-	0.509 U*	-	<0.182	-	<0.182
Boron	ug/L	-	14,400	-	2,220	-	13,600	-	10,300	-	13,700 J	-	17,200
Cadmium	ug/L	-	0.983 J	-	<0.217	-	0.614 J	-	1.69	-	1.77	-	1.62
Calcium	ug/L	-	356,000	-	91,200	-	496,000	-	396,000	-	317,000 J	-	413,000
Chromium	ug/L	-	4.41 U*	-	<1.53	-	1.94 J	-	4.09 U*	-	3.51	-	23.3
Cobalt	ug/L	-	0.492 J	-	0.162 J	-	0.288 J	-	0.530	-	0.306 J	-	0.166 J
Copper	ug/L	-	2.06 U*	-	1.54 J	-	1.13 J	-	2.63 U*	-	2.02	-	1.01 J
Iron	ug/L	-	598	-	285	-	553	-	359	-	394	-	146
Lead	ug/L	-	1.38 U*	-	0.430 J	-	1.24	-	1.08 U*	-	1.30	-	0.613 J
Lithium	ug/L	-	69.7	-	14.0	-	80.3	-	21.2 U*	-	67.0 J	-	103
Magnesium	ug/L	-	-	-	3,760	-	446 J	-	-	-	1,740	-	438 J
Manganese	ug/L	-	6.14	-	15.3	-	6.78	-	15.8	-	13.0	-	2.84 J
Mercury	ug/L	-	<0.101	-	<0.130	-	<0.130	-	<0.101	-	<0.130	-	<0.130
Molybdenum	ug/L	-	3,950	-	514	-	4,500	-	6,860	-	17,100 J	-	16,600
Nickel	ug/L	-	4.31	-	1.57	-	4.12	-	3.06	-	3.42	-	2.50
Potassium	ug/L	-	-	-	14,900	-	106,000	-	-	-	68,500 J	-	71,200
Selenium	ug/L	-	<2.62	-	<1.51	-	1.70 J	-	7.21	-	3.05 J	-	2.78 J
Silicon	ug/L	-	-	-	2,190	-	3,020	-	-	-	3,100	-	4,460
Silver	ug/L	-	<0.121	-	<0.177	-	<0.177	-	<0.121	-	<0.177	-	<0.177
Sodium	ug/L	-	-	-	17,300	-	53,300	-	-	-	82,100 J	-	88,400
Thallium	ug/L	-	0.203 U*	-	0.375 J	-	0.220 J	-	0.687 U*	-	0.405 J	-	<0.148
Vanadium	ug/L	-	19.8	-	6.18	-	208	-	101	-	33.6	-	54.2
Zinc	ug/L	-	6.81	-	11.5	-	5.82	-	6.02	-	24.5	-	5.81
Dissolved Metals													
Aluminum	ug/L	-	-	-	98.9	-	956	-	-	-	430	-	504
Antimony	ug/L	-	4.80	-	<0.378	-	2.28	-	5.67	-	2.98	-	3.79
Arsenic	ug/L	-	68.9	-	5.00	-	43.8	-	17.6	-	43.3	-	48.2
Barium	ug/L	-	64.2	-	51.3	-	60.9	-	180	-	64.0	-	131
Beryllium	ug/L	-	<0.155	-	<0.182	-	<0.182	-	0.219 U*	-	<0.182	-	<0.182
Boron	ug/L	-	14,400	-	2,310	-	14,400	-	10,700	-	16,000 J	-	17,800
Cadmium	ug/L	-	0.869 J	-	<0.217	-	0.507 J	-	1.57	-	1.59	-	1.59
Calcium	ug/L	-	357,000	-	93,800	-	488,000	-	402,000	-	368,000 J	-	407,000
Chromium	ug/L	-	3.18 U*	-	<1.53	-	<1.53	-	2.41 U*	-	<1.53	-	16.7
Cobalt	ug/L	-	0.253 J	-	<0.134	-	<0.134	-	0.322 J	-	0.187 J	-	<0.134
Copper	ug/L	-	1.23 U*	-	<0.627	-	<0.627	-	1.36 U*	-	<0.627	-	<0.627
Iron	ug/L	-	<14.1	-	181	-	109	-	28.7 J	-	53.4 U*	-	<19.5
Lead	ug/L	-	<0.128	-	<0.128	-	0.266 J	-	0.151 J	-	0.187 J	-	<0.128
Lithium	ug/L	-	69.9	-	14.5	-	80.5	-	19.6	-	77.7 J	-	101
Magnesium	ug/L	-	-	-	3,690	-	389 J	-	-	-	1,370	-	213 J
Manganese	ug/L	-	1.40 J	-	13.7	-	2.70 J	-	12.4	-	9.74	-	<0.866
Mercury	ug/L	-	<0.101	-	<0.130	-	<0.130	-	<0.101	-	<0.130	-	<0.130
Molybdenum	ug/L	-	3,890	-	337	-	4,630	-	6,860	-	19,700 J	-	17,400
Nickel	ug/L	-	3.60	-	0.521 J	-	3.48	-	2.48	-	2.85	-	2.34
Potassium	ug/L	-	-	-	15,500	-	109,000	-	-	-	80,300 J	-	73,500
Selenium	ug/L	-	<2.62	-	<1.51	-	1.70 J	-	6.36	-	2.83 J	-	2.55 J
Silicon	ug/L	-	-	-	2,090	-	2,230	-	-	-	2,720	-	4,090
Silver	ug/L	-	<0.121	-	<0.177	-	<0.177	-	<0.121	-	<0.177	-	<0.177
Sodium	ug/L	-	-	-	17,600	-	54,900	-	-	-	94,400 J	-	90,600
Thallium	ug/L	-	<0.128	-	0.149 J	-	<0.148	-	0.251 J	-	0.196 J	-	<0.148
Vanadium	ug/L	-	14.8	-	3.63	-	193	-	94.6	-	24.9	-	50.8
Zinc	ug/L	-	<3.22	-	<3.22	-	<3.22	-	<3.22	-	<3.22	-	<3.22
Radiological Parameters													
Radium-226	pCi/L	-	0.0800 +/-(0.208)UJ	-	0.107 +/-(0.280)U	-	1.05 +/-(0.621)	-	0.153 +/-(0.268)UJ	-	0.309 +/-(0.432)U	-	0.320 +/-(0.417)U
Radium-228	pCi/L	-	-0.00782 +/-(0.356)U	-	0.324 +/-(0.450)U	-	-0.330 +/-(0.444)U	-	0.203 +/-(0.349)U	-	-0.0959 +/-(0.364)U	-	-0.00891 +/-(0.266)U
Radium-226+228	pCi/L	-	0.0800 +/-(0.412)UJ	-	0.431 +/-(0.530)U	-	1.05 +/-(0.764)J	-	0.357 +/-(0.440)UJ	-	0.309 +/-(0.565)U	-	0.320 +/-(0.494)U
Anions													
Chloride	mg/L	-	236	-	60.3	-	391	-	104	-	132	-	116
Fluoride	mg/L	-	0.0717 J	-	0.195	-	<0.0650	-	0.173 J	-	0.0843 J	-	0.219 J
Sulfate	mg/L	-	657	-	138	-	844	-	1,160	-	1,110	-	1,010
General Chemistry													
Alkalinity, Bicarbonate	mg/L	-	-	-	105	-	5.00 UJ	-	-	-	<5.00	-	<5.00
Alkalinity, Carbonate	mg/L	-	-	-	<5.00	-	66.7 J	-	-	-	114	-	76.2
Alkalinity, Total as CaCO3	mg/L	-	-	-	105	-	88.1 J	-	-	-	132	-	195
Ammonia Nitrogren	mg/L	-	-	-	1.18	-	4.75	-	-	-	3.59	-	2.56
Carbon, dissolved organic	mg/L	-	-	-	3.74	-	8.45	-	-	-	13.9	-	14.9
Depth to Water	ft	59.63	-	61.42	-	62.29	-	54.06	-	55.80	-	56.01	-
Dissolved Oxygen	%	3.8	-	5.9	-	2.8	-	1.9	-	5.6	-	2.5	-
Dissolved Oxygen	mg/L	0.33	-	0.55	-	0.25	-	0.17	-	0.55	-	0.23	-
Ethane	ug/L	-	-	-	3.10	-	21.1	-	-	-	2.24	-	2.38
Ferrous Iron - Field	mg/L	-	-	<0.5	-	<0.5	-	-	-	<0.5	-	<0.5	-
Flow Rate	mL/min	-	-	100	-	100	-	-	-	100	-	100	-
Methane	ug/L	-	-	-	1,210	-	7,060	-	-	-	119	-	91.0
Nitrate-Nitrite	mg/L	-	-	-	0.0760 J	-	4.18	-	-	-	<0.0650	-	<0.0650
ORP	mV	-146.2	-	-245.5	-	-152.7	-	-178.8	-	-260.7	-	-256.5	-
pH (field)	SU	10.12	-	7.33	-	10.45	-	9.79	-	9.37	-	11.50	-
Propane	ug/L	-	-	-	4.55	-	51.0	-	-	-	1.82	-	2.02
Specific Cond. (Field)	uS/cm	2,142	-	595	-	2,719	-	2,341	-	1,944	-	2,333	-
Sulfide	mg/L	-	-	-	19.9	-	1.37 J	-	-	-	16.9	-	3.61
Temperature, Water (C)	DEG C	20.6	-	19.3	-	19.1	-	21.3	-	17.9	-	18.0	-
Total Dissolved Solids	mg/L	-	1,770	-	411	-	2,050	-	1,970	-	2,080	-	2,010
Total Organic Carbon	mg/L	-	13.2	-	3.79	-	9.04	-	61.8	-	16.7	-	15.9
Turbidity, field	NTU	9.56	-	3.71	-	9.89	-	9.47	-	12.4	-	3.39	-

See last page for notes.

Table G.1-3 - Pore Water Analytical Results
Cumberland Fossil Plant

Sample Location Sample Date Sample ID Parent Sample ID Sample Depth Sample Type Level of Review	Units	5-Jun-19 CUF-PW-TW09-20190605 90 ft Normal Environmental Sample Final QC Review	5-Jun-19 CUF-PW-TW09-20190605 90 ft Normal Environmental Sample Final-Verified	5-Jun-19 CUF-PW-DUP01-20190605 CUF-PW-TW09-20190605 90 ft Field Duplicate Sample Final-Verified	CUF-TW09 3-Mar-21 CUF-PW-TW09-03032021 90 ft Normal Environmental Sample Final QC Review	3-Mar-21 CUF-PW-TW09-03032021 90 ft Normal Environmental Sample Final-Verified	15-Apr-21 CUF-PW-TW09-04152021 90 ft Normal Environmental Sample Final QC Review	15-Apr-21 CUF-PW-TW09-04152021 90 ft Normal Environmental Sample Final-Verified
Total Metals								
Aluminum	ug/L	-	-	-	-	2,010	-	1,900
Antimony	ug/L	-	3.07 U*	3.13 U*	-	1.87 J	-	1.51 U*
Arsenic	ug/L	-	28.6	29.7	-	37.6	-	39.4
Barium	ug/L	-	99.6	101	-	88.1	-	83.6
Beryllium	ug/L	-	0.302 U*	0.256 U*	-	<0.182	-	0.280 J
Boron	ug/L	-	18,700	19,100	-	20,300	-	22,700
Cadmium	ug/L	-	8.66	8.90	-	4.10	-	3.89
Calcium	ug/L	-	358,000	363,000	-	335,000	-	320,000
Chromium	ug/L	-	3.91 U*	4.06 U*	-	<1.53	-	<1.53
Cobalt	ug/L	-	0.387 J	0.393 J	-	<0.134	-	0.186 J
Copper	ug/L	-	1.57 U*	1.97 U*	-	<0.627	-	0.957 J
Iron	ug/L	-	403	383	-	54.3	-	139
Lead	ug/L	-	1.18 U*	1.14 U*	-	<0.128	-	0.441 J
Lithium	ug/L	-	675	688	-	977	-	843
Magnesium	ug/L	-	-	-	-	<82.7	-	<82.7
Manganese	ug/L	-	5.01	4.95 J	-	0.893 J	-	1.88 J
Mercury	ug/L	-	<0.101	<0.101	-	<0.130	-	<0.130
Molybdenum	ug/L	-	37,100	37,400	-	36,300	-	35,000
Nickel	ug/L	-	4.33	4.66	-	4.33	-	4.60
Potassium	ug/L	-	-	-	-	220,000	-	219,000
Selenium	ug/L	-	546	551	-	447	-	355
Silicon	ug/L	-	-	-	-	4,480	-	4,400
Silver	ug/L	-	<0.121	<0.121	-	<0.177	-	<0.177
Sodium	ug/L	-	-	-	-	305,000	-	312,000
Thallium	ug/L	-	0.370 U*	0.331 U*	-	0.408 J	-	0.819 J
Vanadium	ug/L	-	983	997	-	1,570	-	1,400
Zinc	ug/L	-	5.29	5.09	-	5.26	-	3.71 J
Dissolved Metals								
Aluminum	ug/L	-	-	-	-	1,810	-	1,720
Antimony	ug/L	-	3.00 U*	2.81 U*	-	1.23 J	-	1.31 U*
Arsenic	ug/L	-	28.3	27.9	-	36.6	-	39.2
Barium	ug/L	-	90.4	90.4	-	85.2	-	81.3
Beryllium	ug/L	-	0.193 U*	0.176 U*	-	<0.182	-	<0.182
Boron	ug/L	-	19,500	18,800	-	22,200	-	22,800
Cadmium	ug/L	-	8.59	8.39	-	4.14	-	3.81
Calcium	ug/L	-	358,000	357,000	-	330,000	-	316,000
Chromium	ug/L	-	2.41 U*	1.99 U*	-	<1.53	-	<1.53
Cobalt	ug/L	-	0.222 J	0.218 J	-	<0.134	-	<0.134
Copper	ug/L	-	1.12 U*	1.26 U*	-	<0.627	-	<0.627
Iron	ug/L	-	29.2 J	26.8 J	-	<19.5	-	<19.5
Lead	ug/L	-	<0.128	<0.128	-	<0.128	-	<0.128
Lithium	ug/L	-	679	670	-	964	-	889
Magnesium	ug/L	-	-	-	-	<82.7	-	<82.7
Manganese	ug/L	-	<1.35	<1.35	-	<0.866	-	<0.866
Mercury	ug/L	-	<0.101	<0.101	-	<0.130	-	<0.130
Molybdenum	ug/L	-	37,400	37,000	-	36,600	-	34,200
Nickel	ug/L	-	3.88	3.75	-	3.96	-	4.12
Potassium	ug/L	-	-	-	-	217,000	-	224,000
Selenium	ug/L	-	549	537	-	459	-	358
Silicon	ug/L	-	-	-	-	4,350	-	4,160
Silver	ug/L	-	<0.121	<0.121	-	<0.177	-	<0.177
Sodium	ug/L	-	-	-	-	307,000	-	315,000
Thallium	ug/L	-	0.158 J	0.132 J	-	0.227 J	-	0.214 J
Vanadium	ug/L	-	948	938	-	1,570	-	1,280
Zinc	ug/L	-	<3.22	<3.22	-	<3.22	-	<3.22
Radiological Parameters								
Radium-226	pCi/L	-	0.000 +/-(0.190)UJ	-0.0569 +/-(0.180)UJ	-	0.0286 +/-(0.356)U	-	0.402 +/-(0.547)U
Radium-228	pCi/L	-	0.345 +/-(0.400)U	0.147 +/-(0.373)U	-	0.875 +/-(0.502)	-	0.342 +/-(0.411)U
Radium-226+228	pCi/L	-	0.345 +/-(0.443)UJ	0.147 +/-(0.414)UJ	-	0.903 +/-(0.615)J	-	0.744 +/-(0.684)U
Anions								
Chloride	mg/L	-	282	281	-	249	-	251
Fluoride	mg/L	-	0.0712 J	<0.0658	-	0.0716 J	-	0.0661 J
Sulfate	mg/L	-	1,270	1,280	-	1,320	-	1,240
General Chemistry								
Alkalinity, Bicarbonate	mg/L	-	-	-	-	<5.00	-	5.00 UJ
Alkalinity, Carbonate	mg/L	-	-	-	-	118	-	102 J
Alkalinity, Total as CaCO3	mg/L	-	-	-	-	178	-	173 J
Ammonia Nitrogren	mg/L	-	-	-	-	5.55	-	5.33
Carbon, dissolved organic	mg/L	-	-	-	-	3.42	-	4.09
Depth to Water	ft	57.70	-	-	58.89	-	59.15	-
Dissolved Oxygen	%	2.4	-	-	7.0	-	5.1	-
Dissolved Oxygen	mg/L	0.22	-	-	0.67	-	0.48	-
Ethane	ug/L	-	-	-	-	1.95	-	1.88
Ferrous Iron - Field	mg/L	-	-	-	<0.5	-	<0.5	-
Flow Rate	mL/min	-	-	-	100	-	100	-
Methane	ug/L	-	-	-	-	178	-	150
Nitrate-Nitrite	mg/L	-	-	-	-	<0.0650	-	<0.0650
ORP	mV	-72.5	-	-	-76.0	-	-197.8	-
pH (field)	SU	10.48	-	-	10.89	-	11.39	-
Propane	ug/L	-	-	-	-	0.761 J	-	0.555 J
Specific Cond. (Field)	uS/cm	3,229	-	-	3,303	-	3,340	-
Sulfide	mg/L	-	-	-	-	<1.34	-	3.30
Temperature, Water (C)	DEG C	25.0	-	-	18.8	-	17.2	-
Total Dissolved Solids	mg/L	-	2,630	2,200	-	2,530	-	2,510
Total Organic Carbon	mg/L	-	8.18	8.17	-	3.36	-	4.03
Turbidity, field	NTU	9.33	-	-	2.23	-	4.86	-

Notes:

15.2	measured concentration did not exceed the indicated standard
<0.03	analyte was not detected at a concentration greater than the laboratory reporting limit.
ft	feet
%	percent
Cond.	conductance
DEG C	degrees Celsius
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
mL/min	milliliters per minute
mV	millivolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
pCi/L	picocuries per Liter
SU	Standard Units
U*	result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
ug/L	micrograms per Liter
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias
uS/cm	microSiemens per centimeter

1. Level of review is defined in the Quality Assurance Project Plan.

Table G.1-4 – Pore Water Level Measurements, Groundwater Sampling Event #2 (July 8, 2019)
Cumberland Fossil Plant

Temporary Well / Piezometer ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Piezometer Ground Surface Elevation	Piezometer Sensor Elevation	Piezometer Sensor Depth	Screened Interval	Screened / Piezometer Sensor Formation
		ft btoc	ft msl	ft msl	ft msl	ft msl	ft bgs	ft bgs	
Temporary Wells									
CUF-TW01	8-Jul-19	40.45	430.99	390.54	n/a	n/a	n/a	41.3 - 51.9	CCR Material
CUF-TW03	8-Jul-19	29.04	429.53	400.49	n/a	n/a	n/a	54.9 - 65.5	CCR Material
CUF-TW05	8-Jul-19	30.94	426.80	395.86	n/a	n/a	n/a	49.5 - 56.5	CCR Material
CUF-TW07	8-Jul-19	58.64	443.69	385.05	n/a	n/a	n/a	81.5 - 92.1	CCR Material
CUF-TW08	8-Jul-19	52.61	443.36	390.75	n/a	n/a	n/a	72.1 - 82.7	CCR Material
CUF-TW09	8-Jul-19	56.99	446.44	389.45	n/a	n/a	n/a	79.5 - 90.1	CCR Material
Piezometers									
CUF-B14A	n/a	NM	n/a	NM	440.8	360.8	80.0	n/a	CCR Material
CUF-B15A	8-Jul-19	51.1	n/a	387.3	438.3	353.3	85.0	n/a	CCR Material
CUF-B16A	8-Jul-19	51.0	n/a	388.7	439.7	383.4	56.3	n/a	CCR Material
CUF-B17A	8-Jul-19	55.0	n/a	388.3	443.4	363.9	79.5	n/a	CCR Material
CUF_DAS_A_1_VWPZ2	8-Jul-19	13.2	n/a	374.8	388.0	335.0	53.0	n/a	CCR Material
CUF_DAS_A_2_VWPZ2	8-Jul-19	38.3	n/a	374.6	412.9	353.4	59.5	n/a	CCR Material
CUF_DAS_D_2_VWPZ1	8-Jul-19	16.5	n/a	382.3	398.7	376.6	22.1	n/a	CCR Material
CUF_DAS_D_3_VWPZ3	8-Jul-19	44.7	n/a	382.5	427.2	371.9	55.3	n/a	CCR Material
CUF_DAS_G_1_VWPZ1	8-Jul-19	15.4	n/a	390.1	405.5	379.6	25.9	n/a	CCR Material
CUF_DAS_G_2_VWPZ2	8-Jul-19	36.0	n/a	403.1	439.1	396.1	43.0	n/a	CCR Material
CUF_DAS_INT_1_VWPZ3	8-Jul-19	50.5	n/a	388.6	439.1	379.1	60.0	n/a	CCR Material
CUF_DAS_INT_2_VWPZ2	8-Jul-19	42.8	n/a	391.7	434.5	388.5	46.0	n/a	CCR Material
CUF_F_2A_VWPZ2	8-Jul-19	48.2	n/a	385.4	433.6	353.6	80.0	n/a	CCR Material
CUF_F_2B_VWPZ4	8-Jul-19	26.1	n/a	386.0	412.1	377.1	35.0	n/a	CCR Material
CUF_GSA_G_1_VWPZ1	8-Jul-19	19.8	n/a	393.5	413.3	384.6	28.7	n/a	CCR Material
CUF_GSA_G_2_VWPZ1	8-Jul-19	31.6	n/a	396.6	428.2	388.2	40.0	n/a	CCR Material
CUF_GSA_INT_1_VWPZ5	8-Jul-19	23.6	n/a	399.5	423.1	393.1	30.0	n/a	CCR Material
CUF_GSA_INT_2_VWPZ2	8-Jul-19	29.9	n/a	390.4	420.3	380.3	40.0	n/a	CCR Material
CUF_GSA_L_1_VWPZ4	8-Jul-19	35.8	n/a	394.5	430.3	369.3	61.0	n/a	CCR Material
CUF_GSA_M_1_VWPZ2	8-Jul-19	23.5	n/a	386.5	410.0	382.0	28.0	n/a	CCR Material
CUF_GSA_M_2_VWPZ3	8-Jul-19	45.0	n/a	385.3	430.3	380.3	50.0	n/a	CCR Material
CUF_H_2A_VWPZ4	8-Jul-19	27.9	n/a	396.1	424.0	389.8	34.2	n/a	CCR Material
CUF_H_2B_VWPZ3	8-Jul-19	22.4	n/a	388.3	410.7	353.7	57.0	n/a	CCR Material
CUF_H_2C_VWPZ4	8-Jul-19	6.3	n/a	389.1	395.3	374.0	21.3	n/a	CCR Material
CUF_PZ21	8-Jul-19	5.6	n/a	389.5	395.1	356.0	39.1	n/a	CCR Material
CUF_PZ36	8-Jul-19	24.5	n/a	386.7	411.2	363.2	48.0	n/a	CCR Material
CUF_PZ37	8-Jul-19	19.0	n/a	376.2	395.2	367.2	28.0	n/a	CCR Material
CUF_PZ43	8-Jul-19	19.7	n/a	391.6	411.3	374.3	37.0	n/a	CCR Material

See notes on last page.

Notes:

bgs	below ground surface
btoc	below top of casing
CCR	coal combustion residuals
ft	feet
ID	identification
msl	mean sea level
n/a	not applicable
NM	not measured
SAR	sampling and analysis report

1. Top of casing elevations, screen intervals, and screened formations were obtained from boring logs, well detail and well survey data.

2. For piezometers, ground surface elevation, pore water elevations, and piezometer data obtained from Geotech instrumentation database. Vibrating wire sensor formation information obtained from boring logs. Data from vibrating wire piezometers are averaged for the measurement date.

3. Depth to pore water in piezometers and pore water elevations at all locations are calculated values. Accuracy of piezometer data is to 0.1 ft.

4. Screen interval shown for temporary wells is below ground surface when drilled.

EXHIBITS

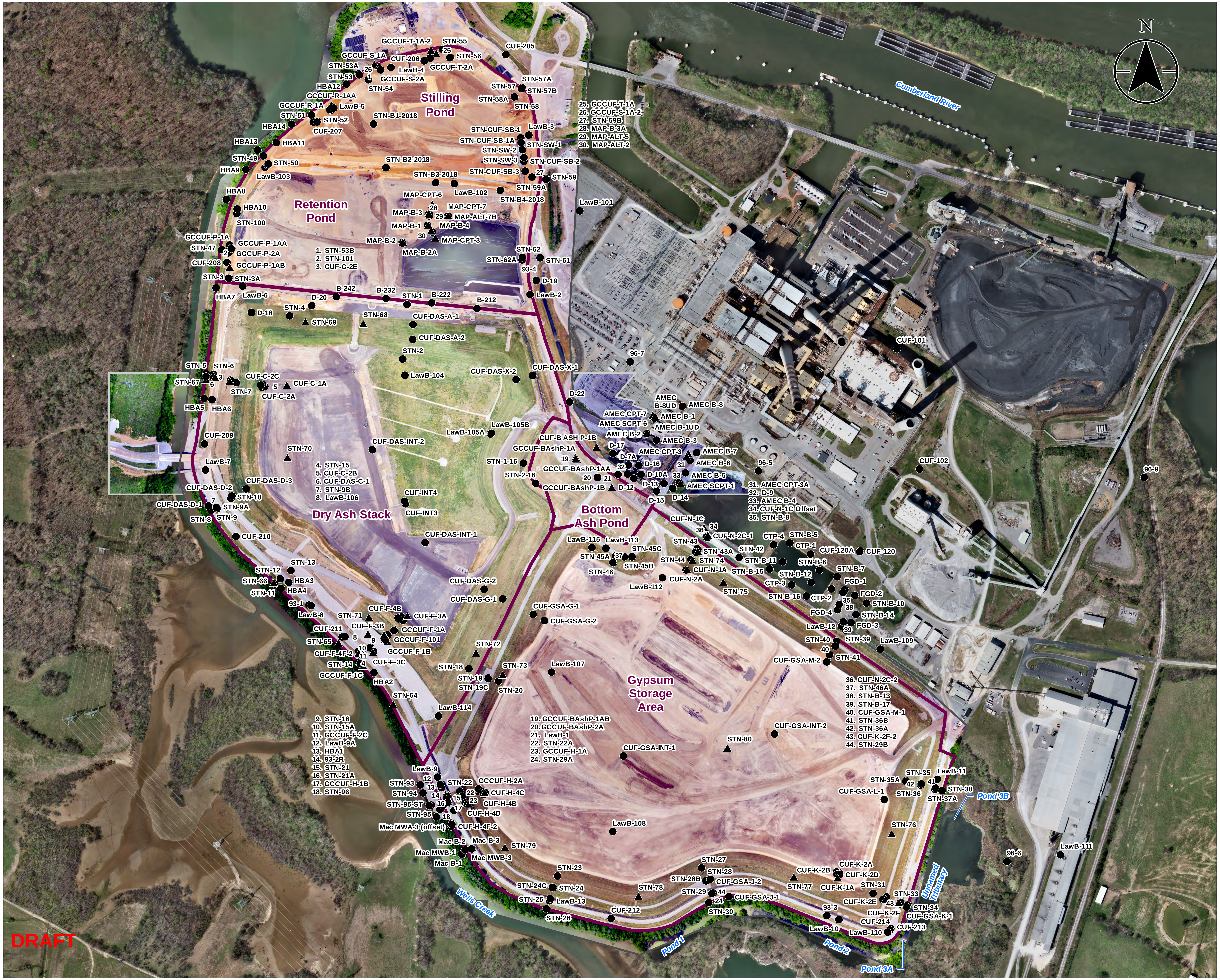


Exhibit No.

G.1-1

Title

Historical Boring and CPT Locations

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

175568209

Stewart County, Tennessee

Prepared by MB on 2022-11-01
Technical Review by JW on 2022-11-01

0 300 600 900 1,200 Feet

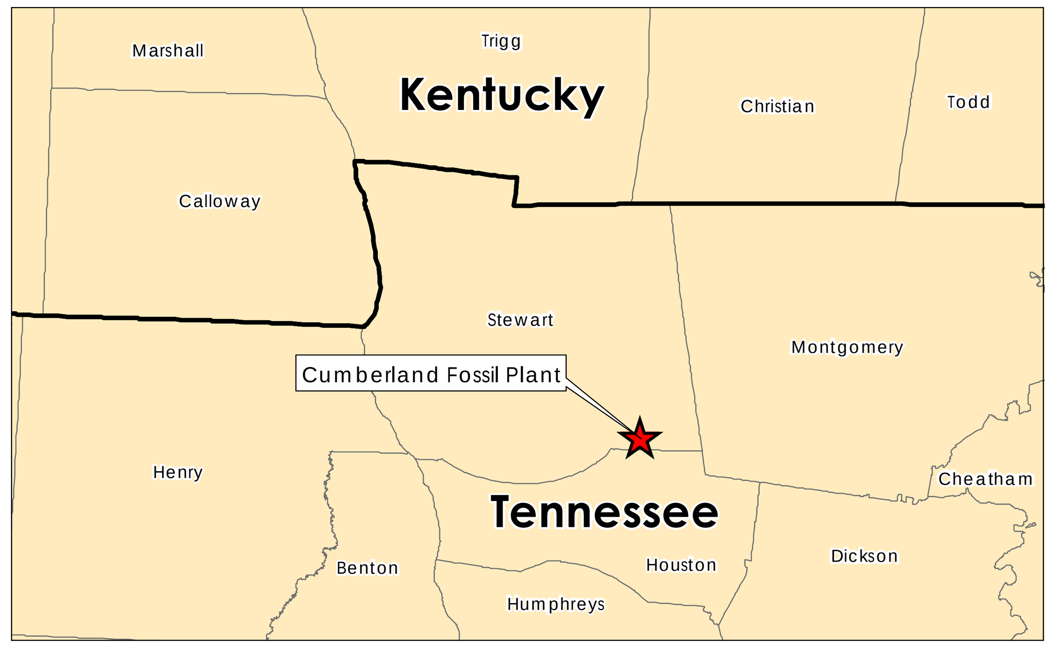
1:3,600 (At original document size of 22x34)

Legend

- Existing Boring
- Existing Cone Penetration Test (CPT)
- 2021 Imagery Boundary
- 2022 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (5/21/2021 and 5/12/2022)



Stantec TVA

Exhibit No.

G.1-2

Title

Boring Location Map

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location | 175568209

Stewart County, Tennessee

Prepared by LMB on 2022-11-01
Technical Review by ND on 2022-11-01

0 300 600 900 1,200 Feet

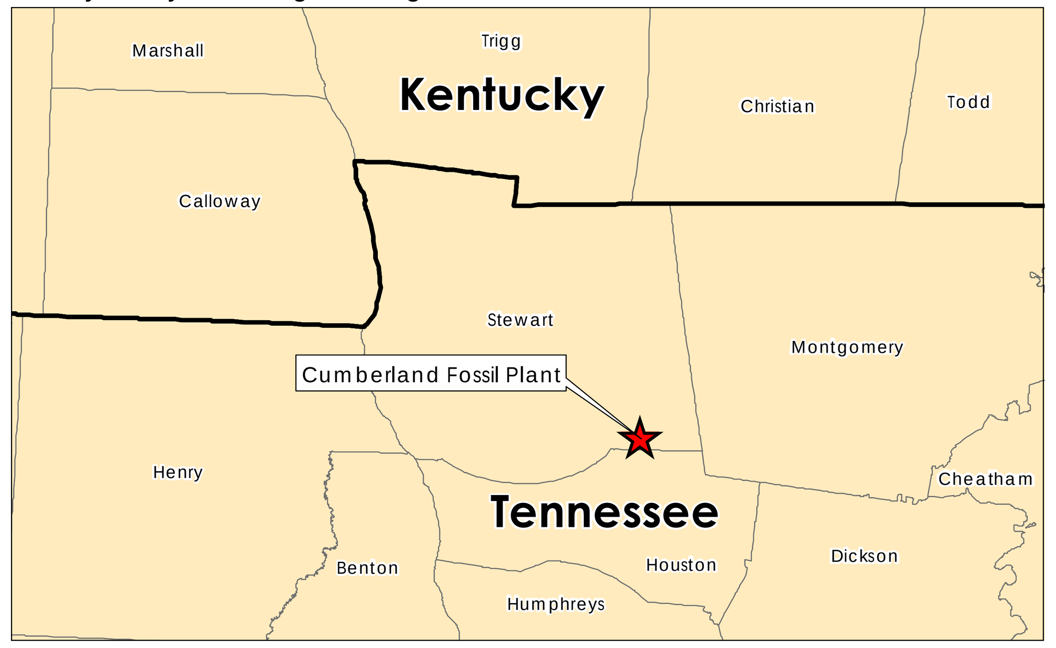
1:3,600 (At original document size of 22x34)

Legend

- Geotechnical Boring
- Geotechnical Boring with Vibrating Wire Piezometer
- Temporary Well (Screened Interval)
- Historical Wells Creek Alignment (Approximate)
- 1990's Perimeter Dike and Foundation Soil Grouting Alignment (Approximate)
- 1980's Interior Bottom Ash Dike (Approximate)
- 2021 Imagery Boundary
- 2022 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (5/21/2021 and 5/12/2022)
3. Temporary wells TW02, TW04, and TW06 were not installed because the borings had insufficient depth of water within gypsum to warrant installation.
4. The locations of geotechnical borings CUF-B11 through CUF-B19 and temporary well locations were surveyed by the R.L.S. Group on 04/24/2019 and 05/15/2019. The geotechnical borings CUF-B20 through CUF-B25 were surveyed by DDS Engineering on 09/22/2020 and 12/01/2020.



Stantec TVA

Exhibit No.

G.1-3

Title

Cone Penetration Testing, Surface Geophysical Surveys, and Supplemental Geotechnical Borings

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location 175566329

Stewart County, Tennessee

Prepared by LMB on 2022-11-01
Technical Review by JD on 2022-11-01

0 300 600 900 1,200 Feet

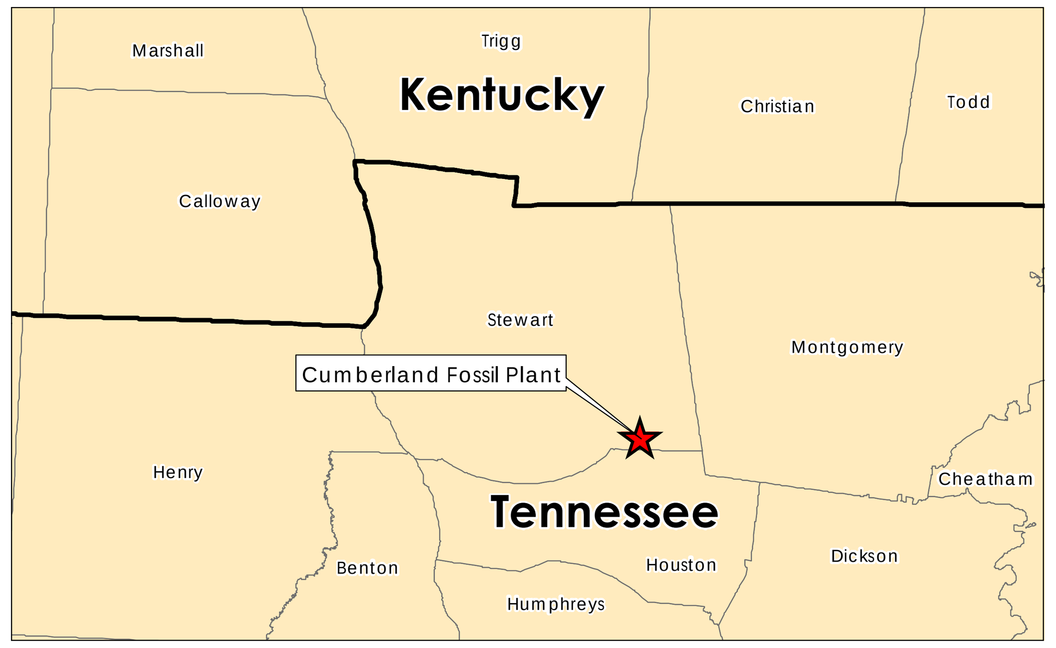
1:3,600 (At original document size of 22x34)

Legend

- Geotechnical Boring
- Cone Penetration Test
- Performed Geophysical Survey (ERI)
- Performed Geophysical Survey (MASW)
- Historical Wells Creek Alignment (Approximate)
- 1990's Perimeter Dike and Foundation Soil Grouting Alignment (Approximate)
- 1980's Interior Bottom Ash Dike (Approximate)
- 2021 Imagery Boundary
- 2022 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (5/21/2021 and 5/12/2022)
3. Location of performed CPTs were surveyed by the RLS Group on 04/29/2019. The location of the geotechnical borings were surveyed by DDS Engineering on 09/22/2020 and 12/01/2020.
4. Electrical Resistivity Imaging (ERI) and Multichannel Analysis of Surface Waves (MASW) surveys were conducted by ARM Geophysics at the transect locations along the raised dike crest and the remnant starter dike crest. Transect locations were based on handheld GPS coordinates by ARM Geophysics at the time of the surveys.



Stantec TVA

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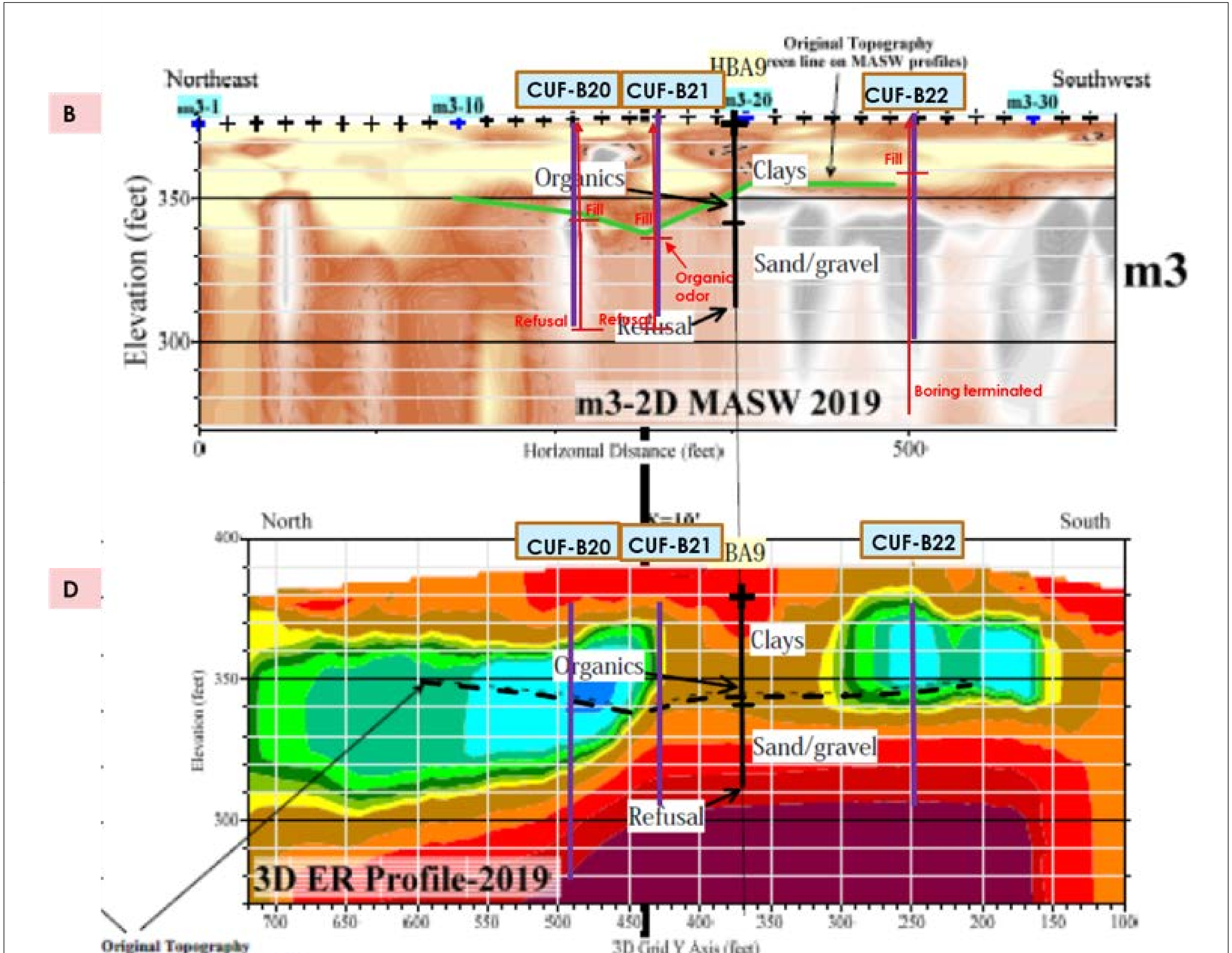


Exhibit No.

G.1-4

Title

Surface Geophysical Survey and Supplemental Geotechnical Boring Profile, North Area, Lower Bench

Client/Project 175568209

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location
Stewart County, Tennessee

Prepared by MD on 2021-03-11
Technical Review by JD on 2021-03-11

Stantec

TVA

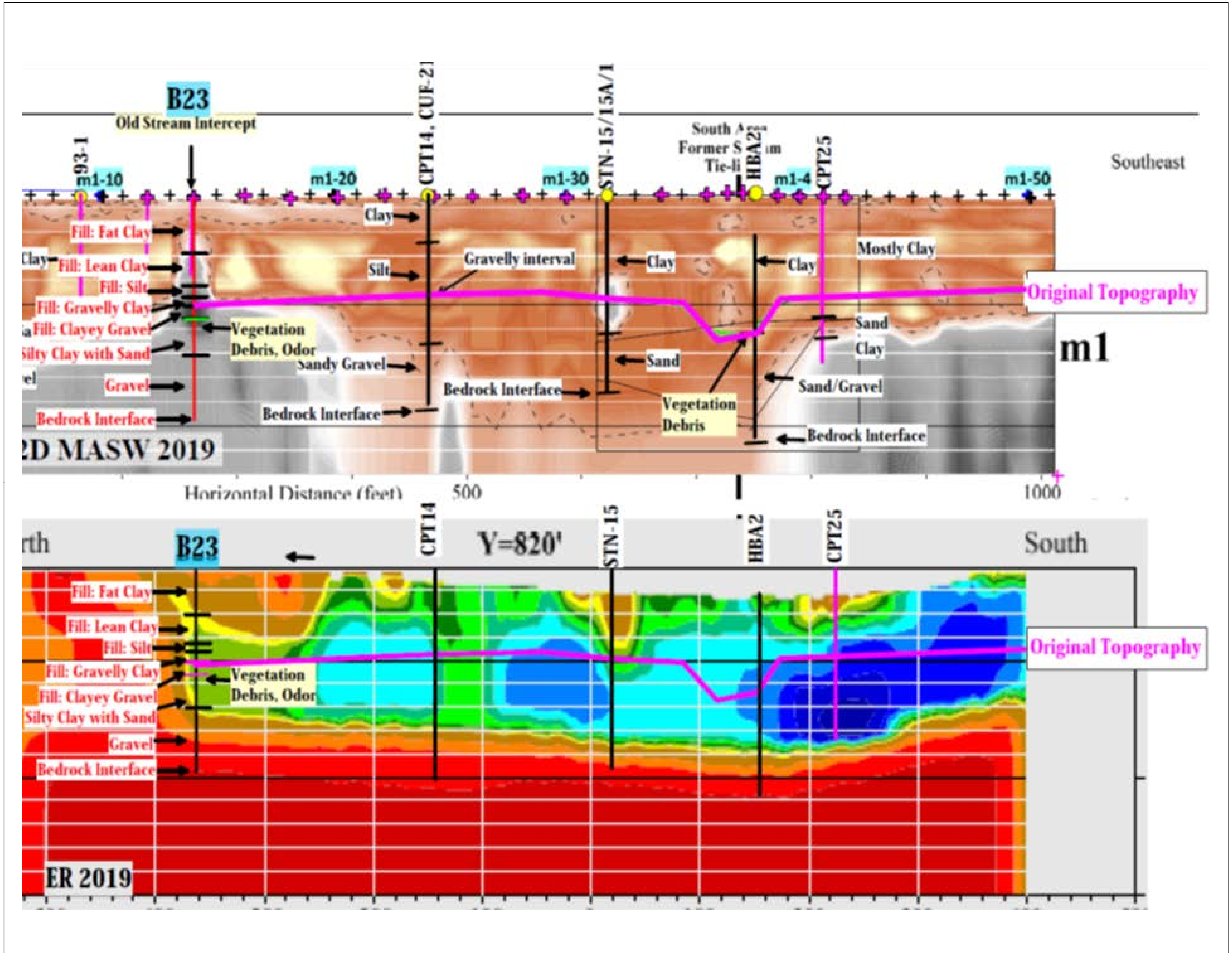


Exhibit No.

G.1-5

Title

Surface Geophysical Survey and Supplemental Geotechnical Boring Profile, South Area, Crest

Client/Project 175568209

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location
Stewart County, Tennessee

Prepared by MD on 2021-03-11
Technical Review by JD on 2021-03-11

Stantec

TVA

U:\TVA-EIP\175568209_CUF_Phase2\gis\mxd\EAR\CUF_EAR_A.14_StillingPondMineralogy11x17.mxd Revised: 2021-08-12 By: lblackman

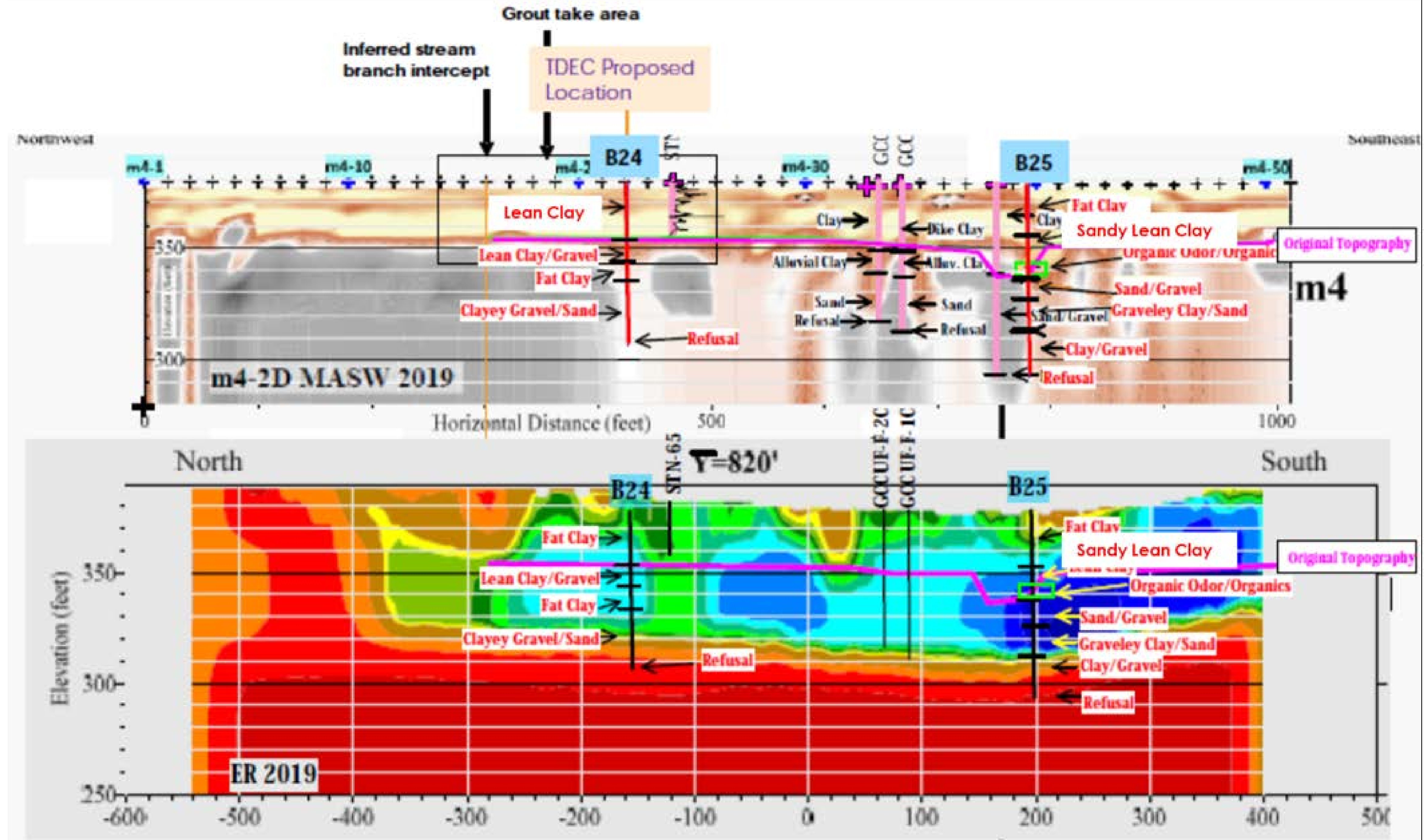
Exhibit No.
G.1-6

Title
Surface Geophysical Survey and Supplemental Geotechnical Boring Profile, South Area, Lower Bench

Client/Project 175568209
Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location
Stewart County, Tennessee

Prepared by MD on 2021-03-11
Technical Review by JD on 2021-03-11



Stantec

TVA

U:\TVA-E\P\175568209_CUF_Phase2\gis\mxd\EAR\CUF_EAR_A14_StillingPondMineralogy11X17.mxd Revised: 2021-08-12 By: lblackman

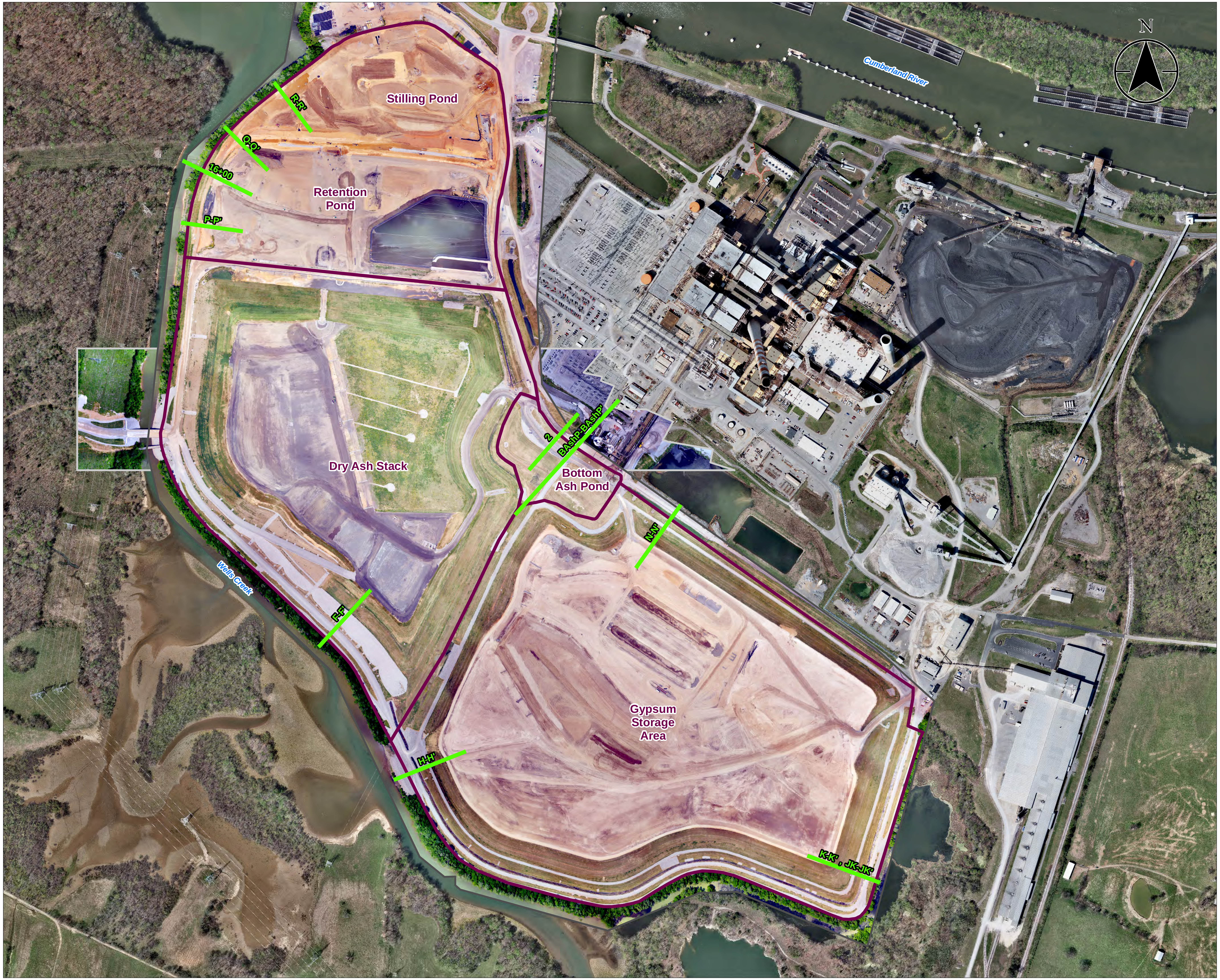


Exhibit No.

G.1-7

Title

Completed Stability Analyses

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209
Prepared by MB on 2022-12-02
Technical Review by JD on 2022-12-02

0 300 600 900 1,200 Feet

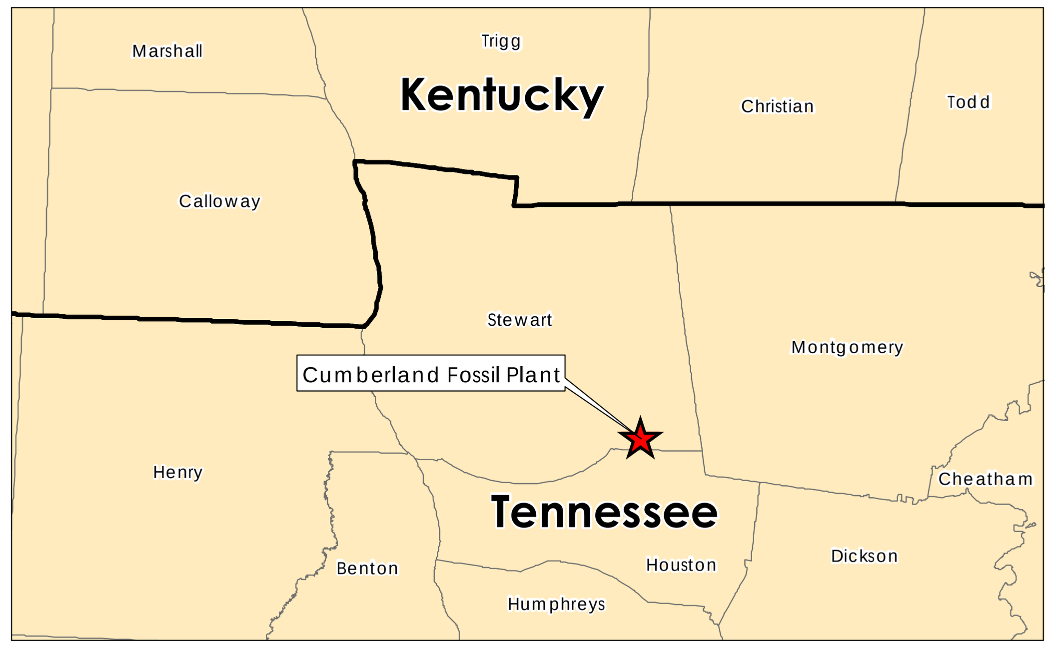
1:3,600 (At original document size of 22x34)

Legend

- Stability Cross Section
- 2021 Imagery Boundary
- 2022 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (5/21/2021 and 5/12/2022)
3. Cross sections shown reflect those locations referenced in the EAR for the required static and/or seismic global stability analyses. Imagery may not reflect the conditions at the time of analyses.
4. Typical sections analyzed for veneer stability are not shown, because they are not associated with any particular plan view location.
5. Section JK-JK' is a hybrid section created to analyze future, targeted gypsum harvesting. The hybrid section incorporates the subsurface conditions at Section K-K' with certain surface geometry elements from adjacent Section J-J'.



Stantec TVA

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Exhibit No.

G.1-8

Title

Boring and Temporary Well Location Map

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

175568209

Stewart County, Tennessee

Prepared by DMB on 2022-10-13
Technical Review by RH on 2022-10-13

0 300 600 900 1,200 Feet

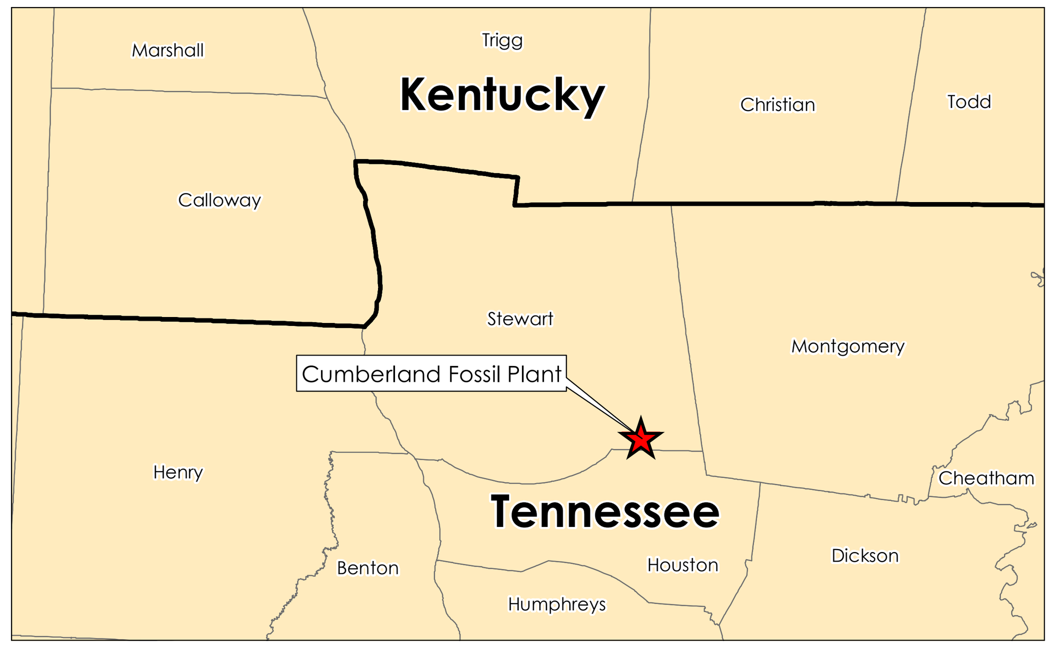
1:3,600 (At original document size of 22x34)

Legend

- Boring
- Non-TDEC Order Geotechnical Boring (used for supplemental CCR material sampling)
- Temporary Well
- Surface Stream Flow
- 2021 Imagery Boundary
- 2022 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (5/21/2021 and 5/12/2022)
3. Geotechnical data includes CCR thickness, clay foundation soil thickness, top of rock elevation, and rock coring (RQD).
4. The geotechnical boring IDs do not include the "MAP (Main Ash Pond)" nomenclature.
5. Temporary wells are screened in CCR material.



Stantec

TVA

Exhibit No.

G.1-9

Title

Pore Water Elevation Contour Map, Event #2 (July 8, 2019)

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209
Prepared by MB on 2022-10-13
Technical Review by MD on 2022-10-13

0 400 800 1,200 1,600 Feet

1:4,800 (At original document size of 22x34)

Legend

- Groundwater Investigation Monitoring Well groundwater elevation in feet above mean sea level (ft amsl); value not used for contouring
- Other Monitoring Well groundwater elevation in ft amsl; value not used for contouring
- Piezometer groundwater elevation in ft amsl; value not used for contouring
- Piezometer in CCR pore water elevation in ft amsl
- Temporary well in CCR pore water elevation in ft amsl
- Cumberland River Gauging Station surface water elevation in ft amsl
- Interpolated Pore water Contour (5 ft interval; elevations are in ft amsl)
- Pore water Contour (5 ft interval; elevations are in ft amsl)
- Surface Stream Flow
- 2021 Imagery Boundary
- 2022 Imagery Boundary
- CCR Unit Area (Approximate)

CCR: Coal combustion residuals

< Groundwater elevations are rounded to nearest foot to constrain potential elevation when depth to groundwater could not be measured.

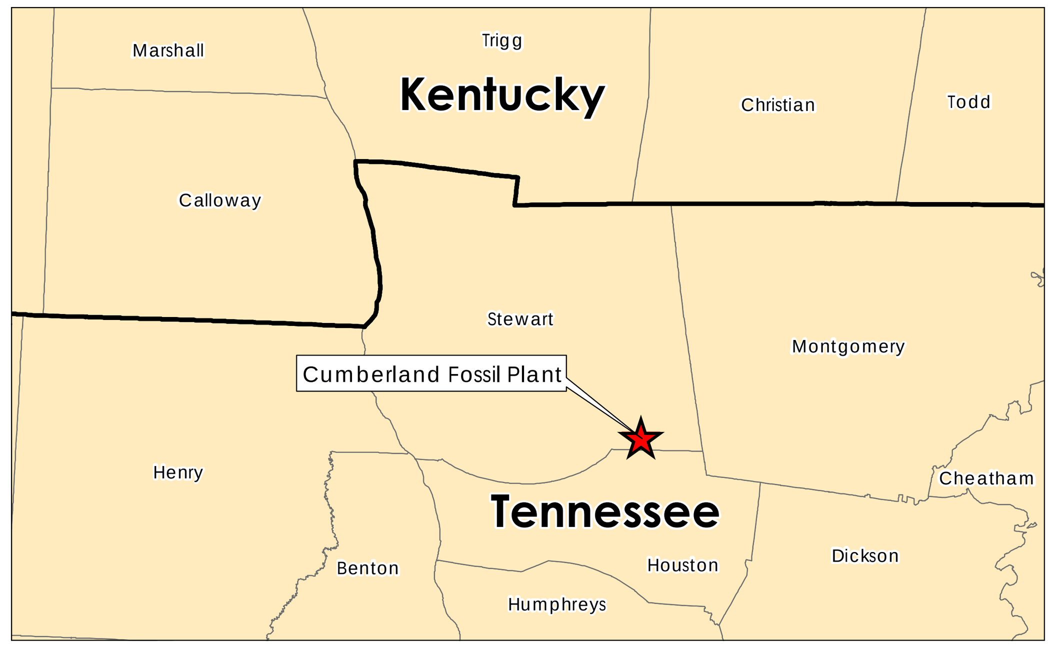
*Groundwater elevation displayed but not used as input for contouring due to factors such as well construction or being screened in a different hydrogeologic unit.

**Piezometer was not collecting groundwater measurements during this monitoring event.

***Nested VWPZ sensors monitoring pore water and groundwater elevations in the same borehole, and the location is shown by a single symbol.

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (5/21/2021 and 5/12/2022)
3. Pore water contours were created with manual adjustment using Surfer Version 16 (December 13, 2018)
4. For PZ's with multiple instruments in CCR material, the reading with the highest pore water elevation is displayed, unless that reading is suspected of being erroneous.



Stantec TVA

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ATTACHMENT G.1-A
GEOCOMP (2023) TECHNICAL MEMORANDUM

Technical Memorandum

To:	Nick McClung, Tennessee Valley Authority	Date:	January 30, 2023
CC:		Pages:	15
Subject:	Static and Seismic Stability Assessment for TVA Cumberland Fossil Plant Dry Fly Ash Stack and Gypsum Disposal Complex		
From:	Allen Marr, PhD, P.E., D.GE, NAE		

1. SUMMARY

Geocomp presented draft stability results at the Dry Fly Ash Stack and Gypsum Disposal Complex at the Tennessee Valley Authority (TVA) Cumberland Fossil Plant (CUF) In Cumberland City, Tennessee in 2019. That analysis showed that a localized condition existed on the slopes where the factor of safety was less than the minimum recommended value for pseudo-static and post-earthquake load cases. At Dry Fly Ash Stack unit, TVA constructed a new buttress, improved drainage patterns and travel routes around its periphery, and regraded slopes of the CCR to increase the factor of safety and meet the stability criteria for pseudo-static and post-earthquake load cases. At Gypsum Disposal Complex unit, TVA is completing a set of actions that includes reducing the overall height of embankment, surface water management improvements, designing Dike 3 to reduce its slope to meet the stability criteria for pseudo-static and post-earthquake load cases. This technical memorandum presents the updated results of evaluations of the expected static and seismic performance of the dry fly ash stack and gypsum disposal complex after these improvements. The updated stability results for gypsum disposal complex presents the redesigned geometry of Dike 3 as proposed regrade. The resulting minimum factors of safety meet the stability criteria for long-term static, pseudo-static, and post-earthquake load cases.

2. INTRODUCTION

This technical memorandum presents the updated results of evaluations of the expected static and seismic performance of the Dry Fly Ash Stack (DFAS) and Gypsum Disposal Complex (GDC) at the Tennessee Valley Authority (TVA) Cumberland Fossil Plant (CUF) in Cumberland City, Tennessee. This work was performed by Geocomp under contract to TVA (Purchase Order No.: 6122641, dated March 12, 2020). It was directed by W. Allen Marr, PE, PhD, NAE. Professors Steven Kramer, PhD and Pedro Arduino, PhD, of the University of Washington in Seattle served as consultants to Geocomp and performed supporting seismic response analyses for this work. Figure 1 shows the location of DFAS and GDC within the Cumberland Fossil Plant.

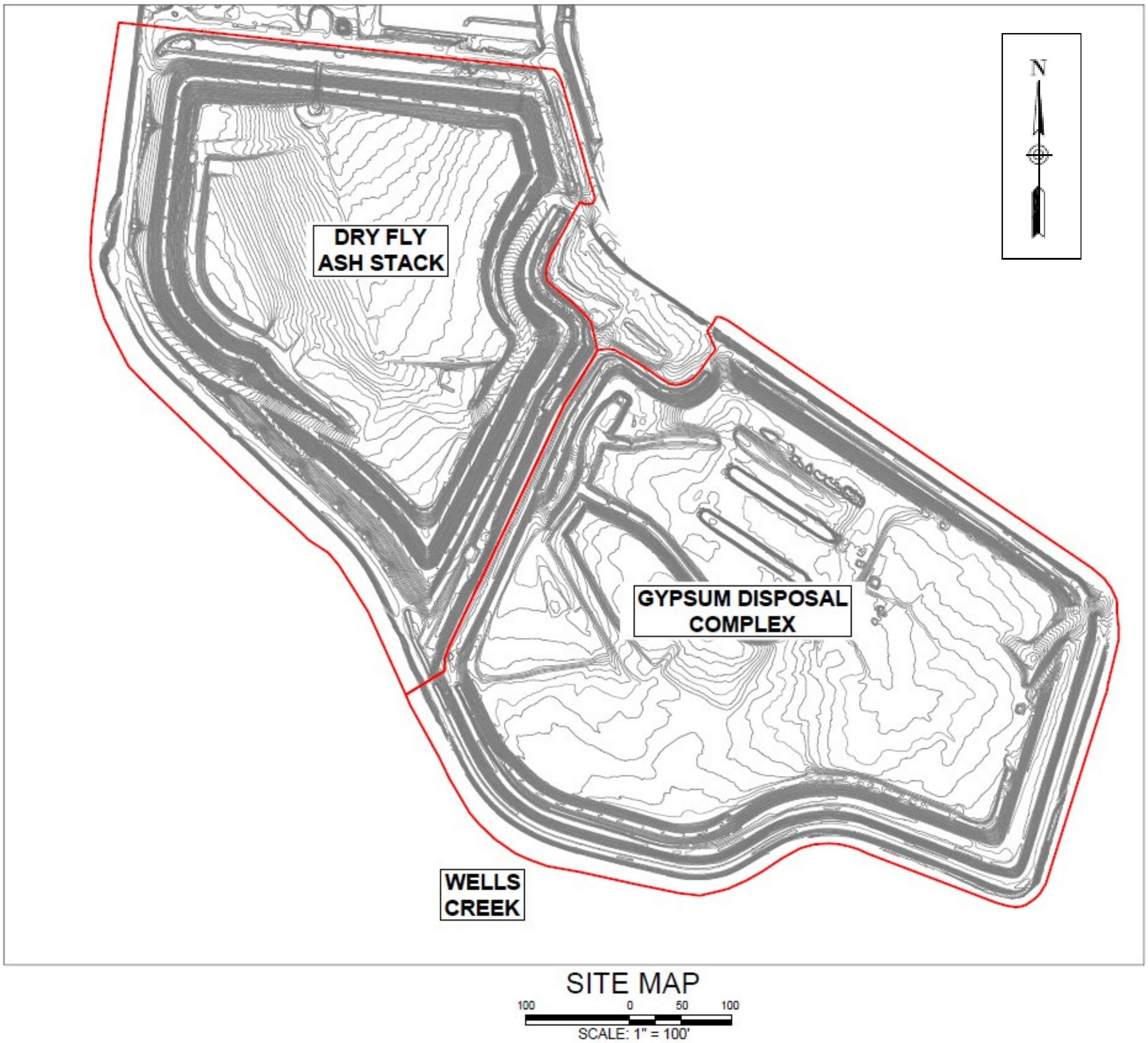

Figure 1. Location of Dry Fly Ash Stack (DFAS) and Gypsum Disposal Complex (GDC) units at CUF

In this updated static and seismic assessment, the critical cross section is defined as a two-dimensional cross section that represents the combination of geometry and subsurface conditions within the CCR management units that is expected to give the lowest factor of safety for global stability of the CCR management unit.

The critical cross sections were selected based on the following methodology:

1. Review the previous stability analysis results and refine the selection of one or more cross sections likely to give the lowest factors of safety for seismic stability.
2. Update the stability analyses with most current information.
3. Proceed with assessment of seismic stability for the selected critical cross section(s).

Table 1 and 2 summarizes the stability analysis results for DFAS and GDC, respectively, obtained by Geocomp in 2019 and 2022. Figure 2 shows the location of the Cross Sections at DFAS and GDC.

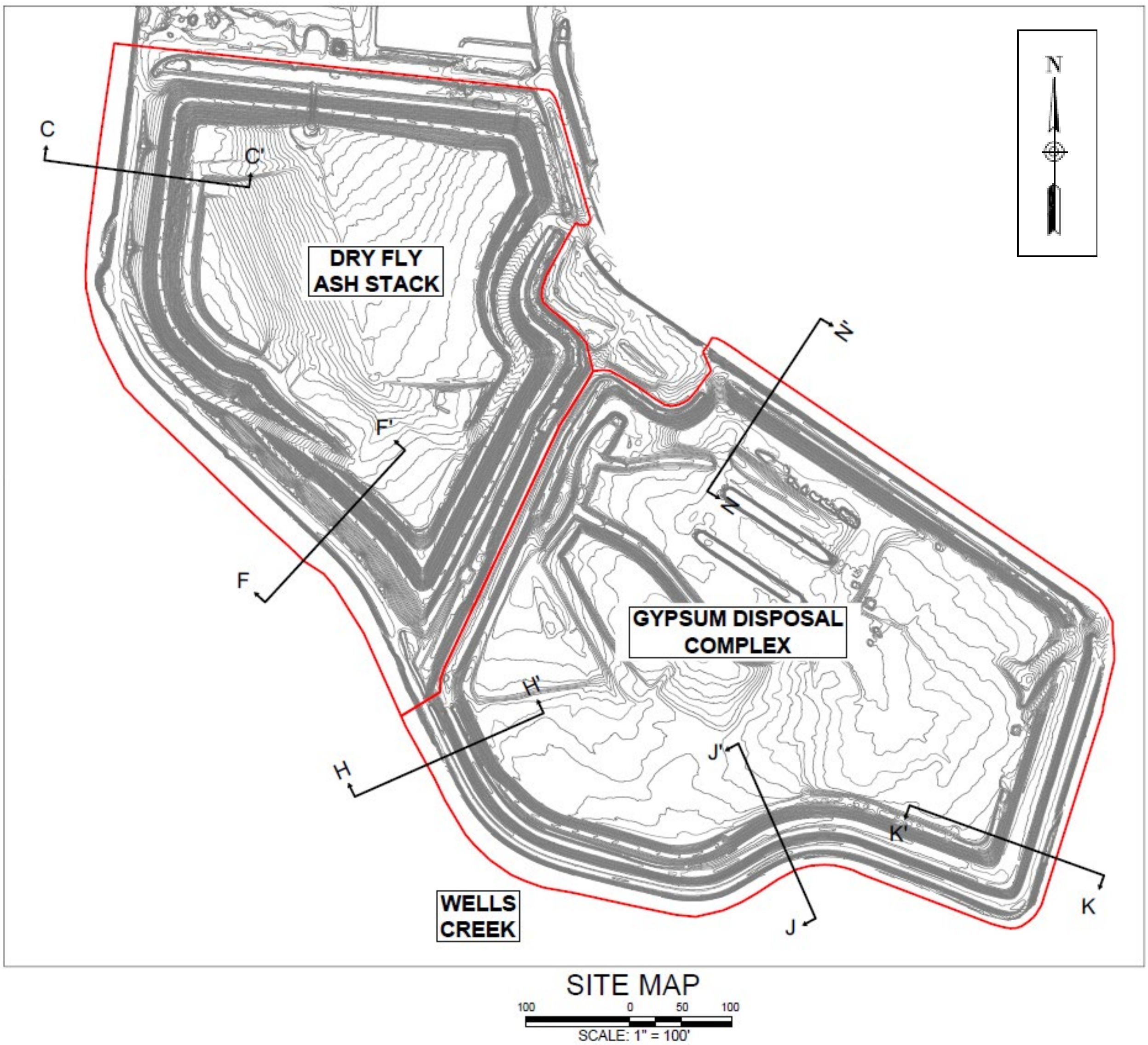

Figure 2. Location of Cross Sections within DFAS and within GDC

Based on the results obtained in 2019, stability results of existing conditions for all static and seismic load cases were the most critical at DFAS unit at Cross Section F-F'. TVA mitigated the stability issue at DFAS unit by constructing a buttress at the toe of the CCR stack along the western perimeter of the unit and improving drainage patterns and travel routes around its periphery. In this updated stability assessment, Cross Sections C-C' and F-F' were selected to be analyzed with as-built buttress geometry and updated piezometric conditions. Cross Section F-F' was selected to be analyzed under future non-marketable stacking conditions where stack height is to 510 ft elevation because it is the most critical cross section at DFAS unit.

At GDC unit, stability analyses conducted by Geocomp in 2019 resulted in factor of safety values less than the acceptance criteria for pseudo-static and post-earthquake load cases at Cross Sections K-K' and for post-earthquake load case at Cross Section N-N'. TVA conducted surface water management improvements, as part of the gypsum harvesting plan. Geocomp conducted interim stability assessments with the improved pore water pressure conditions at GDC unit in March 2022. The factor of safety for post-earthquake load case at Cross Section N-N' improved to meet the criteria (Table 2). With the updated piezometric conditions at GDC unit, the factor of safety for post-earthquake load case at Cross Section K-K' improved. However, it was still below the acceptance criteria. Geocomp designed regrading of Dike 3 to mitigate the stability issue at GDC unit. Redesigned geometry of Dike 3 is modeled as designed future condition in this updated assessment. To determine the extent of needed regrading of Dike 3, Geocomp conducted stability analyses at various cross sections at GDC unit, the results of which are shown in Table 2. Cross Section K-K' represents the critical slope geometry of Dike 3 and Cross Section J-J' represents the critical slope geometry for gypsum stack upslope behind Dike 3. A hybrid Cross Section JK-JK' is created in this updated stability assessment to represent the most critical slope geometry.

In carrying out the assessments for DFAS and GDC, Geocomp performed two-dimensional non-linear ground amplification analyses as well as long-term static, pseudo-static, liquefaction triggering, and post-earthquake slope stability analyses for the three selected cross sections.

Table 1 Summary of Historical Stability Analyses at DFAS Unit

Source	Cross Section	Minimum Factor of Safety (FOS) for Different Load Cases			
		Long-Term Static FOS≥1.5	Pseudo – Static FOS≥1.0	Post – Earthquake FOS≥1.0	Notes
Geocomp July 2019	**C-C'** (Slip Surface)	2.40 (Dike 2)	1.19 (Local 1)	1.07 (Global 2)	• These results are for geometry without the buttress. • Calculated factors of safety for all load cases were above the criteria. • Cross Section C-C' is selected as most critical section for updated stability to provide stability assessment with as built buttress.
	F-F' (Slip Surface)	2.02 (Local 1)	0.92 (Local 1)	0.90 (Global 2)	• These results are for geometry without the buttress. • Calculated factors of safety for pseudo-static and post-earthquake load case were below the criteria. • Cross Section F-F' is selected as most critical section for updated stability assessment to provide stability assessment with as built buttress as well as the future built out geometry.
	F-F' – Future built-out Non-Marketable (Slip Surface)	2.02 (Local 1)	0.91 (Local 1)	0.89 (Global 2)	

* **Bold text** denotes cross sections selected for updated stability assessment in this technical memorandum

Table 2 Summary of Historical Stability Analyses at GDC Unit

Source	Cross Section	Minimum Factor of Safety (FOS) for Different Load Cases			
		Long-Term Static (FOS≥1.5)	Pseudo – Static (FOS≥1.0)	Post – Earthquake (FOS≥1.0)	Notes
Geocomp July 2019	H-H' (Slip Surface)	2.20 (Dike 2)	1.53 (Global 1)	1.20 (Global 2)	• These results are for geometry does not represent redesigned Dike 3 and surface water management improvements. • Calculated factor of safety was above the criteria. • No further assessment was needed.
	K-K' (Slip Surface)	1.72 (Dike 2 Local)	0.90 (Dike 3)	0.64 (Dike 3 Local)	• These results are for geometry does not represent redesigned Dike 3 and surface water management improvements. • Calculated factor of safety for pseudo-static and post-earthquake load case were below the criteria.
	N-N' (Slip Surface)	1.72 (Dike 3 Local)	1.10 (Dike 3)	0.88 (Dike 3)	• These results are for geometry does not represent redesigned Dike 3 and surface water management improvements. • Calculated factor of safety for post-earthquake load case was below the criteria.
Geocomp March 2022 (With updated piezometric conditions)	**K-K'** (Slip Surface)	NA**	NA**	**0.73 (Dike 3 Local)**	• These results are for geometry does not represent redesigned Dike 3 but incorporates surface water management improvements. • Calculated factor of safety for post-earthquake load case was still below the criteria for slip surface going through Dike 3. • Regrading of Dike 3 was designed to mitigate the stability issues. • Cross Section K-K' is selected as part of the hybrid Cross Section JK-JK' for updated stability assessment to provide stability assessment for conditions that represent the design regrading of Dike 3.
	N-N' (Slip Surface)	NA**	NA**	1.02 (Dike 3)	• These results are for geometry does not represent redesigned Dike 3 but incorporates surface water management improvements. • Calculated factor of safety for post-earthquake load case was above the criteria with updated piezometric conditions.

Source	Cross Section	Minimum Factor of Safety (FOS) for Different Load Cases			
		Long-Term Static (FOS≥1.5)	Pseudo – Static (FOS≥1.0)	Post – Earthquake (FOS≥1.0)	Notes
					• No further assessment was needed.
	J-J' (Slip Surface)	NA**	NA**	**1.01** **(Local 1)**	• These results are for geometry does not represent redesigned Dike 3 but incorporates surface water management improvements. • Calculated factor of safety for post-earthquake load case was above the criteria but marginal for a local slip surface within the gypsum stack geometry. • Cross Section J-J' is selected as part of the hybrid Cross Section JK-JK' for updated stability assessment to provide stability assessment for conditions that represent the critical slope geometry of the gypsum stack upslope behind Dike 3.

* **Bold text** denotes cross sections selected for updated stability assessment in this technical memorandum

**NA stands for Not Applicable. These load cases were not analyzed because post-earthquake load case was the controlling load case for seismic stability assessment.

3. GROUND SURFACE ELEVATIONS

The ground surface geometries adopted in the analyses presented in this memorandum are defined as follows:

For DFAS:

- "Existing Conditions" were obtained from contoured plans with planimetric data collected using Light Detection and Ranging (LiDAR) imagery dated September 28, 2022. These data were provided to Geocomp by TVA.
- "Non-Marketable Future Conditions" refers to the ground surface geometry corresponding to the projected stack height with 45 feet of additional Coal Combustion Residuals (CCR). The ground surface elevations for the Non-Marketable Future Condition were provided to Geocomp by TVA electronically on February 1, 2019.

For GDC:

- Existing surface were elevations obtained from contoured plans with planimetric data collected using Light Detection and Ranging (LiDAR) imagery dated January 11, 2022. These data were provided to Geocomp by TVA.
- "Proposed Regrade" geometry of Dike 3 was determined by modifying the existing surface of Dike 3 until the stability criteria for pseudo-static and post-earthquake load cases were met.

4. SUBSURFACE CONDITIONS

The subsurface stratigraphy and material properties at the analyzed cross sections in DFAS and GDC were based on subsurface investigations performed by Stantec and Conetec in 2017/2018[1] and Stantec in 2010. A data report for subsurface investigations performed in 2017/2018 was submitted to TVA by Geocomp in 2020. In this current updated stability assessment, material groups and related parameters are the same as Geocomp's 2019 assessment. Geocomp's stability assessments presented in 2019 were based on the above-mentioned investigations. Geocomp categorized the subsurface materials into the three groups presented in Table 3. This table also includes the type of strength parameters assigned to the materials (i.e. effective stress strength parameters or undrained strengths) for pseudo-static analysis case.

[1] Performed under subcontract to TVA and monitored by Geocomp personnel.

Table 3. Subsurface Material Groups for Pseudo-Static Load Cases

Material Group	Assigned Subsurface Materials	Assigned Strength	
		Above Piezometric Surface	Below Piezometric Surface
High permeability materials	Stacked bottom ash/fly ash, bottom ash dike, bottom ash layer, alluvial silty gravel, dike subgrade, drainage layer, alluvial gravel	Effective Stress Strength	
Low permeability materials	Sluiced fly ash, sluiced fly ash channel, stacked fly ash, alluvial clay, gypsum	Effective Stress Strength	Undrained Strength
Clay dike materials	Dike 1, Dike 2	Undrained Strength	
	Dike 3	Effective Stress Strength	

For post-earthquake stability analyses, all materials that are not expected to liquefy or experience strength loss were assigned strength types as shown in Table 3. All materials that are expected to liquefy or experience strength loss during cyclic loading were assigned post-cyclic undrained shear strengths. For long-term drained stability analyses, all materials were assigned effective stress strengths. Tables A.1 to A.3 in Attachment A lists the selected parameters for all soil layers and all load-cases.

All analyses for DFAS were performed using groundwater conditions obtained from automated piezometer measurements averaged over the period between October 2020 and October 2022. Some instruments in DFAS along cross-section C-C' were disconnected in August 2022 due to construction activities at the site. For those piezometers, values measured for the period between August 2020 and August 2022 were used. At the time when analysis conditions needed to be established, this was the most recent and representative data of the groundwater levels at DFAS. Wells Creek water level was measured continuously except for the period between August 2021 and June 2022 when the equipment was not working[2]. The updated Wells Creek level for the analysis was taken as an average value between November 2020 and November 2022 excluding the time when the gauge was not operational. All analyses for the GDC were performed using average values of piezometer measurements taken between January 14, 2020 and January 14, 2022. We consider average measured pore pressure conditions and river levels over a period of two years that captures the seasonal changes to be the appropriate values to use in the

[2] Confirmed by the TVA Instrumentation engineer Brad Headrick in the email correspondence with Geocomp dated November 16, 2022

seismic assessments to avoid combining the effects of two short-term extreme conditions (earthquake loading and high pore water pressures) that are very unlikely to occur at the same time.

Table of selected material parameters and profiles showing field and laboratory data, piezometric conditions for Cross Sections C-C' and F-F' at DFAS and Cross Section JK-JK' are shown in Attachment A.

5. DESCRIPTION AND RESULTS OF ANALYSES

Geocomp performed two-dimensional non-linear ground amplification analyses as well as static, pseudo-static, and post-earthquake slope stability analyses for the three selected cross sections. Cross Section C-C' at DFAS was evaluated for existing conditions. Cross Section F-F', which showed the lowest FOS for static loading among other sections analyzed in prior assessments, was evaluated for the existing and future stacking conditions. Cross section JK-JK' at GDC was evaluated for proposed regraded Dike 3. The ground amplification analyses were performed using the finite element software OpenSees. For Cross Sections C-C' and F-F', the amplification analysis results conducted in 2019 assessment were utilized because the geometry change related to new buttress with respect to the complete geometry of the cross section was not significant for seismic considerations. For a new and hybrid Cross Section JK-JK', updated amplification analyses were conducted to determine the displacement compatible pseudo-static coefficients. All slope stability analyses were performed using the commercial limit equilibrium analysis software Slope/W by Geoslope International with the Spencer method. Figure 3 shows the slip surface convention used for presenting the stability results.

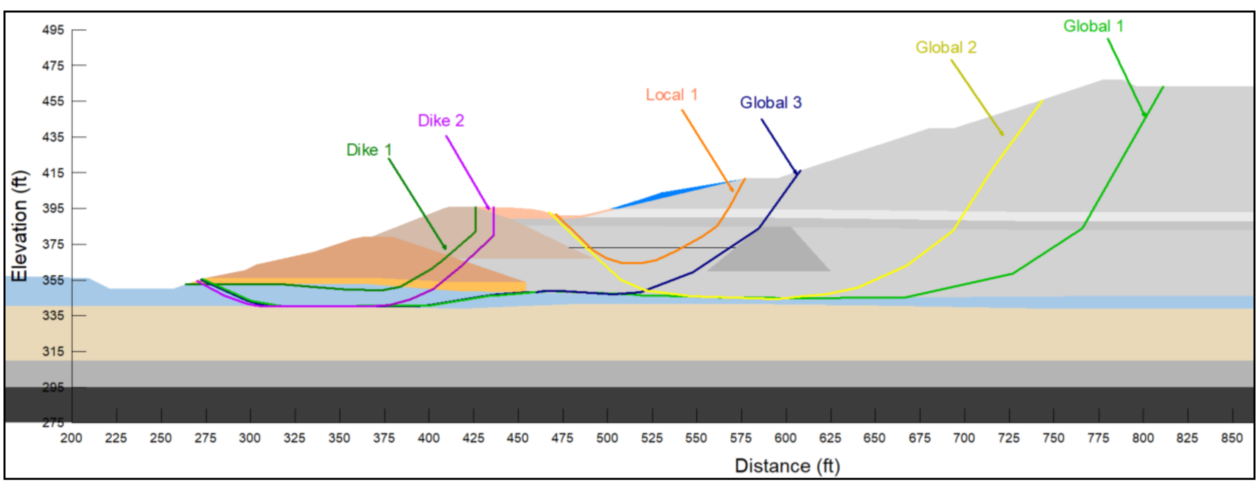

Figure 3. Convention used to Label Slip Surfaces

EXISTING AND PROPOSED REGRADE CONDITIONS

Geocomp analyzed three stability load cases to evaluate the Factors of Safety (FOS) for "Existing Conditions" at DFAS and "Proposed Regrade" at GDC. Unless otherwise stated, the strength types adopted for subsurface materials are as shown in Table 3. The groundwater conditions used in all three analyses were the baseline conditions presented in Section 3. The three stability load cases analyzed were as follows:

- *Static stability analysis for drained loading*

  This analysis was used to determine the FOS for drained loading. For this case, all subsurface materials were assigned effective stress strength parameters.

- *Pseudo-static stability analysis*

  This analysis was performed to determine the pseudo-static FOS under a horizontal seismic coefficient corresponding to 18 inches of allowable slope displacement, which is a more cautious criterion than the 36 inches outlined in TDEC Order Stability SAP. The horizontal seismic coefficient giving 18 inches of permanent displacement was determined using Newmark sliding block analysis.

- *Post-earthquake stability analysis*

  This analysis was performed to determine the static stability immediately following an earthquake. As a starting point, the evaluation of the potential for liquefaction triggering was performed using the procedure proposed by Boulanger and Idriss (2008, 2014)[3]. This evaluation was further refined using cyclic laboratory test data to determine: (1) if a material will liquefy by shaking and (2) undrained shear strengths of materials after cyclic loading. For materials with insufficient or no laboratory test data, shear strengths after cyclic loading were determined using the correlations developed by Boulanger and Idriss (2008). Materials that are not expected to liquefy or soften were assigned the same shear strengths as in the static stability analysis for undrained loading.

Results of the slope stability analysis for each load case under existing conditions are presented in Tables 4 and 5 for the slip surfaces shown in the convention presented in Figure 3. Cross-sections for all analyzed critical surfaces with corresponding factors of safety are presented in Attachment B of this memorandum.

---

[3] Boulanger, R.W. and Idriss, I.M. (2008). Soil Liquefaction During Earthquakes, Earthquake Engineering Research Institute.
Boulanger, R.W. and Idriss, I.M. (2014). CPT and SPT Based Liquefaction Triggering Procedures, Report No. UCD/CGM-14/01, Center for Geotechnical Modeling, Department of Civil and Environmental Engineering, University of California, Davis, April.

Table 4. FOS Computed for DFAS under Existing Conditions

DFAS Existing Conditions						
Analysis	Cross Section C-C'			Cross Section F-F'		
	Static drained loading	Pseudo-static k_h[a]	Post-earthquake	Static drained loading	Pseudo-static k_h[a]	Post-earthquake
Local 1	3.66	2.39 (k_h = 0.022)	2.45	2.56	1.22 (k_h = 0.019)	1.24
Global 1	2.72	2.07 (k_h = 0.017)	2.07	2.29	1.31 (k_h = 0.016)	1.07
Global 2	2.92	1.71 (k_h = 0.021)	1.44	2.31	1.35 (k_h = 0.017)	1.09
Global 3	2.35	NA[b]	1.96	2.62	1.43 (k_h = 0.020)	1.22
Dike 1	2.43	1.97 (k_h = 0.030)	2.19	2.01	1.83 (k_h = 0.020)	1.81
Dike 2	1.94	2.03 (k_h = 0.030)	1.84	1.99	1.63 (k_h = 0.018)	1.48

Note: [a] k_h refers to the 18-inch displacement compatible horizontal seismic coefficient used in the pseudo-static stability analysis.
[b] NA stands for Not Applicable. This slip surface was not critical for seismic load cases and was not included in this table.

Table 5. FOS Computed for GDC for Proposed Regrade Conditions

GDC "Proposed Regrade" Conditions			
Analysis	Cross Section JK-JK'		
	Static drained loading	Pseudo-static k_h[a]	Post-earthquake
Local1	3.58	2.02 (k_h = 0.027)	1.79
Global 1	2.25	1.44 (k_h = 0.020)	1.15
Global 2	3.23	1.41 (k_h = 0.020)	1.11
Global 3	2.95	1.36 (k_h = 0.024)	1.08
Dike 2	1.67	NA[b]	1.65
Dike 3	3.02	1.55 (k_h = 0.023)	1.30
Dike 3 Local	2.79	1.43 (k_h = 0.025)	1.09

Note: [a] k_h refers to the 18-inch displacement compatible horizontal seismic coefficient used in the pseudo-static stability analysis.
[b] NA stands for Not Applicable. This slip surface was not critical for seismic load cases and was not included in this table.

FUTURE STACKING CONDITIONS

Geocomp analyzed three stability load cases to evaluate the Factors of Safety (FOS) at DFAS for Non-Marketable Future Conditions. Unless otherwise stated, the strength types adopted for subsurface materials are as shown in Table 3. Groundwater conditions used in the analyses were the baseline conditions presented in Section 3. The three stability load cases analyzed were as follows:

- *Static stability analysis for drained loading*

  These analyses were used to determine the FOS for drained loading. All materials in this analysis were assigned effective stress strength parameters and baseline groundwater conditions.

- *Pseudo-static stability analysis*

  These analyses were performed to determine the pseudo-static FOS under a horizontal seismic coefficient corresponding to 18 inches of allowable slope displacement. This horizontal seismic coefficient was determined using Newmark sliding block analyses. The approach to assign strength types for this load case is generally the same as the approach adopted in the pseudo-static stability analysis for existing conditions. The only difference is that the strengths in this case were based on effective stresses corresponding to the full load of the future stacking under the baseline pore water pressure conditions. This corresponds to the time when all excess pore pressures due to stacking have fully dissipated.

- *Post-earthquake stability analysis*

  These analyses were performed to determine the static stability of the full stack immediately after an earthquake. The approach to assign strength types for this load case is generally the same as the approach adopted in the post-earthquake stability analysis for existing conditions. The only difference is that the strengths in this case were based on effective stresses corresponding to the full load of the future stacking under the baseline ground water conditions. This corresponds to the time when all excess pore pressures due to stacking have fully dissipated.

Table 6 shows the factor of safety computed from slope stability analysis for each load case under future built out conditions for the slip surfaces shown in the convention presented in Figure 3. Results for all analyzed critical surfaces are presented in Attachment B of this memorandum.

Table 6. FOS Computed for DFAS under Non-Marketable Future Stacking Condition

DFAS Future Non-Marketable Stacking Scenario - Cross Section F-F'			
Analysis	Static drained loading	Pseudo-static k_h[(a)]	Post-earthquake
Local 1	2.56	1.22 (k_h = 0.019)	1.24
Global 1	2.23	1.28 (k_h = 0.016)	1.05
Global 2	2.20	1.28 (k_h = 0.017)	1.04
Global 3	2.62	1.44 (k_h = 0.020)	1.22
Dike 1	2.01	1.85 (k_h = 0.020)	1.81
Dike 2	1.99	1.63 (k_h = 0.018)	1.48

Note: [(a)] k_h refers to the 18-inch displacement compatible horizontal seismic coefficient used in the pseudo-static stability analysis.

6. DISCUSSION

The results of the static and seismic stability assessment of TVA CUF site indicate that Cross Sections C-C', F-F', and JK-JK' selected as the most representative of the potentially critical cross sections satisfy the stability criteria for static and seismic stability of a CCR management unit. Table 7 summarizes the results for the long-term static, pseudo-static, and post-earthquake factor of safety for all Cross Sections C-C', F-F', and JK-JK' where the minimum factor of safety at each cross section is shown.

Table 7. Summary of Factors of Safety from Slope Stability Analysis

Load Case	CUF Unit	Cross Section	Slip Surface	Calculated minimum FOS	Required FOS
Long-Term Static	DFAS	C-C'	Dike 2	1.94	≥ 1.5
		F-F'	Dike 2	1.99	
		F-F' (Non-Marketable)	Dike 2	1.99	
	GDC	JK-JK' (Proposed Regrade)	Dike 2	1.67	
Pseudo-Static	DFAS	C-C'	Global 2	1.59	≥ 1.0
		F-F'	Local 1	1.22	
		F-F' (Non-Marketable)	Local 1	1.22	
	GDC	JK-JK' (Proposed Regrade)	Global 3	1.36	
Post-Earthquake	DFAS	C-C'	Global 2	1.44	≥ 1.0
		F-F'	Global 1	1.07	
		F-F' (Non-Marketable)	Global 2	1.04	
	GDC	JK-JK' (Proposed Regrade)	Global 3	1.08	

At DFAS with installed buttress and improved pore water pressure conditions the resulting factors of safety for global stability now meet or exceed all required minimum values. At GDC after the completion of the proposed regrading of Dike 3 and improved pore water pressure conditions, the resulting factors of safety for global stability meet or exceed all required minimum values.

Please do not hesitate to contact us if you have questions or comments.

Sincerely yours,

W. Allen Marr, PhD, P.E., D.GE, NAE
CEO, Geocomp

Attachments:
Attachment A – Parameter Development Tables and Profiles
Attachment B – Results of Slope Stability Analyses

Attachment A. Parameter Development Profiles

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Parameter Development Profiles

Dry Fly Ash Stack

Cross Section C-C'

Table A.1 Selected Soil Parameters for Stability Analyses – Cross Section C-C’ at DFAS

Cross Section	Soil Layers	Unit Weight (pcf)	σ'_p(psf)	Long-term Static Strength Parameters		Pseudo-Static Strength Parameters		Post-Earthquake Strength Parameters
				Effective Friction Angle, ϕ’ (deg)	Cohesion (psf)	Effective Friction Angle, ϕ’ (deg)	Undrained Strength Ratio, S_u/σ'_v or Undrained Strength, S_u (psf)	Residual/Softened Undrained Strength Ratio S_r/σ'_v
Cross-section C-C	Stacked Fly Ash	95	N/A	40	0	40	N/A	N/A
	Stacked Bottom Ash/ Fly Ash	100	N/A	38	0	38	N/A	N/A
	Sluiced Fly Ash 1	100	N/A	25	0	25	N/A	N/A
	Sluiced Fly Ash 2	100	N/A	25	0	N/A	0.24	0.15
	Sluiced Fly Ash Channel 1	100	N/A	25	0	25	N/A	N/A
	Sluiced Fly Ash Channel 2	100	N/A	25	0	N/A	0.16	0.15
	Upper Alluvial Clay_Crest	123	12,200	32	0	32	Defined as a function in stability models; $\frac{S_u}{\sigma'_v} = S \times \left(\frac{\sigma'_p}{\sigma'_v}\right)^m$ where S=0.24, m=0.82	Defined as a function in stability models; $\frac{S_u}{\sigma'_v} = S \times \left(\frac{\sigma'_p}{\sigma'_v}\right)^m$ where S=0.18, m=0.84
	Upper Alluvial Clay_Dike	120	6,900	32	0	32		
	Upper Alluvial Clay_Dike 2	120	6,900	32	0	32		
	Upper Alluvial Clay_Dike 1 Toe	120	6,900	32	0	32		
	Upper Alluvial Clay_Toe	116	6,900	32	0	32		
	Lower Alluvial Clay_Crest	123	15,500	32	0	32		
	Lower Alluvial Clay_Dike	124	11,800	32	0	32		
	Lower Alluvial Clay_Toe	118	8,500	32	0	32		
	Alluvial Sandy Clay Crest	120	10,600	32	0	32		
	Alluvial Sandy Clay Dike	120	11,800	32	0	32		
	Alluvial Sandy Clay Toe	120	10,100	32	0	32		
	Dike 1	122	N/A	35	250	35	1,000 psf	N/A
	Dike 1 Subgrade	115	N/A	30	0	30	N/A	N/A
	Dike 2	128	N/A	35	250	35	1,500 psf	N/A
	Bottom Ash Dike	115	N/A	35	0	35	N/A	N/A
	Buttress (bottom ash)	105	N/A	35	0	35	N/A	N/A

Notes: N/A: Not applicable

σ'_p – Maximum past pressure

σ'_v – Vertical effective stress

S_u – Undrained shear strength

FIGURE A.1: CUF C-C' - CREST - Stress and Index Parameters

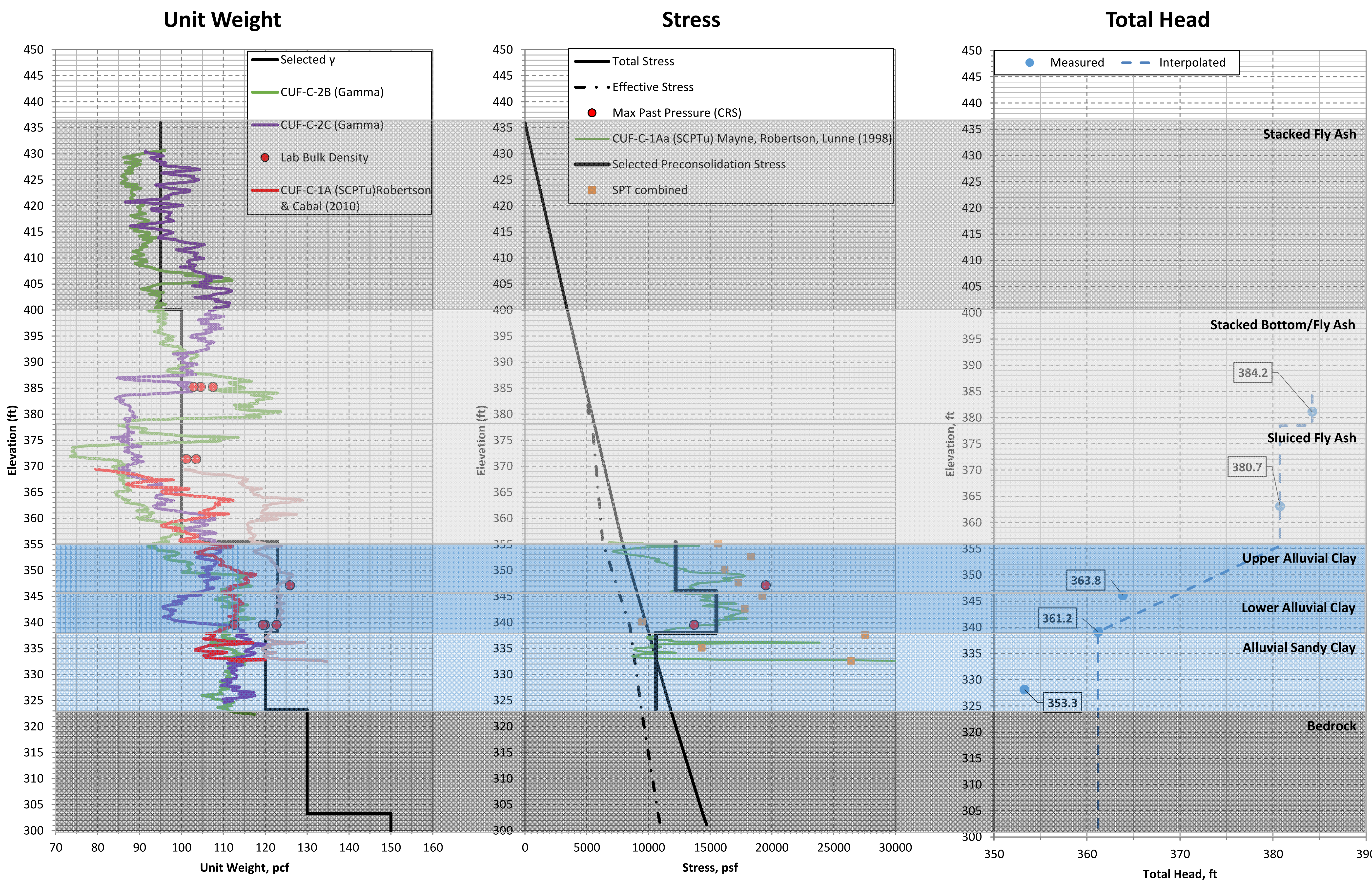


FIGURE A.2: CUF-C-C' - CREST- Shear Strength Parameters

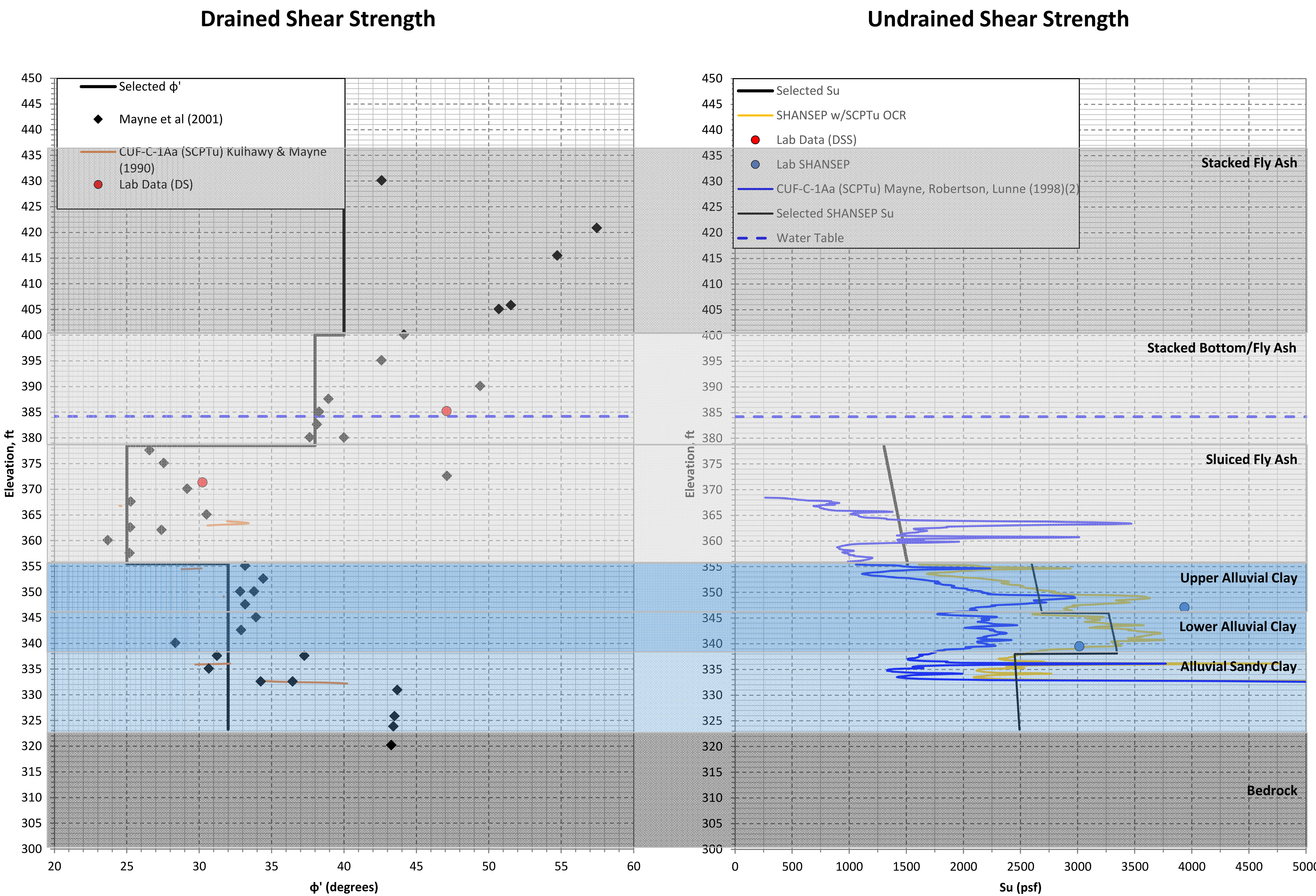


FIGURE A.3: CUF C-C' - TOE - Stress and Index Parameters

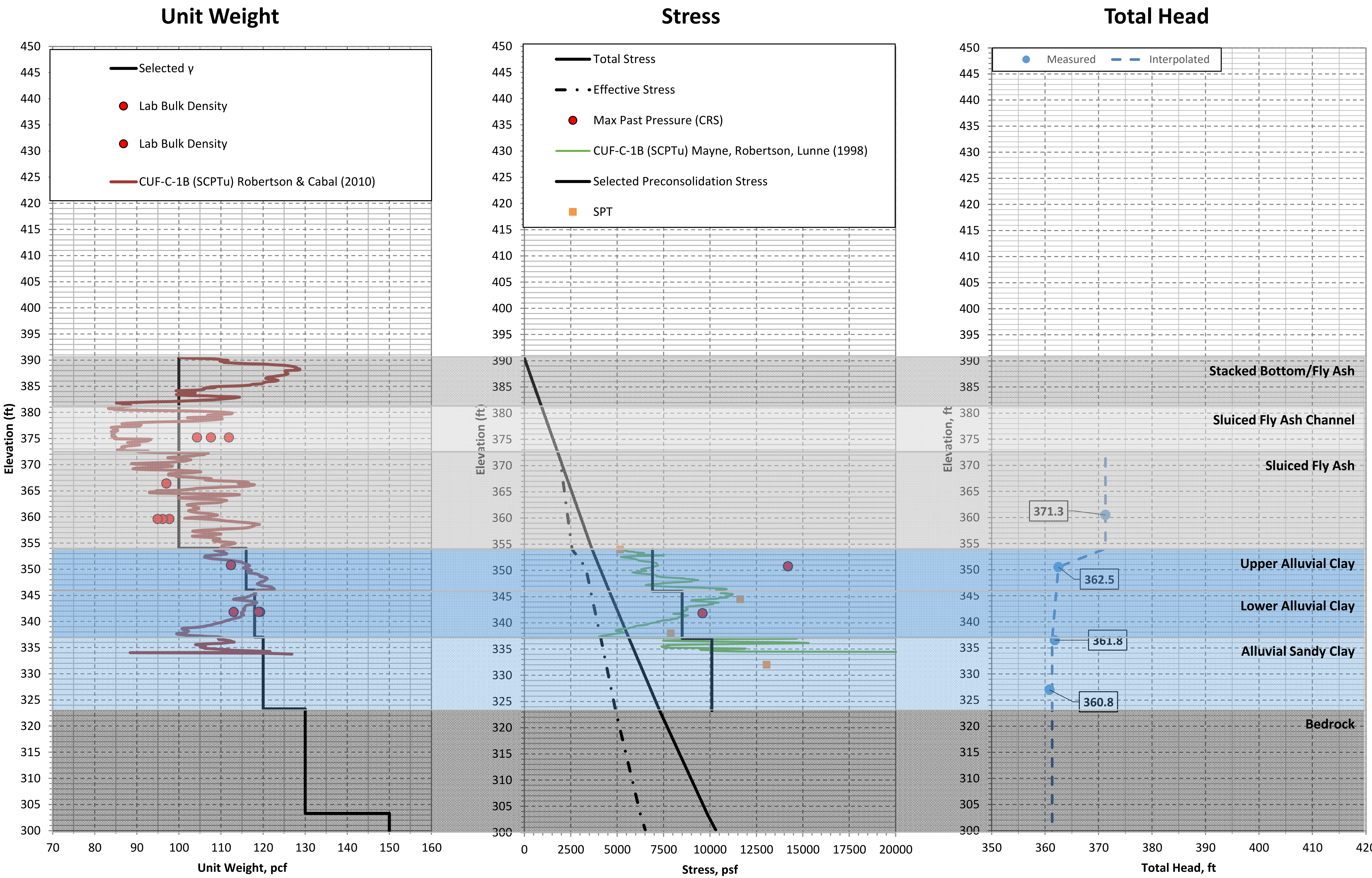


FIGURE A.4: CUF-C-C' - TOE- Shear Strength Parameters

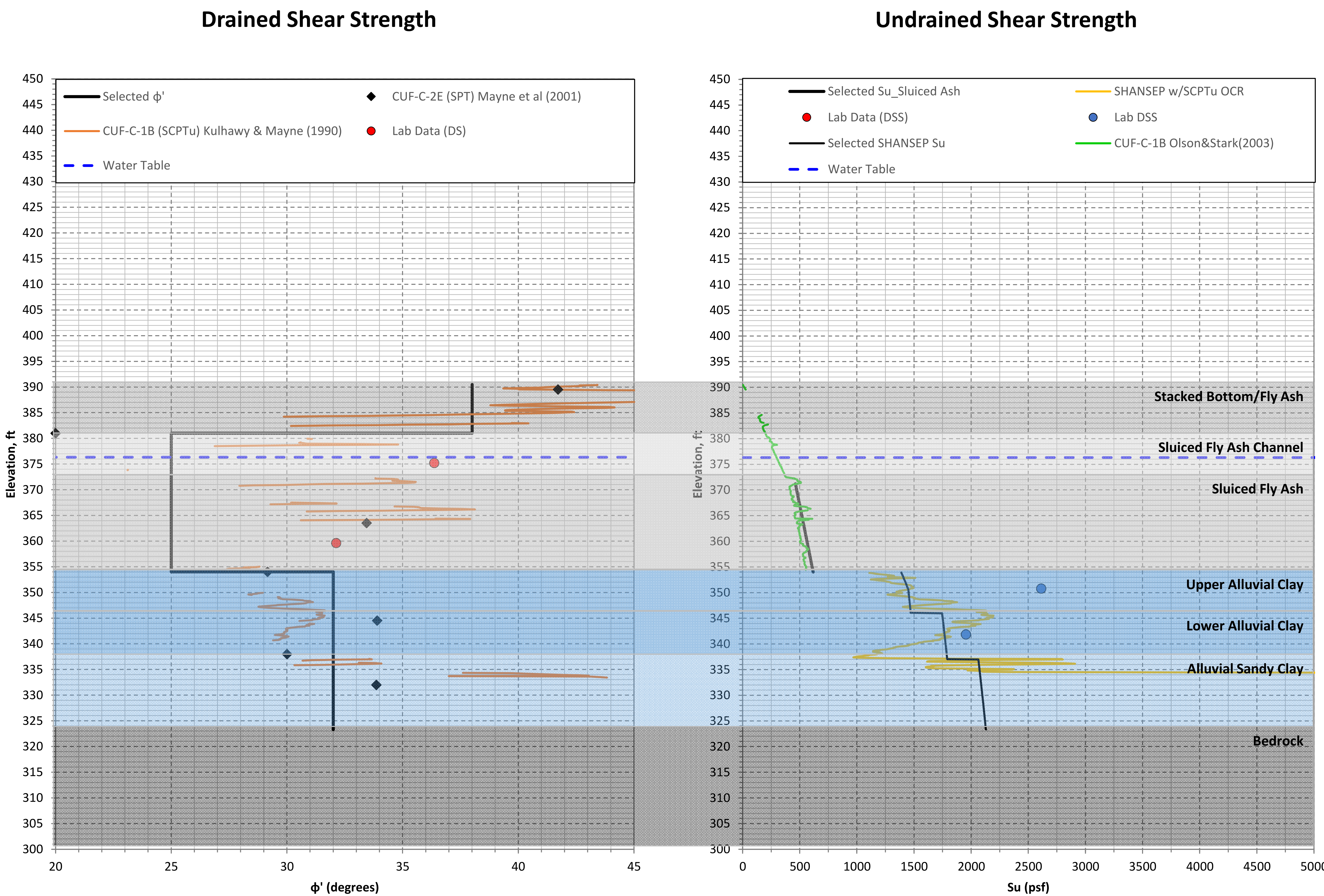


FIGURE A.5: CUF C-C' - DIKE - Stress and Index Parameters

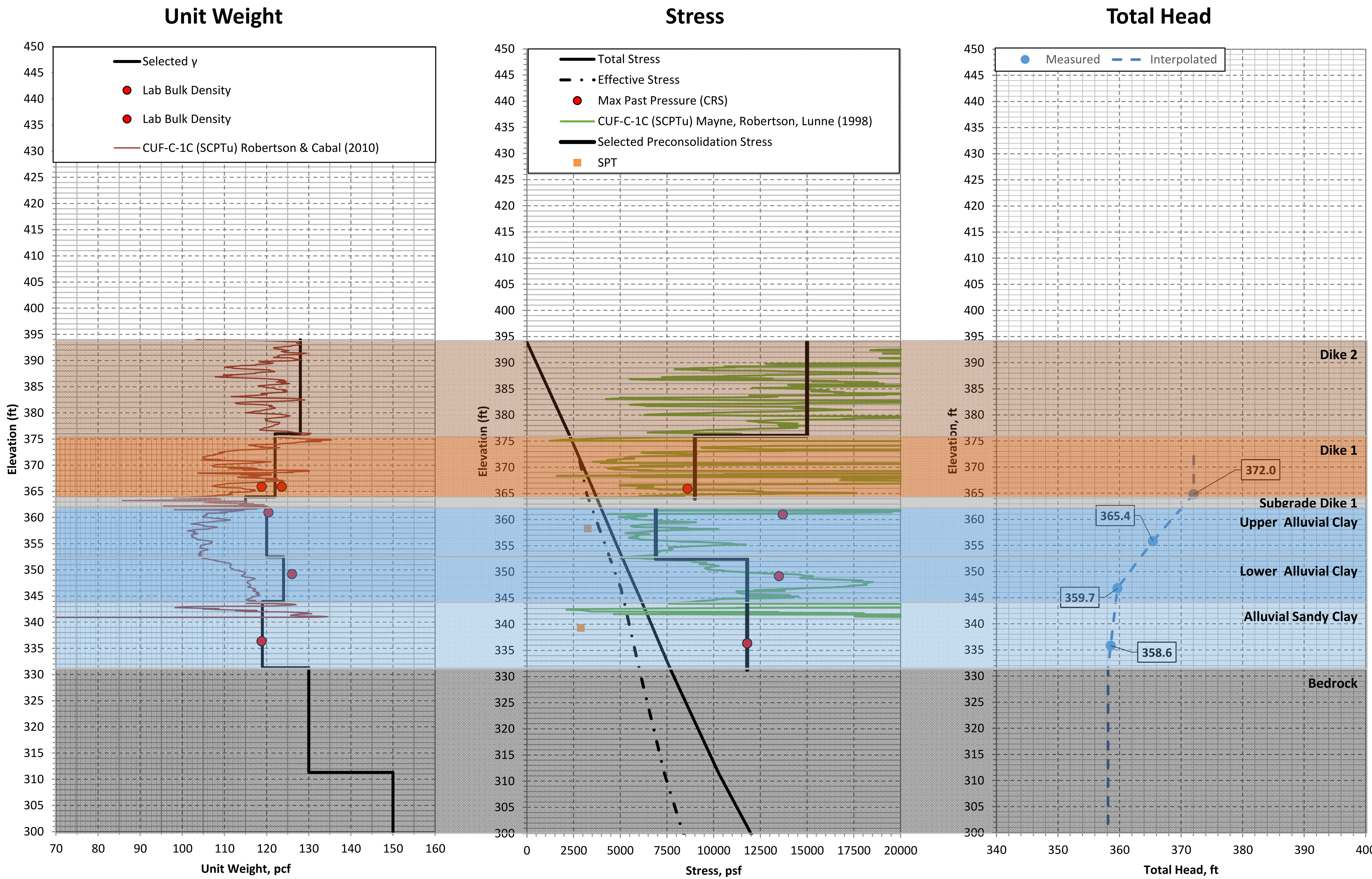
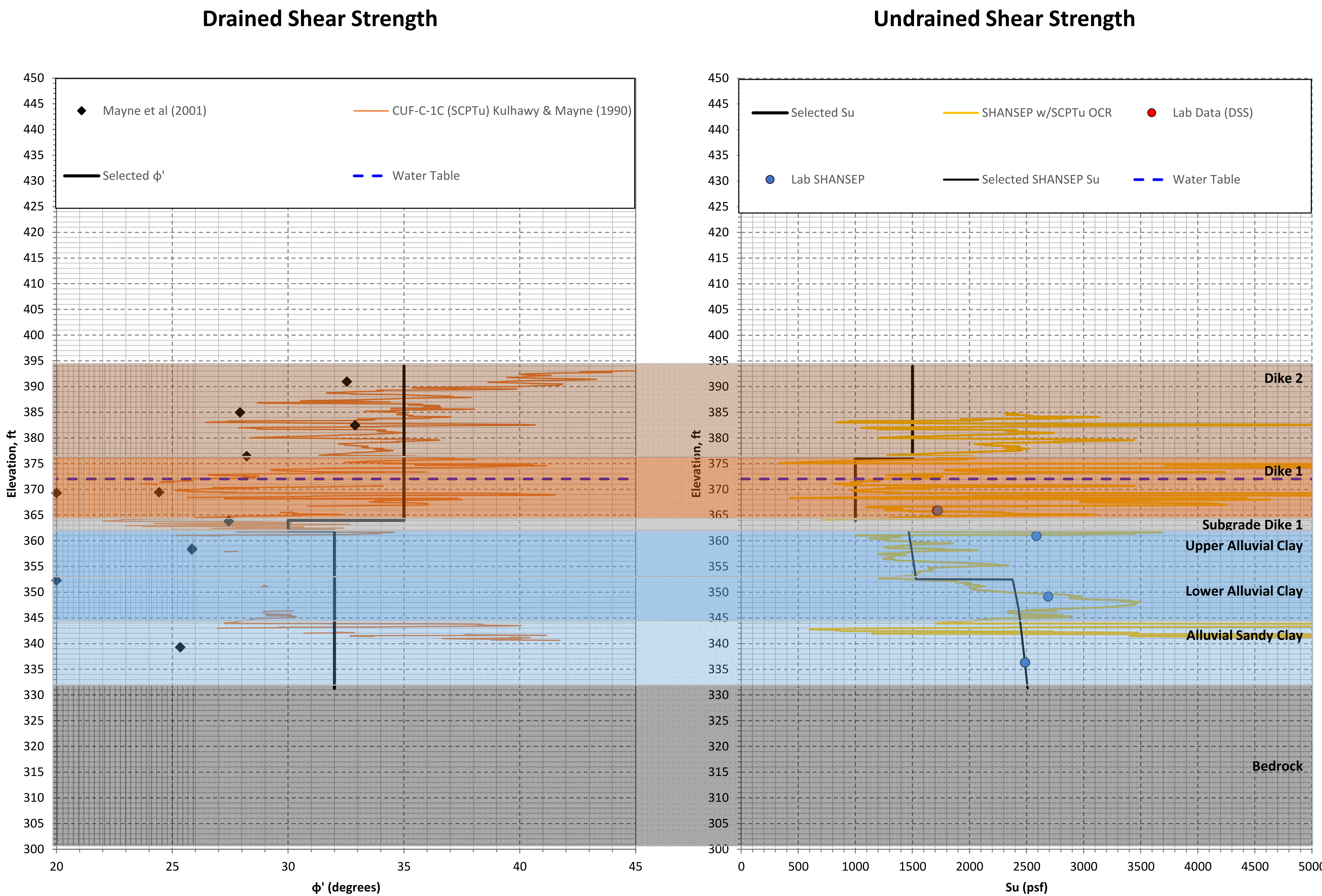


FIGURE A.6: CUF-C-C' - DIKE - Shear Strength Parameters



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Parameter Development Profiles

Dry Fly Ash Stack

Cross Section F-F'

Table A.2 Selected Soil Parameters for Stability Analyses – Cross Section F-F' at DFAS

Cross Section	Soil Layers	Unit Weight (pcf)	σ'_p(psf)	Long-term Static Strength Parameters		Pseudo-Static Strength Parameters		Post-Earthquake Strength Parameters
				Effective Friction Angle, ϕ' (deg)	Cohesion (psf)	Effective Friction Angle, ϕ' (deg)	Undrained Strength Ratio, S_u/σ'_v or Undrained Strength, S_u (psf)	Residual/Softened Undrained Strength Ratio S_r/σ'_v
Cross-section F-F	Stacked Fly Ash	110	N/A	40	0	40	N/A	N/A
	Stacked Bottom Ash/ Fly Ash	110	N/A	34	0	34	N/A	N/A
	Drainage Layer	110	N/A	32	0	32	N/A	N/A
	Sluiced Fly Ash 1	100	N/A	25	0	25	N/A	N/A
	Sluiced Fly Ash 2	100	N/A	25	0	25	0.24	0.15
	Sluiced Fly Ash Channel 1	100	N/A	25	0	25	N/A	N/A
	Sluiced Fly Ash Channel 2	100	N/A	25	0	25	0.16	0.15
	Alluvial Clay Bench	120	7700	32	0	32	Defined as a function in stability models; $\frac{S_u}{\sigma'_v} = S \times \left(\frac{\sigma'_p}{\sigma'_v}\right)^m$ where S=0.24, m=0.82	Defined as a function in stability models; $\frac{S_u}{\sigma'_v} = S \times \left(\frac{\sigma'_p}{\sigma'_v}\right)^m$ where S=0.18, m=0.84
	Alluvial Clay Crest	120	9,500	32	0	32		
	Alluvial Clay Dike 1	120	5,500	32	0	32		
	Alluvial Clay Dike 2	120	4700	32	0	32		
	Alluvial Clay Toe	120	6,600	32	0	32		
	Alluvial Silty Gravel	121	N/A	34	0	34	N/A	N/A
	Dike 1	125	N/A	35	250	35	1,500 psf	N/A
	Dike 1 Subgrade	125	N/A	34	0	34	N/A	N/A
	Dike 2	127	N/A	35	250	35	1,750 psf	N/A
	Bottom Ash Dike	115	N/A	35	0	35	N/A	N/A
	Buttress (soil)	122	N/A	Bilinear $\phi_1' = 36$, $\phi_2' = 19$ at $\sigma'_v = 523.3$ psf	200	Bilinear $\phi_1' = 36$, $\phi_2' = 19$ at $\sigma'_v = 523.3$ psf	N/A	N/A
	Buttress (riprap)	132	N/A	40	0	40	N/A	N/A

Notes: N/A: Not applicable
σ'_p – Maximum past pressure
σ'_v – Vertical effective stress
S_u – Undrained shear strength

FIGURE A.7: CUF F-F' - CREST - Stress and Index Parameters

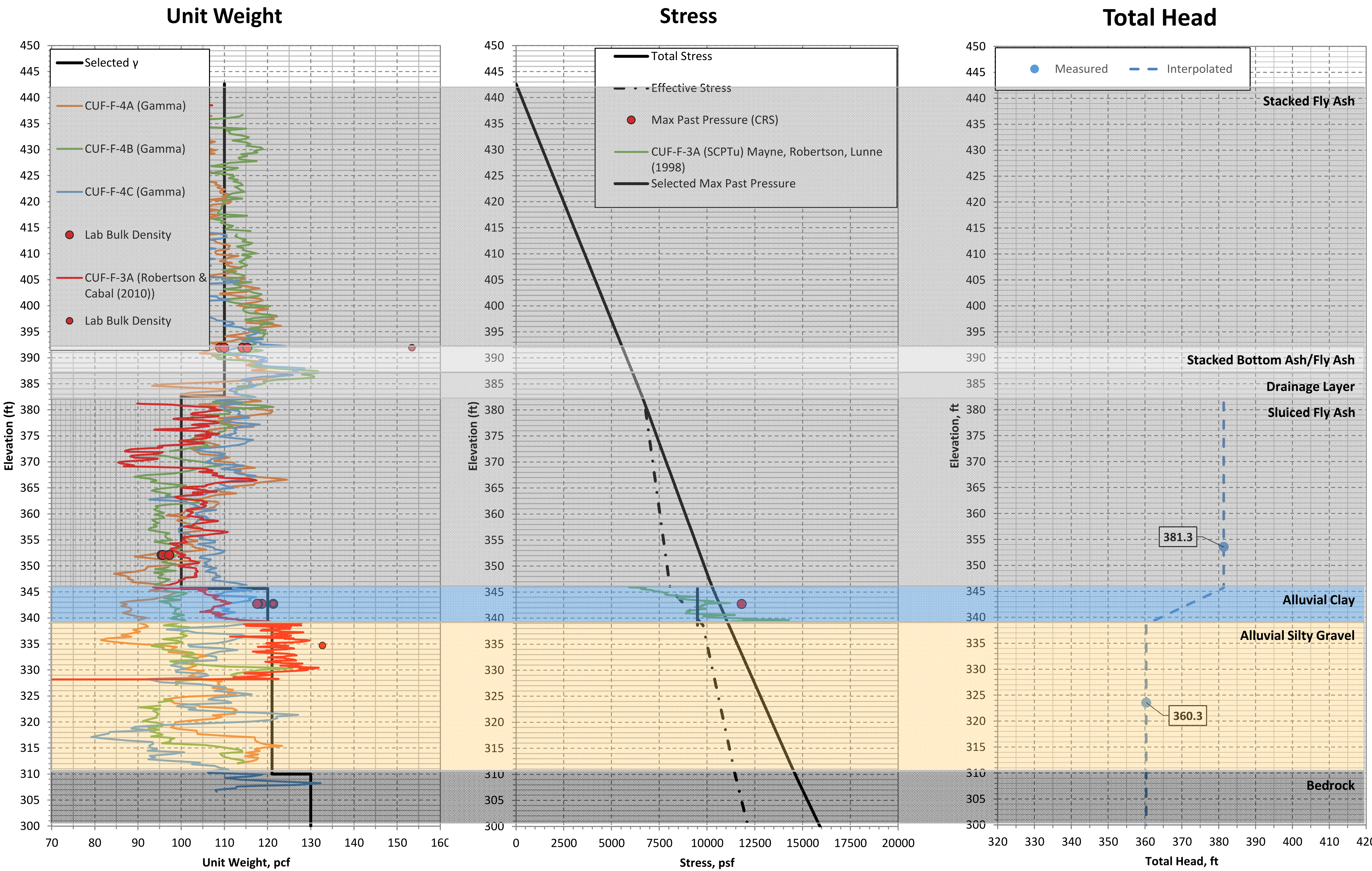


FIGURE A.8: CUF-F-F' - CREST- Shear Strength Parameters

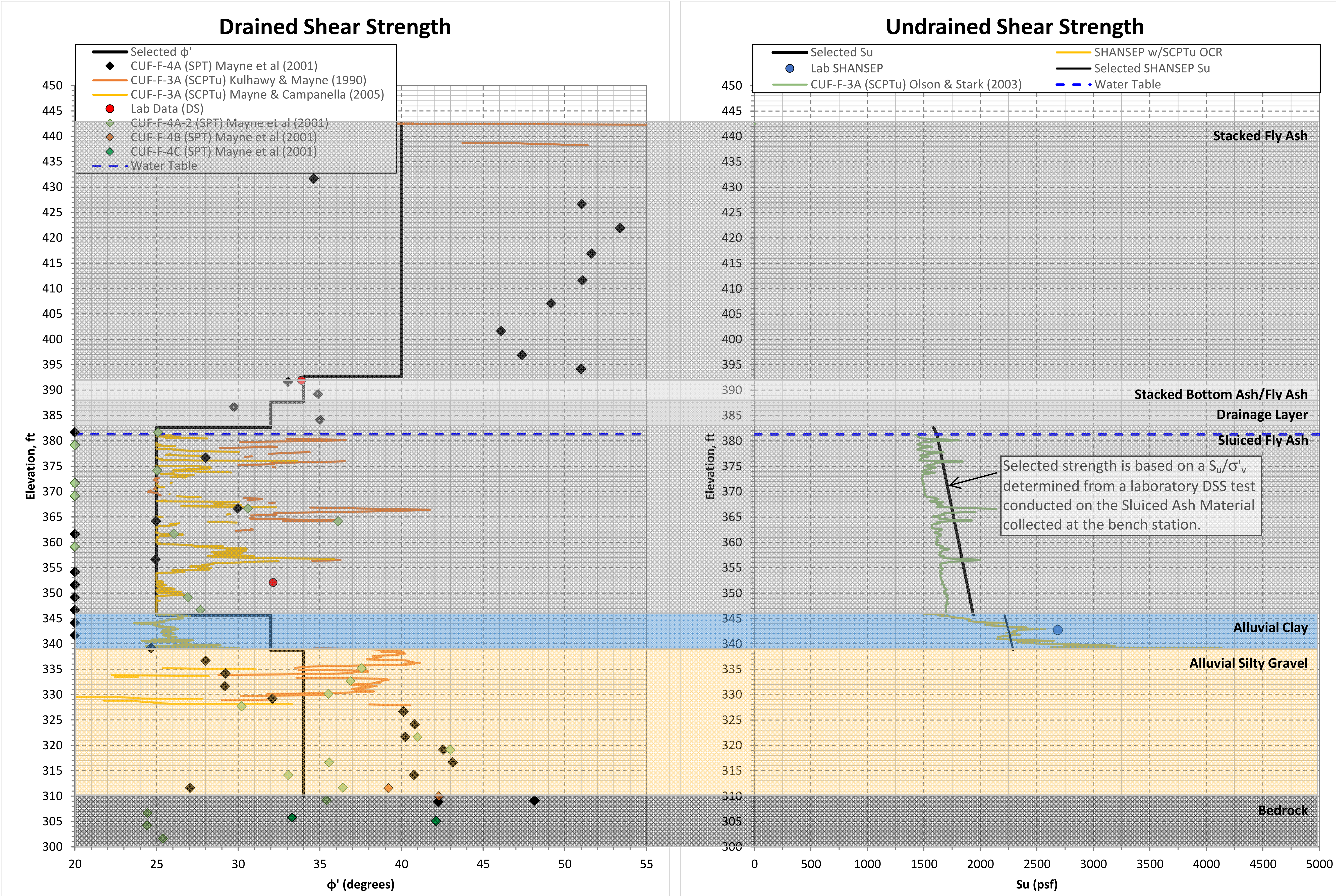


FIGURE A.9 : CUF F-F' - BENCH - Stress and Index Parameters

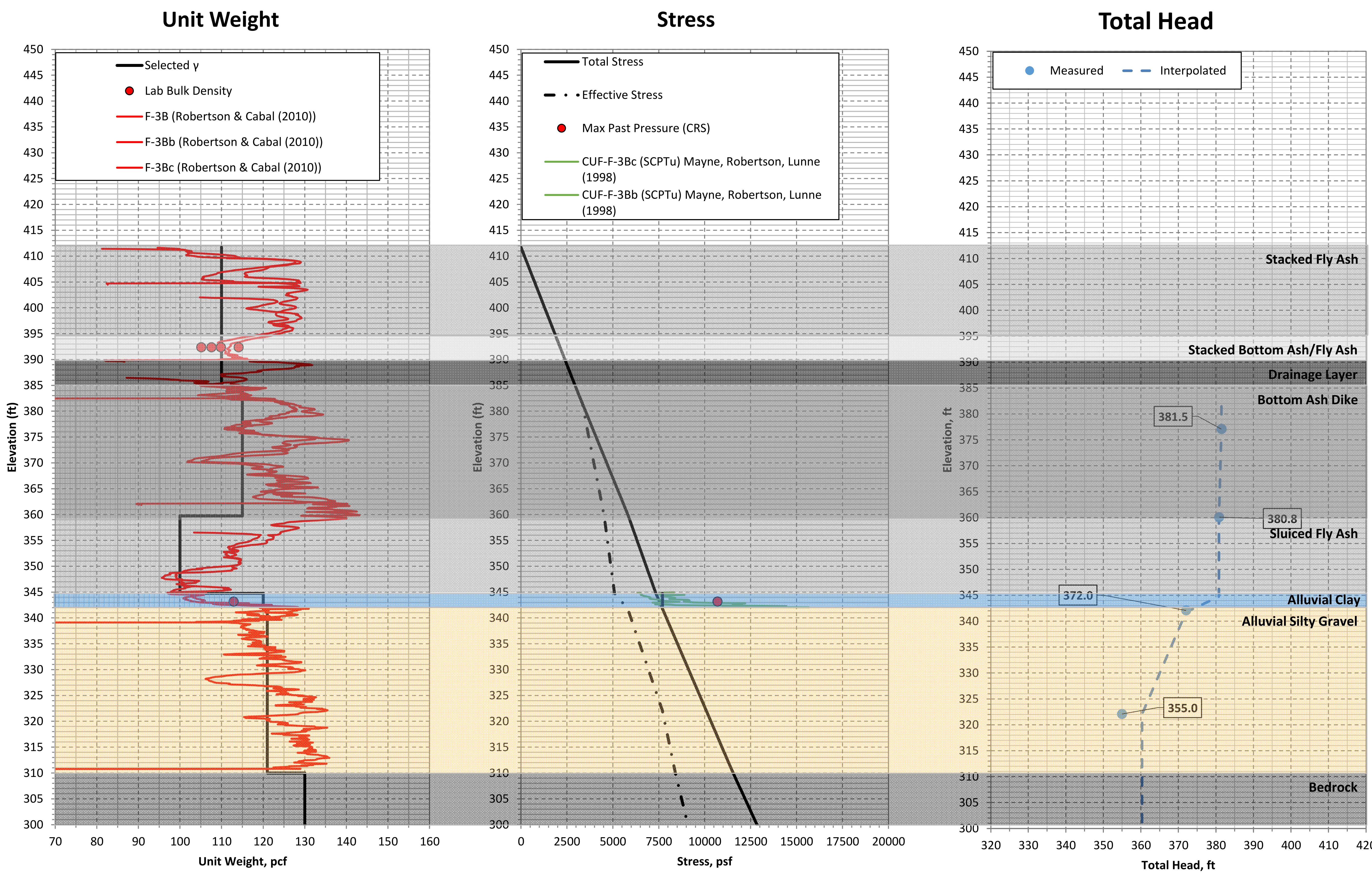


FIGURE A.10: CUF-F-F' - BENCH - Shear Strength Parameters

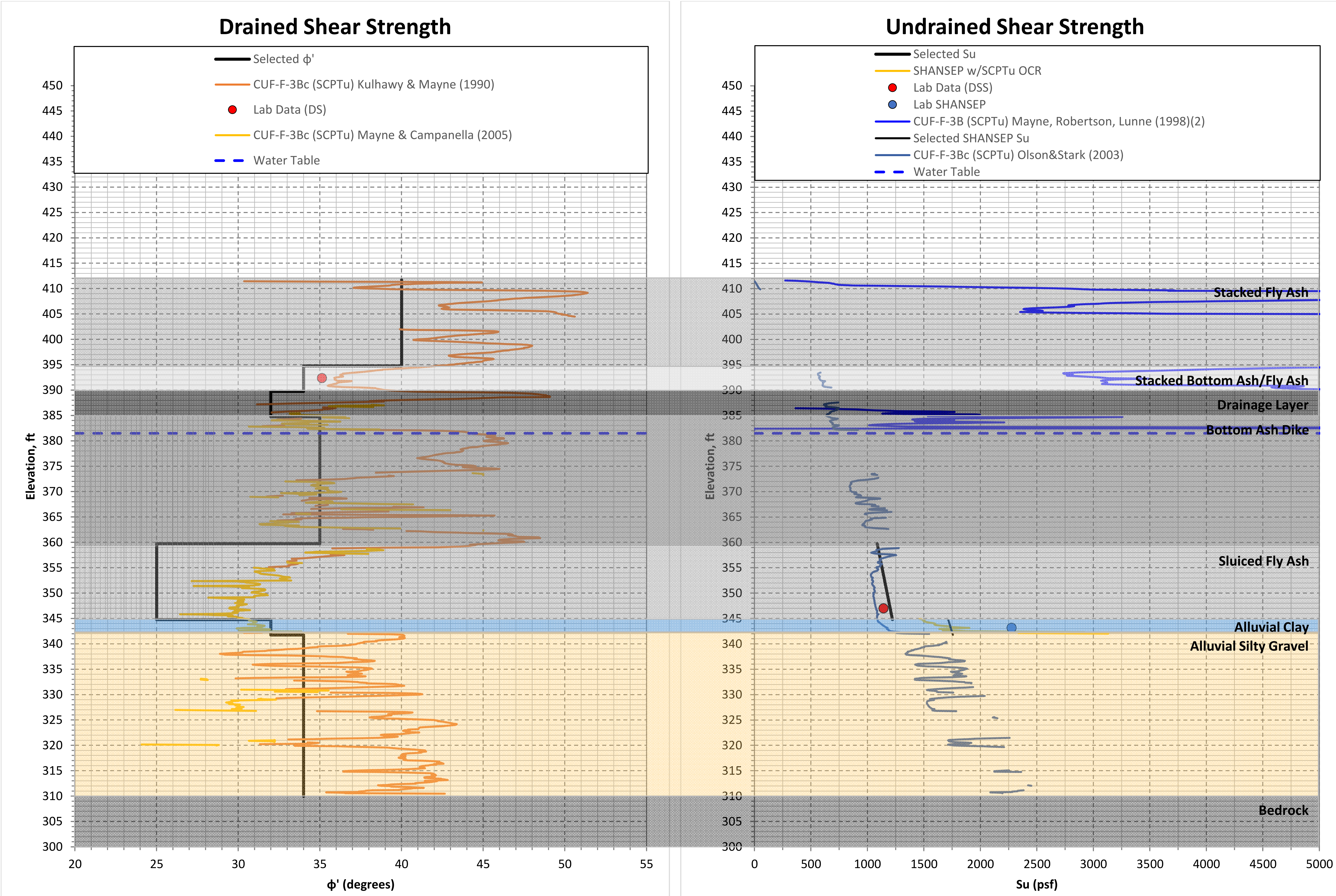


FIGURE A.11 : CUF F-F' - TOE - Stress and Index Parameters

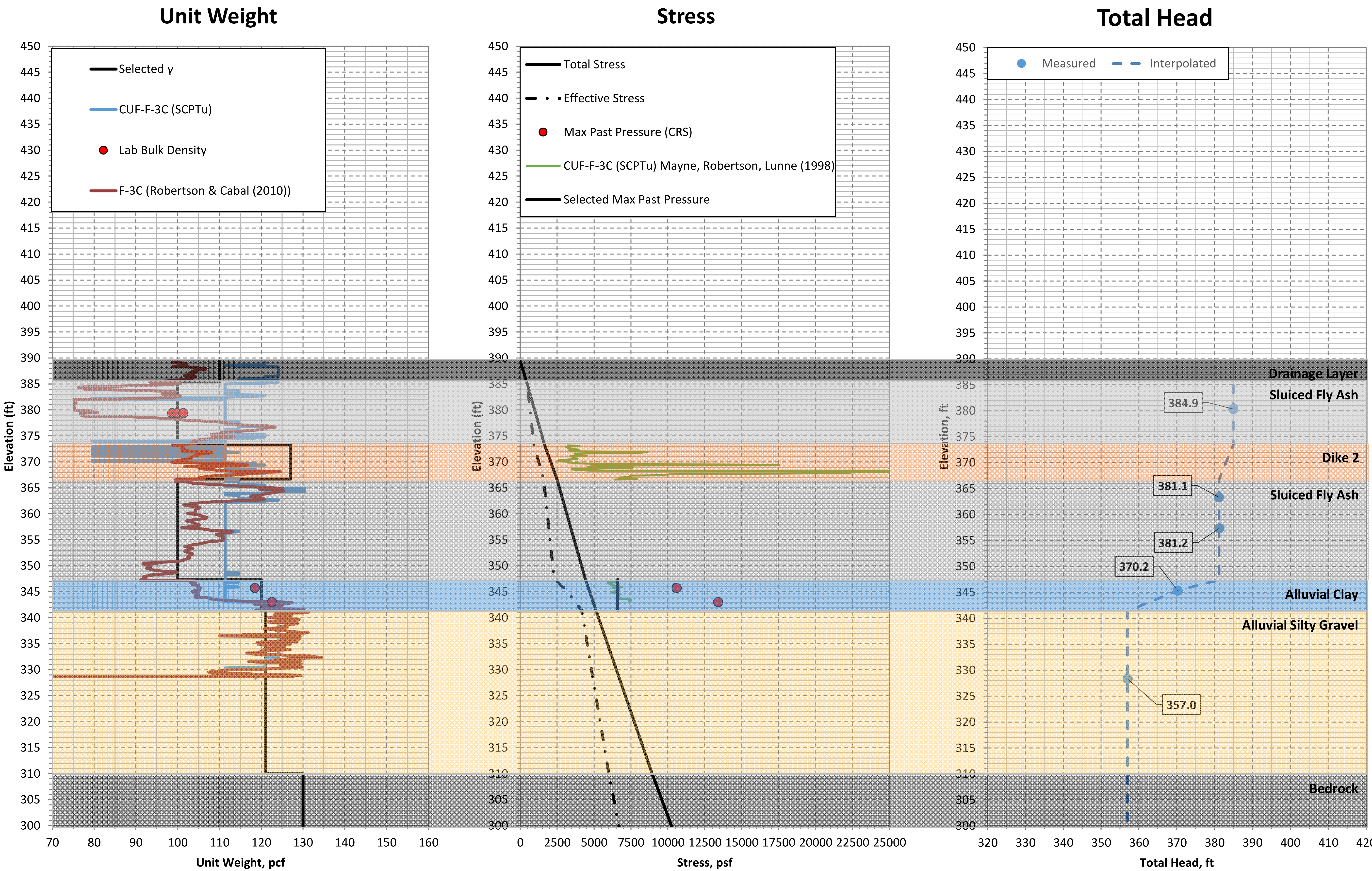


FIGURE A.12: CUF-F-F' - TOE - Shear Strength Parameters

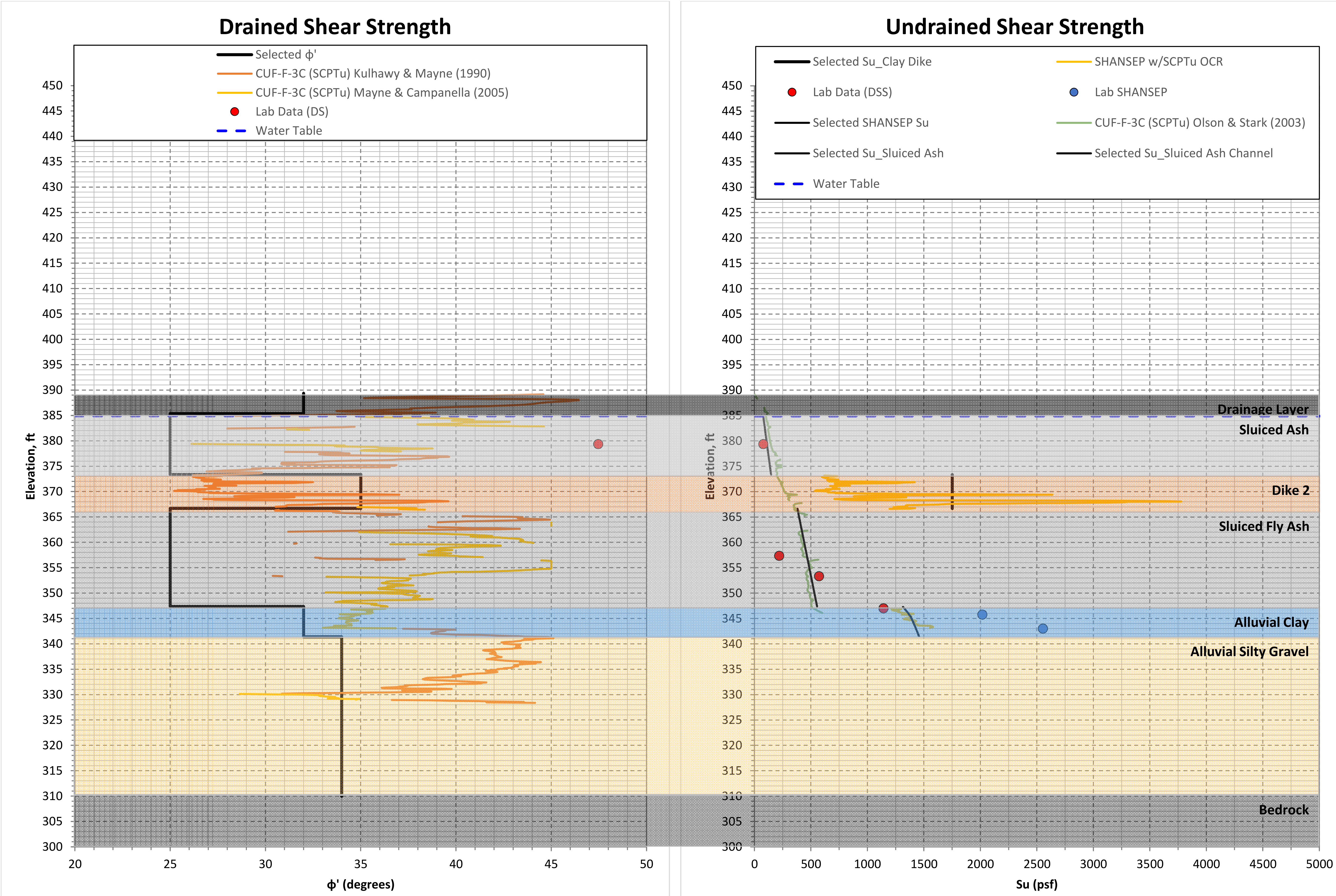


FIGURE A.13: CUF F-F' - DIKE - Stress and Index Parameters

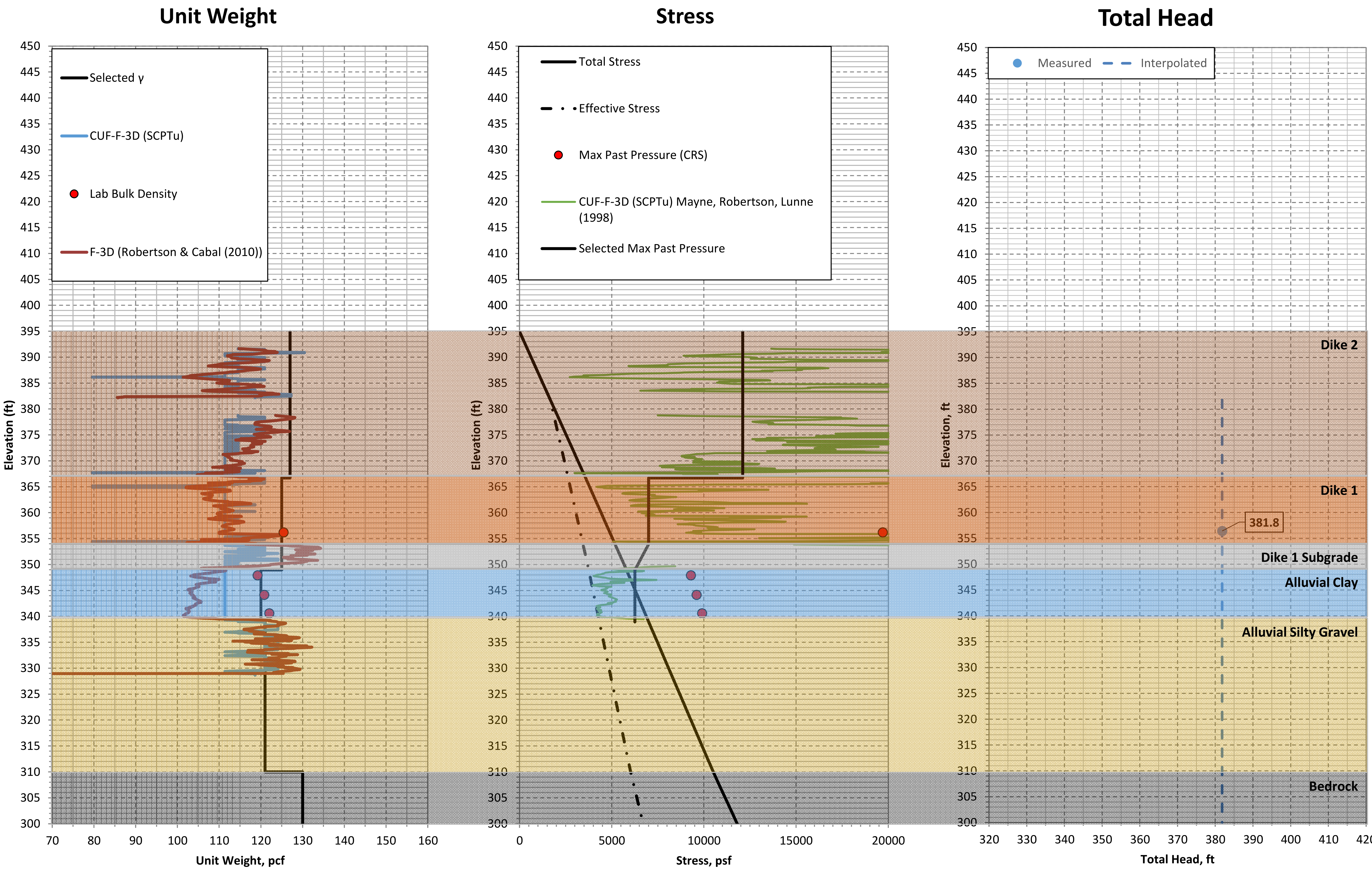
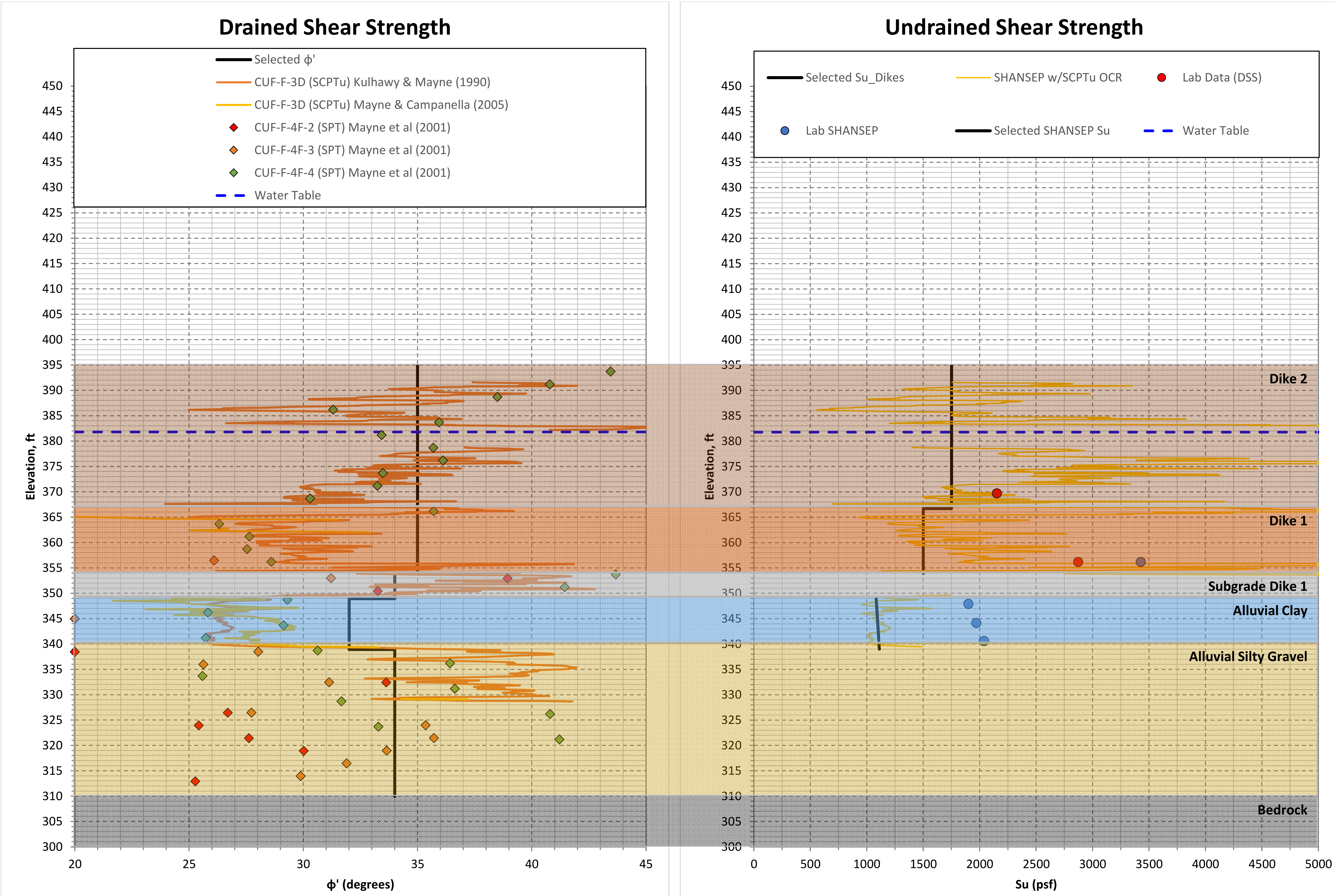


FIGURE A.14: CUF-F-F' - DIKE - Shear Strength Parameters



Parameter Development Profiles

Gypsum Disposal Complex

Cross Section JK-JK'

Table A.3 Selected Soil Parameters for Stability Analyses – Cross Section JK-JK' at GDC

Cross Section	Soil Layers	Unit Weight (pcf)	σ'p(psf)	Long-term Static Strength Parameters		Pseudo-Static Strength Parameters		Post-Earthquake Strength Parameters
				Effective Friction Angle, ϕ' (deg)	Cohesion (psf)	Effective Friction Angle, ϕ' (deg)	Undrained Strength Ratio, S_u/σ'_v or Undrained Strength, S_u (psf)	Residual/Softened Undrained Strength Ratio S_r/σ'_v
Cross-section JK-JK'	Lower Sluiced Fly Ash	100	N/A	28	0	28	N/A	0.15
	Upper Sluiced Fly Ash	100	N/A	28	0	28	N/A	0.15
	Drainage Layer	110	N/A	38	0	38	N/A	N/A
	Alluvial Clay Crest	120	7,300	32	0	32	Defined as a function in stability models; $\frac{S_u}{\sigma'_v} = S \times \left(\frac{\sigma'_p}{\sigma'_v}\right)^m$ where S=0.24, m=0.82	Defined as a function in stability models; $\frac{S_u}{\sigma'_v} = S \times \left(\frac{\sigma'_p}{\sigma'_v}\right)^m$ where S=0.18, m=0.84
	Alluvial Clay Slope	120	7,300	32	0	32		
	Alluvial Clay Dike 3	120	7,300	32	0	32		
	Alluvial Clay Dike 2	120	7,300	32	0	32		
	Alluvial Clay Dike 1	120	7,300	32	0	32		
	Alluvial Clay Wells Creek	120	7,300	32	0	32		
	Dike 1	123	N/A	35	250	35	1,500 psf	N/A
	Dike 2	123	N/A	35	250	35	1,750 psf	N/A
	Dike 3	123	N/A	35	250	35	1,750 psf	N/A
	Bottom Ash Dike	115	N/A	35	0	35	N/A	N/A
	Gypsum	105	N/A	39	0	39	N/A	N/A
	Riprap	150	N/A	40	0	40	N/A	N/A

Notes: N/A: Not applicable

σ'_p – Maximum past pressure

σ'_v – Vertical effective stress

S_u – Undrained shear strength

FIGURE A.15: CUF JK-JK' - CREST - Stress and Index Parameters

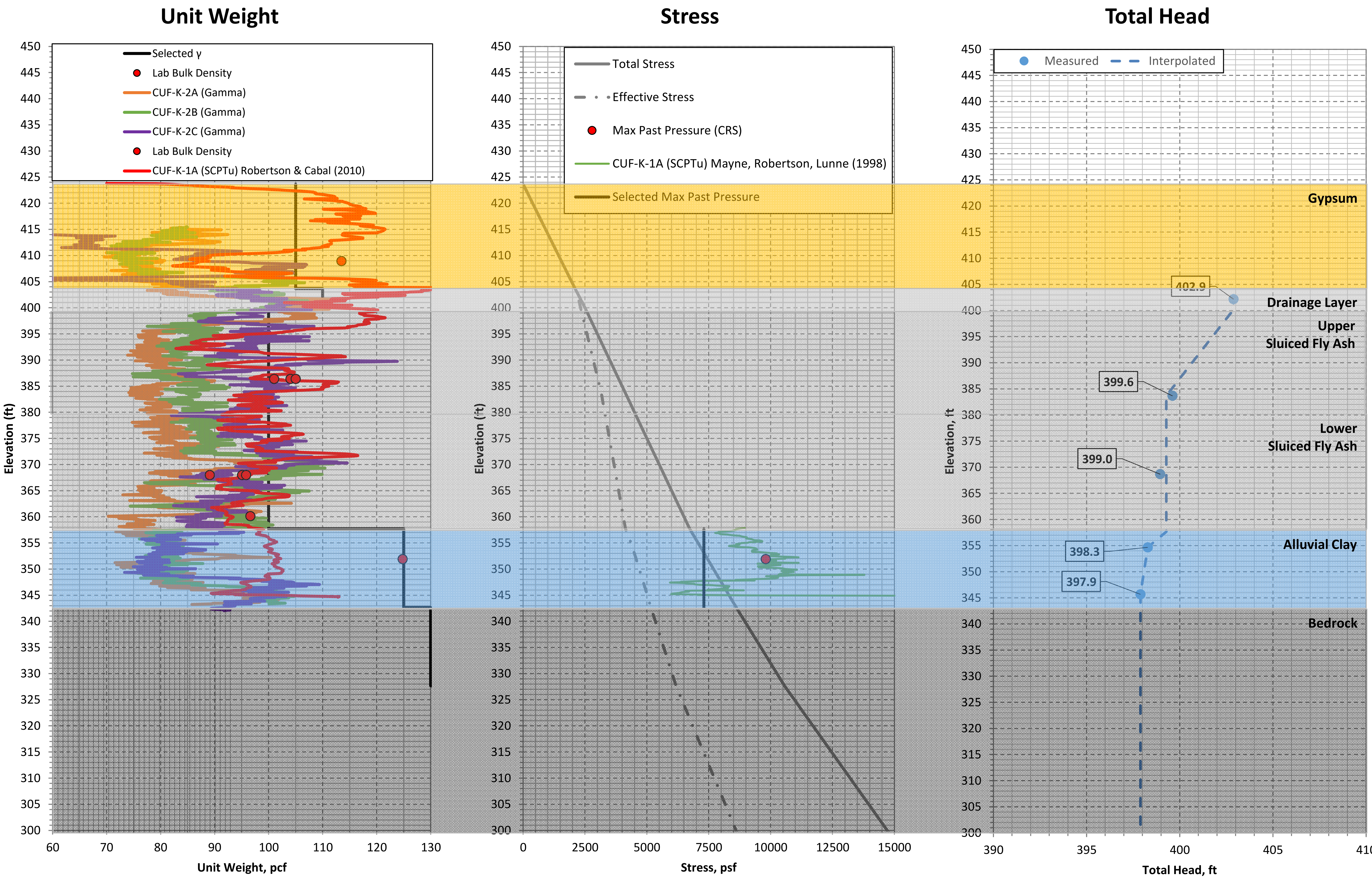
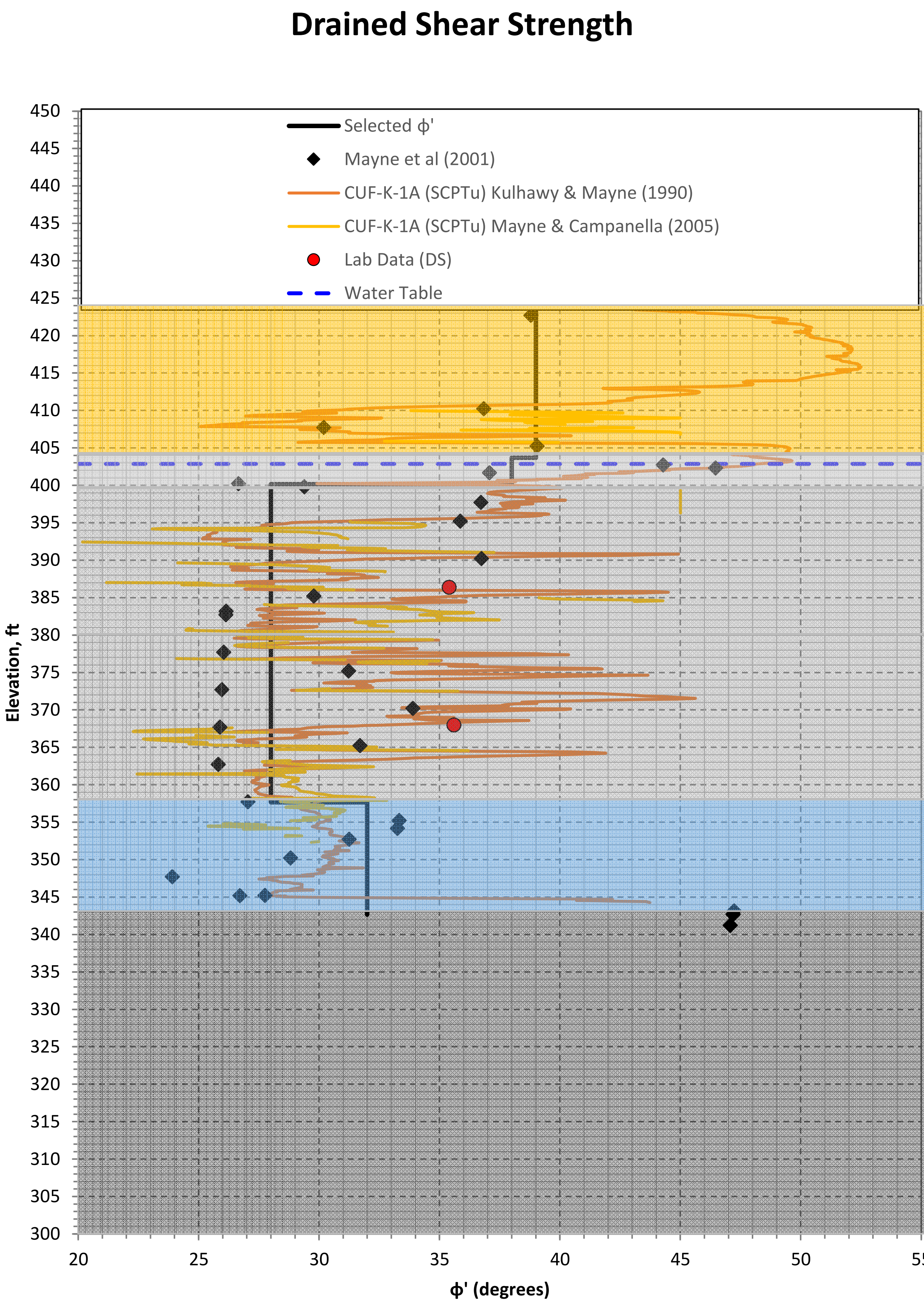


FIGURE A.16:CUF JK-JK' - CREST- Shear Strength Parameters



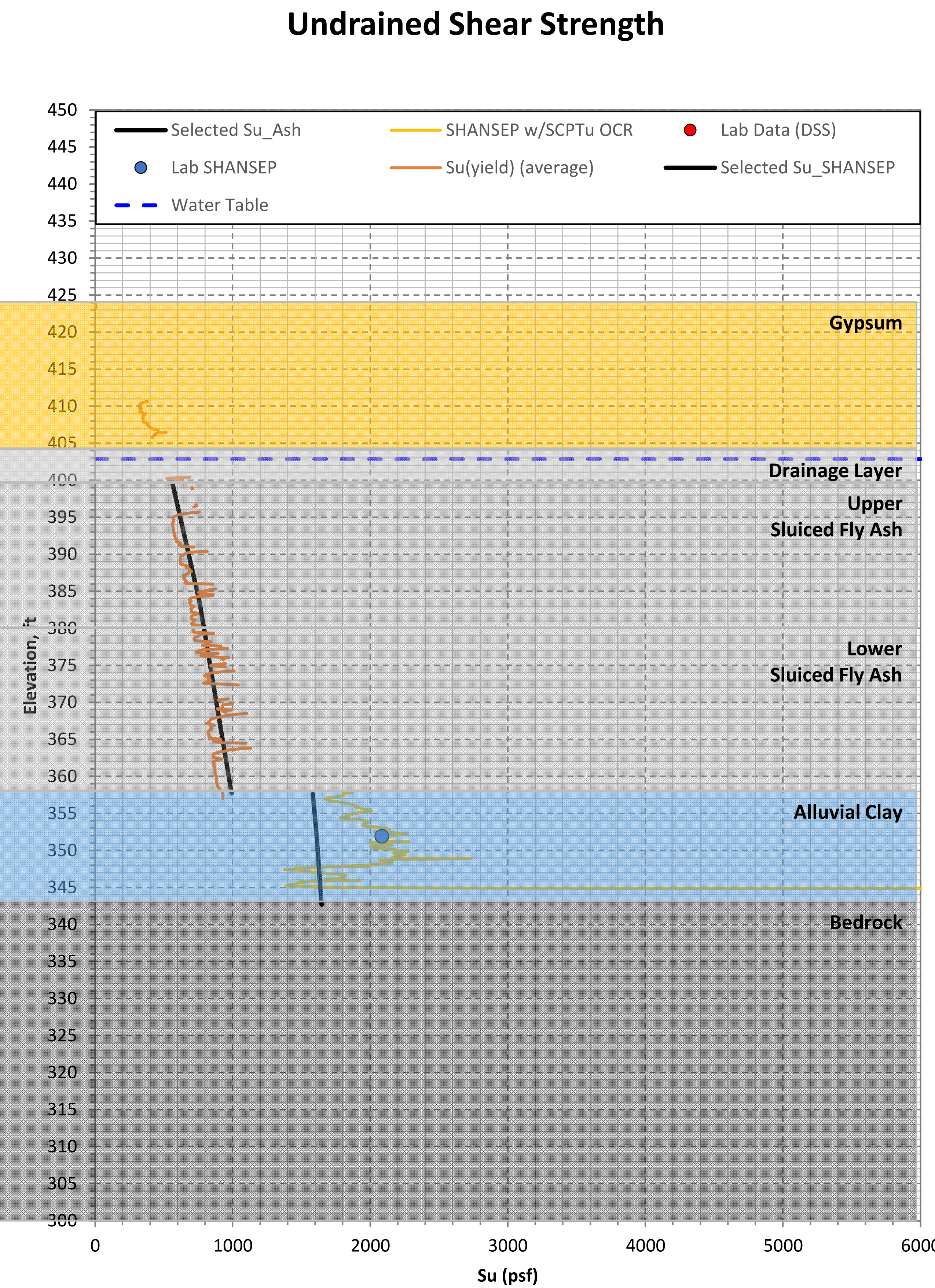


FIGURE A.17: CUF JK-JK' - DIKE3 - Stress and Index Parameters

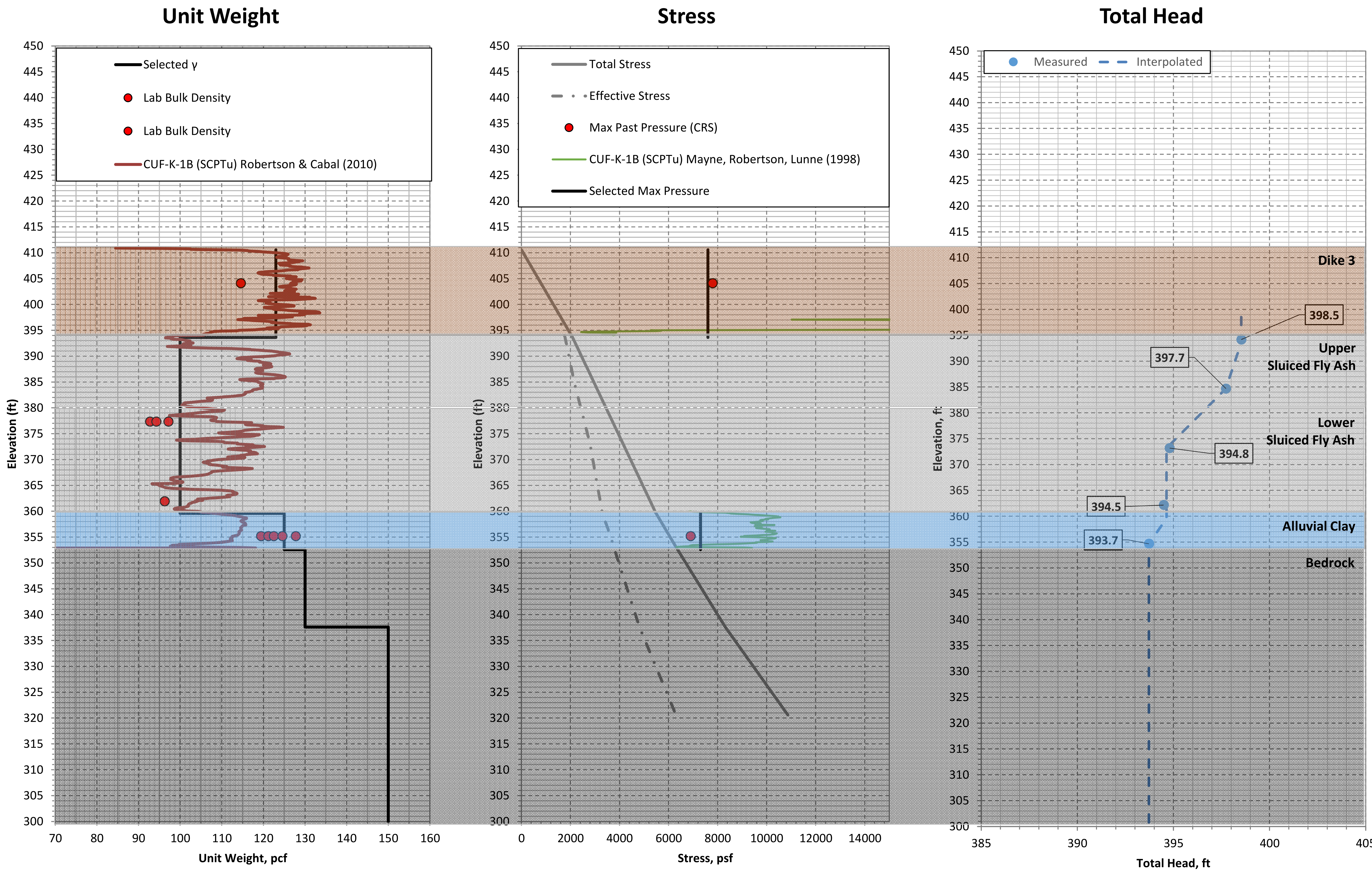


FIGURE A.18: CUF JK-JK' - DIKE 3 - Shear Strength Parameters

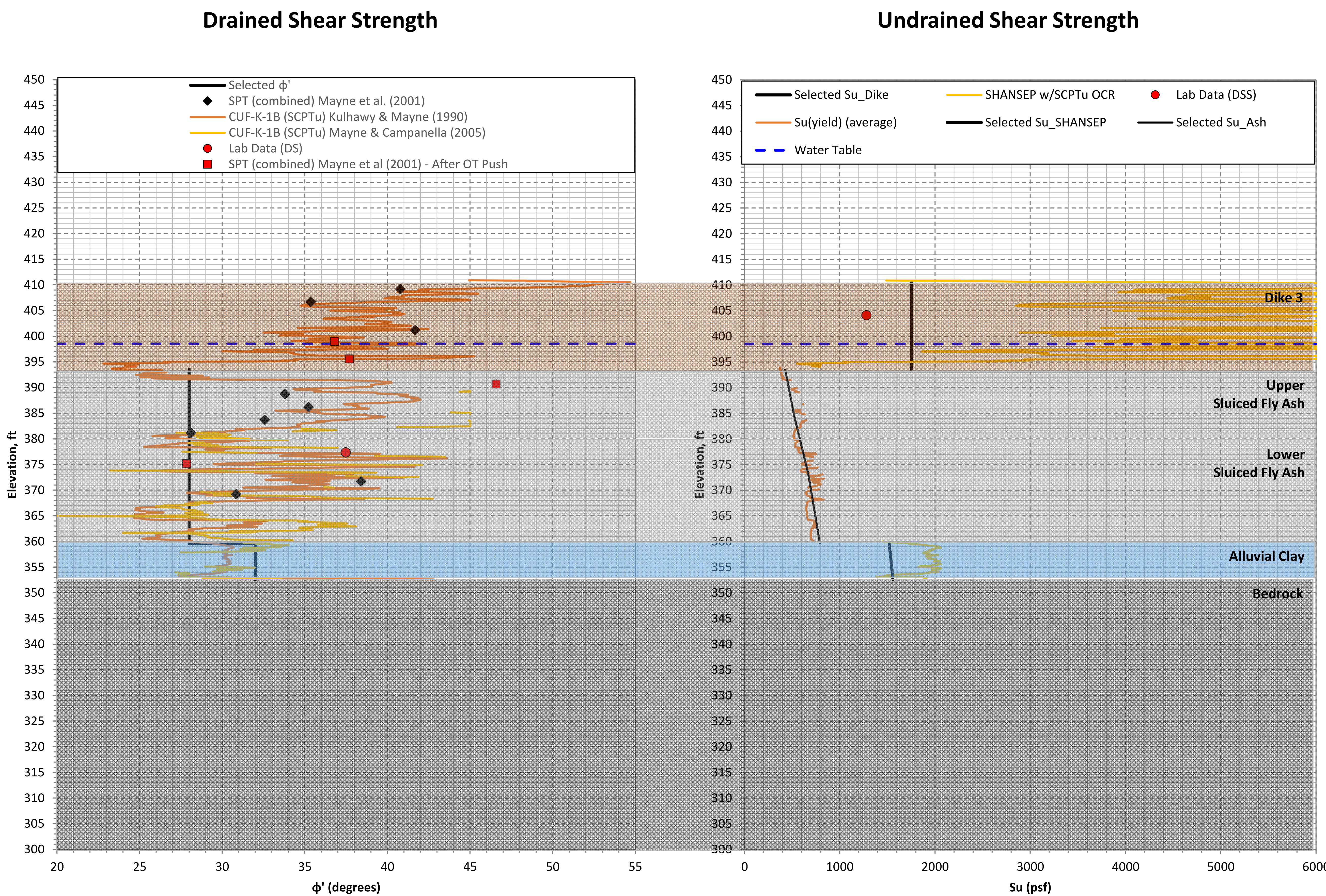


FIGURE A.19: CUF JK-JK' - DIKE2 - Stress and Index Parameters

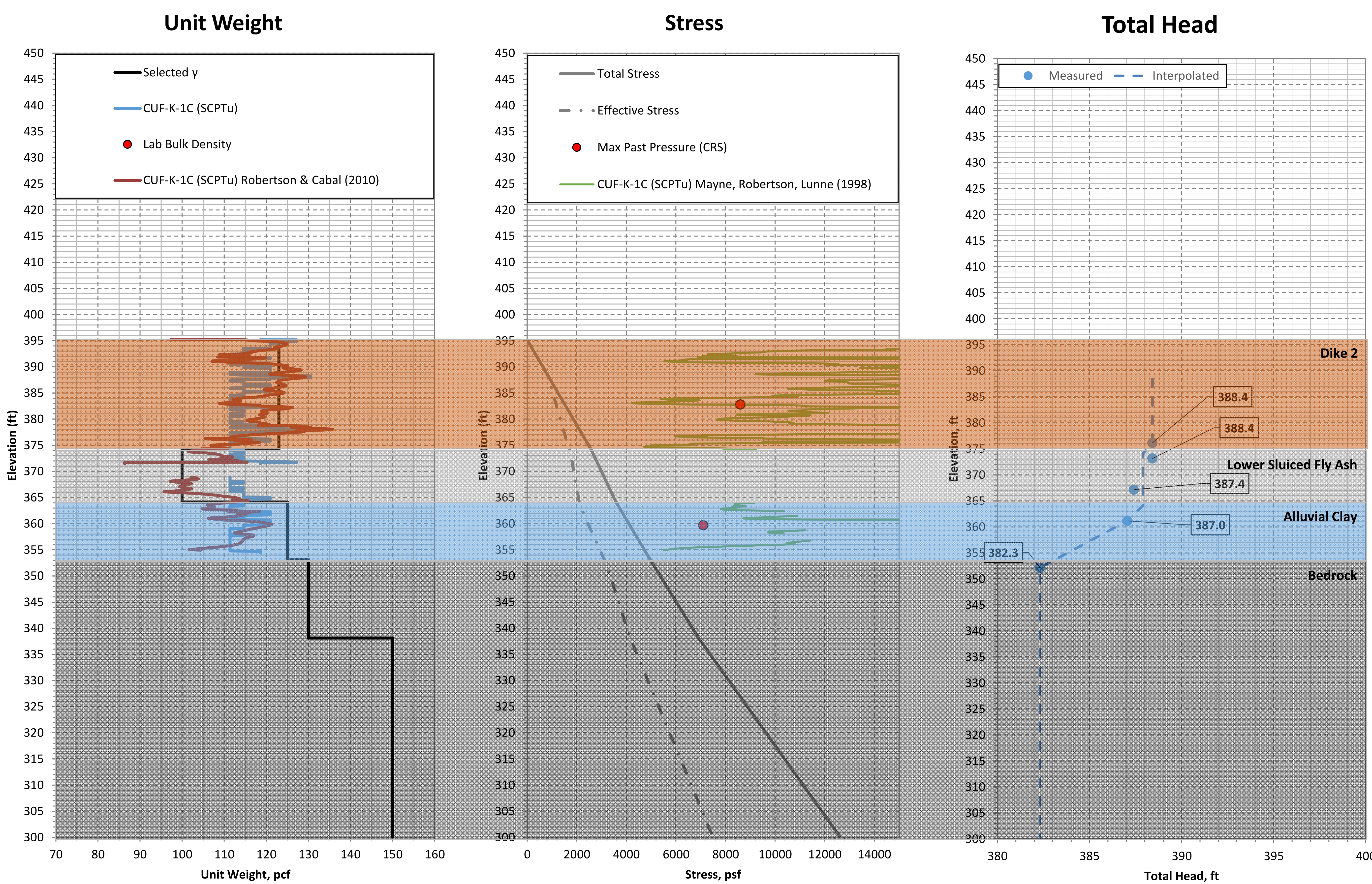
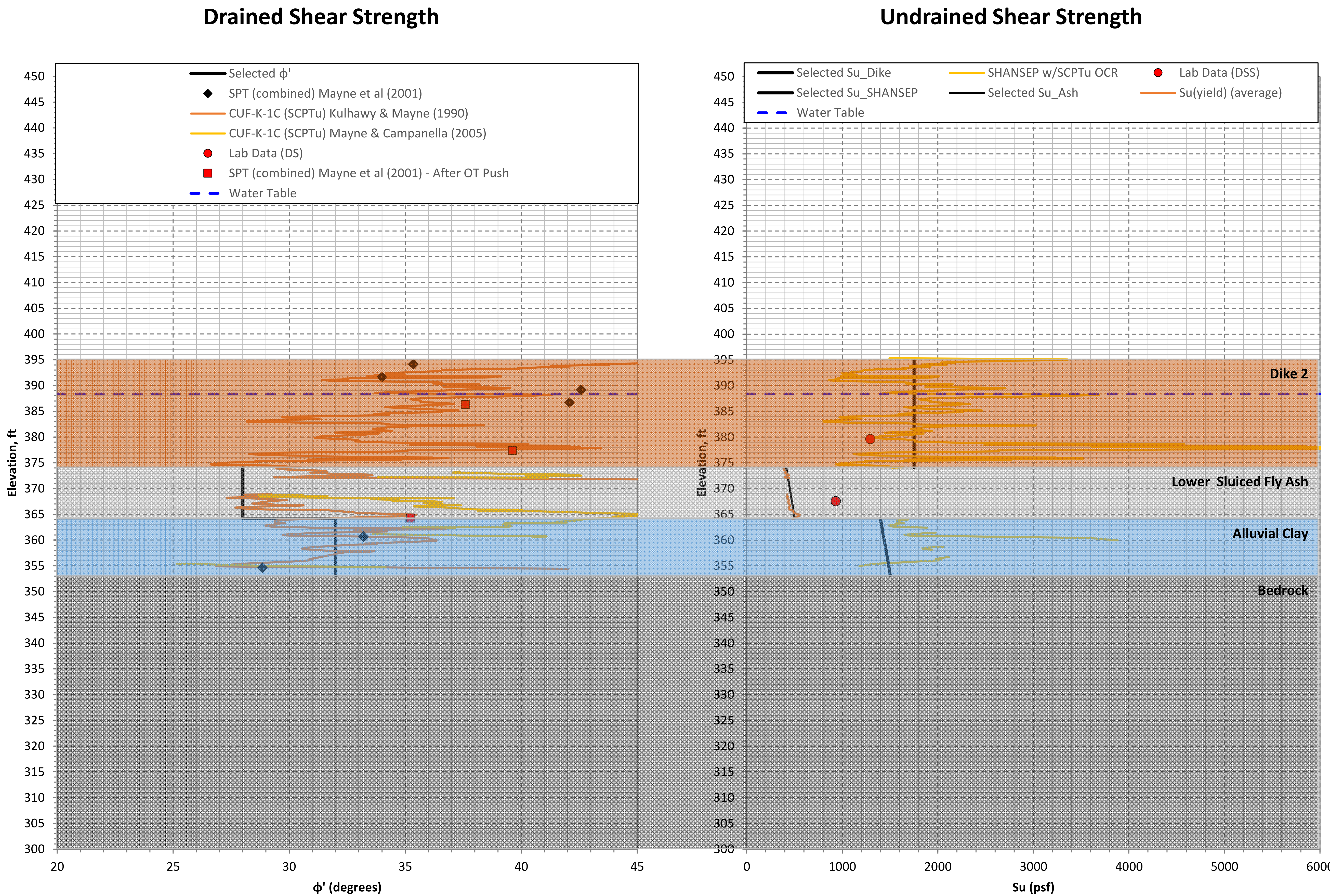


FIGURE A.20: CUF JK-JK' - DIKE 2 - Shear Strength Parameters



Attachment B. Results of Slope Stability Analyses

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Stability Results

Tennessee Valley Authority

Seismic Assessment
Cumberland Fossil Plant

Dry Fly Ash Stack

Tennessee Valley Authority
Cumberland Fossil Plant
Dry Fly Ash Stack
Cumberland City, TN

Cross Section C-C'
Existing Condition
Long-Term Static

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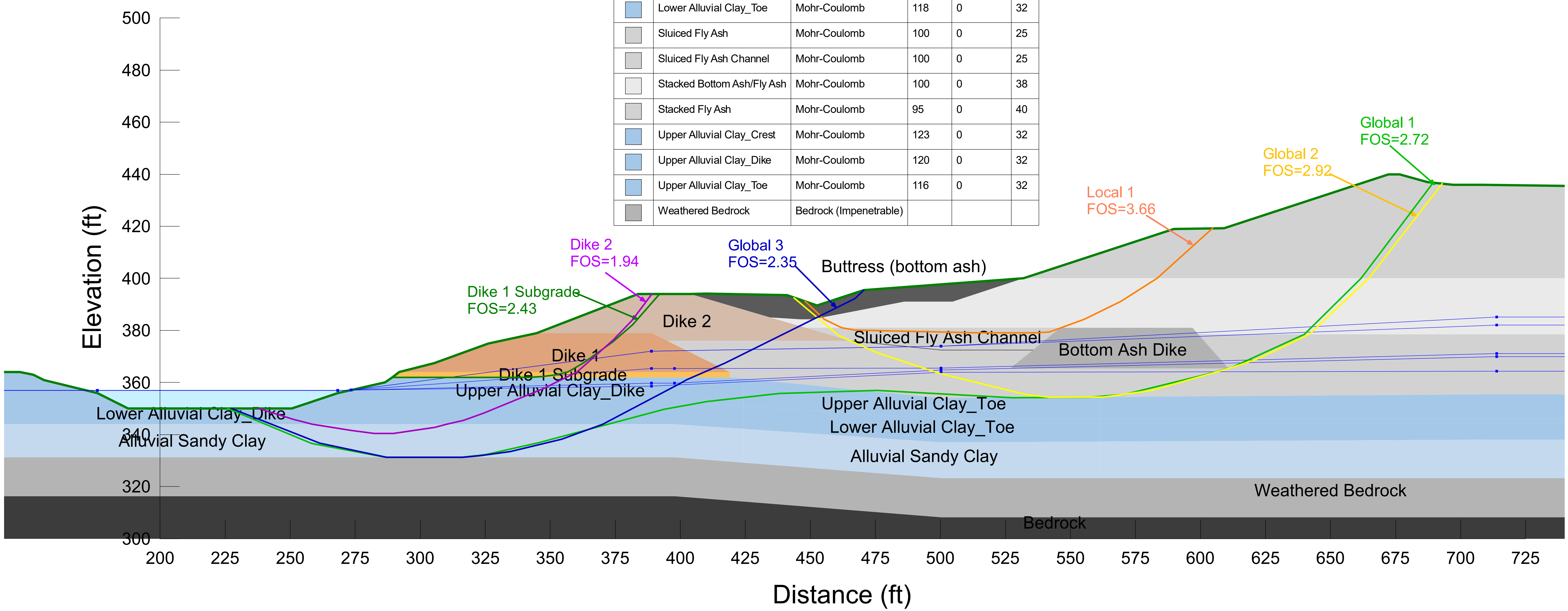
Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Alluvial Sandy Clay	Mohr-Coulomb	120	0	32
	Bedrock	Bedrock (Impenetrable)			
	Bottom Ash Dike	Mohr-Coulomb	115	0	35
	Buttress (bottom ash)	Mohr-Coulomb	105	0	35
	Dike 1	Mohr-Coulomb	122	250	35
	Dike 1 Subgrade	Mohr-Coulomb	115	0	30
	Dike 2	Mohr-Coulomb	128	250	35
	Lower Alluvial Clay_Crest	Mohr-Coulomb	123	0	32
	Lower Alluvial Clay_Dike	Mohr-Coulomb	124	0	32
	Lower Alluvial Clay_Toe	Mohr-Coulomb	118	0	32
	Sluiced Fly Ash	Mohr-Coulomb	100	0	25
	Sluiced Fly Ash Channel	Mohr-Coulomb	100	0	25
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	100	0	38
	Stacked Fly Ash	Mohr-Coulomb	95	0	40
	Upper Alluvial Clay_Crest	Mohr-Coulomb	123	0	32
	Upper Alluvial Clay_Dike	Mohr-Coulomb	120	0	32
	Upper Alluvial Clay_Toe	Mohr-Coulomb	116	0	32
	Weathered Bedrock	Bedrock (Impenetrable)			

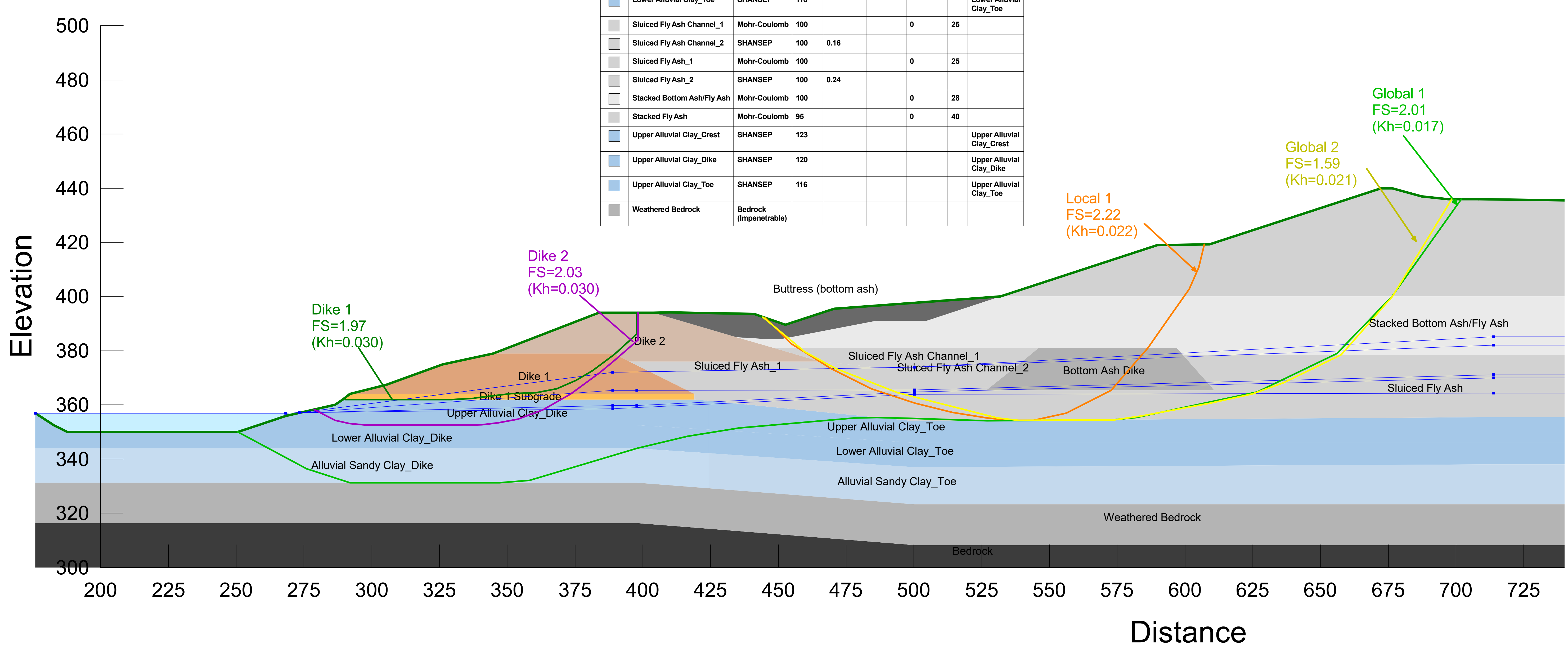


Tennessee Valley Authority
Cumberland Fossil Plant
Dry Fly Ash Stack
Cumberland City, TN

Cross Section C-C'
Existing Condition
Pseudo Static

Geocomp
A SERCEL COMPANY

Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)	Cohesion' (psf)	Phi' (°)	Undrained Shear Strength vs Vertical Effective Stress Function
	Alluvial Sandy Clay_Crest	SHANSEP	120					Alluvial Sandy Clay_Crest
	Alluvial Sandy Clay_Dike	SHANSEP	120					Alluvial Sandy Clay_Dike
	Alluvial Sandy Clay_Toe	SHANSEP	120					Alluvial Sandy Clay_Toe
	Bedrock	Bedrock (Impenetrable)						
	Bottom Ash Dike	Mohr-Coulomb	115			0	35	
	Buttress (bottom ash)	Mohr-Coulomb	105			0	35	
	Dike 1	Undrained (Phi=0)	122		1,000			
	Dike 1 Subgrade	Mohr-Coulomb	115			0	30	
	Dike 2	Undrained (Phi=0)	128		1,500			
	Lower Alluvial Clay_Crest	SHANSEP	123					Lower Alluvial Clay_Crest
	Lower Alluvial Clay_Dike	SHANSEP	124					Lower Alluvial Clay_Dike
	Lower Alluvial Clay_Toe	SHANSEP	118					Lower Alluvial Clay_Toe
	Sluiced Fly Ash Channel_1	Mohr-Coulomb	100			0	25	
	Sluiced Fly Ash Channel_2	SHANSEP	100	0.16				
	Sluiced Fly Ash_1	Mohr-Coulomb	100			0	25	
	Sluiced Fly Ash_2	SHANSEP	100	0.24				
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	100			0	28	
	Stacked Fly Ash	Mohr-Coulomb	95			0	40	
	Upper Alluvial Clay_Crest	SHANSEP	123					Upper Alluvial Clay_Crest
	Upper Alluvial Clay_Dike	SHANSEP	120					Upper Alluvial Clay_Dike
	Upper Alluvial Clay_Toe	SHANSEP	116					Upper Alluvial Clay_Toe
	Weathered Bedrock	Bedrock (Impenetrable)						



Tennessee Valley Authority
Cumberland Fossil Plant
Dry Fly Ash Stack
Cumberland City, TN

Cross Section C-C'
Existing Condition
Post Earthquake

Geocomp
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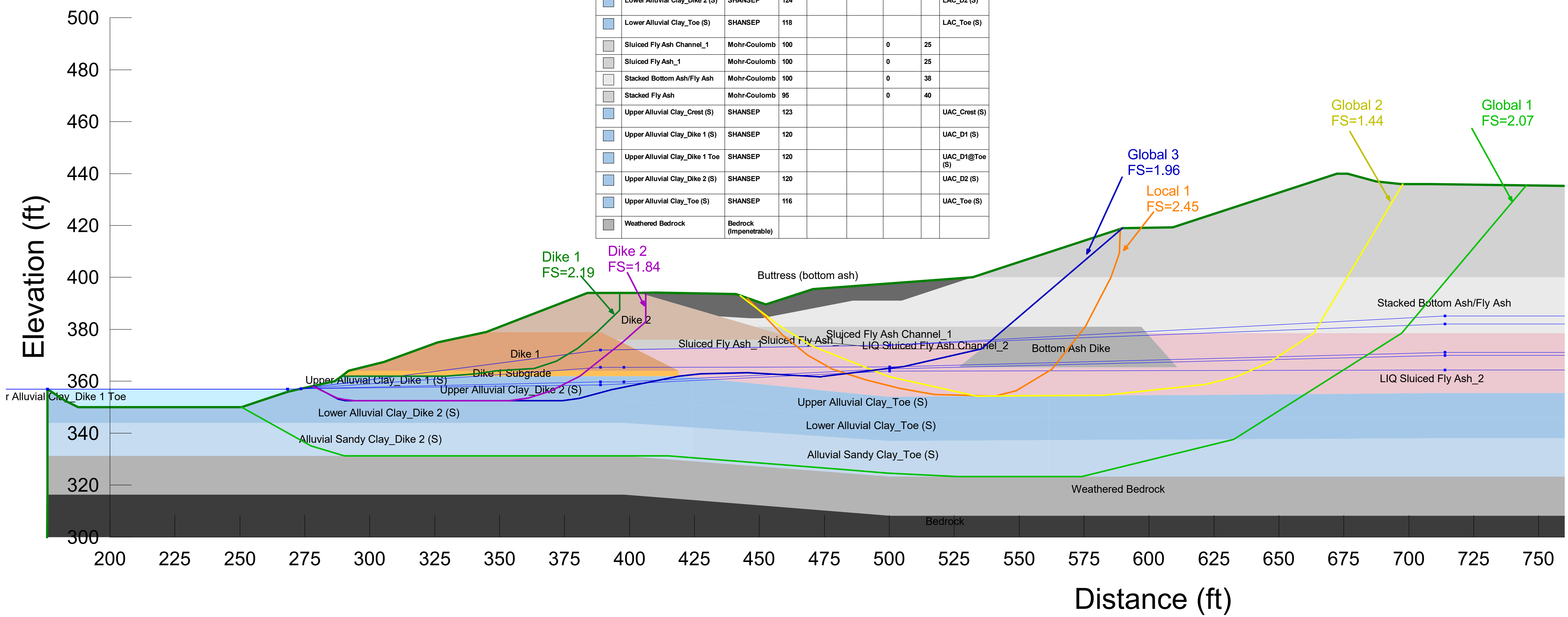
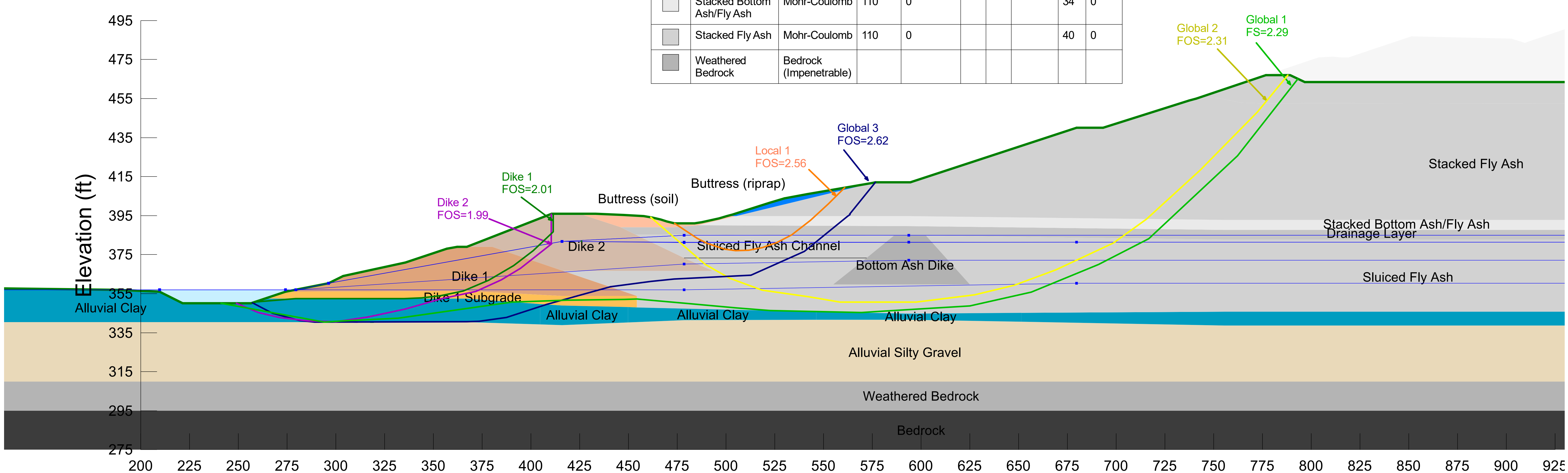
Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)	Cohesion' (psf)	Phi' (°)	Undrained Shear Strength vs Vertical Effective Stress Function
	Alluvial Sandy Clay_Crest (S)	SHANSEP	120					SAC_Crest (S)
	Alluvial Sandy Clay_Dike 2 (S)	SHANSEP	120					SAC_D2 (S)
	Alluvial Sandy Clay_Toe (S)	SHANSEP	120					SAC_Toe (S)
	Bedrock	Bedrock (Impenetrable)						
	Bottom Ash Dike	Mohr-Coulomb	115			0	35	
	Buttress (bottom ash)	Mohr-Coulomb	105			0	35	
	Dike 1	Undrained (Phi=0)	122		1,000			
	Dike 1 Subgrade	Mohr-Coulomb	115			0	30	
	Dike 2	Undrained (Phi=0)	128		1,500			
	LIQ Sluiced Fly Ash Channel_2	SHANSEP	100	0.15				
	LIQ Sluiced Fly Ash_2	SHANSEP	100	0.15				
	Lower Alluvial Clay_Crest (S)	SHANSEP	123					LAC_Crest (S)
	Lower Alluvial Clay_Dike 2 (S)	SHANSEP	124					LAC_D2 (S)
	Lower Alluvial Clay_Toe (S)	SHANSEP	118					LAC_Toe (S)
	Sluiced Fly Ash Channel_1	Mohr-Coulomb	100			0	25	
	Sluiced Fly Ash_1	Mohr-Coulomb	100			0	25	
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	100			0	38	
	Stacked Fly Ash	Mohr-Coulomb	95			0	40	
	Upper Alluvial Clay_Crest (S)	SHANSEP	123					UAC_Crest (S)
	Upper Alluvial Clay_Dike 1 (S)	SHANSEP	120					UAC_D1 (S)
	Upper Alluvial Clay_Dike 1 Toe	SHANSEP	120					UAC_D1@Toe (S)
	Upper Alluvial Clay_Dike 2 (S)	SHANSEP	120					UAC_D2 (S)
	Upper Alluvial Clay_Toe (S)	SHANSEP	116					UAC_Toe (S)
	Weathered Bedrock	Bedrock (Impenetrable)						



Tennessee Valley Authority Seismic Assessment Cumberland Fossil Plant Dry Fly Ash Stack Cumberland City, TN
Cross Section F-F'
Existing Conditions
Long Term

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)	Phi' (°)	Phi-B (°)
	Alluvial Clay	Mohr-Coulomb	120	0				32	0
	Alluvial Silty Gravel	Mohr-Coulomb	121	0				34	0
	Bedrock	Bedrock (Impenetrable)							
	Bottom Ash Dike	Mohr-Coulomb	115	0				35	0
	Buttress (riprap)	Mohr-Coulomb	132	0				40	0
	Buttress (soil)	Bilinear	122	200	36	19	523.3		0
	Dike 1	Mohr-Coulomb	125	250				35	0
	Dike 1 Subgrade	Mohr-Coulomb	125	0				34	0
	Dike 2	Mohr-Coulomb	127	250				35	0
	Drainage Layer	Mohr-Coulomb	110	0				32	0
	Sluiced Fly Ash	Mohr-Coulomb	100	0				25	0
	Sluiced Fly Ash Channel	Mohr-Coulomb	100	0				25	0
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	110	0				34	0
	Stacked Fly Ash	Mohr-Coulomb	110	0				40	0
	Weathered Bedrock	Bedrock (Impenetrable)							

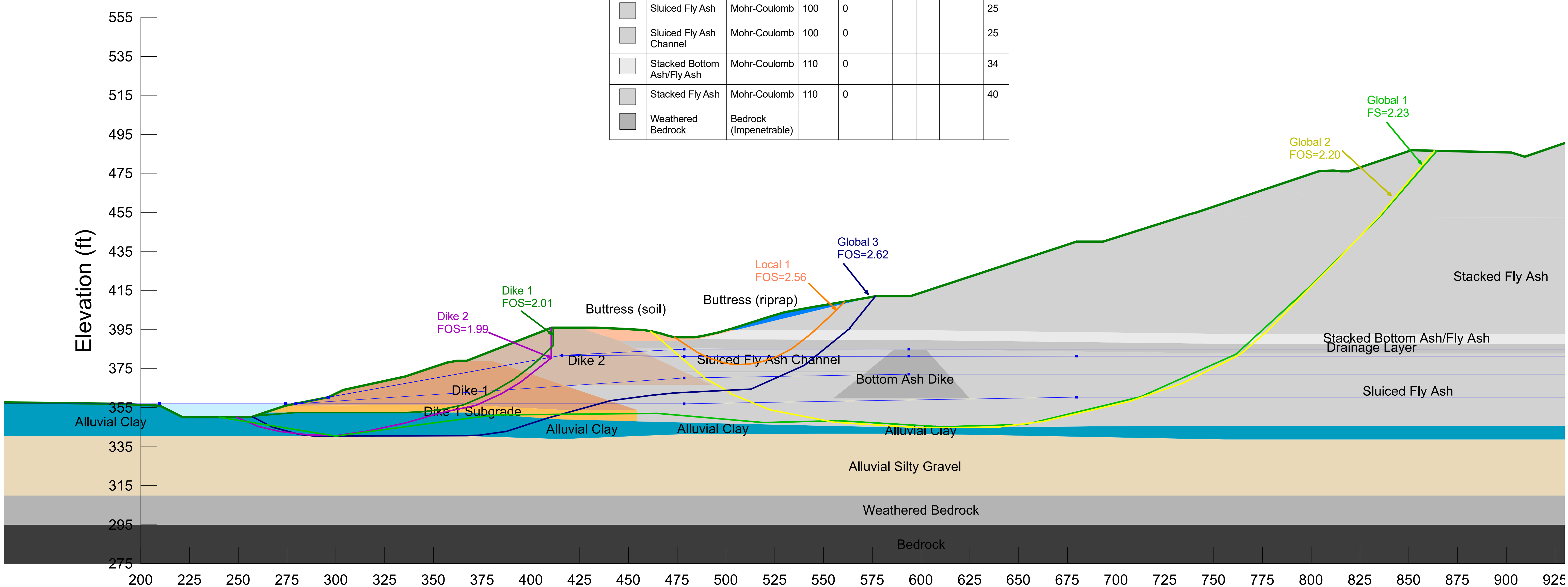


Tennessee Valley Authority
Seismic Assessment
Cumberland Fossil Plant

Dry Fly Ash Stack Cumberland City, TN

Cross Section F-F' Future Non-Marketable Conditions Long Term

Color	Name	Model	Unit Weight (pcf)	Cohesion' (psf)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)	Phi' (°)
	Alluvial Clay	Mohr-Coulomb	120	0				32
	Alluvial Silty Gravel	Mohr-Coulomb	121	0				34
	Bedrock	Bedrock (Impenetrable)						
	Bottom Ash Dike	Mohr-Coulomb	115	0				35
	Buttress (riprap)	Mohr-Coulomb	132	0				40
	Buttress (soil)	Bilinear	122	200	36	19	523.3	
	Dike 1	Mohr-Coulomb	125	250				35
	Dike 1 Subgrade	Mohr-Coulomb	125	0				34
	Dike 2	Mohr-Coulomb	127	250				35
	Drainage Layer	Mohr-Coulomb	110	0				32
	Marketable Stacked Fly Ash	Mohr-Coulomb	110	0				40
	Non-Marketable Stacked Fly Ash	Mohr-Coulomb	110	0				40
	Sluiced Fly Ash	Mohr-Coulomb	100	0				25
	Sluiced Fly Ash Channel	Mohr-Coulomb	100	0				25
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	110	0				34
	Stacked Fly Ash	Mohr-Coulomb	110	0				40
	Weathered Bedrock	Bedrock (Impenetrable)						



Tennessee Valley Authority
Seismic Assessment
Cumberland Fossil Plant
Dry Fly Ash Stack
Cumberland City, TN

Cross Section F-F' Existing Condition Pseudo-Static

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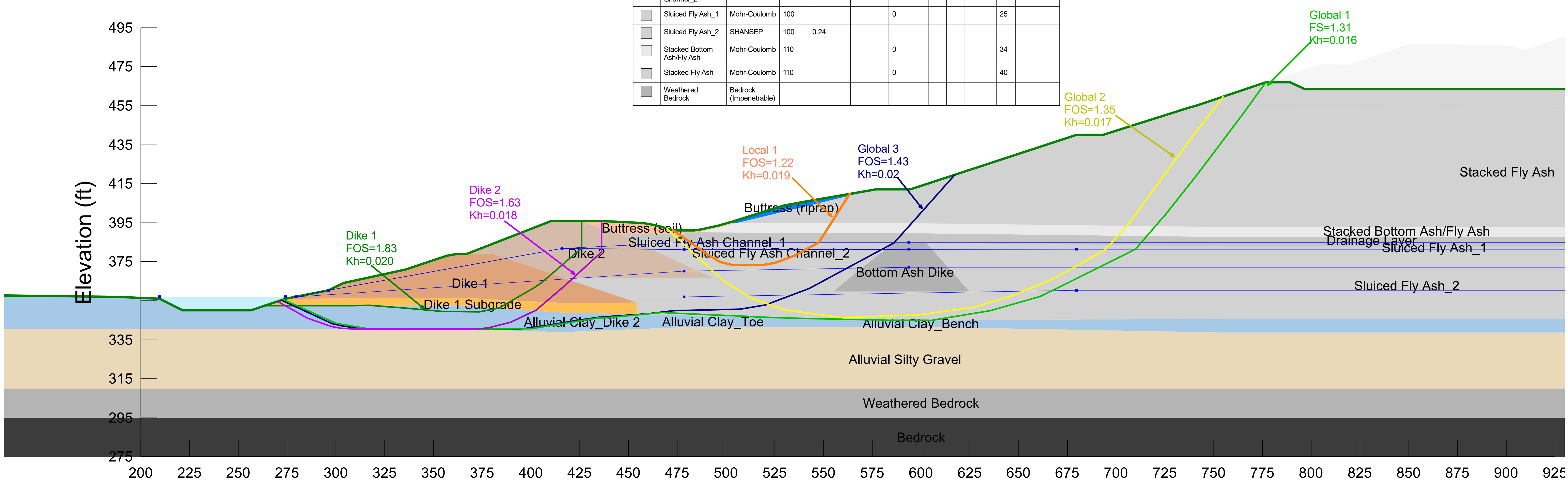
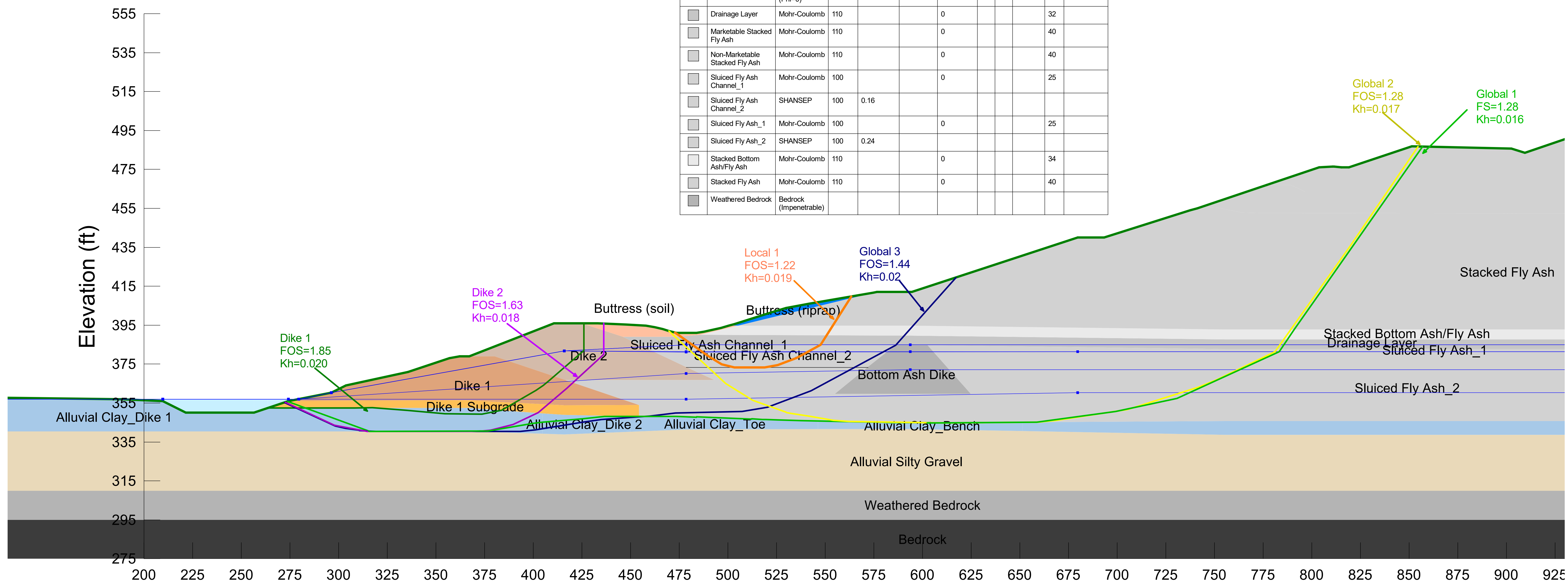
Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)	Cohesion' (psf)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)	Phi' (°)	Undrained Shear Strength vs Vertical Effective Stress Function
	Alluvial Clay_Bench	SHANSEP	120								Alluvial Clay_Bench
	Alluvial Clay_Crest	SHANSEP	120								Alluvial Clay_Crest
	Alluvial Clay_Dike 1	SHANSEP	120								Alluvial Clay_Dike 1
	Alluvial Clay_Dike 2	SHANSEP	120								Alluvial Clay_Dike 2
	Alluvial Clay_Toe	SHANSEP	120								Alluvial Clay_Toe
	Alluvial Silty Gravel	Mohr-Coulomb	121			0				34	
	Bedrock	Bedrock (Impenetrable)									
	Bottom Ash Dike	Mohr-Coulomb	115			0				35	
	Buttress (riprap)	Mohr-Coulomb	132			0				40	
	Buttress (soil)	Bilinear	122			200	36	19	523.3		
	Dike 1	Undrained (Phi=0)	125		1,500						
	Dike 1 Subgrade	Mohr-Coulomb	125			0				34	
	Dike 2	Undrained (Phi=0)	127		1,750						
	Drainage Layer	Mohr-Coulomb	110			0				32	
	Sluiced Fly Ash Channel_1	Mohr-Coulomb	100			0				25	
	Sluiced Fly Ash Channel_2	SHANSEP	100	0.16							
	Sluiced Fly Ash_1	Mohr-Coulomb	100			0				25	
	Sluiced Fly Ash_2	SHANSEP	100	0.24							
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	110			0				34	
	Stacked Fly Ash	Mohr-Coulomb	110			0				40	
	Weathered Bedrock	Bedrock (Impenetrable)									



Tennessee Valley Authority
Seismic Assessment Cumberland Fossil Plant
Dry Fly Ash Stack
Cumberland City, TN

Cross Section F-F'
Future Non-Marketable Condition
Pseudo-Static

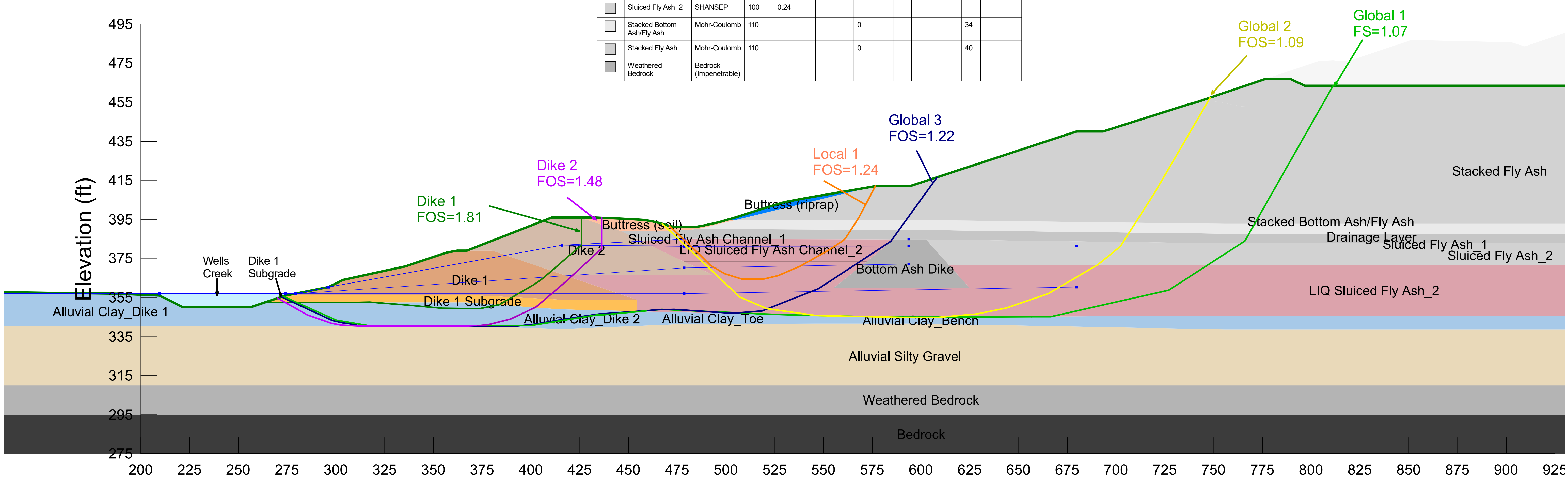
Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)	Cohesion' (psf)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)	Phi' (°)	Undrained Shear Strength vs Vertical Effective Stress Function
	Alluvial Clay_Bench	SHANSEP	120								Alluvial Clay_Bench
	Alluvial Clay_Crest	SHANSEP	120								Alluvial Clay_Crest
	Alluvial Clay_Dike 1	SHANSEP	120								Alluvial Clay_Dike 1
	Alluvial Clay_Dike 2	SHANSEP	120								Alluvial Clay_Dike 2
	Alluvial Clay_Toe	SHANSEP	120								Alluvial Clay_Toe
	Alluvial Silty Gravel	Mohr-Coulomb	121			0				34	
	Bedrock	Bedrock (Impenetrable)									
	Bottom Ash Dike	Mohr-Coulomb	115			0				35	
	Buttress (riprap)	Mohr-Coulomb	132			0				40	
	Buttress (soil)	Bilinear	122			200	36	19	523.3		
	Dike 1	Undrained (Phi=0)	125		1,500						
	Dike 1 Subgrade	Mohr-Coulomb	125			0				34	
	Dike 2	Undrained (Phi=0)	127		1,750						
	Drainage Layer	Mohr-Coulomb	110			0				32	
	Marketable Stacked Fly Ash	Mohr-Coulomb	110			0				40	
	Non-Marketable Stacked Fly Ash	Mohr-Coulomb	110			0				40	
	Sluiced Fly Ash Channel_1	Mohr-Coulomb	100			0				25	
	Sluiced Fly Ash Channel_2	SHANSEP	100	0.16							
	Sluiced Fly Ash_1	Mohr-Coulomb	100			0				25	
	Sluiced Fly Ash_2	SHANSEP	100	0.24							
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	110			0				34	
	Stacked Fly Ash	Mohr-Coulomb	110			0				40	
	Weathered Bedrock	Bedrock (Impenetrable)									



Tennessee Valley Authority
Seismic Assessment
Cumberland Fossil Plant
Dry Fly Ash Stack
Cumberland City, TN

Cross Section F-F'
Existing Condition
Post-Earthquake

Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)	Cohesion' (psf)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)	Phi' (°)	Undrained Shear Strength vs Vertical Effective Stress Function
	Alluvial Clay_Bench	SHANSEP	120								AC_Bench (S)
	Alluvial Clay_Crest	SHANSEP	120								AC_Crest (S)
	Alluvial Clay_Dike 1	SHANSEP	120								AC_D1 (S)
	Alluvial Clay_Dike 2	SHANSEP	120								AC_D2 (S)
	Alluvial Clay_Toe	SHANSEP	120								AC_Toe (S)
	Alluvial Silty Gravel	Mohr-Coulomb	121			0				34	
	Bedrock	Bedrock (Impenetrable)									
	Bottom Ash Dike	Mohr-Coulomb	115			0				35	
	Buttress (riprap)	Mohr-Coulomb	132			0				40	
	Buttress (soil)	Bilinear	122			200	36	19	523.3		
	Dike 1	Undrained (Phi=0)	125		1,500						
	Dike 1 Subgrade	Mohr-Coulomb	125			0				34	
	Dike 2	Undrained (Phi=0)	127		1,750						
	Drainage Layer	Mohr-Coulomb	110			0				32	
	LIQ Sluiced Fly Ash Channel_2	SHANSEP	100	0.15							
	LIQ Sluiced Fly Ash_2	SHANSEP	100	0.15							
	Sluiced Fly Ash Channel_1	Mohr-Coulomb	100			0				25	
	Sluiced Fly Ash_1	Mohr-Coulomb	100			0				25	
	Sluiced Fly Ash_2	SHANSEP	100	0.24							
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	110			0				34	
	Stacked Fly Ash	Mohr-Coulomb	110			0				40	
	Weathered Bedrock	Bedrock (Impenetrable)									



Tennessee Valley Authority
Seismic Assessment
Cumberland Fossil Plant
Dry Fly Ash Stack
Cumberland City, TN

Cross Section F-F' Future Non-Marketable Condition Post-Earthquake

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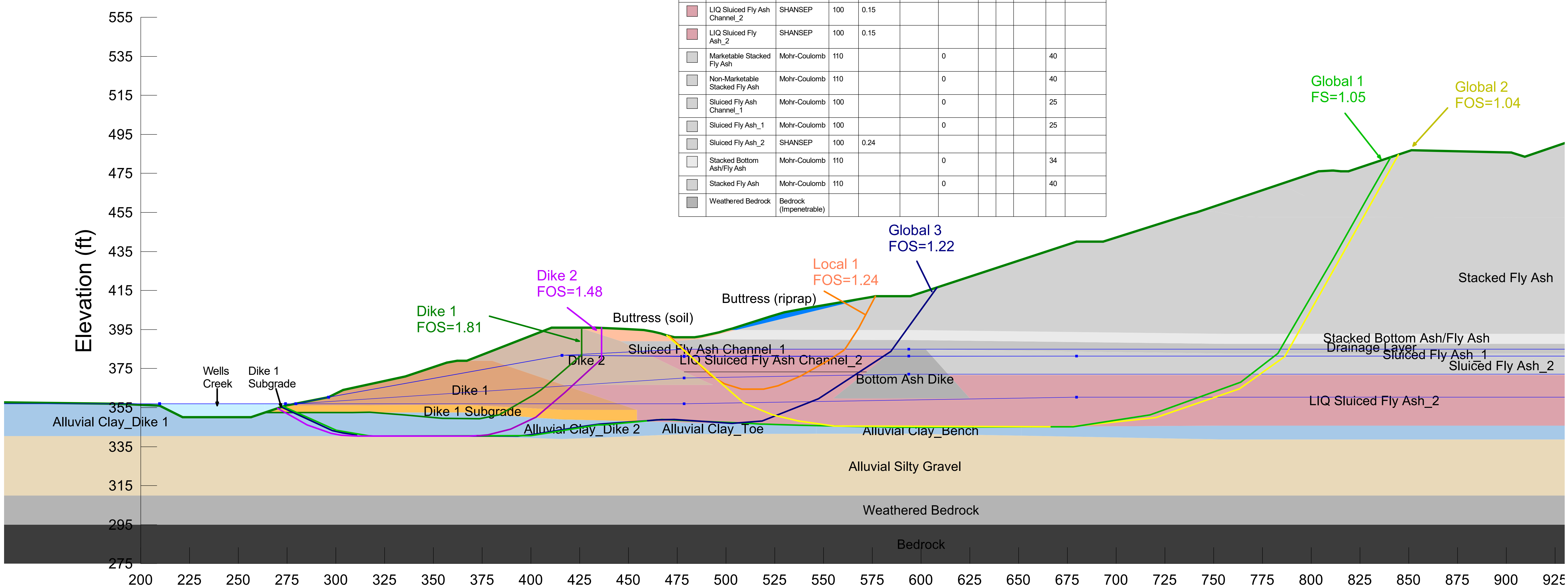
A SERCEL COMPANY

Color	Name	Model	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)	Cohesion' (psf)	Phi 1 (°)	Phi 2 (°)	Bilinear Normal (psf)	Phi' (°)	Undrained Shear Strength vs Vertical Effective Stress Function
	Alluvial Clay_Bench	SHANSEP	120								AC_Bench (S)
	Alluvial Clay_Crest	SHANSEP	120								AC_Crest (S)
	Alluvial Clay_Dike 1	SHANSEP	120								AC_D1 (S)
	Alluvial Clay_Dike 2	SHANSEP	120								AC_D2 (S)
	Alluvial Clay_Toe	SHANSEP	120								AC_Toe (S)
	Alluvial Silty Gravel	Mohr-Coulomb	121			0				34	
	Bedrock	Bedrock (Impenetrable)									
	Bottom Ash Dike	Mohr-Coulomb	115			0				35	
	Buttress (riprap)	Mohr-Coulomb	132			0				40	
	Buttress (soil)	Bilinear	122			200	36	19	523.3		
	Dike 1	Undrained (Phi=0)	125		1,500						
	Dike 1 Subgrade	Mohr-Coulomb	125			0				34	
	Dike 2	Undrained (Phi=0)	127		1,750						
	Drainage Layer	Mohr-Coulomb	110			0				32	
	LIQ Sluiced Fly Ash Channel_2	SHANSEP	100	0.15							
	LIQ Sluiced Fly Ash_2	SHANSEP	100	0.15							
	Marketable Stacked Fly Ash	Mohr-Coulomb	110			0				40	
	Non-Marketable Stacked Fly Ash	Mohr-Coulomb	110			0				40	
	Sluiced Fly Ash Channel_1	Mohr-Coulomb	100			0				25	
	Sluiced Fly Ash_1	Mohr-Coulomb	100			0				25	
	Sluiced Fly Ash_2	SHANSEP	100	0.24							
	Stacked Bottom Ash/Fly Ash	Mohr-Coulomb	110			0				34	
	Stacked Fly Ash	Mohr-Coulomb	110			0				40	
	Weathered Bedrock	Bedrock (Impenetrable)									



Geocomp
A SERCEL COMPANY

Stability Results

Tennessee Valley Authority

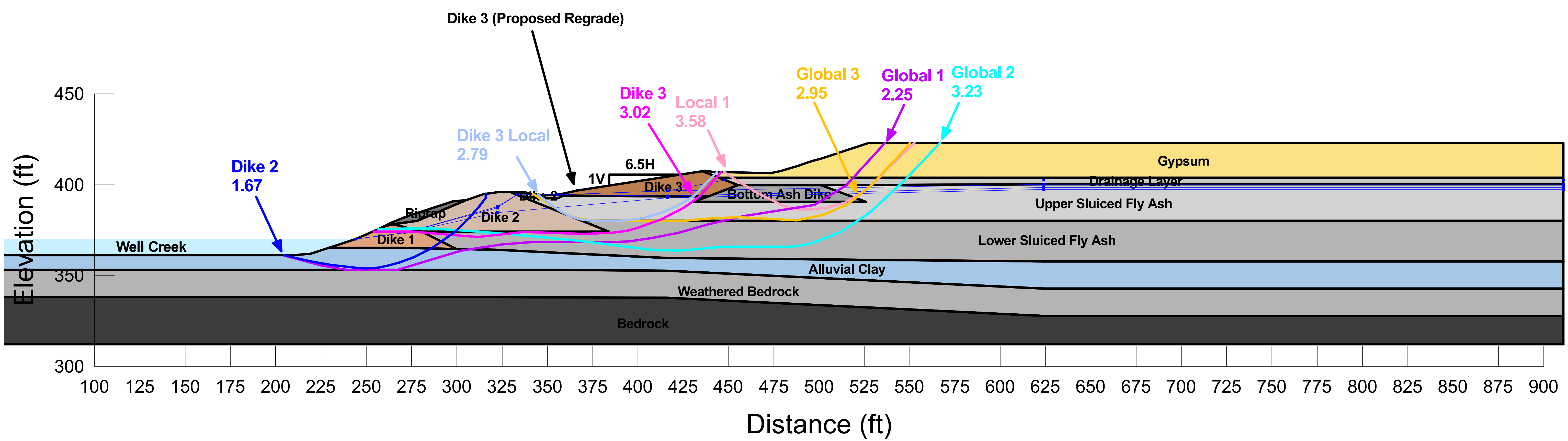
Seismic Assessment
Cumberland Fossil Plant

Gypsum Disposal Complex

Tennessee Valley Authority
Cumberland Fossil Plant
Gypsum Disposal Complex
Cumberland City, TN

Cross Section JK-JK' - Long-Term Static
11/29/2022

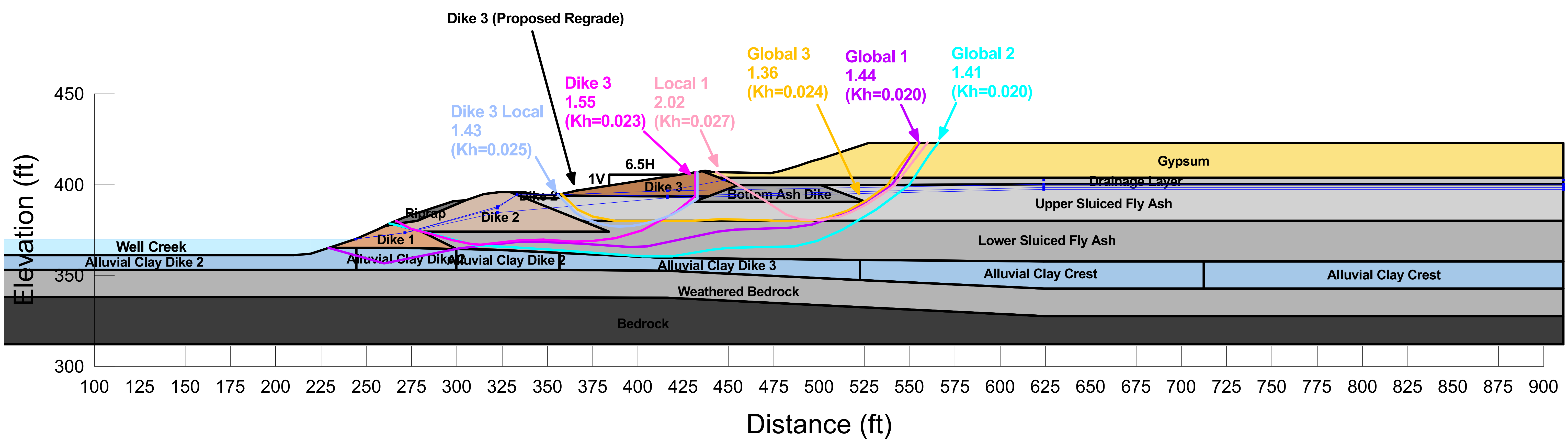
Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Alluvial Clay	120	0	32
	Bedrock			
	Bottom Ash Dike	115	0	35
	Dike 1	123	250	35
	Dike 2	123	250	35
	Dike 3	123	250	35
	Drainage Layer	110	0	38
	Gypsum	105	0	39
	Lower Sluiced Fly Ash	100	0	28
	Riprap	150	0	40
	Upper Sluiced Fly Ash	100	0	28
	Weathered Bedrock			



Tennessee Valley Authority
Cumberland Fossil Plant
Gypsum Disposal Complex
Cumberland City, TN

Cross Section JK-JK' - Pseudo Static
11/29/2022

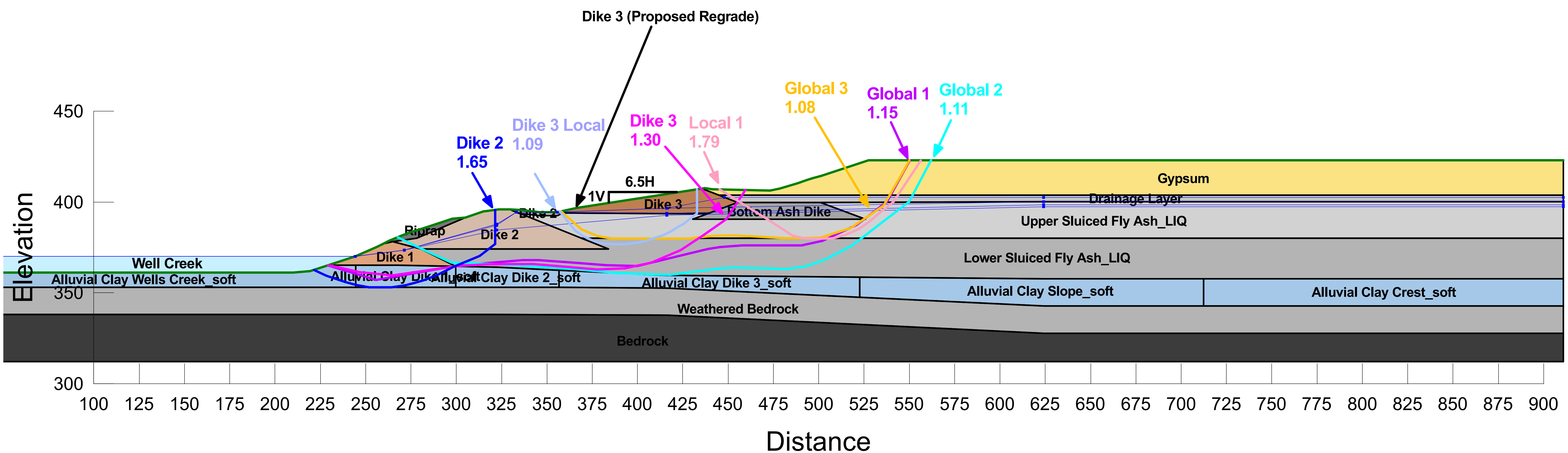
Color	Name	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)	Phi' (°)
	Alluvial Clay Crest	120			
	Alluvial Clay Dike 2	120			
	Alluvial Clay Dike 3	120			
	Bedrock				
	Bottom Ash Dike	115			35
	Dike 1	123		1,500	
	Dike 2	123		1,750	
	Dike 3	123		1,750	
	Drainage Layer	110			38
	Gypsum	105			39
	Lower Sluiced Fly Ash	100	0.24		
	Riprap	150			40
	Upper Sluiced Fly Ash	100	0.24		
	Weathered Bedrock				



Tennessee Valley Authority
Cumberland Fossil Plant
Gypsum Disposal Complex
Cumberland City, TN

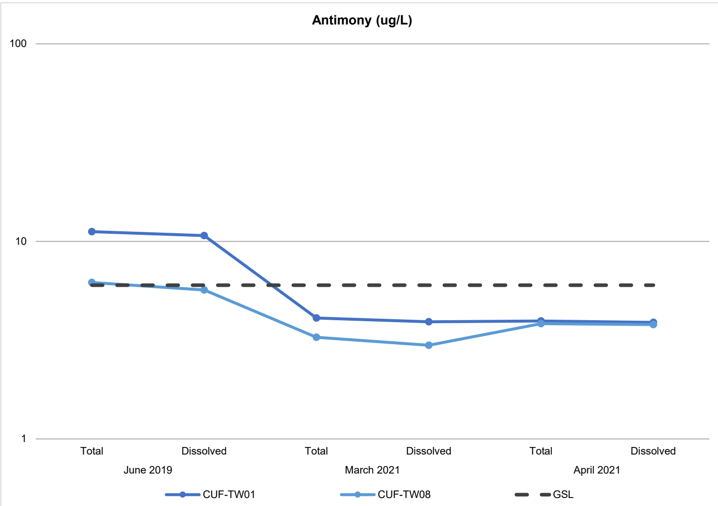
Cross Section JK-JK' - Post-Earthquake
01/10/2023

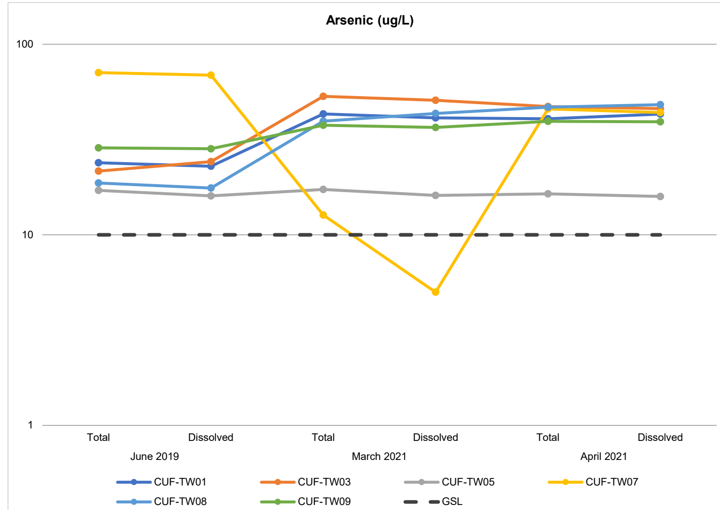
Color	Name	Unit Weight (pcf)	Tau/Sigma Ratio	Cohesion (psf)	Phi' (°)
	Alluvial Clay Crest_soft	120			
	Alluvial Clay Dike 1_soft	120			
	Alluvial Clay Dike 2_soft	120			
	Alluvial Clay Dike 3_soft	120			
	Alluvial Clay Slope_soft	120			
	Alluvial Clay Wells Creek_soft	120			
	Bedrock				
	Bottom Ash Dike	115			35
	Dike 1	123		1,500	
	Dike 2	123		1,750	
	Dike 3	123		1,750	
	Drainage Layer	110			38
	Gypsum	105			39
	Lower Sluiced Fly Ash_LIQ	100	0.15		
	Riprap	150			40
	Upper Sluiced Fly Ash_LIQ	100	0.15		
	Weathered Bedrock				

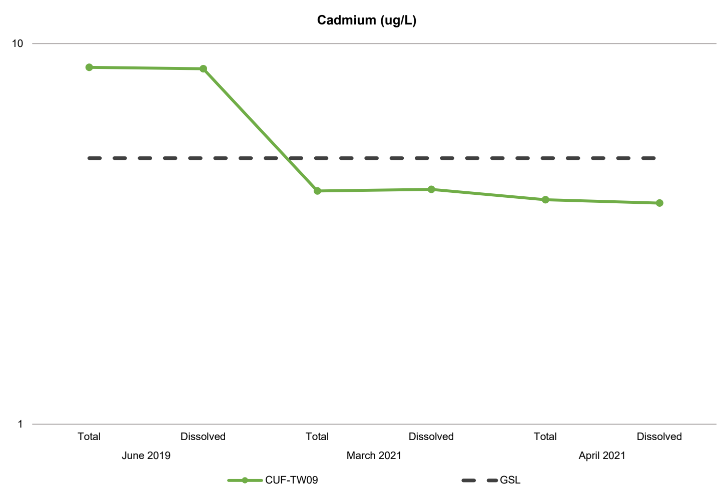


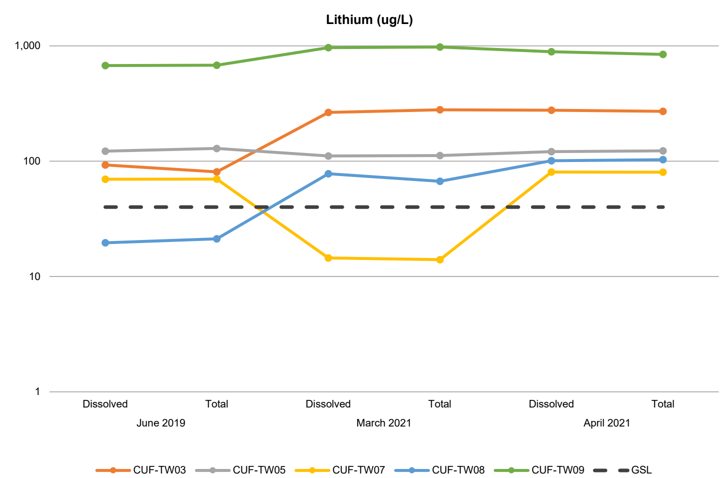
ATTACHMENT G.1-B
PORE WATER CONCENTRATIONS OVER TIME

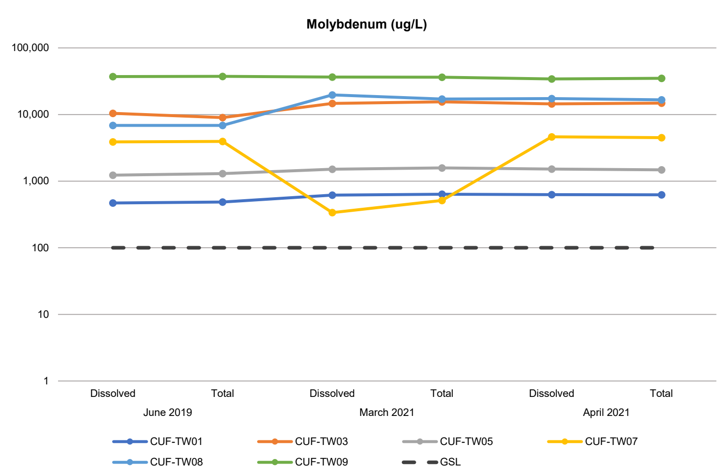
Attachment A - Pore Water Concentrations over Time
CCR Rule Parameters
Cumberland Fossil Plant - Cumberland City, Tennessee

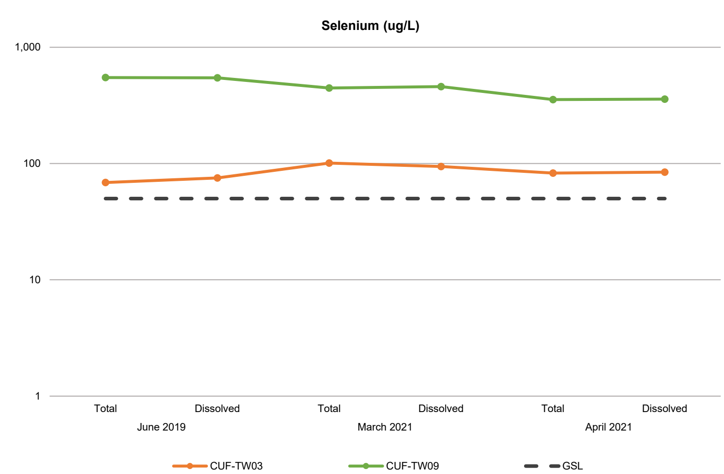






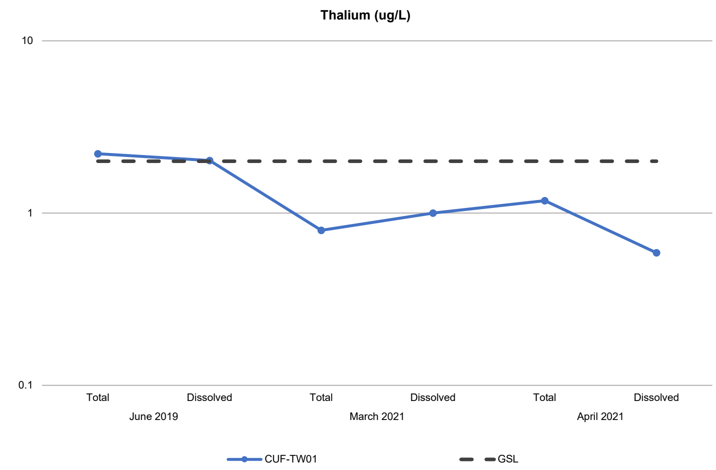


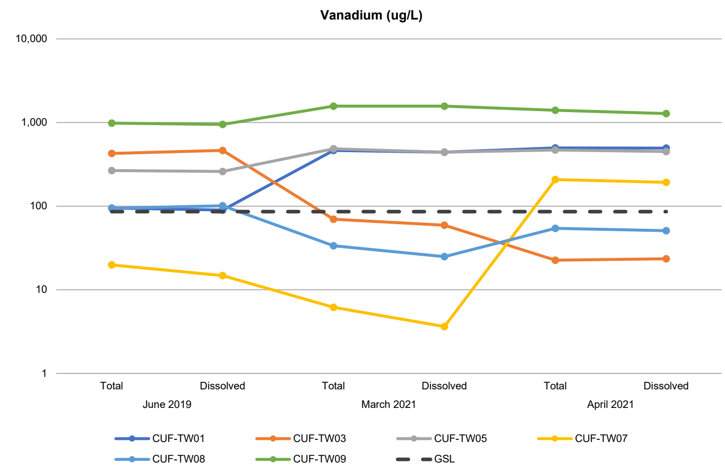




GSL = Groundwater Screening Levels
Note: GSLs are not directly applicable to pore water and are being used for comparison purposes only.

Attachment A - Pore Water Concentrations over Time
CCR Rule Parameters
Cumberland Fossil Plant - Cumberland City, Tennessee





GSL = Groundwater Screening Levels

Note: GSLs are not directly applicable to pore water and are being used for comparison purposes only

APPENDIX G.2

EXPLORATORY DRILLING SAMPLING AND ANALYSIS REPORT

Stantec

Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Cumberland Fossil Plant
Cumberland City, Tennessee

April 16, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

TVA

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	April 16, 2021

Sign-off Sheet

This document entitled Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Nicholas Duda

Nick Duda, Engineer in Training

Reviewed by Stan A. Harris

Stan Harris, Senior Principal Engineer

Approved by J. M. Kerr, Jr.

James M. Kerr, Jr., Senior Principal Geologist

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Abbreviations

ARM	ARM Group, Inc.
ASTM	American Society for Testing and Materials
CCR	Coal Combustion Residuals
COC	Chain-Of-Custody
ConeTec	ConeTec Inc.
CPT	Cone Penetration Test
CUF Plant	Cumberland Fossil Plant
DAS	Dry Ash Stack
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
ERI	Electrical Resistivity Imaging
EXD	Exploratory Drilling
FSP	Field Sampling Personnel
GPS	Global Positioning System
GSA	Gypsum Storage Area
ID	Identification
IDW	Investigation Derived Waste
IP	Induced Polarization
MASW	Multichannel Analysis of Surface Waves
PE	Professional Engineer
PG	Professional Geologist
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SP/RP	Stilling Pond/Retention Pond
SS	Split spoon
ST	Undisturbed (Shelby) Tube
Stantec	Stantec Consulting Services Inc.

TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TI	Technical Instruction
TVA	Tennessee Valley Authority
VWP	Vibrating Wire Piezometer

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this sampling and analysis report (SAR), on behalf of the Tennessee Valley Authority (TVA), to document activities related to exploratory drilling (EXD) at TVA's Cumberland Fossil (CUF) Plant located in Cumberland City, Tennessee.

The purpose of the EXD was to drill borings, advance cone penetration test (CPT) soundings, install temporary wells, and install piezometers to evaluate subsurface conditions at the CUF Plant, in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to summarize activities completed to meet the objectives of the EXD Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the EXD activities represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the CUF Plant. The evaluation of the results will consider other aspects of the environmental investigation, including data collected under other State and/or coal combustion residuals (CCR) programs, and will be presented in the Environmental Assessment Report (EAR).

The EXD activities were performed in conjunction with CCR materials characterization and material quantity investigations in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order:

- *Exploratory Drilling SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *CCR Material Characteristics SAP* (Stantec 2018c)
- *Material Quantity SAP* (Stantec 2018d)
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The EXD was implemented in accordance with TVA- and TDEC-approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the CUF Plant EXD SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.10.

EXD field work consisted of five primary activities – drilling and sampling, downhole testing in rock, installing temporary wells, installing piezometers, and surface geophysics. Quality Assurance oversight of field data acquisition protocols, sampling practices, and field data review were performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA. Geotechnical laboratory testing and data review was performed by Stantec.

2.0 OBJECTIVE AND SCOPE

The primary objective of the EXD, conducted pursuant to the EXD SAP, was to perform borings, install temporary wells, install piezometers, and perform surface and downhole geophysics to further characterize subsurface conditions at the CUF Plant, in response to the TDEC Order. The EXD SAP included activities at three CCR units: Dry Ash Stack (DAS), Gypsum Storage Area (GSA), and Stilling Pond/Retention Pond (SP/RP).

The activities conducted during EXD support data collection for the CCR material characteristics and material quantity investigations at the CUF Plant, including pore water level measurements and soil sample collection for analysis of CCR-related constituents.

The approach for EXD was to:

- Perform soil and rock borings and geotechnical laboratory testing to refine subsurface characterization and material quantity estimates
- Install temporary wells to allow for pore water sampling and measuring piezometric (i.e., pore water) levels within CCR units
- Install vibrating wire piezometers (VWPs) to allow water level (i.e., pore water pressure) readings in the various materials
- Use hollow-stem auger drilling techniques to collect soil samples at staked boring locations approved by TDEC and considered suitable for the drill rig to safely access
- Use rock coring to collect rock samples to characterize shallow bedrock
- Perform downhole testing in rock, including pressure testing and downhole geophysics to characterize subsurface lithology and hydrogeology of shallow bedrock
- Use CPT techniques to perform in-situ testing for subsurface characterization at staked sounding locations approved by TDEC and considered suitable for the CPT rig to safely access
- Complete temporary well development, hydraulic conductivity (slug) testing, and survey activities
- Perform surface geophysics in the vicinity of pre-construction channels of Wells Creek and an area of historical grouting, to better characterize the foundation soils
- Perform supplemental geotechnical borings, to correlate to buried stream channels or other geophysical anomalies identified in the soil.

The scope of work of the EXD consisted of the following tasks:

- Drilling borings and advancing CPT soundings
- Collecting disturbed and undisturbed soil samples and rock cores for lithologic information
- Performing downhole testing in rock at select boring locations
- Installing temporary wells, constructing surface protections, and developing the wells
- Installing VWPs
- Conducting slug tests in temporary wells
- Performing geotechnical laboratory testing
- Performing surface geophysics
- Performing supplemental geotechnical borings at identified geophysical anomalies
- Surveying boring, CPT sounding, and temporary well locations.

Details on each EXD activity are presented in the sections below. These activities were carried out concurrently with CCR material sampling and pore water monitoring and sampling, which were performed in accordance with the CCR Material Characteristics and Material Quantity SAPs. Refer to the CCR Material Characterization and Material Quantity SARs for information from those concurrent activities.

3.0 FIELD ACTIVITIES

EXD field activities were conducted in several separate phases. The first phase was conducted between November 27, 2018 and May 9, 2019 and consisted of hollow-stem auger drilling for geotechnical borings and temporary wells, temporary well installation, and VWP installation. Downhole testing in rock was performed concurrently with drilling, between December 5, 2018 and May 3, 2019. CPT soundings were conducted between January 8, 2019 and January 23, 2019. Temporary well development was conducted between May 20 and 28, 2019. Temporary well slug testing was conducted between July 15 and 19, 2019. Surface geophysical surveys were conducted between September 9 and 13, 2019. Supplemental drilling was conducted between June 2, 2020 and November 10, 2020 and consisted of additional hollow-stem auger drilling. Prior to initiating field activities, TVA conducted environmental reviews, obtained permits, and performed utility clearances as necessary to complete the field work.

Stantec performed EXD field activities based on guidance and specifications listed in TVA's Environmental (ENV) Technical Instructions (TIs), the SAPs, and the QAPP, except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, oversight of select field activities, field documentation, and centralized data management were performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation.

During the EXD, Stantec conducted the following field activities:

- Confirmed locations for planned borings and CPTs
- Drilled an initial 18 borings within the DAS, GSA, and SP/RP, under the direction of a Stantec Professional Geologist (PG) or Professional Engineer (PE) licensed in the State of Tennessee
- Collected soil samples, and rock samples at select borings, to develop a continuous subsurface log/lithologic profile for each boring, with select soil samples subjected to geotechnical laboratory testing
- Performed downhole testing (pressure testing and borehole geophysics) in rock in select borings, to characterize subsurface lithology and hydrogeology of the bedrock
- Installed temporary wells in six of the borings, under the direction of a Stantec PG licensed in the State of Tennessee
- Developed and conducted slug tests in all six temporary wells to estimate hydraulic conductivity
- Installed 14 VWPs in four geotechnical borings
- Advanced 33 CPTs

- Performed surface geophysical surveys in the vicinity of the pre-construction channels of Wells Creek and an area of historical grouting, and based on the results, considered whether targeted geotechnical borings were recommended
- Drilled six supplemental geotechnical borings, to correlate to buried stream channels or other geophysical anomalies identified in the soil.

Following temporary well installation, temporary well surface protections were constructed, and each boring and CPT location was surveyed.

Appendix A provides a site location map; an EXD boring and temporary well) location map; a CPT, surface geophysical survey and supplemental geotechnical boring location map; and an instrumentation location map. Appendix B provides summary tables of information collected during the EXD. Appendix C includes subsurface logs, temporary well installation details, and VWP installation details. Appendix D includes photographs related to the borings, temporary wells, and VWPs. Appendix E includes in-situ testing results and Appendix F includes geotechnical laboratory testing results.

3.1 WORK LOCATIONS

The boring, CPT, and surface geophysics locations were selected to address data gaps and supplement existing data at the CUF Plant as described in the EXD SAP. Rationale for individual boring and CPT locations, as well as surface geophysics transect locations, are discussed below. A site location map; boring and temporary well location map; a CPT, surface geophysics and supplemental geotechnical boring location map; and instrument layout map are provided as Exhibits A.1 through A.4 in Appendix A.

In order to provide data regarding CCR material quantity, pore water levels, CCR material characteristics, and subsurface characterization, borings were drilled, temporary wells installed, and VWPs installed at locations shown on Exhibits A.2 through A.4. A total of twenty-four borings, six of which include temporary well installations and four of which include VWP installations, and 33 CPTs were completed. Table 1 provides the number of borings and CPTs completed (including temporary well installations) in each CCR unit. Table 2 lists the borings/CPTs and more detail about the purpose for each.

Table 1. Exploratory Drilling Performed in Each CCR Unit

CCR Unit	No. of Borings without Temporary Wells or VWPs	No. of Borings with Temporary Wells Installed	No. of Borings with VWPs Installed	No. of CPT Soundings
Dry Ash Stack	3	3	4	23
Gypsum Storage Area	5	3	0	0
Stilling Pond/Retention Pond	6	0	0	10
Total	14	6	4	33

Notes:
CCR = Coal Combustion Residuals
CPT = Cone Penetration Test
VWPs = Vibrating Wire Piezometers
No. = Number

Table 2. Summary of EXD Borings

Boring No.	CCR Unit	Borehole Termination Criteria	Temporary Well Screen or VWP Tip Location(s)	Boring Purpose
CUF-TW01	GSA	Obtain 20 ft of Rock Core	CCR	PZ, PW, Geo
CUF-TW02	GSA	Encounter Drainage Layer beneath gypsum	Not Installed	Geo
CUF-TW03	GSA	Obtain 20 ft of Rock Core	CCR	PZ, PW, Geo
CUF-TW04	GSA	Encounter Drainage Layer beneath gypsum	Not Installed	Geo
CUF-TW05	GSA	Obtain 20 ft of Rock Core	CCR	PZ, PW, Geo
CUF-TW06	GSA	Encounter Drainage Layer beneath gypsum	Not Installed	Geo
CUF-B18	GSA	Obtain rock core to approximate elevation 300 ft	--	Geo
CUF-B19	GSA	Obtain rock core to approximate elevation 275 ft	--	Geo
CUF-TW07	DAS	Obtain 20 ft of Rock Core	CCR	PZ, PW, Geo
CUF-TW08	DAS	Obtain 20 ft of Rock Core	CCR	PZ, PW, Geo
CUF-TW09	DAS	Obtain 20 ft of Rock Core	CCR	PZ, PW, Geo
CUF-B14	DAS	Obtain 20 ft of Rock Core	CCR, Foundation Soil (x2), Bedrock	VWP, Geo
CUF-B15	DAS	Obtain 20 ft of Rock Core	CCR, Foundation Soil, Bedrock	VWP, Geo
CUF-B16	DAS	Obtain 20 ft of Rock Core	CCR (x2), Foundation Soil, Bedrock	VWP, Geo
CUF-B17	DAS	Obtain 20 ft of Rock Core	CCR, Foundation Soil, Bedrock	VWP, Geo
CUF-B23	DAS	Refusal	--	Geo
CUF-B24	DAS	Refusal	--	Geo
CUF-B25	DAS	Refusal	--	Geo
CUF-CPT08	DAS	Refusal	--	Geo
CUF-CPT09	DAS	Refusal	--	Geo
CUF-CPT10	DAS	Refusal	--	Geo
CUF-CPT11	DAS	Refusal	--	Geo
CUF-CPT12	DAS	Refusal	--	Geo
CUF-CPT13	DAS	Refusal	--	Geo
CUF-CPT14	DAS	Refusal	--	Geo
CUF-CPT15	DAS	Refusal	--	Geo
CUF-CPT16	DAS	Refusal	--	Geo
CUF-CPT17	DAS	Refusal	--	Geo
CUF-CPT17A	DAS	Refusal	--	Geo
CUF-CPT18	DAS	Refusal	--	Geo
CUF-CPT19	DAS	Refusal	--	Geo
CUF-CPT20	DAS	Refusal	--	Geo
CUF-CPT21	DAS	Refusal	--	Geo
CUF-CPT22	DAS	Refusal	--	Geo

Table 2. Summary of EXD Borings

Boring No.	CCR Unit	Borehole Termination Criteria	Temporary Well Screen or VWP Tip Location(s)	Boring Purpose
CUF-CPT22A	DAS	Refusal	--	Geo
CUF-CPT23	DAS	Refusal	--	Geo
CUF-CPT24	DAS	Refusal	--	Geo
CUF-CPT24A	DAS	Refusal	--	Geo
CUF-CPT25	DAS	Refusal	--	Geo
CUF-CPT25A	DAS	Refusal	--	Geo
CUF-CPT26	DAS	Refusal	--	Geo
CUF-B11	SP/RP	Obtain 20 ft of Rock Core	--	Geo
CUF-B12	SP/RP	Obtain 20 ft of Rock Core	--	Geo
CUF-B13	SP/RP	Obtain 20 ft of Rock Core	--	Geo
CUF-B20	SP/RP	Refusal	--	Geo
CUF-B21	SP/RP	Refusal	--	Geo
CUF-B22	SP/RP	Refusal[1]	--	Geo
CUF-CPT01	SP/RP	Refusal	--	Geo
CUF-CPT02	SP/RP	Refusal	--	Geo
CUF-CPT03	SP/RP	Refusal	--	Geo
CUF-CPT04	SP/RP	Refusal	--	Geo
CUF-CPT05	SP/RP	Refusal	--	Geo
CUF-CPT06	SP/RP	Refusal	--	Geo
CUF-CPT07	SP/RP	Refusal	--	Geo
CUF-CPT27	SP/RP	Refusal	--	Geo
CUF-CPT28	SP/RP	Refusal	--	Geo
CUF-CPT29	SP/RP	Refusal	--	Geo

Notes:
CCR = Coal Combustion Residuals;
CPT = Cone Penetration Test;
DAS = Dry Ash Stack;
Geo = Geotechnical Data;
GSA = Gypsum Storage Area;
N/A = Not Applicable;
No. = Number;
PW = Pore Water Sampling;
PZ = Piezometric (Pore Water) Levels;
SP/RP = Stilling Pond/Retention Pond;
VWP = Vibrating Wire Piezometer;
Refusal indicates rock-like resistance to borehole or CPT advancement. This may indicate the beginning of weathered bedrock, boulders, rock remnants, cemented materials, or other hard/dense layers that prevent hole advancement.
1.Boring CUF-B22 was terminated based on field observations by the Stantec PG, without achieving the planned auger refusal.

As shown on Exhibit A.2 in Appendix A and in Table 2 above, a total of eight borings, including three borings with temporary wells and two geotechnical borings were drilled within the footprint of the GSA. The borings are located in accessible areas of the unit interior and unit perimeter to improve spatial coverage for CCR material thickness and pore water levels, and to facilitate CCR material characterization and pore water sampling. The temporary wells were screened near the bottom of the CCR in the unit (Exhibit A.4), after the portion of the borehole was sealed that penetrated the foundation soils and bedrock.

Three additional, shallower temporary wells (CUF-TW02, CUF-TW04, and CUF-TW06) were to be screened in gypsum, just above the drainage layer/sluiced CCR interface. However, upon reaching the planned termination criteria, water levels in borings CUF-TW02, CUF-TW04, and CUF-TW06 were monitored (per the TDEC-approved plan) and were found to have insufficient depth of water to facilitate CCR pore water sampling. Therefore, these three temporary wells were not installed and the borings were backfilled with 30% solids bentonite grout per the SAP.

As shown on Exhibit A.2 in Appendix A and in Table 2 above, initially seven borings, including three borings with temporary wells and four geotechnical borings with VWPs, were drilled within the footprint of the DAS. Twenty-three CPT soundings, as noted in Table 2 above, were also performed at the DAS, as shown on Exhibit A.3. The borings are located in accessible areas of the unit interior to improve spatial coverage for CCR material thickness and pore water levels, and to facilitate CCR material characterization and pore water sampling. The temporary wells were screened near the bottom of the CCR in the unit (Exhibit A.4), after the portion of the borehole was sealed that penetrated the foundation soils and bedrock. The CPT soundings were advanced to better characterize CCR material thickness and the uppermost foundation soils in the immediate vicinity of the mapped, pre-construction channels of Wells Creek. In order to better characterize the pore water pressures within the DAS, fourteen VWP transducers were also installed within the four borings (Exhibit A.4).

As shown on Exhibit A.2 in Appendix A and in Table 2 above, initially three geotechnical borings were drilled within the footprint of the SP/RP. Ten CPT soundings, as noted in Table 2 above, were also performed at the SP/RP, as shown in Exhibit A.3. The borings and soundings are located in accessible areas of the unit interior and unit perimeter to improve spatial coverage for CCR material thickness and pore water pressures within the foundation soils. The CPT soundings were advanced to better characterize the CCR material thickness and uppermost foundation soils in the immediate vicinity of the mapped, pre-construction channels of Wells Creek.

As a follow up to the CPTs described above, surface geophysics were conducted to better characterize the foundation soils in the immediate vicinity of the mapped, pre-construction channels of Wells Creek and in an area of historical grouting. The intent was to conduct electrical resistivity imaging (ERI) and multichannel analysis of surface waves (MASW) surveys in two areas of interest. As part of the ERI surveys, induced polarization (IP) surveys were also performed. The “North Area” is along a portion of the west perimeter of the SP/RP, and the “South Area” is along the southwest perimeter of the DAS. Exhibit A.3 in Appendix A shows the geophysical survey transects. In the North Area, ERI/IP transect ER1 and MASW transect M2 are located along the Raised Dike, while ERI/IP transect ER2 and MASW transect M3 are located along the Remnant Crest of the Starter Dike. Each transect in the North Area is approximately 700 feet long. In the South Area, ERI/IP transect ER3 and MASW transect M1 are located along the Raised Dike, while ERI/IP transect ER4 and MASW transect M4 are located along the Remnant Crest of the Starter Dike. Each transect in the South Area is approximately 1,000 feet long.

As shown on Exhibits A.2 and A.3 in Appendix A and in Table 2 above, six supplemental geotechnical borings were drilled, three along the west perimeter of the SP/RP (i.e., the North Area of surface geophysics) and three along the southwest perimeter of the DAS (i.e., the South Area of surface geophysics). In the North Area, the purpose of two borings (CUF-B20 and CUF-B21) is to characterize the dike and foundation soil type(s) in or near the stream alignment. The purpose of the third boring (CUF-B22) is to characterize the dike and foundation soil type(s) at an anomaly observed in the geophysical results. In the South Area, the purpose of two borings (CUF-B23 and CUF-B24) is to characterize the dike and foundation soil type(s) at anomalies observed in the geophysical results. The purpose of the third boring (CUF-B25) is to characterize the dike and foundation soil type(s) in or near the stream alignment.

3.2 DOCUMENTATION

Stantec maintained EXD field documentation in general accordance with ENV-TI-05.80.03, *Field Record Keeping*, the EXD SAP, and the QAPP. Field documentation for environmental soil sampling activities is described in the CCR Material Characteristics SAR. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Field activities and data were primarily recorded on program-specific field forms. Additional information regarding EXD field documentation is provided below.

3.2.1 Field Forms

Stantec used program-specific field forms to record field observations and data for specific activities. Field forms used during the EXD included:

- *Daily Field Activity Log*
- *Subsurface Log*
- *Chain-of-Custody (COC)*
- *Cone Penetration Test Inspection*
- *Monitoring Well Installation Field Log*
- *Well Development Form*
- *Equipment Calibration Form*
- *Slug Test Data Form*
- *Vibrating Wire Piezometer Installation Notes and Details*
- *Water Pressure Test Form*
- *Borehole Geophysical Logging Data Form*
- *Surface Geophysics Daily Checklist.*

3.2.1.1 Daily Field Activity Log

Stantec field sampling personnel (FSP) recorded field activities, observations, and data on a *Daily Field Activity Log* to chronologically document the field program. Deviations from the SAP, Tis, or QAPP were documented on *the Daily Field Activity Log*.

3.2.1.2 Subsurface Log

A Stantec PG or PE licensed in the State of Tennessee prepared a *Subsurface Log* for each boring. The log documented date, boring location, drilling personnel, tooling/equipment used, depth to pore water, sample number, sample recovery, soil/rock lithology, and other relevant observations. Soil color was logged per the appropriate Munsell Soil Color Chart (Munsell Color 2009). Information from these logs was used to construct the subsurface logs provided in Attachment C.1 in Appendix C.

3.2.1.3 Chain-of-Custody

Stantec FSP completed geotechnical *COC* documentation for each soil and rock sample collected during the EXD. The sample identification (ID), sample location, sample depth, type of sample, sampling date, and sample custody record were recorded on the *COCs*. The Field Team Leader reviewed the *COCs* for completeness, and the FSP conducted a quality control check of samples in each shipment compared to sample IDs on the corresponding *COC* prior to submittal to the laboratory. *COCs* were completed in general accordance with ENV-TI-05.80.02*: Sample Labeling and Custody*.

3.2.1.4 Cone Penetration Test Inspection

Stantec FSP completed a *Cone Penetration Test Inspection Form* for each CPT sounding. The form documented the cone equipment, number of pore pressure dissipation tests, average depth intervals for shear wave velocity tests, use of casing (if any), refusal parameters, and grouting information. Note that the CPT contractor was responsible for collecting the necessary subsurface data (depth, penetration resistance, pore pressure, shear wave velocity, etc.) for their report.

3.2.1.5 Monitoring Well Installation Field Log

A Stantec PG licensed in the State of Tennessee prepared a *Monitoring Well Installation Field Log* for each temporary well. The log documented the well location, well installation date(s), well installation materials, well depth, screened interval, depth interval for each backfill material, and surface completion details. Information from these logs was used to construct the temporary well installation details provided in Attachment C.2 in Appendix C.

3.2.1.6 Well Development Form

Stantec FSP completed a *Well Development Form* for each temporary well. The form documented well location, well development date(s), elapsed time since development started, depth to pore water, purge rate, cumulative purge volume, and pore water quality parameter measurements throughout and at completion of the development process.

3.2.1.7 Equipment Calibration Form

Stantec FSP performed daily equipment calibrations of the water quality meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration test results for temperature, turbidity, specific conductance, pH, and verified that the field instruments' sensors were operating within acceptable criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.8 Slug Test Data Form

Stantec FSP completed a *Slug Test Data Form* for the hydraulic conductivity tests performed at each temporary well. The form primarily documented well location, slug test date(s), and initial and final pore water level measurements before and after each slug test attempt. The pore water level measurements during the tests were recorded by an automated pressure transducer and data recorder and subsequently downloaded.

3.2.1.9 Vibrating Wire Piezometer Installation Notes and Details

A Stantec PG or PE licensed in the State of Tennessee prepared a *Vibrating Wire Piezometer Installation Notes and Details* for each boring containing VWPs. The log documented the piezometer location, piezometer installation date(s), borehole depth, piezometer installation materials, transducer calibration data, quality checks of the transducer(s), transducer depth(s), installation notes, and surface completion details (protective casing, concrete pad, bollards, etc.). Information from these logs was used to construct the piezometer installation details provided in Attachment C.3 in Appendix C.

3.2.1.10 Water Pressure Test Form

Stantec FSP completed a *Water Pressure Test Form* for the pressure testing of select boreholes during drilling. The form documented the equipment used, test method, the depth interval tested, volume of water, pressure readings, and the time interval for each pressure interval tested.

3.2.1.11 Borehole Geophysical Logging Data Form

Stantec FSP completed a *Borehole Geophysical Logging Data Form* for each borehole that included downhole geophysical testing. The form primarily documented the testing location, test date(s), test type, equipment (tool) used, and depth interval(s) tested.

3.2.1.12 Surface Geophysics Daily Checklist

Stantec FSP completed a *Surface Geophysics Daily Checklist* for each day surface geophysics was conducted. For each technique applied, the form documented if certain quality control checks were performed prior to, during, and after data acquisition and any comments related to those checks.

3.2.2 Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters data were calibrated each day prior to sampling as specified by the SAP, QAPP, and ENV-TI-05.80.46*: Field Measurement*

Using a Multi-Parameter Sonde. Afternoon calibration verifications were performed to evaluate if instruments remained within acceptable criteria during sampling. Temperature and barometric pressure were recorded using a calibrated National Institute of Standards and Technology traceable thermometer and the National Weather Service (via mesowest.utah.edu) barometric pressure readings for Clarksville Outlaw Field (KCKV) in Clarksville, Tennessee, respectively. Additional details regarding equipment calibration were recorded on the *Equipment Calibration Form*, as described in Section 3.2.1.7.

3.2.3 Photographs

In addition to documentation of field activities described above, photographs were taken to document the field investigation. A photographic log of soil samples and rock cores, as applicable, recovered from each boring, and site condition photographs including the surface completion of installed temporary wells and VWPs are provided in Attachments D.1 and D.2 respectively, in Appendix D.

3.3 DRILLING AND SAMPLING

The following sections present drilling and soil sampling procedures used during the EXD. Drilling and sampling activities were performed under the direction of a Stantec PG or PE licensed in the State of Tennessee. CPT activities were conducted under the observation of a Stantec graduate geologist.

3.3.1 Drilling

Drilling, sampling, temporary well installation, and VWP installation was performed by Stantec drillers licensed in Tennessee, using Stantec equipment. CPTs were performed by ConeTec Inc. (ConeTec) under contract to Stantec, with field oversight by Stantec. Except for five of the supplemental geotechnical borings, the borings and CPTs were drilled in areas with drive-on access; no special site preparations were necessary to facilitate access. Five of the six supplemental borings were located along the Remnant Crest of the Starter Dike, which necessitated the use of a wrecker to safely position the drill rig.

Hollow-stem auger borings were advanced by means of split-spoon and/or Shelby tube sampling to recover soil for lithologic description, photographic documentation, and sample collection. Each run was then overdrilled using 4.25-inch hollow-stem augers. In borings that included rock coring, upon encountering auger refusal, drilling was performed utilizing NQ-sized wireline rock core tooling. After reaching the bottom of borehole, the 4.25-inch hollow-stem augers and rock coring tooling (where applicable) were withdrawn. In borings receiving temporary wells, the upper portion of the borehole was overdrilled with 8.25-inch (inside diameter) hollow-stem augers to ream the borehole to a larger diameter, to facilitate subsequent installation of the temporary well. Hollow-stem augers and rock core tooling were decontaminated using a high-pressure steam cleaner and potable water after use at each temporary well boring.

The CPT soundings were performed using a 20-ton track rig and a 25-ton truck rig, each equipped to record data on 2.5 cm intervals throughout the sounding depth. The CPTs were conducted in general accordance with American Society for Testing and Materials (ASTM) D5778. Shear wave velocity tests and/or pore pressure dissipation tests were performed at select locations, as requested in the field by the Stantec geologist. Each CPT sounding was backfilled with 30% solids bentonite grout per the SAP.

A summary of the as-drilled boring and CPT depths, elevations, and types of sampling or testing is presented in Table B.1 and B.2 respectively in Appendix B. Boring and CPT locations are included on Exhibit A.2 and A.3 in Appendix A. ConeTec's report, including CPT logs/data and details regarding the procedures and equipment used can be found in Appendix E (Attachment E.1).

3.3.2 Soil and Rock Sampling

During advancement of each boring, the Stantec PG or PE prepared field subsurface logs using a mobile data collection platform. Inputs included a description of subsurface lithology, sample recovery, color using the Munsell Soil Color Chart, and other relevant parameters as required by the SAPs and TIs. Subsurface logs for the CUF Plant EXD are presented in Attachment C.1 in Appendix C.

Soil samples were collected from each boring to provide lithologic information for a continuous subsurface log/soil profile for the proposed borings. Temporary well borings and geotechnical borings were advanced using a conventional rotary drill rig with split-spoon (SS) and undisturbed (Shelby) tube (ST) sampling. Two-inch and/or three-inch diameter split-spoons were used to collect disturbed SS soil samples. SS and ST samples were collected for general soil and CCR characterization and potential laboratory testing. Each drill rig employed for in-situ penetration testing utilized an automatic hammer. The hammer weight and/or drop height may vary based on the drill rig, sampler size, and the sampling objectives of each boring.

Rock core samples were collected from select borings, to characterize the rock strata type and structure. Rock coring was performed using NQ-sized rock core tooling.

Table B.3 in Appendix B summarizes the soil and rock samples collected in each boring along with rig type, sampler, and hammer information. The subsurface logs in Attachment C.1 record the depths of the recovered samples along with the results of the in-situ penetration testing program, including field blow counts.

Select soil samples collected during the EXD were subjected to geotechnical laboratory testing. Select SS and ST samples were subjected to Unified Soil Classification System laboratory classification and index testing including natural moisture content, gradation, Atterberg limits, and specific gravity tests. Additionally, select ST samples were subjected to hydraulic conductivity tests. Not all test types were performed on all encountered materials. Tests were assigned based on material recovery, availability, and subsurface characterization needs. No testing was performed on rock core samples. Appendix F presents the geotechnical laboratory testing results for select soil samples which are summarized in Attachment F.1 (Tables F.1 through F.6). The laboratory data sheets for each specific test are provided in Attachments F.2 through F.4.

3.3.3 Sample Shipment

At appropriate intervals, assigned personnel transported the geotechnical samples to the testing laboratory or designated storage facility. A geotechnical *COC* accompanied the samples throughout the shipping process.

SS samples are disturbed samples and were treated as Group B samples as discussed in ASTM D4220. The Shelby tubes were stored vertically in padded racks constructed in accordance with ASTM D4220. Rock core samples were placed in labeled, wooden core boxes. Based on anticipated weather conditions during sampling operations, care was taken in the storage of the samples to guard against the samples being exposed to extreme heat or cold. Prior to transport, the tubes were transferred to a custom box built in accordance with ASTM D4220 guidelines for transporting Group D type soil samples.

3.4 DOWNHOLE TESTING IN ROCK

3.4.1 Pressure Testing

Upon completion of rock coring, targeted pressure testing (packer tests) was conducted to provide an estimate of hydraulic conductivity of bedrock. The bedrock was tested by isolating intervals (generally five to ten feet each) of the borehole with inflatable rubber packers. Potable water was pumped into each interval at constant pressure for typically five minutes, with volume of water lost into the bedrock formation measured using a flow meter. Tests were repeated within each interval over a range of pressures, typically in five pounds per square inch increments. Estimated hydraulic conductivity values were calculated from the field data based on the rate of flow into the formation at each location. Table B.4 in Appendix B provides a summary of the estimated bedrock hydraulic conductivities in each tested interval.

3.4.2 Downhole Geophysics

Downhole geophysical testing in rock was performed by ARM Group Inc. (ARM), under contract to Stantec, with field oversight by Stantec. ARM performed geophysical logging using the following investigative methods: natural gamma, fluid temperature, fluid resistivity, caliper, acoustic televiewer, heat pulse flowmeter (ambient and pumping), and Idronaut (dissolved oxygen, oxidation-reduction potential, pH, fluid temperature, fluid resistivity, and pressure). When ARM's Idronaut probe was not available, Stantec collected pH, dissolved oxygen, and oxidation-reduction potential data in borings CUF-B11 through CUF-B14, CUF-B18, CUF-B19, CUF-TW01, CUF-TW03, and CUF-TW05. Stantec supplied this data to ARM for reporting. In addition to producing downhole geophysical logs for each method, ARM also produced diagrams for structural data (i.e., orientation of planar features) and interpretation of water producing or receiving zones. ARM's downhole geophysical testing report is provided in Attachment E.2 in Appendix E.

3.5 TEMPORARY WELL INSTALLATION

3.5.1 Temporary Well Installation

Temporary wells were installed in the borings by qualified drill crews working under the direction of a Stantec PG and a licensed Tennessee driller. Temporary well installation was carried out in general accordance with ENV-TI-05.80.25: *Monitoring Well and Piezometer Installation and Development*. Temporary well construction details are documented on the Well Installation Detail sheets provided in Attachment C.2 in Appendix C.

The lowest portions of the borings were backfilled with bentonite pellets, then generally topped with a layer of sand filter pack (20/40 mesh). The temporary wells were installed above the backfilled portion. Temporary wells consisted of a four-inch diameter Schedule 40 polyvinyl chloride (PVC) pre-packed well screen (0.010-inch slots) and riser. The screen and riser consisted of flush-joint, threaded PVC pipe. The screen length was nominally 10 feet. The PVC riser extended a minimum of 2.5 feet above the ground surface and was capped with a temporary plug or slip cap. The annular space was backfilled with a sand filter pack extending approximately two feet above and six inches below the screen. A bentonite pellet seal approximately two feet thick was placed on top of the sand filter pack. The sand filter pack and bentonite pellets were either placed by tremie method or poured slowly into the annular space of the drill tooling to prevent bridging.

After the bentonite pellet seal had sufficiently hydrated for a duration equal to or greater than the minimum recommended by the manufacturer (a minimum of four hours), the remaining annular space was backfilled with a 30% solids bentonite grout. The grout was placed by tremie method through one-inch or 1.5-inch diameter PVC pipe using pumps gauged to allow the installation crew to monitor pressures during the grouting process.

As allowed in the EXD SAP, TVA elected to modify the surface protection for each of the temporary well installations. Instead of installing a concrete well pad and steel protective cover, Stantec installed temporary surface protection (fence posts and plastic fencing) around each riser pipe. Fence posts were driven shallow enough to avoid penetrating the final cap system at the Ash Pond. A summary of temporary well installations is presented in Table B.5 in Appendix B. Construction details are presented in the Temporary Well Installation Details provided in Attachment C.2 in Appendix C.

3.5.2 Temporary Well Development

After drilling and installation of the temporary wells, the pore water levels within the temporary wells were monitored to evaluate whether a sufficient pore water column was available for well development. A temporary well was deemed viable for development if two feet of pore water was present at the bottom of the well, per the TDEC-approved memorandum from Stantec to TVA titled *Procedures for Installation or Abandonment of Temporary and Permanent Wells When Anticipated Water Levels Are Not Initially Observed* (Stantec 2019). The six temporary wells (CUF-TW01, CUF-TW03, CUF-TW05, and CUF-TW07 through CUF-TW09) were deemed viable and developed to remove fine particulates from the well casing to support subsequent low-flow pore water sampling events.

Each new temporary monitoring well was developed in accordance with ENV-TI-05.80.25: *Monitoring Well and Piezometer Installation and Development* by a combination of bailing, surging, and pumping after a minimum of 24 hours following temporary well installation. First, a three-inch diameter PVC bailer was lowered and raised within the screened intervals to create a slight surging action to dislodge particles within the temporary wells and sand filter packs. Then the bailer was used to remove turbid pore water from the temporary well. Baseline readings of turbidity, pH, temperature, and specific conductance were measured using a calibrated YSI Pro Plus water quality meter and a calibrated Hach 2100Q turbidity meter. This process of alternately surging and bailing was repeated several times to decrease the pore water turbidity within the temporary wells. Lastly, a submersible pump was employed to further develop the temporary wells until stabilization criteria for turbidity (≤10 Nephelometric Turbidity Units), pH (±0.1

Standard Unit), temperature (±10%), and specific conductance (±10%) were achieved. The target turbidity value was based on well purging criteria specified in ENV-TI-05.80.42: *Groundwater Sampling* at the time of development. Temporary well development details were recorded on the *Well Development Form.*

Development of each temporary well was completed within a span of one to four hours, except for CUF-TW07 which was developed through multiple efforts over the course of four days. Recharge rates observed within the temporary wells near the conclusion of development ranged from 0.6 gallons/hour at temporary well CUF-TW08 to 1.6 gallons/hour at temporary wells CUF-TW01 and CUF-TW03. After development, the temporary wells met the stabilization criteria (pH, temperature, turbidity, and specific conductance). A summary of initial and final temporary well development data is presented in Table B.6 in Appendix B.

3.5.3 Hydraulic Conductivity (Slug) Testing

After development, Stantec performed slug tests in the temporary wells to estimate hydraulic conductivity. The slug tests were performed in accordance with the ASTM D4044: *Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers*. A pressure transducer with a data recorder was used to collect pore water level information from the temporary wells.

Three rising-head and three falling-head slug tests were performed at each temporary well, except for CUF-TW05 where four rising-head and four falling-head slug tests were performed, as shown on Table B.7 in Appendix B. Each temporary well was tested by taking an initial measurement of the static pore water level followed by the insertion of the pressure transducer into the temporary well. After the transducer had been installed, a falling-head slug test was conducted by introducing a solid slug (e.g., PVC pipe filled with sand) into the temporary well to cause a nearly instantaneous rise in the pore water level. The pore water levels were then recorded at regular intervals until reaching near initial static levels. After the first test concluded, a rising-head slug test was conducted by removing the slug to cause a nearly instantaneous drop in the pore water level. Pore water levels were recorded until initial static pore water levels were reached again. The data were recorded electronically by the transducer and downloaded into a data collector. Raw data were checked in the field for discrepancies prior to demobilizing from the CUF Plant.

The field data were analyzed using AQTESOLV™ Version 4.50 Professional software to estimate the hydraulic conductivity of the saturated soils in the screened interval. Calculated hydraulic conductivities are summarized in Table B.7 in Appendix B, and the full software output package is provided as Attachment E.3 in Appendix E.

Specific to the CUF Plant temporary wells, analysis for each was completed using the Bouwer-Rice method. The solution was typically matched to the normalized plotted recovery data between 70-80% recovery.

3.6 INSTRUMENTATION INSTALLATION

VWPs were installed in the borings by qualified drill crews working under the direction of a Stantec PG or PE. VWP construction details are documented on the Piezometer Installation Detail sheets provided in Attachment C.3 in Appendix C.

After completion of the boring, the number of VWP transducers and installation depths were selected based on observed subsurface conditions and EXD objectives. Each VWP transducer was checked and prepared per the manufacturer recommendations, prior to installation. Hollow-stem augers were left in place to keep the borehole open and the depth to the bottom of the borehole was measured. A sacrificial tape was then affixed to a sacrificial Schedule 40 PVC pipe in order to attach the VWPs and lower to the desired depth(s) in the borehole. The hollow-stem augers were removed as the borehole was backfilled with 30% solids bentonite grout through the sacrificial pipe. At the surface, excess cable from each VWP was coiled and placed in a five-gallon bucket for protection.

As allowed in the EXD SAP, TVA elected to modify the surface protection for each of the VWP installations. Instead of installing a concrete pad and steel protective cover, Stantec installed temporary surface protection (fence posts and plastic fencing) around each riser pipe.

A map of piezometer locations and the material(s) monitored can be found in Exhibit A.4 in Appendix A. A summary of VWP installations is presented in Table B.8 in Appendix B. Construction details are presented in the Piezometer Installation Details provided in Attachment C.3 in Appendix C.

3.7 SURFACE GEOPHYSICS

Surface geophysical testing was performed by ARM under contract to Stantec, with field oversight by Stantec. ERI/IP and MASW surveys were conducted to better characterize the foundation soils in the immediate vicinity of the mapped, pre-construction channels of Wells Creek and in an area of historical grouting. Results of the surface geophysical investigation was utilized to locate supplemental geotechnical borings. ARM's surface geophysical survey report is provided in Attachment E.4 in Appendix E.

Note that any interpretations and/or conclusions presented in ARM's report are preliminary and subject to change, based on consideration of other aspects of the environmental investigation, including data collected under other State and/or CCR programs. Conclusions will be presented in the EAR.

3.7.1 Electrical Resistivity Imaging/Induced Polarization Method

The ERI method measures the electrical resistivity of subsurface materials and relies on the principle that different subsurface materials resist the flow of electrical current to varying degrees. In general, soil and rock act as electrical insulators and are highly resistive. The flow of electrical current is primarily through moisture-filled pore spaces and along grain-surface boundaries. Resistivity measurements yield useful information for the characterization of the stratigraphy, structure, and composition of the subsurface. The following physical characteristics of subsurface materials reduce resistivity: increasing water content, increasing groundwater specific conductance, increasing clay content, and decreasing grain size.

Resistivity values typically increase across air-filled voids or dry, loose material and decrease across water-filled voids or saturated zones as compared to adjacent soil or rock material. Resistivity values typically increase with an increasing degree of compaction or lithification.

The IP method was also conducted along with the ERI survey. During the survey, the voltage decay is observed after the injected current is switched off. This method can sometimes differentiate between areas of coarse-grained and fine-grained material.

The ERI survey was conducted using an Advanced Geosciences, Inc. Supersting R8 earth resistivity meter. Data was collected using the dipole-dipole array configuration. Equipment checks were conducted in the beginning of the project in accordance with the manufacturer's guidelines. A differential global positioning system (GPS) was used to locate and survey orientations and extents for each ERI transect. Stainless steel stakes were placed along a uniform electrode spacing interval from the beginning to the end of each ERI line using survey tapes. The stakes were hammered approximately five to eight inches into the ground using a small sledgehammer. Once a stake was securely implanted into the ground, it was attached to a corresponding electrode along the length of the cable, or segment of cable for long arrays. Electrodes were securely connected to their corresponding electrode stakes using rubber bands or stainless-steel springs. A contact resistance test was conducted to evaluate the resistance between each electrode and the earth. Water was applied to electrodes with unusually high contact resistances and the contact resistance test was rerun until stable contact resistance measurements were established at each electrode.

3.7.2 Multichannel Analysis of Surface Waves Method

MASW seismic surveys can discriminate between and among materials with relatively different physical properties such as density, based on the velocity of the seismic wave as it travels through each discrete layer. In general, the more rigid the material, the faster a surface wave will travel through it.

The MASW survey was completed using a 24-channel seismograph connected to 24 geophones on a streamer cable with the geophone spacing set at five feet. The seismic source was an accelerated weight drop such as a propelled energy generator 40 kilogram or equivalent. A differential GPS was used to acquire spatial coordinates of the center point of the MASW shots. After completing the initial data collection, the field data was downloaded for preliminary analysis of data quality and depth penetration. Alterations to field parameters were made, as needed, following preliminary data analysis. At the end of each survey day, the data were further reviewed, and processing was conducted by an experienced geophysicist.

3.8 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during EXD included:

- Soil cuttings
- Used calibration solutions
- Temporary well development water

- Decontamination fluids
- Personal protective equipment (PPE)
- General trash.

IDW was handled in general accordance with ENV-TI-05.80.05: *Field Sampling Equipment Cleaning and Decontamination*; ENV-TI-05.80.25: *Monitoring Well and Piezometer Installation and Development*; the EXD SAP; the CUF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW were coordinated with the CUF Plant facility management. Soil cuttings, decontamination fluids, and temporary well development water were managed as authorized by the CUF Plant facility management and in accordance with the EXD SAP. Used disposable PPE (e.g., nitrile gloves) and general trash were placed in garbage bags and disposed of in a municipal waste dumpster onsite.

3.9 BORING, CPT, AND TEMPORARY WELL SURVEYS

Geotechnical boring locations (CUF-B11 through CUF-B14, CUF-B16, and CUF-B17), CPT locations, and temporary well locations (CUF-TW07 through CUF-TW09) were surveyed on April 24, 2019 by the R.L.S. Group. Additional geotechnical boring locations (CUF-B15, CUF-B18, and CUF-B19), and temporary well locations (CUF-TW01 through CUF-TW06) were surveyed on May 15, 2019 by the R.L.S. Group. Five of the supplemental boring locations (CUF-B20 through CUF-B22, CUF-B24, and CUF-B25) were surveyed on September 22, 2020 by DDS Engineering. The location for the last supplemental boring (CUF-B23) was surveyed on December 1, 2020 by DDS Engineering. Measurements were calculated relative to the coordinate systems used by the CUF Plant. Boring, CPT, and temporary well survey information is provided in Table B.9 in Appendix B.

3.10 VARIATIONS

The proposed scope and procedures for the EXD were outlined in the SAP, QAPP, applicable TVA TIs, and ASTM standards, as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAP are described in the following sections. As discussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for the EXD activities at the CUF Plant.

3.10.1 Variations in Scope

Variations in scope are provided below.

- Temporary well CUF-TW10 was originally proposed to be in the interior of the SP/RP, however the well was not installed due to conflicts with construction activities at the SP/RP. There were no accessible locations that would meet the technical objectives for CUF-TW10. This change in scope was approved by TDEC.

- As noted in Section 3.1, upon reaching the planned termination depths, water levels in borings CUF-TW02, CUF-TW04, and CUF-TW06 were monitored (per the TDEC-approved plan) and were found to have insufficient depth of water to facilitate CCR pore water sampling. Therefore, temporary wells were not installed in borings CUF-TW02, CUF-TW04, and CUF-TW06, and were backfilled with 30% solids bentonite grout, per the SAP.

- Many of the CPTs reached refusal well above the expected top of bedrock elevation, and likely refused within the dike fill. As a result, surface geophysical surveys were added in the vicinity of the pre-construction channels of Wells Creek and an area of historical grouting. This change in scope was approved by TDEC.

- During rock coring in boring CUF-B15, two clay-filled features of significant thickness (7.3 feet and 13.2 feet) were encountered within the limestone bedrock. Due to difficult drilling conditions, the core barrel broke off at the bottom of the hole and was unable to be retrieved. Based on discussions with TVA, the proposed downhole testing in rock (pressure testing and downhole geophysics) was not performed due to the potential loss and/or damage to the equipment in the hole.

- Supplemental geotechnical borings CUF-B20 through CUF-B25 were added to correlate to buried stream channels or other geophysical anomalies identified in the soil. This change in scope was approved by TDEC.

- Boring CUF-B22 was terminated based on field observations by the Stantec PG, without achieving the planned auger refusal. However, the bottom of hole elevation was significantly deeper than anticipated and was well below the elevations of interest based on the surface geophysics. The decision to terminate the boring was based on the above factors, difficult drilling conditions, and the potential for loss of drill tooling in the hole.

3.10.2 Variations in Procedures

Variations in procedures occurring in the field are provided below.

- Well seal type and grouting procedures used during temporary well installation were modified to allow for the use of a bentonite grout and to account for manufacturer's specifications. Revised procedures were approved by TDEC and appropriate well seals and grouting were achieved at each temporary well.

3.11 LIMITATIONS

The methods and locations of the subsurface exploration considered objectives of the EIP, available historical data, and input from TVA and TDEC. The subsurface exploration was developed to address specific data gaps, as outlined in the EIP. The methods used in this field exploration include inherent limitations as described below.

- The information presented herein was gathered from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. However, no warranties can be made regarding the continuity of conditions between borings

- The subsurface logs describe subsurface conditions at the specific locations at the time of drilling. Pore water levels may fluctuate over time with adjacent reservoir water level, weather conditions, and/or other influences.

4.0 SUMMARY

The data presented in this report is from the EXD activities at the CUF Plant. The EXD included a total of 24 auger borings and 33 CPT soundings. Of the twenty-four auger borings, six included temporary well installations and four included VWP installations. The borings and CPTs were implemented to improve spatial coverage for CCR thickness, uppermost foundation soil type, top of rock, and pore water levels within the CCR units at the time of drilling. The scope of work for EXD included:

- Drilled eight auger borings within the GSA
- Drilled ten auger borings and advanced twenty-three CPTs within the DAS
- Drilled six auger borings and advanced ten CPTs within the SP/RP
- Collected soil samples, and rock samples at select borings, to develop a continuous subsurface log/soil profile for each boring, with select soil samples subjected to geotechnical laboratory testing
- Performed downhole testing in rock at select boring locations
- Installed a total of fourteen VWPs in four geotechnical borings
- Installed temporary wells in six of the auger borings (three in the GSA and three in the DAS)
- Developed and conducted slug testing in six temporary wells to estimate hydraulic conductivity
- Conducted four surface geophysical transects, two ERI/IP and two MASW transects, at the DAS
- Conducted four surface geophysical transects, two ERI/IP and two MASW transects, at the SP/RP
- Surveyed each new boring, CPT, and temporary well location.

A summary of the EXD performed in each CCR unit is presented in Table 1. A summary of the EXD borings and CPTs, including CCR unit and borehole termination criteria, are presented in Table 2. Boring summary, CPT summary, soil and rock sample summary, pressure testing results, temporary well construction details, well development data, hydraulic slug testing results, vibrating wire piezometer installation details and survey information are presented in Tables B.1 through B.9, respectively. Subsurface logs, temporary well installation details, and piezometer installation details are located in Attachment C.1, Attachment C.2, and Attachment C.3, respectively. Geotechnical laboratory testing results for select soil samples are presented in Appendix F.

EXD activities were carried out concurrently with CCR material sampling and pore water monitoring and sampling, which were performed in accordance with the CCR Material Characteristics and Material Quantity SAPs. Refer to the CCR Material Characterization and Material Quantity SARs for information from those concurrent activities.

Stantec has completed the EXD at the CUF Plant in Cumberland City, Tennessee, in accordance with the EXD SAP as documented herein. The data collected during the EXD are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. EXD boring, CPT, temporary well installation, VWP installation, and geophysical data will be evaluated along with data collected under other TDEC Order SAPs, including but not limited to, the CCR materials characteristics and CCR material quantity investigations, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

American Society for Testing and Materials (ASTM). D4044: *Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers*.

ASTM. D4220: *Standard Practices for Preserving and Transporting Soil Samples*.

ASTM. D5778: *Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils*.

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Stantec. 2018d. *Material Quantity Sampling and Analysis Plan, Cumberland Fossil Plant*. *Revision 3*. Prepared for Tennessee Valley Authority. June 25, 2018.

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Tennessee Valley Authority (TVA). ENV-TI-05.80.02, *Sample Labeling and Custody*.

TVA. ENV-TI-05.80.03, *Field Record Keeping.*

TVA. ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*.

TVA. ENV-TI-05.80.25, *Monitoring Well and Piezometer Installation and Development*.

TVA. ENV-TI-05.80.42, *Groundwater Sampling.*

TVA. ENV-TI-05.80.46, *Field Measurement Using a Multiparameter Sonde.*

APPENDIX A – EXHIBITS

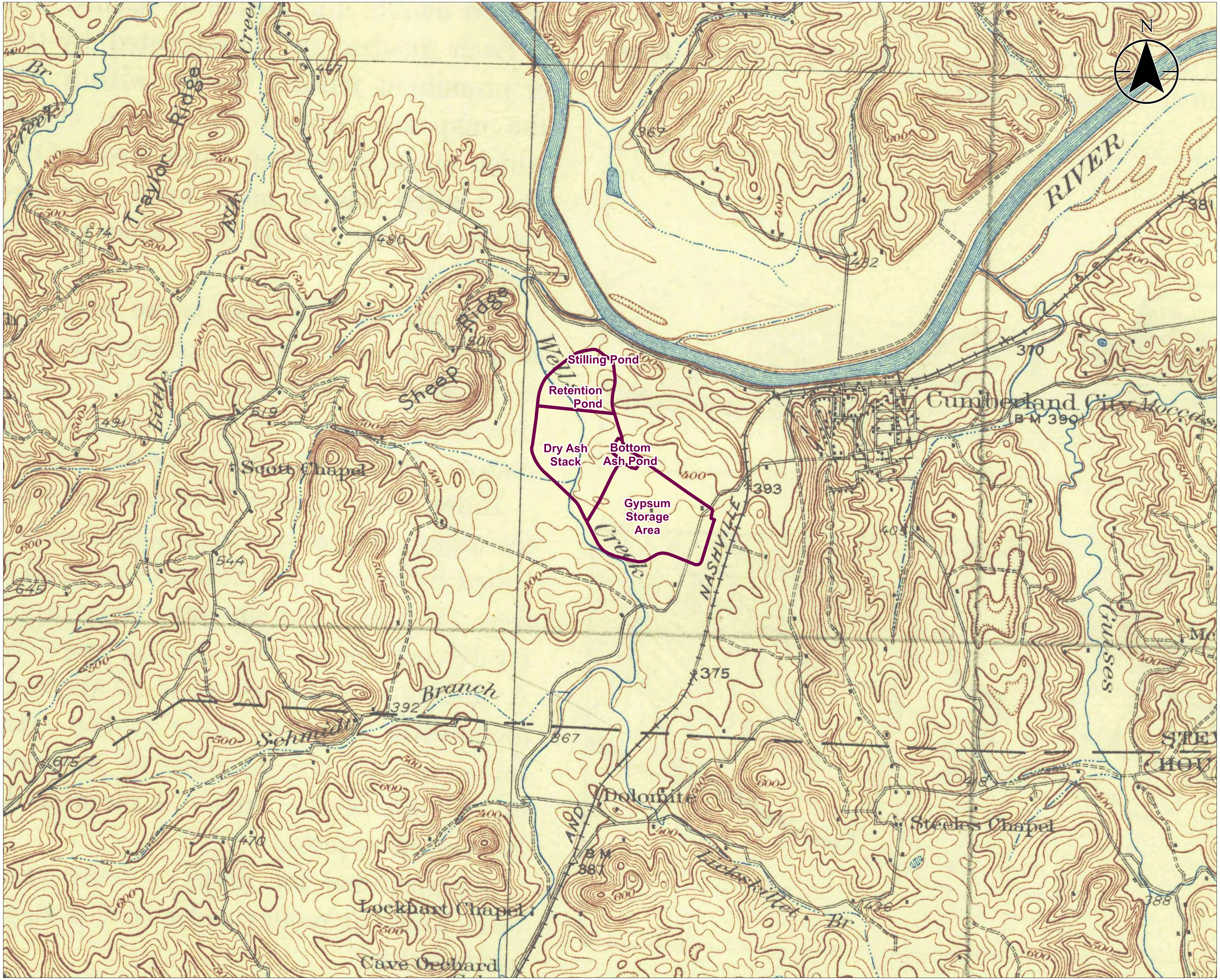


Exhibit No.
A.1

Title
Site Location Map - USGS (1931)

Client/Project
Tennessee Valley Authority
Cumberland Fossil Plant (CUF) TDEC Order

Project Location
Stewart County, Tennessee

175566329
Prepared by LMB on 2021-01-08
Technical Review by SG on 2021-01-08

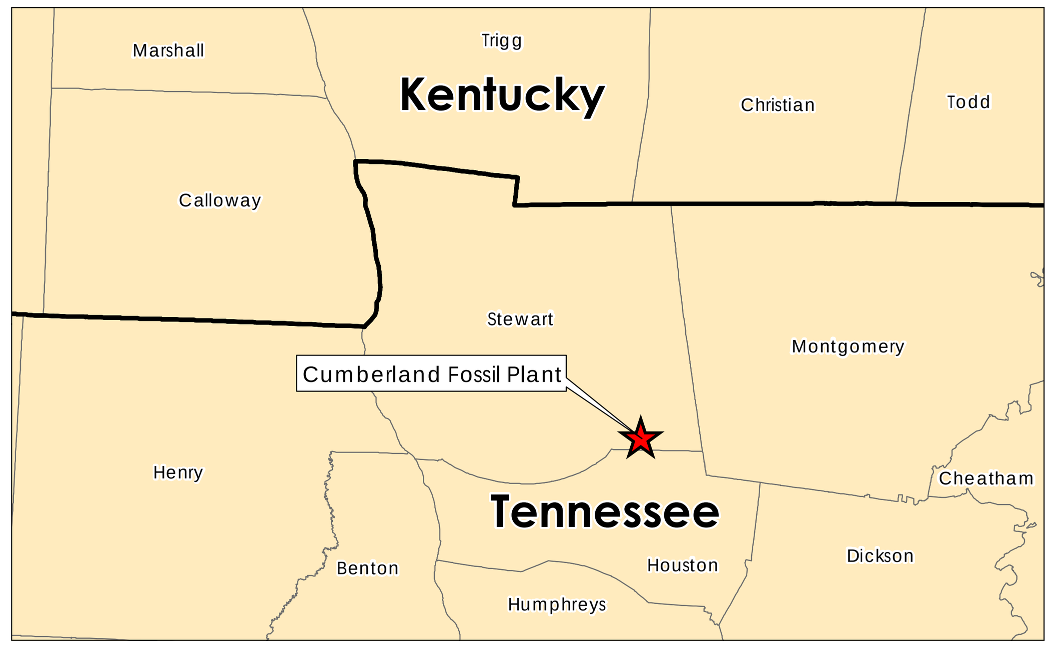
0 1,250 2,500 3,750 5,000 Feet
1:15,000 (At original document size of 22x34)

Legend

CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Topographic mapping corresponds to the Erin Quadrangle (Edition of 1931, Scale 1:62,500)



Stantec
TVA

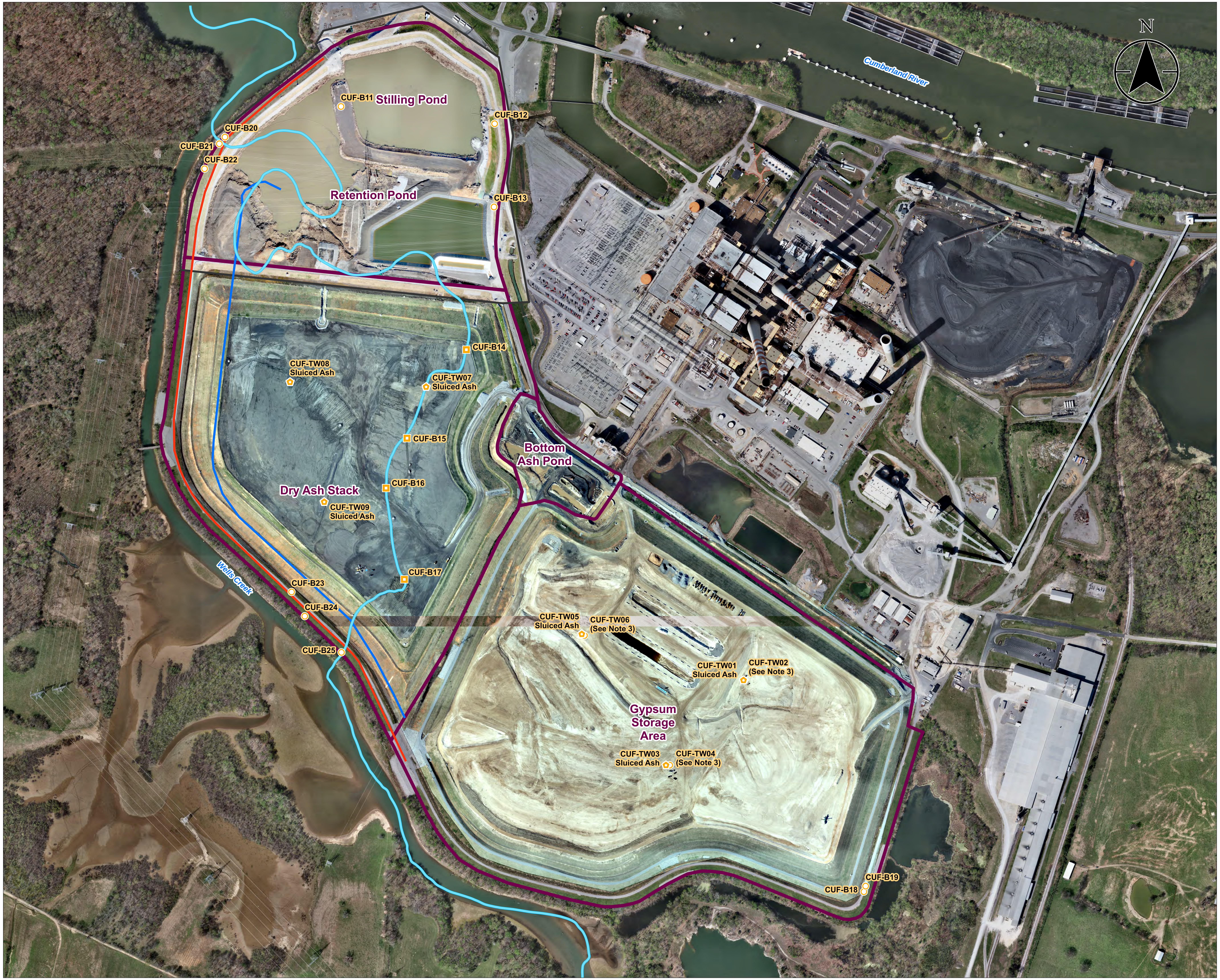


Exhibit No.
A.2

Title
Boring Location Map

Client/Project
Tennessee Valley Authority
Cumberland Fossil Plant (CUF) TDEC Order

Project Location
Stewart County, Tennessee

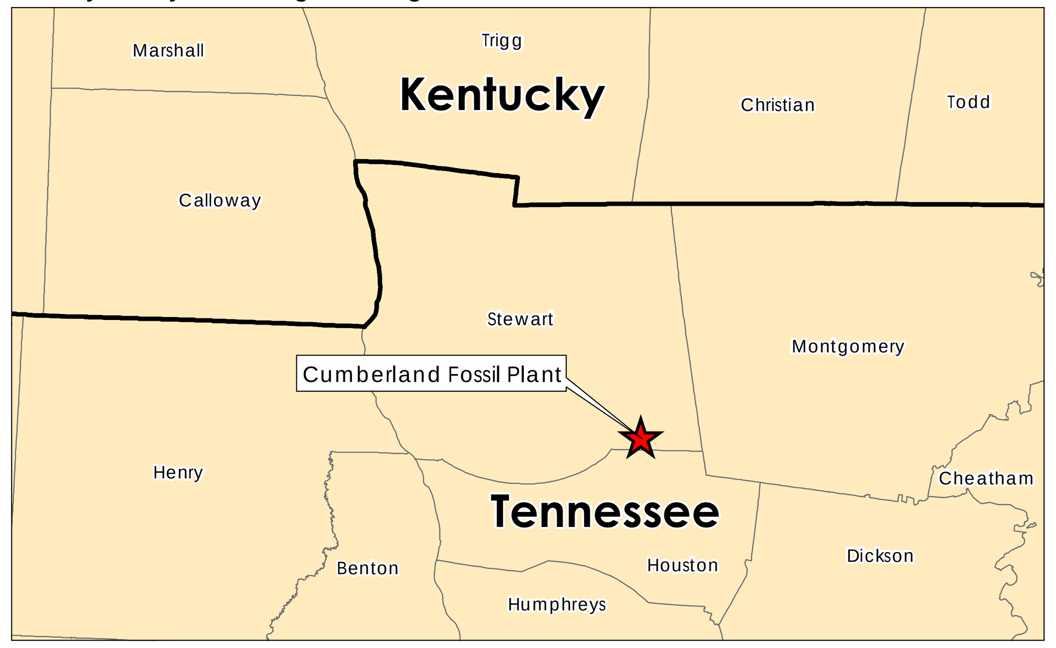
175568209
Prepared by LMB on 2021-03-12
Technical Review by ND on 2021-03-12

0 300 600 900 1,200 Feet
1:3,600 (At original document size of 22x34)

Legend

- Geotechnical Boring
- Geotechnical Boring with Vibrating Wire Piezometer
- Temporary Well (Screened Interval)
- Historical Wells Creek Alignment (Approximate)
- 1990's Perimeter Dike and Foundation Soil Grouting Alignment (Approximate)
- 1980's Interior Bottom Ash Dike (Approximate)
- 2019 Imagery Boundary
- CCR Unit Area (Approximate)

Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017 & 2019)
3. Temporary wells TW02, TW04, and TW06 were not installed because the borings had insufficient depth of water within gypsum to warrant installation.
4. The locations of geotechnical borings CUF-B11 through CUF-B19 and temporary well locations were surveyed by the R.L.S. Group on 04/24/2019 and 05/15/2019. The geotechnical borings CUF-B20 through CUF-B25 were surveyed by DDS Engineering on 09/22/2020 and 12/01/2020.



Stantec

TVA

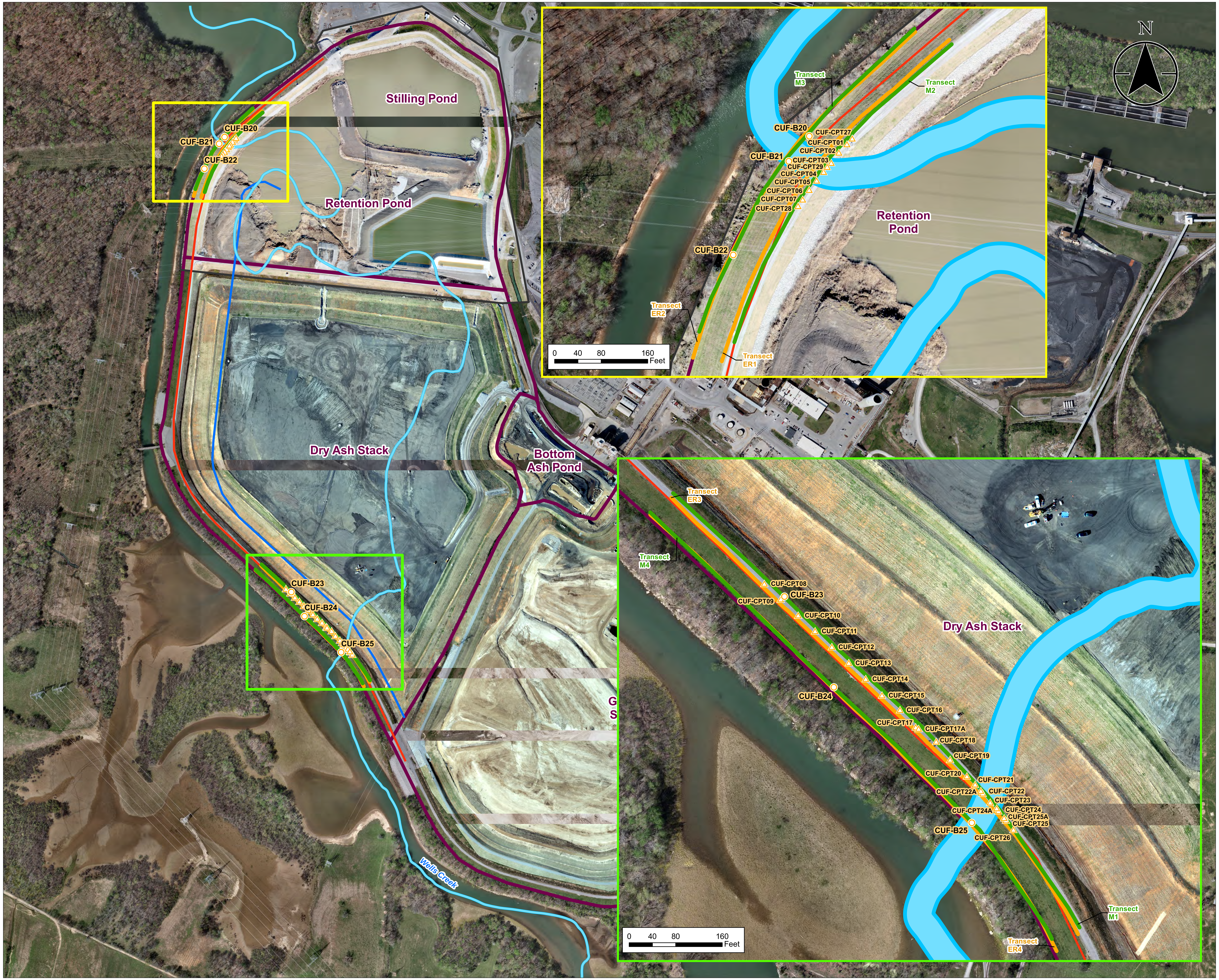


Exhibit No.
A.3

Title
Cone Penetration Testing, Surface Geophysical Surveys, and Supplemental Geotechnical Borings

Client/Project
Tennessee Valley Authority
Cumberland Fossil Plant (CUF) TDEC Order

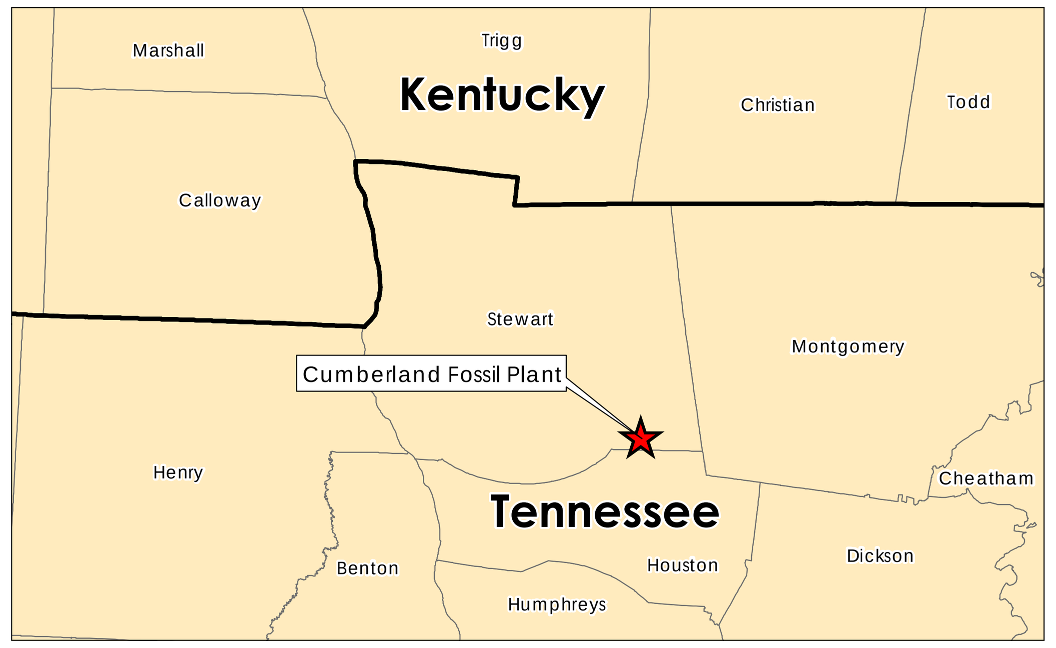
Project Location: Stewart County, Tennessee
175566329
Prepared by LMB on 2021-03-12
Technical Review by JD on 2021-03-12

0 300 600 900 1,200 Feet
1:3,600 (At original document size of 22x34)

Legend

- Geotechnical Boring
- Cone Penetration Test
- Performed Geophysical Survey (ERI)
- Performed Geophysical Survey (MASW)
- Historical Wells Creek Alignment (Approximate)
- 1990's Perimeter Dike and Foundation Soil Grouting Alignment (Approximate)
- 1980's Interior Bottom Ash Dike (Approximate)
- 2019 Imagery Boundary
- CCR Unit Area (Approximate)

Notes
1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017 & 2019)
3. Location of performed CPTs were surveyed by the RLS Group on 04/29/2019. The location of the geotechnical borings were surveyed by DDS Engineering on 09/22/2020 and 12/01/2020.
4. Electrical Resistivity Imaging (ERI) and Multichannel Analysis of Surface Waves (MASW) surveys were conducted by ARM Geophysics at the transect locations along the raised dike crest and the remnant starter dike crest. Transect locations were based on handheld GPS coordinates by ARM Geophysics at the time of the surveys.



Stantec
TVA

V:\TVA-EIP\175568209_CUF_Phase2\gis\mxd\CUF_EXD_SAR\CUF_A.3_CPT_Borings_Geophysical.mxd Revised: 2021-03-12 By: lblackman

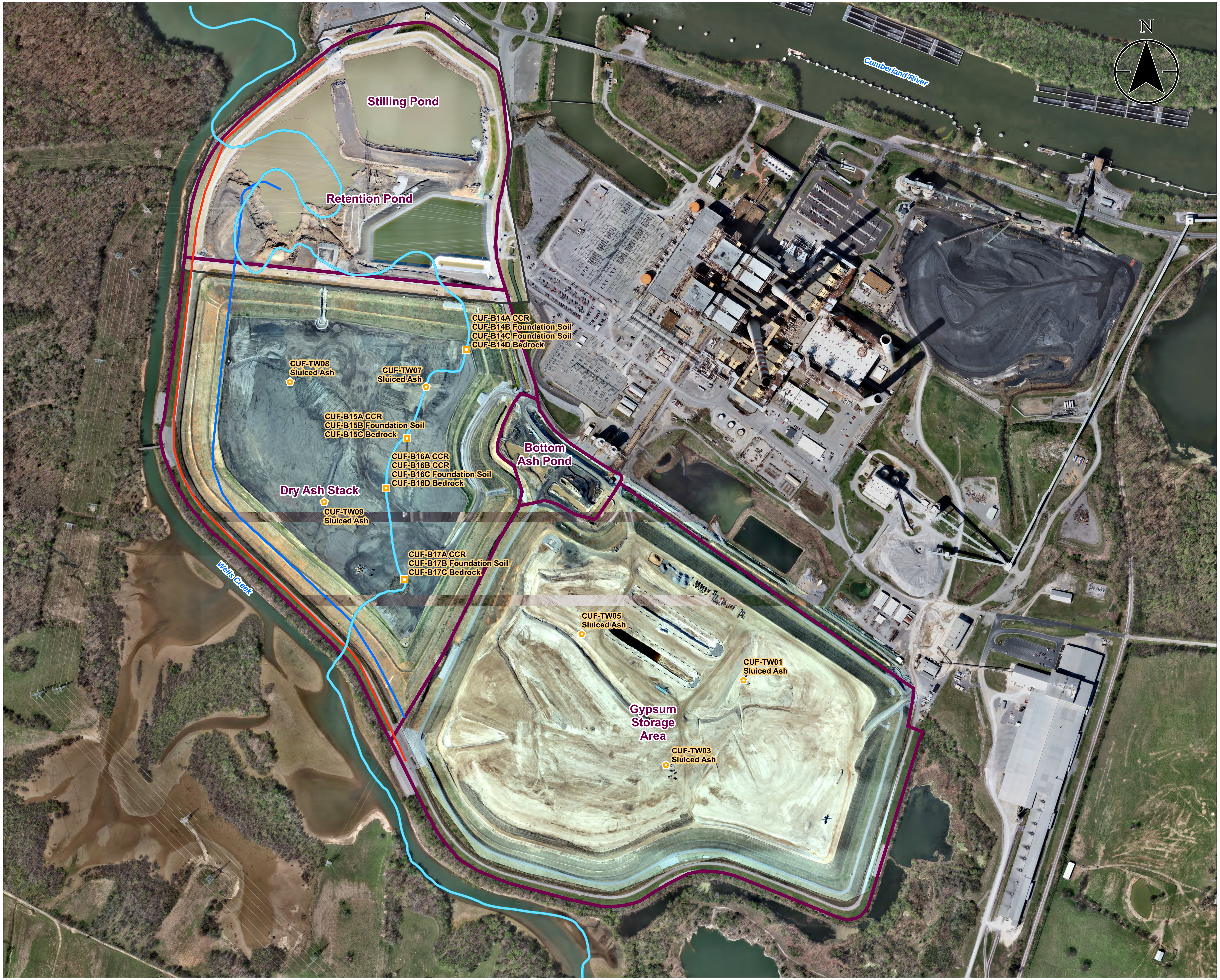


Exhibit No.

A.4

Title

Instrumentation Location Map

Client/Project

Tennessee Valley Authority
Cumberland Fossil Plant (CUF) TDEC Order

Project Location

Stewart County, Tennessee

175568209
Prepared by LMB on 2021-03-12
Technical Review by ND on 2021-03-12

0 300 600 900 1,200 Feet

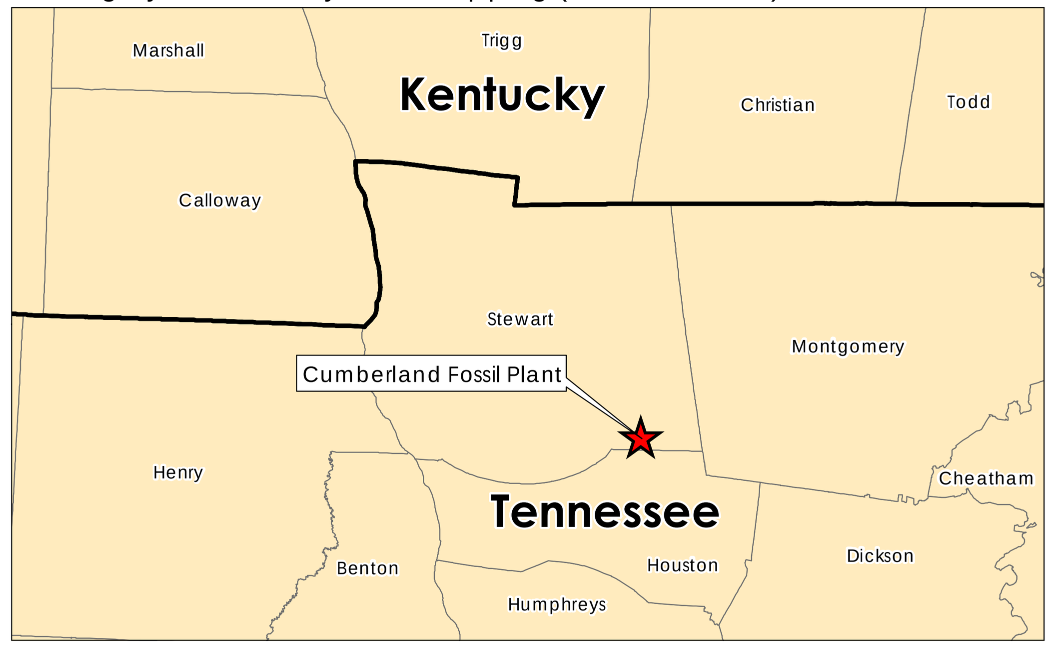
1:3,600 (At original document size of 22x34)

Legend

- Vibrating Wire Piezometer (Tip Interval)
- Temporary Well (Screened Interval)
- Historical Wells Creek Alignment (Approximate)
- 1990's Perimeter Dike and Foundation Soil Grouting Alignment (Approximate)
- 1980's Interior Bottom Ash Dike (Approximate)
- 2019 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017 & 2019)



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TVA

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APPENDIX B - TABLES

Table B.1 - Summary of Borings
Cumberland Fossil Plant
November 2018 - November 2020

Boring ID	Ground Surface Elev.	Bottom of CCR Elev.	Top of Rock Elev.	Refusal Elev.	Bottom of Hole Elev.	Total Hole Depth	Total Overburden Footage	Sample / Test Type
	ft NGVD29	ft NGVD29	ft NGVD29	ft NGVD29	ft NGVD29	ft bgs	ft	
CUF-TW01	426.7	366.4	358.9	358.9	336.3	90.4	67.8	SS, ST, RC
CUF-TW02	427.0	400.0	NR	NR	400.0	27.0	27.0	SS, ST
CUF-TW03	424.4	357.0	345.5	345.5	325.0	99.4	78.9	SS, ST, RC
CUF-TW04	424.0	398.0	NR	NR	398.0	26.0	26.0	SS, ST
CUF-TW05	422.5	363.9	348.0	348.0	326.8	95.7	74.5	SS, ST, RC
CUF-TW06	422.0	400.5	NR	NR	400.5	21.5	21.5	SS, ST
CUF-TW07	438.3	342.1	312.8	312.8	292.8	145.5	125.5	SS, ST, RC
CUF-TW08	435.7[4]	353.0	307.4	307.4	287.2	148.5	128.3	SS, ST, RC
CUF-TW09	442.1	350.1	309.1	308.4	284.4	157.7	133.0	SS, ST, RC
CUF-B11	390.1	349.1	307.5	306.1	286.1	104.0	82.6	SS, ST, RC
CUF-B12	387.4	384.7	337.4	337.4	317.4	70.0	50.0	SS, RC
CUF-B13	394.7	N/A	368.2	367.2	314.2	80.5	26.5	SS, ST, RC
CUF-B14	440.8	359.4	317.4	315.8	295.7	145.1	123.4	SS, ST, RC
CUF-B15	438.3	340.8	314.8	314.6	280.4	157.9	123.5	SS, ST, RC
CUF-B16	439.7	340.9	315.7	315.8	295.2	144.5	124.0	SS, ST, RC
CUF-B17	443.4	340.9	335.4	335.7	314.9	128.5	108.0	SS, ST, RC
CUF-B18	395.0	363.9	354.6	354.0	303.6	91.4	40.4	SS, ST, RC
CUF-B19	394.8	364.3	350.8	349.5	275.3	119.5	44.0	SS, ST, RC
CUF-B20	378.8	N/A	NR	301.9	301.9	76.9	76.9	SS
CUF-B21	379.4	N/A	NR	299.9	299.9	79.5	79.5	SS
CUF-B22	379.0	N/A	NR	NR	271.8	107.2	107.2	SS
CUF-B23	395.3	359.6	N/A	303.8	303.8	91.5	91.5	SS
CUF-B24	379.9	N/A	313.9	310.0	310.0	69.9	66.0	SS
CUF-B25	378.7	N/A	293.1	293.0	293.0	85.7	85.6	SS

Notes:

bgs	below ground surface	NGVD29	National Geodetic Vertical Datum of 1929
CCR	coal combustion residuals	NR	No Refusal
Elev.	elevation	RC	rock core (NQ-size rock core tooling)
ft	feet	SS	split-spoon (2” or 3”, refer to boring log for sampler size)
ID	identification	ST	undisturbed thin-walled Shelby tube
N/A	Not Applicable		

1. Ground surface elevations listed are as-drilled elevations.
2. Refusal indicates rock-like resistance to boring advancement. This may indicate the beginning of weathered bedrock, boulders, rock remnants, cemented materials, or other hard/dense layers that prevent hole advancement. Some refusal elevations were determined based on information from the boring logs and professional judgement.
3. Bottom of CCR elevation does not include minor amounts of CCR that are either beneficially resused as fill or mixed in general fill. These minor amounts of CCR, if encountered, are noted on the boring logs.
4. Ground surface elevation for CUF-TW08 refers to the surface (i.e., depth = 0.0 ft on the boring log) at the time of drilling. After drilling, but prior to installing the temporary well, TVA placed additional fill material at this location which raised the surface elevation.

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Table B.2 - Summary of Cone Penetration Testing
Cumberland Fossil Plant
January 2019

Sounding ID	Ground Surface Elev.	Refusal Elev.	Total Hole Depth	No. of Pore Pressure Dissipation Tests
	ft NGVD29	ft NGVD29	ft bgs	
CUF-CPT01	394.8	361.3	33.5	3
CUF-CPT02	394.9	375.0	19.9	2
CUF-CPT03	394.7	371.6	23.1	2
CUF-CPT04	394.6	373.6	21.0	2
CUF-CPT05	394.6	361.8	32.8	1
CUF-CPT06	394.7	363.7	31.0	2
CUF-CPT07	394.9	361.1	33.8	3
CUF-CPT08	395.3	365.9	29.4	1
CUF-CPT09	395.5	363.6	31.9	2
CUF-CPT10	395.6	366.5	29.1	1
CUF-CPT11	395.6	365.3	30.3	1
CUF-CPT12	395.6	372.0	23.7	1
CUF-CPT13	395.5	362.4	33.1	2
CUF-CPT14	395.5	321.5	74.0	4
CUF-CPT15	395.3	352.2	43.1	1
CUF-CPT16	395.6	352.2	43.5	2
CUF-CPT17	395.5	352.7	42.8	3
CUF-CPT17a	395.4	354.0	41.4	3
CUF-CPT18	395.6	369.7	25.9	1
CUF-CPT19	395.3	353.7	41.6	2
CUF-CPT20	395.3	354.8	40.5	1
CUF-CPT21	395.3	372.0	23.3	1
CUF-CPT22	395.4	350.7	44.7	2
CUF-CPT22a	395.5	353.1	42.4	3 [4]
CUF-CPT23	395.4	353.1	42.3	2
CUF-CPT24	395.5	375.2	20.3	1
CUF-CPT24a	395.5	373.9	21.7	0
CUF-CPT25	395.5	318.0	77.5	4
CUF-CPT25a	395.5	354.2	41.3	2
CUF-CPT26	395.3	374.6	20.7	0
CUF-CPT27	394.6	375.2	19.4	0 [3]
CUF-CPT28	394.9	371.8	23.1	2
CUF-CPT29	394.6	375.7	18.9	0 [3]

Notes:

bgs	below ground surface	ID	identification
CPT	cone penetration test	NGVD29	National Geodetic Vertical Datum of 1929
Elev.	elevation	No.	number
ft	feet		

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1. Ground surface elevations listed are as-drilled elevations.

2. Refusal indicates rock-like resistance to CPT advancement. This may indicate the beginning of weathered bedrock, boulders, rock remnants, cemented materials, or other hard/dense layers that prevent hole advancement.

3. CUF-CPT27 and CUF-CPT29 each included one pore pressure dissipation test performed in the field. However, during post-processing these tests did not produce valid data, and as such are not included herein.

4. CUF-CPT22a included three pore pressure dissipation tests, which were documented by ConeTec in their report. However, one of these tests was not recorded by Stantec on the field forms.

Table B.3 - Summary of Soil and Rock Samples
Cumberland Fossil Plant
November 2018 - November 2020

Boring ID	No. 2" SS Samplers Driven	No. 3" SS Samplers Driven	No. ST Samplers Pushed	Rock Core (Y/N)	Drill Rig ID	Split-Spoon Sampler Size	Hammer Weight (lbs)	Hammer Drop Height (inches)
CUF-TW01	--	43	4	Y	CME 75#2, #712	3"	340	30
CUF-TW02	--	16	2	N	CME 75#2, #712	3"	340	30
CUF-TW03	--	48	2	Y	CME 75#2, #712	3"	340	30
CUF-TW04	--	17	1	N	CME 75#2, #712	3"	340	30
CUF-TW05	--	42	4	Y	CME 75#2, #712	3"	340	30
CUF-TW06	--	13	1	N	CME 45T#2, #814	3"	340	30
CUF-TW07	--	80	2	Y	CME 75#2, #712	3"	340	30
CUF-TW08	--	82	3	Y	CME 75#2, #712	3"	340	30
CUF-TW09	--	76	3	Y	CME 75#2, #712	3"	340	30
CUF-B11	33	--	1	Y	CME 75#2, #712	2"	140	30
CUF-B12	21	--	0	Y	CME 45T#2, #814	2"	140	30
CUF-B13	9	--	2	Y	CME 45T#2, #814	2"	140	30
CUF-B14	46	--	5	Y	CME 75#2, #712	2"	140	30
CUF-B15	47	--	3	Y	CME 85#2, #951	2"	140	30
CUF-B16	47	--	3	Y	CME 75#2, #712	2"	140	30
CUF-B17	42	--	2	Y	CME 75#2, #712	2"	140	30
CUF-B18	14	--	3	Y	CME 75#2, #712	2"	140	30
CUF-B19	15	--	3	Y	CME 75#2, #712	2"	140	30
CUF-B20	30	6	0	N	CME 55T#1, #709	2" and 3"	140	30
CUF-B21	25	13	0	N	CME 55T#1, #709	2" and 3"	140	30
CUF-B22	39	4	0	N	CME 55T#1, #709	2" and 3"	140	30
CUF-B23	37	3	0	N	CME 55LCX #714	2" and 3"	140	30
CUF-B24	32	--	0	N	CME 55T#1, #709	2"	140	30
CUF-B25	30	3	0	N	CME 55LCX #714	2" and 3"	140	30
Total	**467**	**446**	**44**	**--**	--	--	--	--

Notes:

CME	Central Mining Equipment	SS	split-spoon
ID	identification	ST	undisturbed thin-walled Shelby tube
lbs	pounds	Y/N	Yes/No
No.	number		

1. Number of samplers driven/pushed includes attempts that had zero recovery.

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Table B.4 - Summary of Hydraulic Conductivity Estimates Derived from Pressure Testing in Rock
Cumberland Fossil Plant
December 2018 - April 2019

Boring ID	Depth Interval (ft)		Test Length (ft)	Flow Rate (gal/min)	Total Head (ft)	Hydraulic Conductivity (cm/sec)
CUF-TW01	72.0	79.8	7.8	4.6	89.9	2.9E-04
CUF-TW01	80.0	90.4	10.4	3.0	101.7	1.4E-04
CUF-TW03	82.0	89.4	7.4	0.5	105.2	2.8E-05
CUF-TW03	89.4	99.4	10.0	3.5	111.5	1.5E-04
CUF-TW05	77.5	85.5	8.0	0.2	100.7	1.1E-05
CUF-TW05	85.5	95.7	10.2	1.7	109.8	7.2E-05
CUF-TW07	127.5	132.5	5.0	0.9	144.1	5.0E-05
CUF-TW07	130.5	135.5	5.1	0.5	149.2	2.6E-05
CUF-TW07	135.5	145.5	10.0	1.4	156.6	4.2E-05
CUF-TW08	129.0	138.4	9.4	0.3	149.7	1.0E-05
CUF-TW08	138.5	148.5	10.0	1.0	162.0	2.9E-05
CUF-TW09	139.7	147.7	8.0	3.7	160.2	1.3E-04
CUF-TW09	139.7	147.7	8.0	3.6	160.2	1.3E-04
CUF-TW09	147.7	157.7	10.0	1.3	166.7	3.7E-05
CUF-B11	86.5	94.0	7.5	0.0	105.6	0.0E+00
CUF-B11	94.0	104.0	10.0	0.3	114.3	1.2E-05
CUF-B12	52.6	57.6	5.0	0.2	72.2	2.2E-05
CUF-B12	55.0	60.0	5.0	0.2	74.6	2.1E-05
CUF-B12	60.0	70.0	10.0	0.2	82.1	1.2E-05
CUF-B13	72.0	80.5	8.5	0.7	93.9	4.0E-05
CUF-B14	127.5	134.6	7.1	5.9	150.1	2.4E-04
CUF-B14	135.0	145.1	10.1	1.8	156.8	5.4E-05
CUF-B16	127.5	134.5	7.0	0.8	150.5	3.3E-05
CUF-B16	134.5	144.5	10.0	1.2	157.2	3.6E-05
CUF-B17	111.5	118.5	7.0	0.0	131.0	0.0E+00
CUF-B17	118.5	128.5	10.0	0.3	139.5	1.0E-05
CUF-B18	44.0	52.0	8.0	6.5	65.5	5.6E-04
CUF-B18	52.0	62.0	10.0	0.1	76.5	6.2E-06
CUF-B18	62.0	71.7	9.7	0.4	86.4	2.2E-05
CUF-B18	72.0	81.3	9.3	0.4	96.2	2.1E-05
CUF-B18	82.0	91.4	9.4	0.0	104.4	0.0E+00
CUF-B19	46.0	54.8	8.8	0.5	67.1	3.9E-05
CUF-B19	54.5	64.5	10.0	0.1	76.5	6.2E-06
CUF-B19	64.5	74.5	10.0	0.1	86.5	5.5E-06
CUF-B19	74.5	84.5	10.0	0.2	96.5	9.8E-06
CUF-B19	84.4	94.4	10.0	0.2	105.5	9.0E-06
CUF-B19	94.5	104.5	10.0	0.0	116.5	0.0E+00
CUF-B19	104.5	114.5	10.0	0.1	126.3	3.7E-06
CUF-B19	114.5	119.5	5.0	0.6	134.0	3.6E-05

Table B.4 - Summary of Hydraulic Conductivity Estimates Derived from Pressure Testing in Rock
Cumberland Fossil Plant
December 2018 - April 2019

Boring ID	Depth Interval (ft)	Test Length (ft)	Flow Rate (gal/min)	Total Head (ft)	Hydraulic Conductivity (cm/sec)

Notes:

cm	centimeter
ft	feet
gal	gallon
ID	identification
min	minute
sec	second

Hydraulic Conductivity Calculation:

$$K = \frac{CQ}{2\pi LH} * \ln(L/r)$$

K	hydraulic conductivity (cm/sec)
Q	flow rate (gal/min)
L	test length (ft)
H	total head (ft)
r	borehole radius (0.1250) (ft)
C	conversion factor (0.0679) (cm-min-ft^3)/(ft-sec-gal)

Total Head Calculation:

$$H = P * C_{pressure} + \left(\frac{D_{top} - D_{bottom}}{2} + H_{gauge}\right)$$

H	total head (ft)
P	pressure (psi)
$C_{pressure}$	conversion factor (psi to head ft)
D_{top}	top test depth (ft)
D_{bottom}	bottom test depth (ft)
H_{gauge}	gauge height (ft)

Table B.5 - Summary of Temporary Well Installation
Cumberland Fossil Plant
February 2019 - April 2019

	Bottom of Well		Screened Interval		Bottom of CCR Interface	
Well ID	Depth	Elevation	Depth	Elevation	Depth	Elevation
	ft bgs	ft NGVD29	ft bgs	ft NGVD29	ft bgs	ft NGVD29
CUF-TW01	52.3	374.4	41.3 - 51.9	385.4 - 374.8	60.3	366.4
CUF-TW03	65.9	358.5	54.9 - 65.5	369.5 - 358.9	67.4	357.0
CUF-TW05	56.9	365.6	45.9 - 56.5	376.6 - 366.0	58.6	363.9
CUF-TW07	92.5	345.8	81.5 - 92.1	356.8 - 346.2	96.2	342.1
CUF-TW08[3]	83.1	354.9	72.1 - 82.7	365.9 - 355.3	82.7	353.0
CUF-TW09	90.5	351.6	79.5 - 90.1	362.6 - 352.0	92.0	350.1

Notes:

bgs	below ground surface
CCR	coal combustion residuals
ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

1. Measurement data are from Well Installation Details (Attachment C.2).
2. Temporary wells CUF-TW01, CUF-TW03, CUF-TW05, and CUF-TW07 through CUF-TW09 were surveyed on 4/24/2019 and 5/15/2019 by the RLS Group.
3. After drilling CUF-TW08, but prior to installing the temporary well, TVA placed additional CCR at this location to raise the surface elevation by approximately 2.3 ft. For the bottom of well and screened interval, depths shown here are referenced (i.e., depth = 0.0 ft) to the ground surface after the additional CCR was placed, which are consistent with the temporary well installation detail. For the bottom of CCR interface, depths shown here are referenced (i.e., depth = 0.0 ft) to the ground surface at the time of drilling, which is consistent with the boring log.

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Table B.6 - Summary of Well Development Data
Cumberland Fossil Plant
May 2019

Well ID	pH		Turbidity		Specific Conductance		Temperature	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
			NTU	NTU	uS/cm	uS/cm	DEG C	DEG C
CUF-TW01	8.35	8.13	106	9.50	2,427	2,377	19.8	20.3
CUF-TW03	8.98	9.29	83.9	8.91	3,142	3,796	20.9	21.0
CUF-TW05	10.17	10.39	17.8	7.92	3,828	3,925	23.8	23.5
CUF-TW07	9.28	9.46	928	9.74	1,547	1,855	21.8	24.9
CUF-TW08	9.02	9.15	171	9.41	1,910	1,970	29.6	22.0
CUF-TW09	9.23	10.06	74.5	9.16	2,827	3,047	24.2	24.0

Notes:

DEG C	degrees Celsius
ID	identification
NTU	Nephelometric Turbidity Unit
uS/cm	microSiemens per centimeter

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Table B.7 - Summary of Hydraulic Conductivity (Slug) Testing Results
Cumberland Fossil Plant
July 2019

Well ID	Saturated Thickness	Number of Tests		Average Hydraulic Conductivity	Average Hydraulic Conductivity
		Falling Head	Rising Head		
	ft			ft/day	cm/s
CUF-TW01	15.8	3	3	0.1574	5.55E-05
CUF-TW03	41.8	3	3	1.514	5.34E-04
CUF-TW05	30.0	4	4	2.913	1.03E-03
CUF-TW07	38.7	3	3	0.1469	5.18E-05
CUF-TW08	35.2	3	3	0.1136	4.01E-05
CUF-TW09	37.6	3	3	0.2318	8.18E-05

Notes:

cm/s	centimeters per second
ft	feet
ft/day	feet per day
ID	identification

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Table B.8 - Summary of Vibrating Wire Piezometer Installation
Cumberland Fossil Plant
January 2019 - May 2019

Boring ID	VWP ID	Ground Surface Elev.	VWP Sensor: Installed Depth	VWP Sensor: Tip Elev.	VWP Sensor: Material
		ft NGVD29	ft bgs	ft NGVD29	
CUF-B14	CUF-B14A	440.8	80.0	360.8	CCR
	CUF-B14B	440.8	91.0	349.8	Foundation Soil
	CUF-B14C	440.8	121.0	319.8	Foundation Soil
	CUF-B14D	440.8	143.0	297.8	Bedrock
CUF-B15	CUF-B15A	438.3	85.0	353.3	CCR
	CUF-B15B	438.3	110.5	327.8	Foundation Soil
	CUF-B15C	438.3	134.0	304.3	Bedrock
CUF-B16	CUF-B16A	439.7	56.3	383.4	CCR
	CUF-B16B	439.7	76.6	363.1	CCR
	CUF-B16C	439.7	115.0	324.7	Foundation Soil
	CUF-B16D	439.7	142.5	297.2	Bedrock
CUF-B17	CUF-B17A	443.4	79.5	363.9	CCR
	CUF-B17B	443.4	107.0	336.4	Foundation Soil
	CUF-B17C	443.4	126.5	316.9	Bedrock

Notes:

bgs	below ground surface	ID	identification
CCR	coal combustion residuals	NGVD29	National Geodetic Vertical Datum of 1929
Elev.	elevation	VWP	vibrating wire piezometer
ft	feet		

1. Ground surface elevations listed are as-drilled elevations.
2. Measurement data are from VWP Installation Details (Appendix C.2)

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Table B.9 - Summary of Boring, CPT, and Temporary Well Survey Data
Cumberland Fossil Plant
November 2018 - December 2020

Boring, CPT, or Temporary Well ID	TN State Plane Northing	TN State Plane Easting	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Remarks
	ft NAD27 Plant	ft NAD27 Plant	DMS NAD27 Plant	DMS NAD27 Plant	ft NGVD29	ft NGVD29	
CUF-TW01	729,394.08	1,512,993.69	36°23'4.07"	-87°39'16.03"	426.7	430.99	
CUF-TW02	729,384.58	1,513,010.23	36°23'3.98"	-87°39'15.83"	427.0	--	Temporary well not installed
CUF-TW03	728,847.22	1,512,494.43	36°22'58.58"	-87°39'22.02"	424.4	429.53	
CUF-TW04	728,842.52	1,512,513.05	36°22'58.53"	-87°39'21.79"	424.0	--	Temporary well not installed
CUF-TW05	729,690.72	1,511,953.03	36°23'6.83"	-87°39'28.82"	422.5	426.8	
CUF-TW06	729,685.25	1,511,968.30	36°23'6.78"	-87°39'28.63"	422.0	--	Temporary well not installed
CUF-TW07	731,283.83	1,510,951.08	36°23'22.41"	-87°39'41.40"	438.3	443.69	
CUF-TW08[4]	731,314.89	1,510,074.98	36°23'22.57"	-87°39'52.12"	438.0	443.36	
CUF-TW09	730,542.31	1,510,294.38	36°23'14.97"	-87°39'49.27"	442.1	446.44	
CUF-B11	733,085.92	1,510,402.97	36°23'40.14"	-87°39'48.48"	390.1	--	
CUF-B12	732,974.31	1,511,391.80	36°23'39.20"	-87°39'36.36"	387.4	--	
CUF-B13	732,439.01	1,511,388.27	36°23'33.91"	-87°39'36.29"	394.7	--	
CUF-B14	731,519.55	1,511,209.75	36°23'24.78"	-87°39'38.28"	440.8	--	
CUF-B15	730,949.04	1,510,827.32	36°23'19.08"	-87°39'42.84"	438.3	--	
CUF-B16	730,628.44	1,510,693.12	36°23'15.89"	-87°39'44.42"	439.7	--	
CUF-B17	730,040.74	1,510,810.30	36°23'10.10"	-87°39'42.86"	443.4	--	
CUF-B18	728,029.16	1,513,769.04	36°22'50.70"	-87°39'6.27"	395.0	--	
CUF-B19	728,064.78	1,513,779.79	36°22'51.06"	-87°39'6.14"	394.8	--	
CUF-B20	732,889.43	1,509,655.34	36°23'38.07"	-87°39'57.58"	378.8	--	
CUF-B21	732,846.26	1,509,620.12	36°23'37.63"	-87°39'58.00"	379.4	--	
CUF-B22	732,685.32	1,509,524.53	36°23'36.03"	-87°39'59.13"	379.0	--	
CUF-B23	729,959.30	1,510,084.20	36°23'9.17"	-87°39'51.72"	395.3	--	
CUF-B24	729,803.41	1,510,169.16	36°23'7.64"	-87°39'50.65"	379.9	--	
CUF-B25	729,570.80	1,510,405.99	36°23'5.38"	-87°39'47.71"	378.7	--	
CUF-CPT01	732,876.08	1,509,719.88	36°23'37.95"	-87°39'56.79"	394.8	--	
CUF-CPT02	732,861.65	1,509,706.45	36°23'37.80"	-87°39'56.95"	394.9	--	
CUF-CPT03	732,844.07	1,509,693.26	36°23'37.63"	-87°39'57.10"	394.7	--	
CUF-CPT04	732,828.67	1,509,680.26	36°23'37.47"	-87°39'57.26"	394.6	--	
CUF-CPT05	732,813.74	1,509,668.00	36°23'37.32"	-87°39'57.41"	394.6	--	
CUF-CPT06	732,797.79	1,509,655.47	36°23'37.16"	-87°39'57.56"	394.7	--	
CUF-CPT07	732,781.03	1,509,644.06	36°23'36.99"	-87°39'57.69"	394.9	--	
CUF-CPT08	729,981.87	1,510,049.83	36°23'9.39"	-87°39'52.15"	395.3	--	
CUF-CPT09	729,955.03	1,510,078.16	36°23'9.13"	-87°39'51.80"	395.5	--	
CUF-CPT10	729,927.45	1,510,107.51	36°23'8.86"	-87°39'51.43"	395.6	--	
CUF-CPT11	729,900.53	1,510,137.00	36°23'8.60"	-87°39'51.07"	395.6	--	
CUF-CPT12	729,873.32	1,510,165.97	36°23'8.33"	-87°39'50.71"	395.6	--	
CUF-CPT13	729,845.95	1,510,194.83	36°23'8.07"	-87°39'50.35"	395.5	--	
CUF-CPT14	729,818.41	1,510,224.04	36°23'7.80"	-87°39'49.98"	395.5	--	
CUF-CPT15	729,790.23	1,510,252.09	36°23'7.53"	-87°39'49.64"	395.3	--	
CUF-CPT16	729,765.09	1,510,282.63	36°23'7.28"	-87°39'49.26"	395.6	--	
CUF-CPT17	729,735.64	1,510,309.64	36°23'7.00"	-87°39'48.92"	395.5	--	
CUF-CPT17a	729,732.90	1,510,315.02	36°23'6.97"	-87°39'48.85"	395.4	--	
CUF-CPT18	729,710.79	1,510,344.27	36°23'6.76"	-87°39'48.49"	395.6	--	
CUF-CPT19	729,679.78	1,510,368.57	36°23'6.45"	-87°39'48.19"	395.3	--	

Table B.9 - Summary of Boring, CPT, and Temporary Well Survey Data
Cumberland Fossil Plant
November 2018 - December 2020

Boring, CPT, or Temporary Well ID	TN State Plane Northing	TN State Plane Easting	Latitude	Longitude	Ground Surface Elevation	Top of Casing Elevation	Remarks
	ft NAD27 Plant	ft NAD27 Plant	DMS NAD27 Plant	DMS NAD27 Plant	ft NGVD29	ft NGVD29	
CUF-CPT20	729,651.35	1,510,397.29	36°23'6.18"	-87°39'47.83"	395.3	--	
CUF-CPT21	729,637.22	1,510,411.91	36°23'6.04"	-87°39'47.65"	395.3	--	
CUF-CPT22	729,621.55	1,510,425.14	36°23'5.89"	-87°39'47.48"	395.4	--	
CUF-CPT22a	729,626.17	1,510,422.02	36°23'5.93"	-87°39'47.52"	395.5	--	
CUF-CPT23	729,606.12	1,510,438.13	36°23'5.74"	-87°39'47.32"	395.4	--	
CUF-CPT24	729,591.57	1,510,451.85	36°23'5.59"	-87°39'47.15"	395.5	--	
CUF-CPT24a	729,596.25	1,510,449.01	36°23'5.64"	-87°39'47.19"	395.5	--	
CUF-CPT25	729,575.45	1,510,464.14	36°23'5.44"	-87°39'47.00"	395.5	--	
CUF-CPT25a	729,579.55	1,510,461.69	36°23'5.48"	-87°39'47.03"	395.5	--	
CUF-CPT26	729,559.42	1,510,477.44	36°23'5.28"	-87°39'46.83"	395.3	--	
CUF-CPT27	732,886.00	1,509,728.70	36°23'38.05"	-87°39'56.68"	394.6	--	
CUF-CPT28	732,769.82	1,509,635.61	36°23'36.88"	-87°39'57.79"	394.9	--	
CUF-CPT29	732,837.28	1,509,686.19	36°23'37.56"	-87°39'57.19"	394.6	--	

Notes:

CPT	cone penetration	NAD27 Plant	North American Datum of 1927 (Plant Local)
DMS	Degrees, Minutes, Seconds	NGVD29	National Geodetic Vertical Datum of 1929
ft	feet	TN	Tennessee
ID	identification	N/A	Not Applicable

1. TN State Plane Northings and Eastings references the plant-specific coordinate system (NAD27) horizontal datum.
2. The temporary wells CUF-TW07 through CUF-TW09, borings CUF-B11 through CUF-B14, CUF-B16, and CUF-B17, and CPT locations were surveyed on 4/24/2019 by RLS Group. The temporary wells CUF-TW01 through CUF-TW06 and borings CUF-B15, CUF-B18, and CUF-B19 were surveyed on 5/15/2019 by RLS Group. The borings CUF-B20 through CUF-B22 and CUF-B24 and CUF-B25 were surveyed 9/22/2020 by DDS Engineering. The boring CUF-B23 was surveyed 12/1/2020 by DDS Engineering. State Plane coordinates rounded to the nearest 0.01 feet. Latitude and Longitude rounded to the nearest 0.01 second. Ground surface elevations rounded to the nearest 0.1 feet.
3. Top of casing elevations only apply to temporary wells.
4. Ground surface elevation for CUF-TW08 refers to the surface (i.e., depth = 0.0 ft on the boring log) at the time of drilling. After drilling, but prior to installing the temporary well, TVA placed additional fill material at this location which raised the surface elevation.

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APPENDIX C - SUBSURFACE LOGS, TEMPORARY WELL INSTALLATION DETAILS, AND VIBRATING WIRE PIEZOMETER INSTALLATION DETAILS

ATTACHMENT C.1
SUBSURFACE LOGS

REFER TO

APPENDIX B.4
GEOTECH BORINGS

ATTACHMENT C.2
TEMPORARY WELL INSTALLATION DETAILS

REFER TO

APPENDIX C.1
TEMPORARY WELLS

ATTACHMENT C.3
VIBRATING WIRE PIEZOMETER
INSTALLATION DETAILS

REFER TO

APPENDIX C.3
PIEZOMETERS

APPENDIX D - PHOTOGRAPHS OF BORINGS, TEMPORARY WELLS, AND VIBRATING WIRE PIEZOMETERS

ATTACHMENT D.1

Photographic Log of Soil and Rock Samples

ATTACHMENT D.1.1

Photographic Log of Gypsum Storage Area Samples

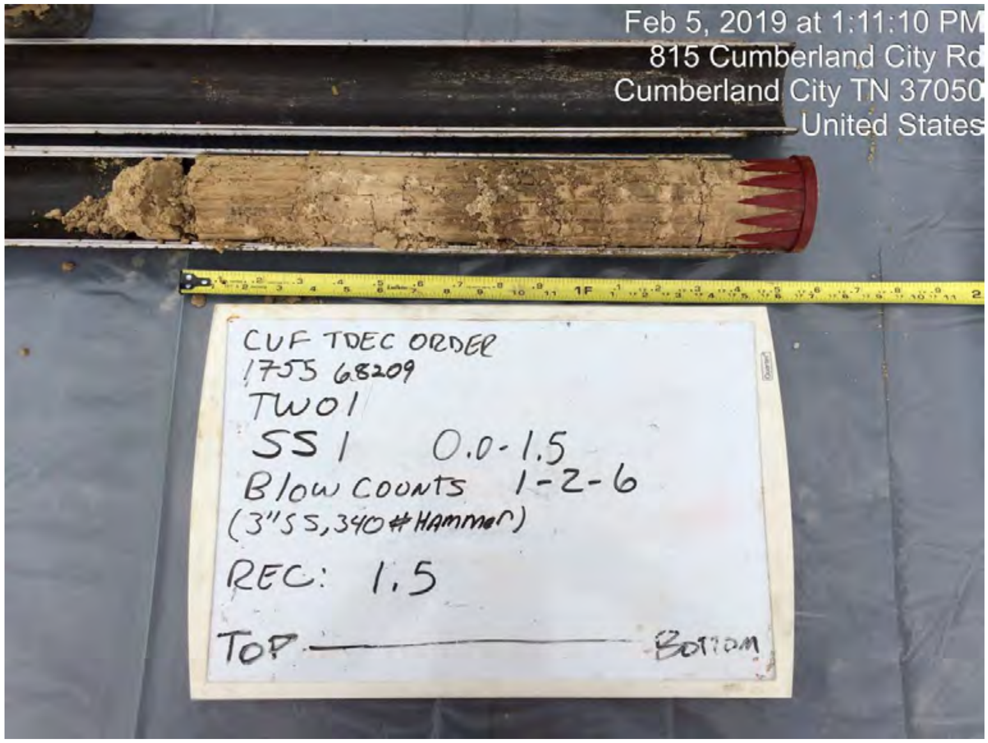
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 1

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (0.0-1.5 feet). Sample identifier on white board should be SS01.

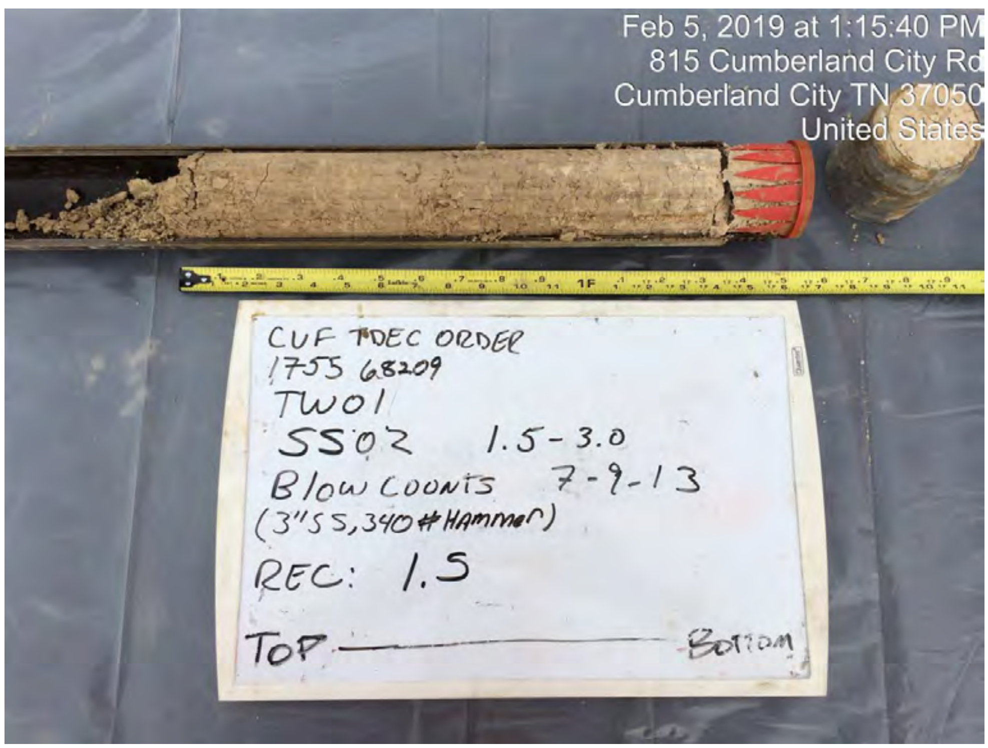


Photograph ID: 2

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (1.5-3.0 feet).



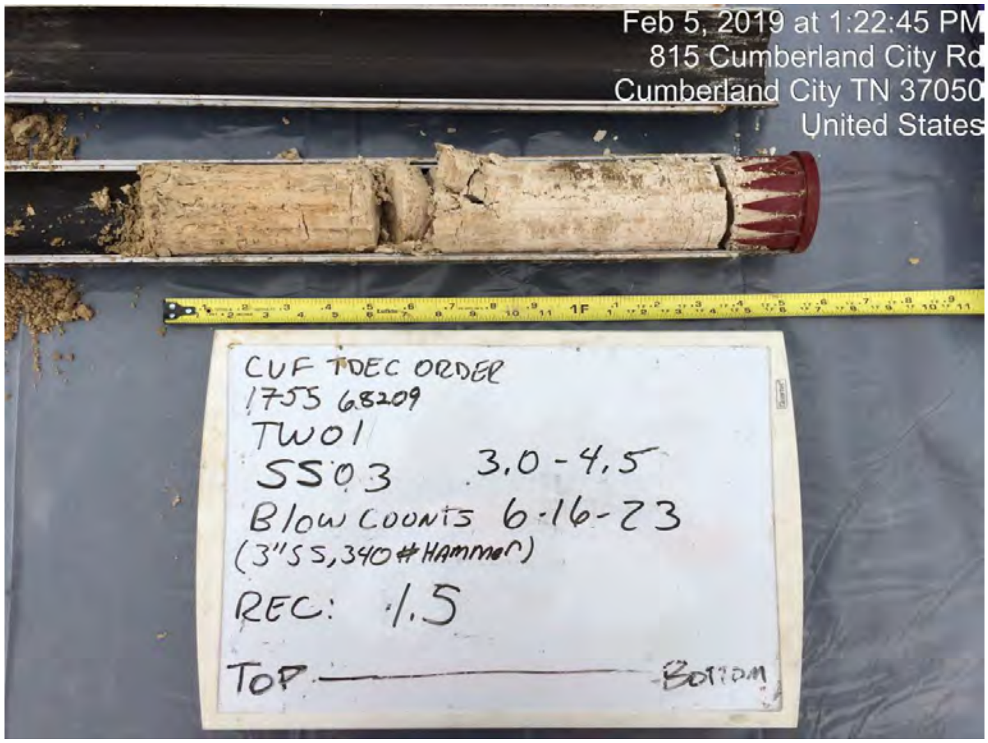
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 3

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (3.0-4.5 feet). Blowcount shown on white board should be 6-23-16.

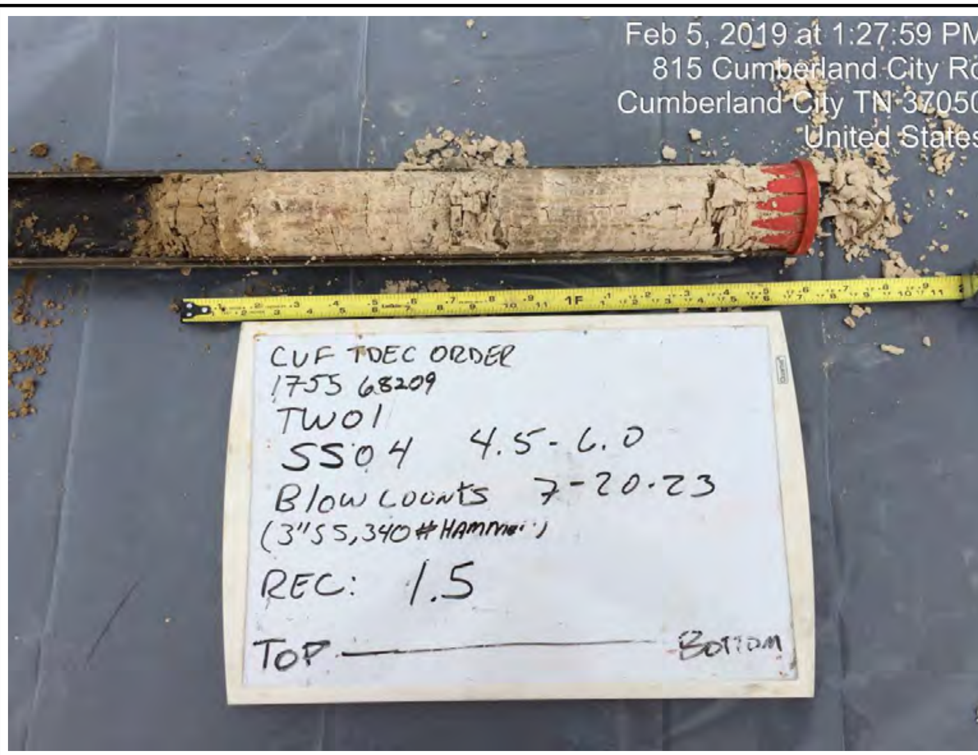


Photograph ID: 4

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (4.5-6.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 5

Photo Location: CUF-TW01

Photo Date: 2/5/2019

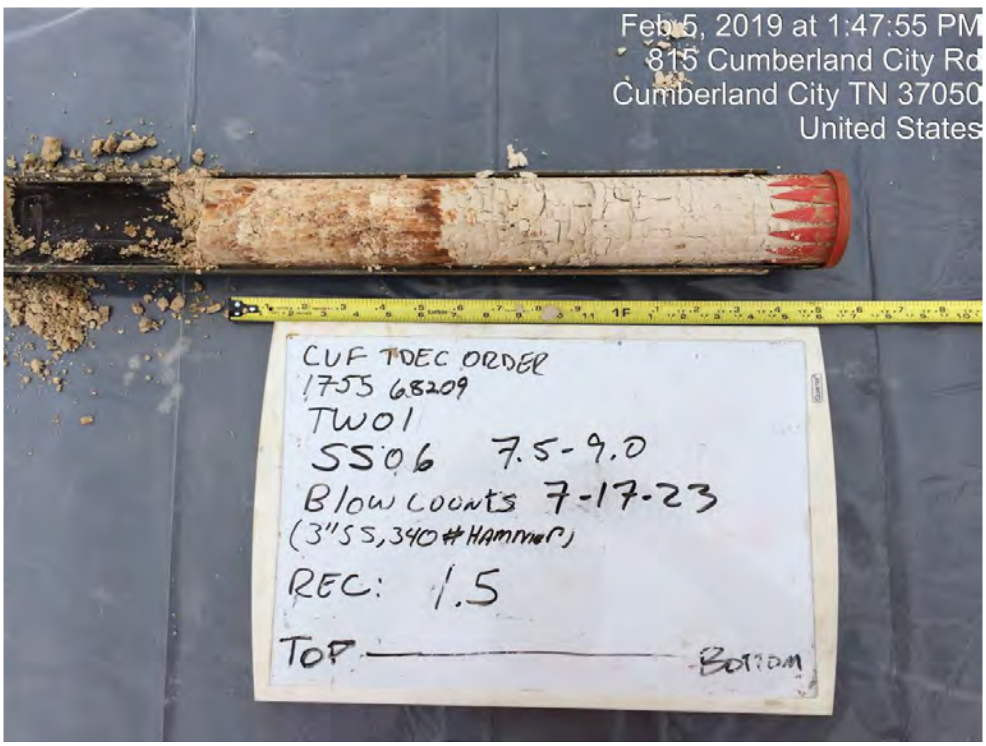
Comments: Interval (6.0-7.5 feet).

Photograph ID: 6

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (7.5-9.0 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 7

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (9.0-10.5 feet).

Photograph ID: 8

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (10.5-12.0 feet).

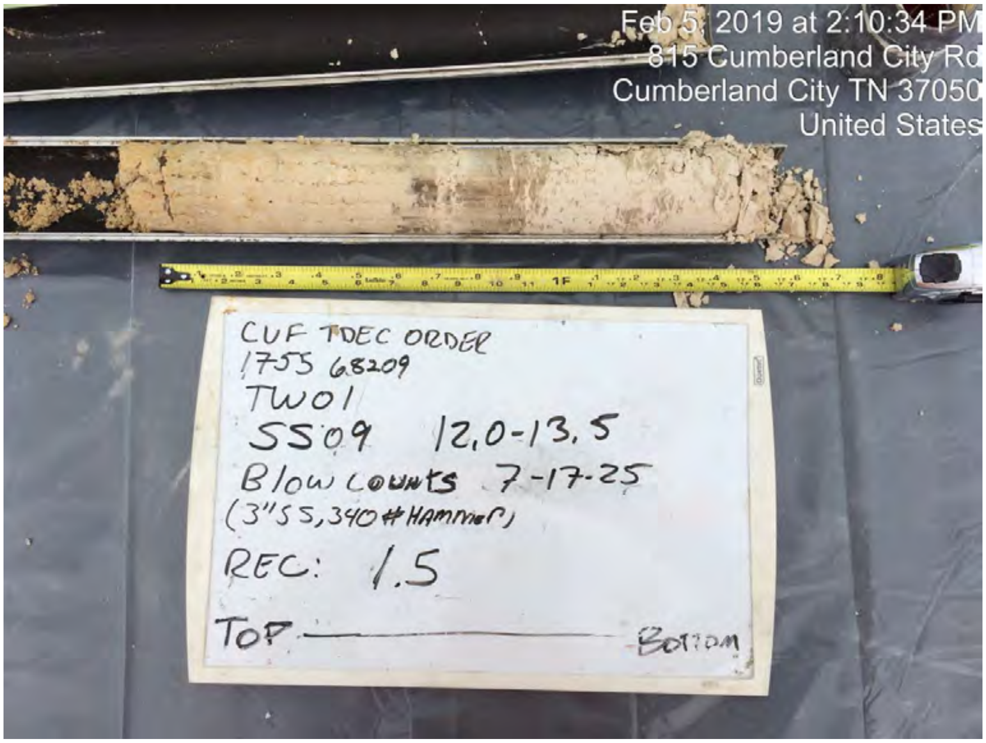
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 9

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (12.0-13.5 feet).



Photograph ID: 10

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (13.5-15.0 feet).

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Photographic Log

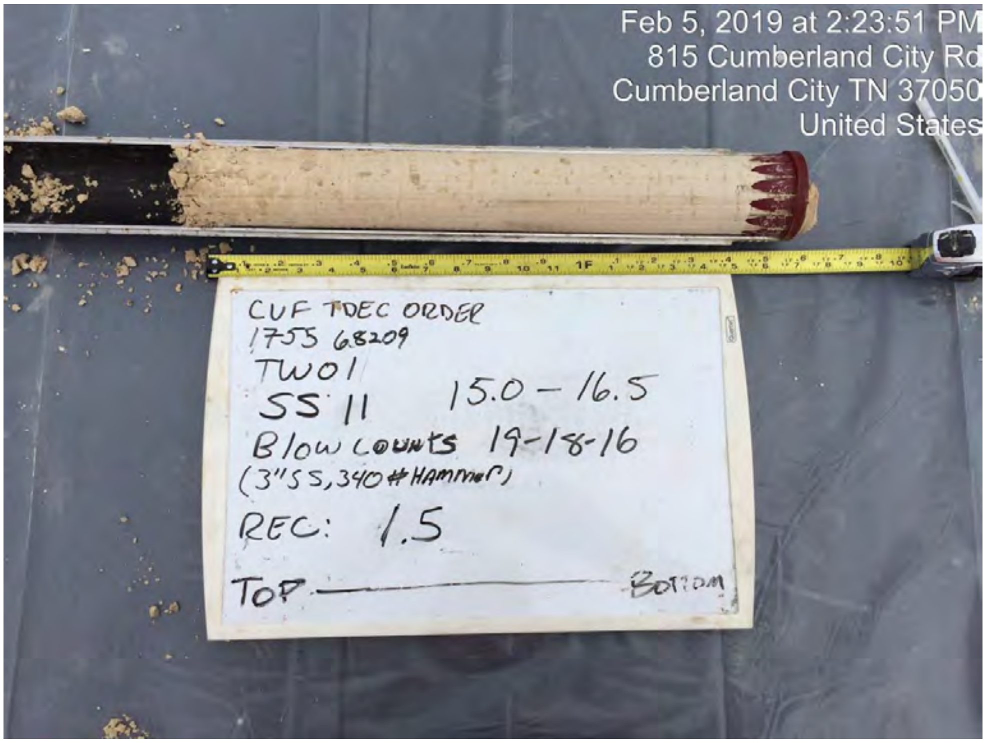
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 11

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (15.0-16.5 feet).

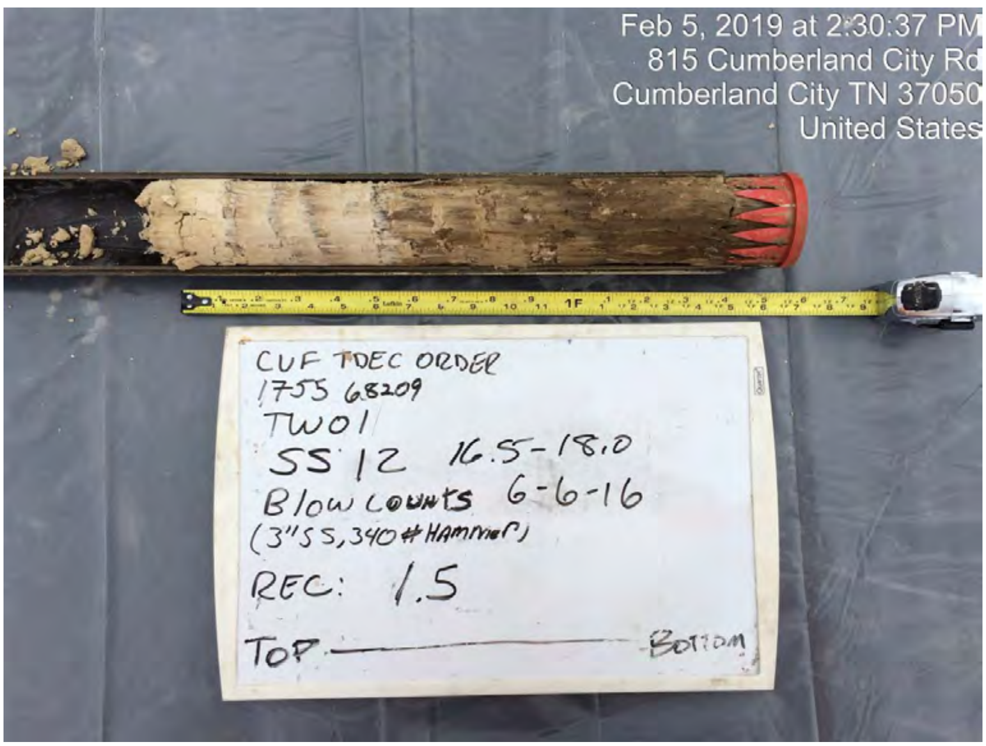


Photograph ID: 12

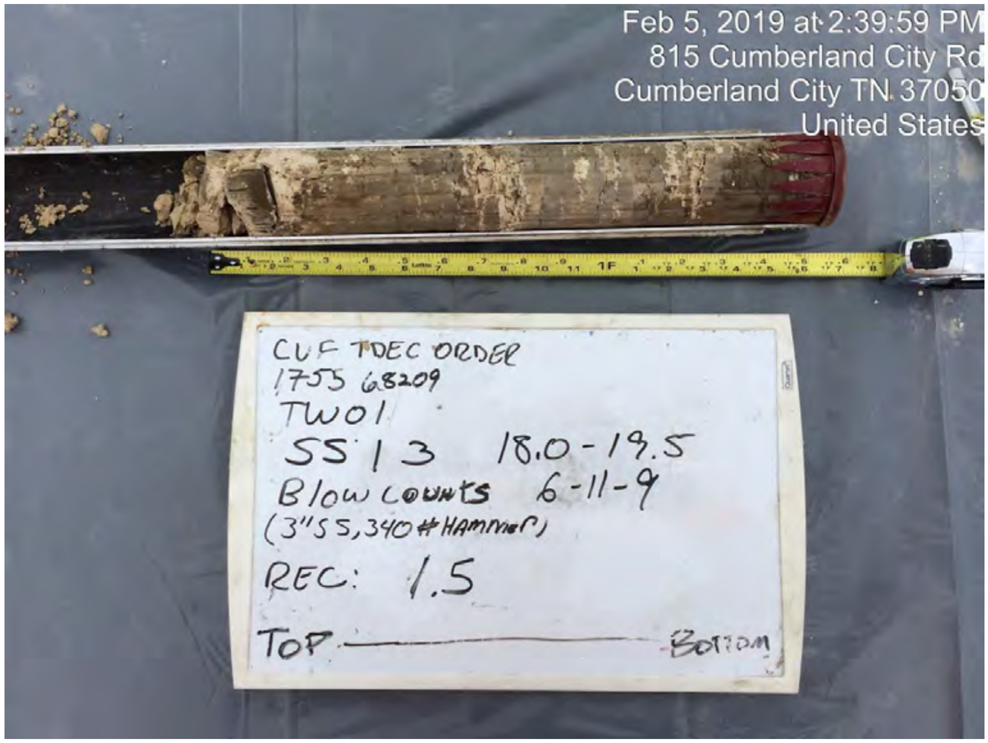
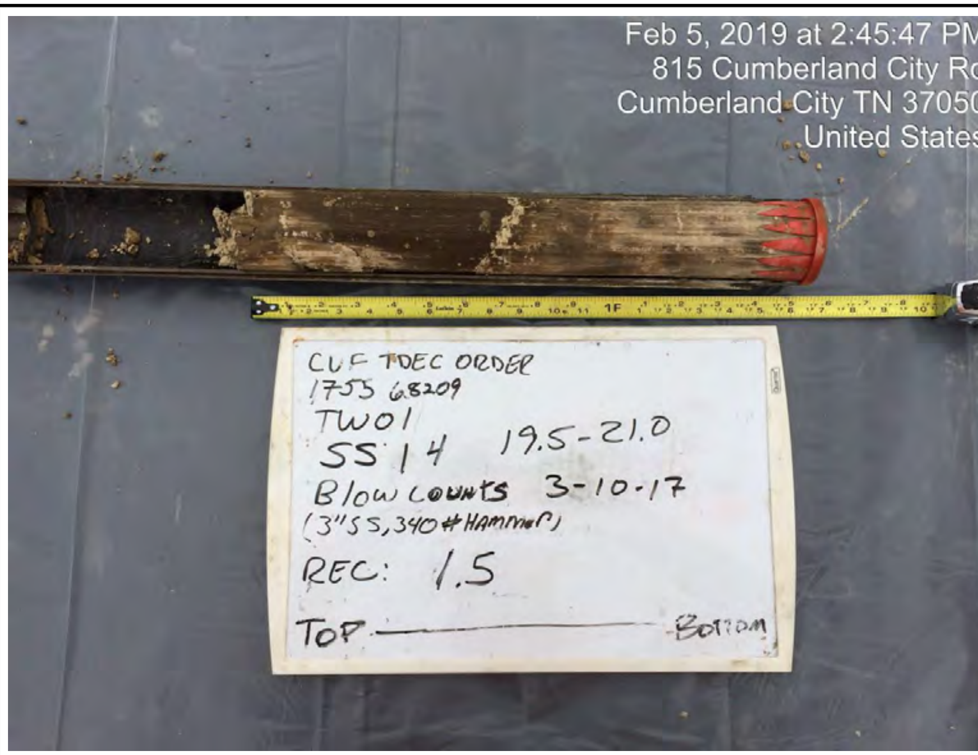
Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (16.5-18.0 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 13 **Photo Location:** CUF-TW01 **Photo Date:** 2/5/2019 **Comments:** Interval (18.0-19.5 feet).	
Photograph ID: 14 **Photo Location:** CUF-TW01 **Photo Date:** 2/5/2019 **Comments:** Interval (19.5-21.0 feet).	

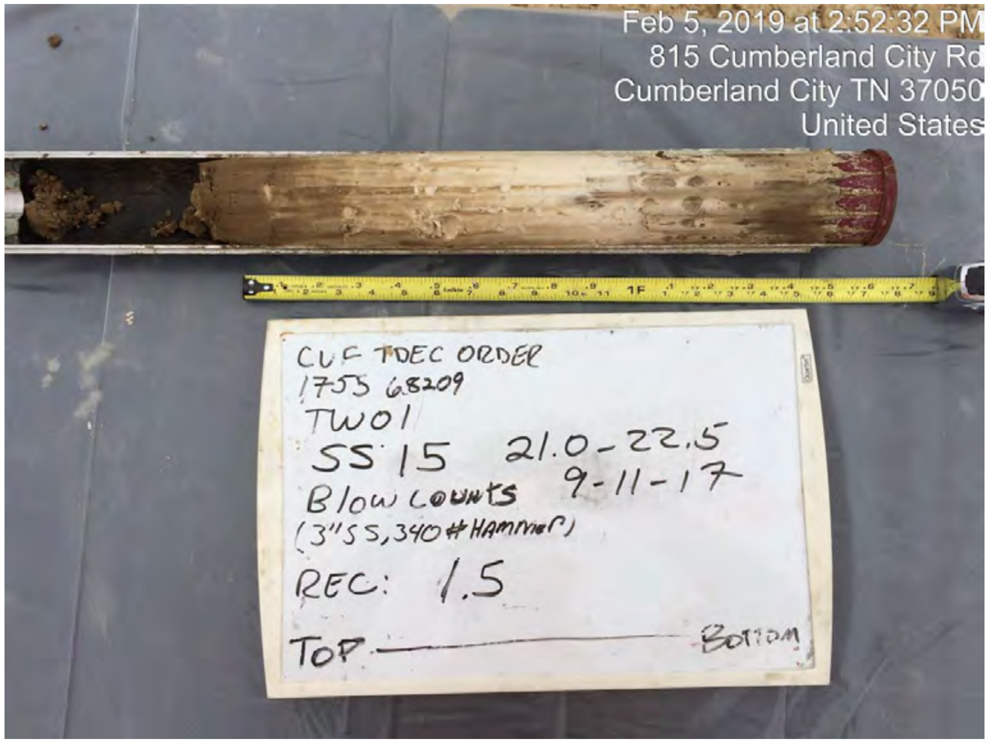
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 15

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (21.0-22.5 feet).



Photograph ID: 16

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (22.5-24.0 feet).

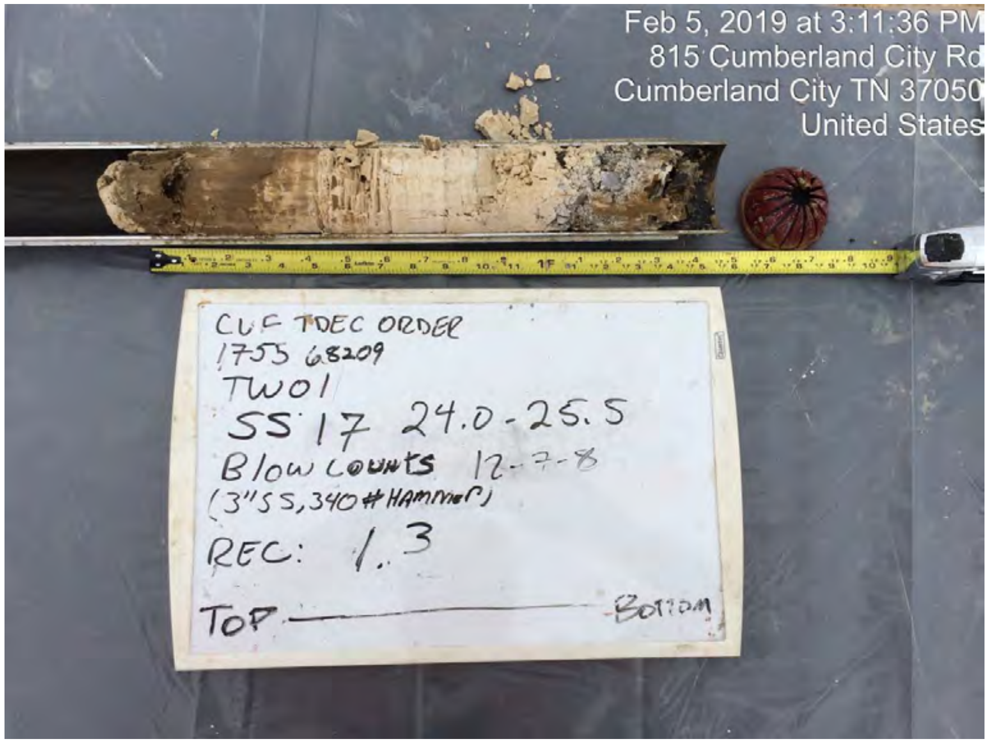
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 17

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (24.0-25.5 feet).

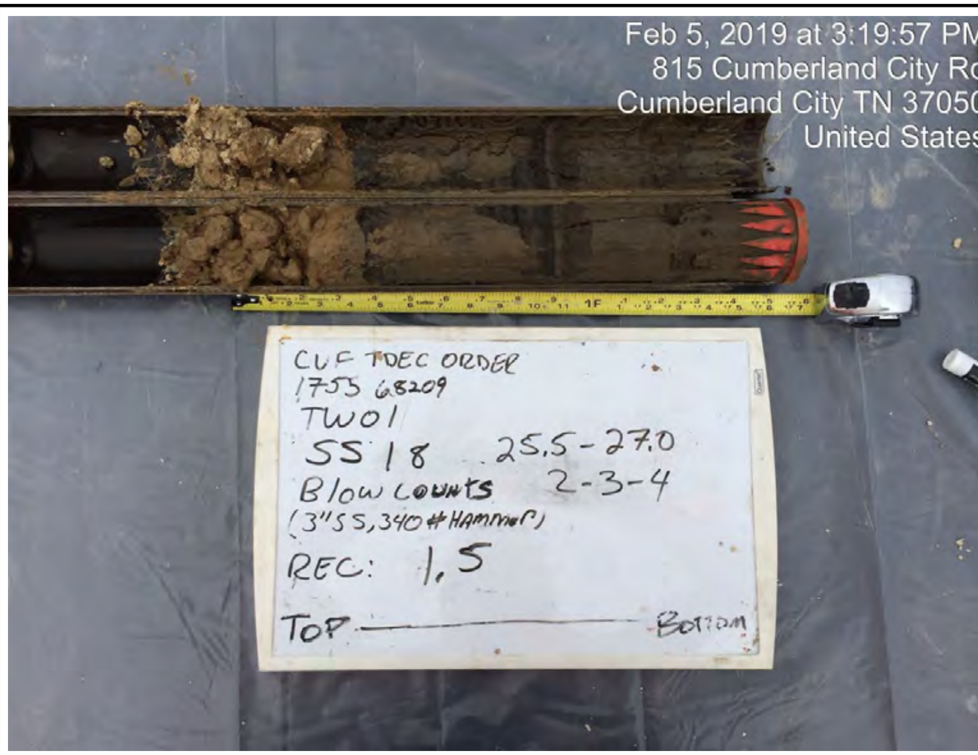


Photograph ID: 18

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (25.5-27.0 feet). Blowcount shown on white board should be 2-4-3.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 19

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (27.0-28.5 feet).

Photograph ID: 20

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (28.5-30.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 21

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (30.0-31.5 feet). Interval shown on white board should be 30.0-31.5 feet.

Photograph ID: 22

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (31.5-33.0 feet).

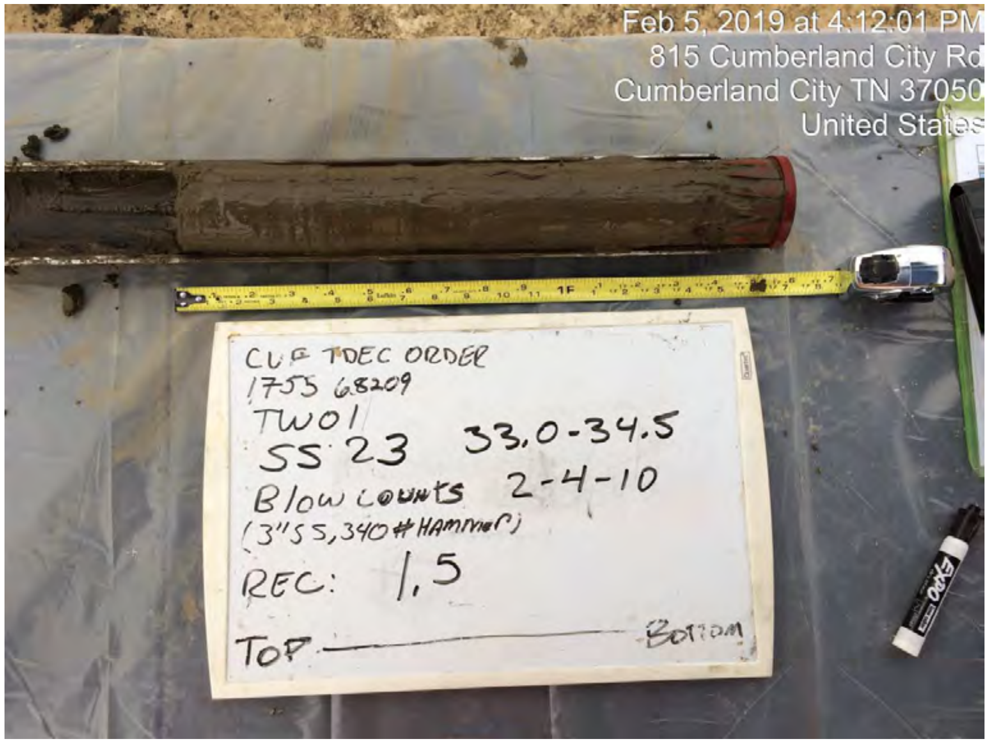
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 23

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (33.0-34.5 feet).



Photograph ID: 24

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Photo of interval (34.5-34.6 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 25

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (34.6-36.0 feet). Recovery shown on white board should be 1.4.

Photograph ID: 26

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (36.0-37.5 feet).

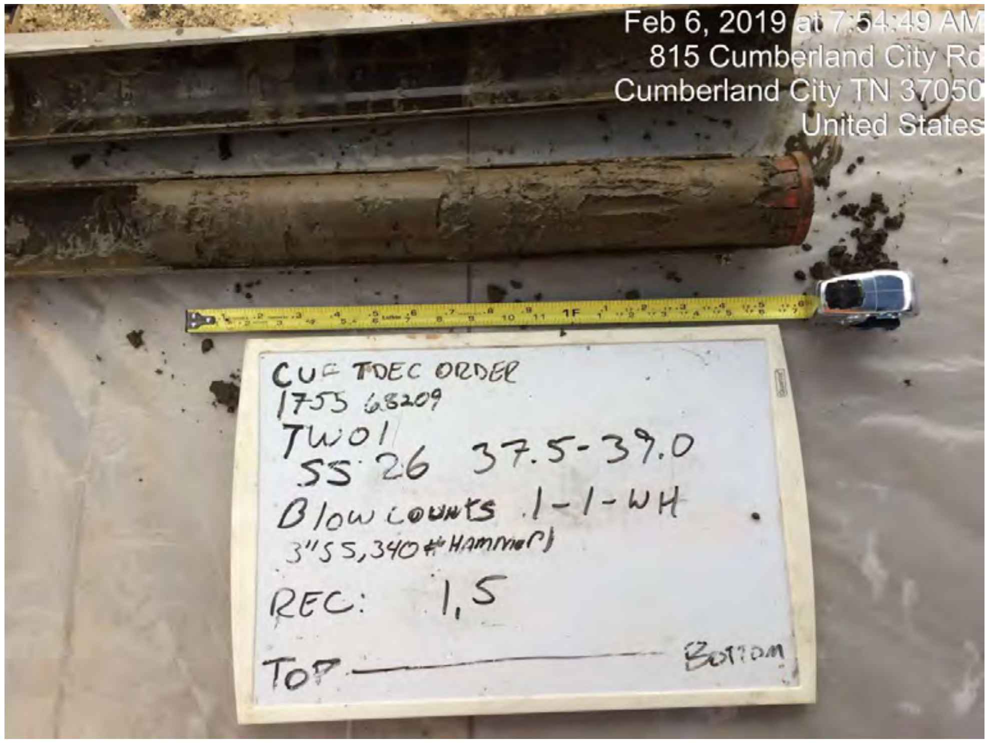
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 27

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (37.5-39.0 feet).

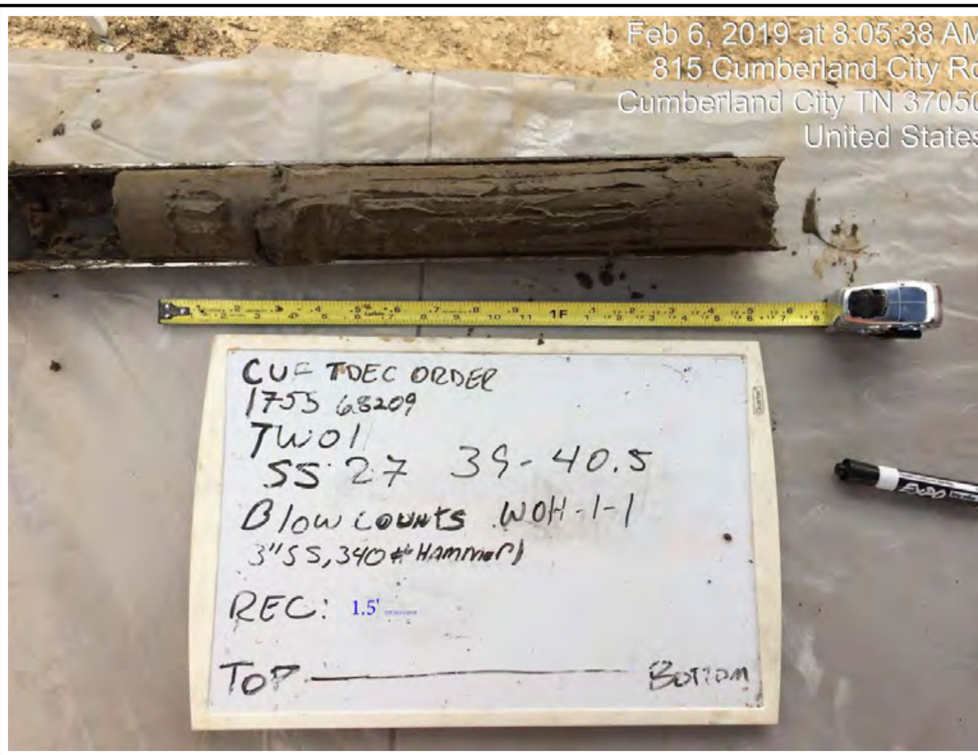


Photograph ID: 28

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (39.0-40.5 feet). Interval shown on white board should be 39.0-40.5 feet. WOH on white board is the same as WH on the boring log.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 29

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Photo of interval (40.5-42.5 feet) unavailable because sample collected with shelby tube.

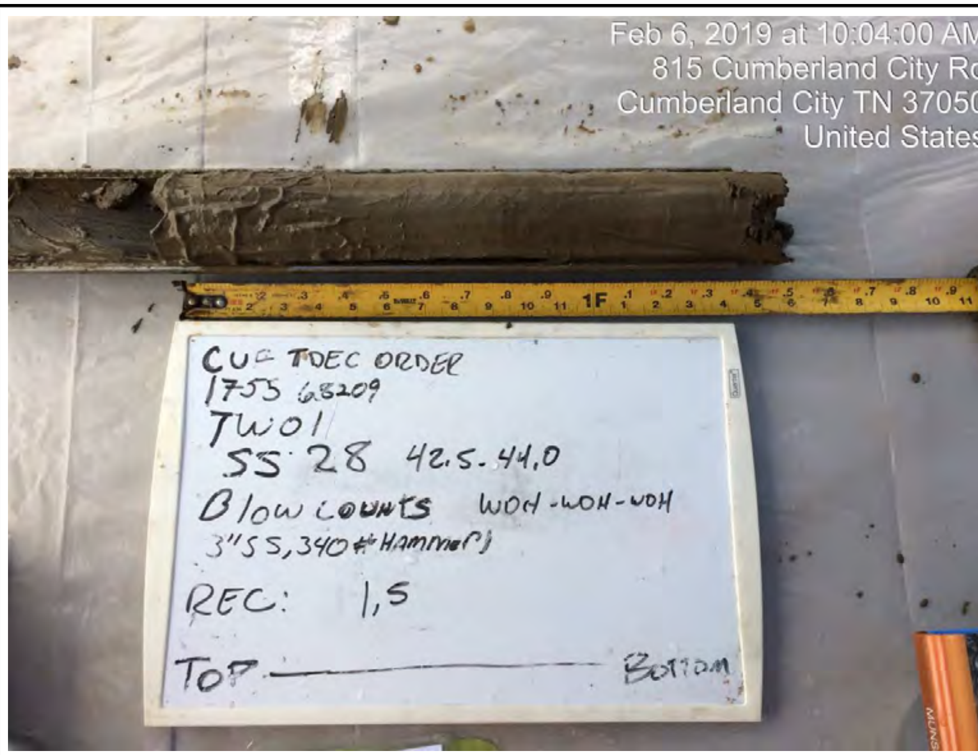
No Photo Applicable

Photograph ID: 30

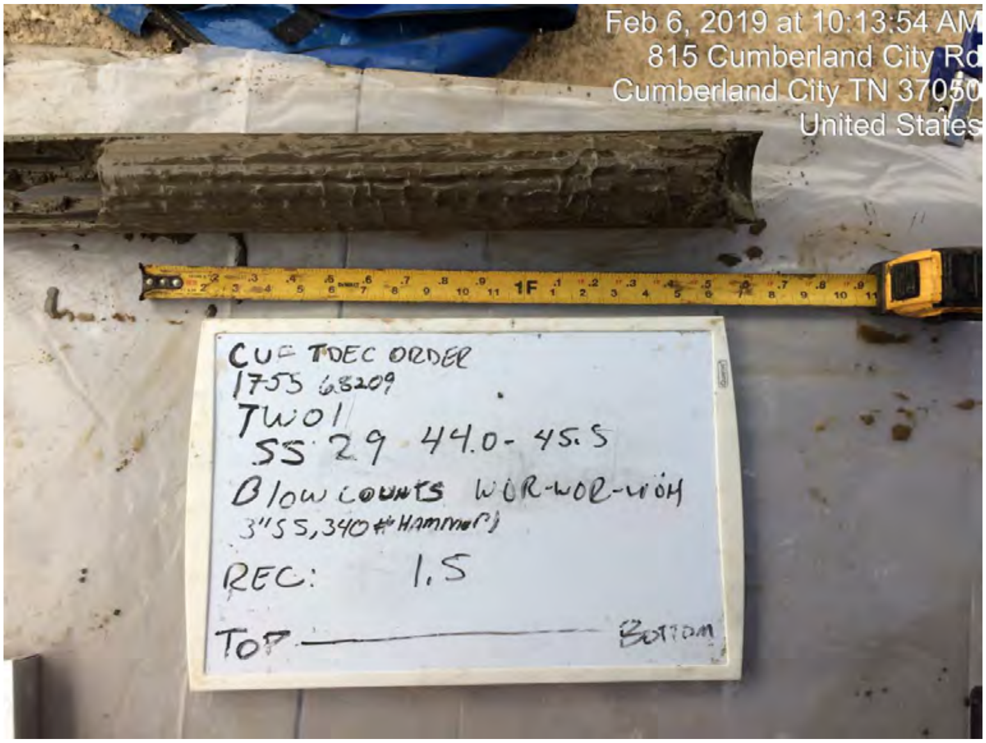
Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (42.5-44.0 feet). WOH on white board is the same as WH on the boring log.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 31 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Interval (44.0-45.5 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.	
Photograph ID: 32 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Interval (45.5-47.0 feet). Blowcount shown on white board should be 1-WH-1.	

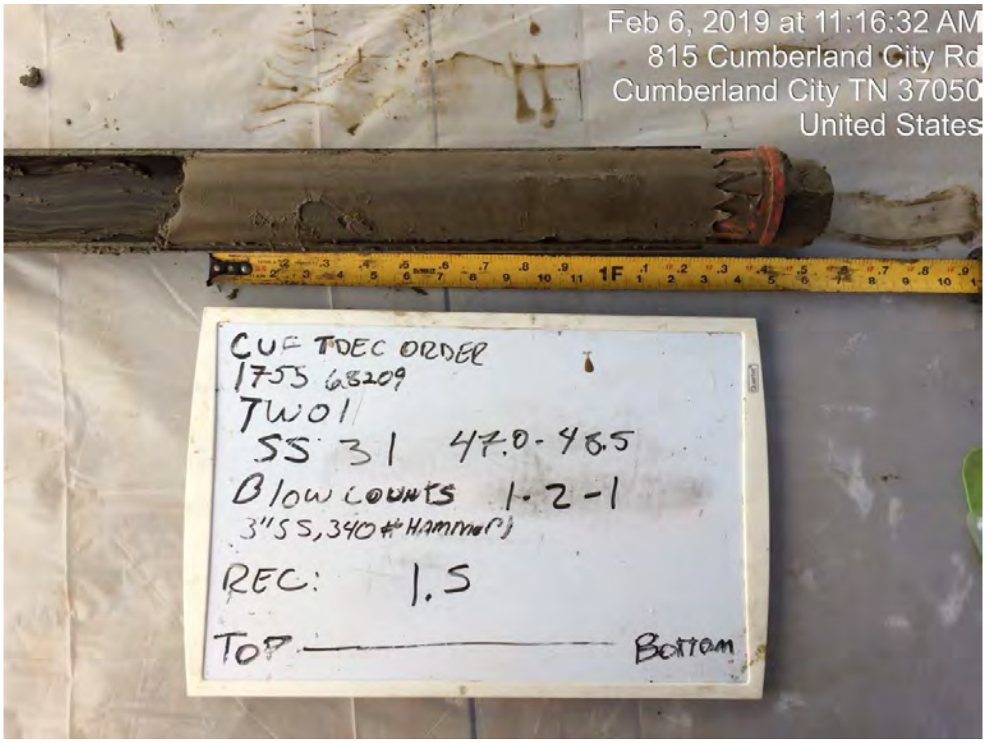
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 33

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (47.0-48.5 feet).

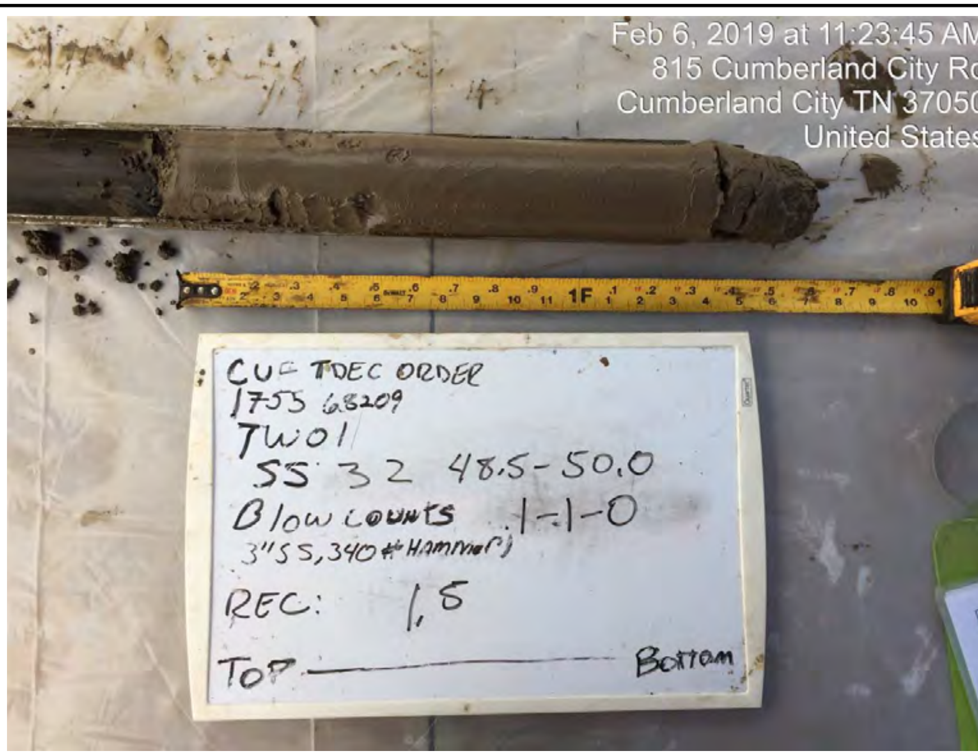


Photograph ID: 34

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (48.5-50.0 feet). Blowcount shown on white board should be 1-1-WH.



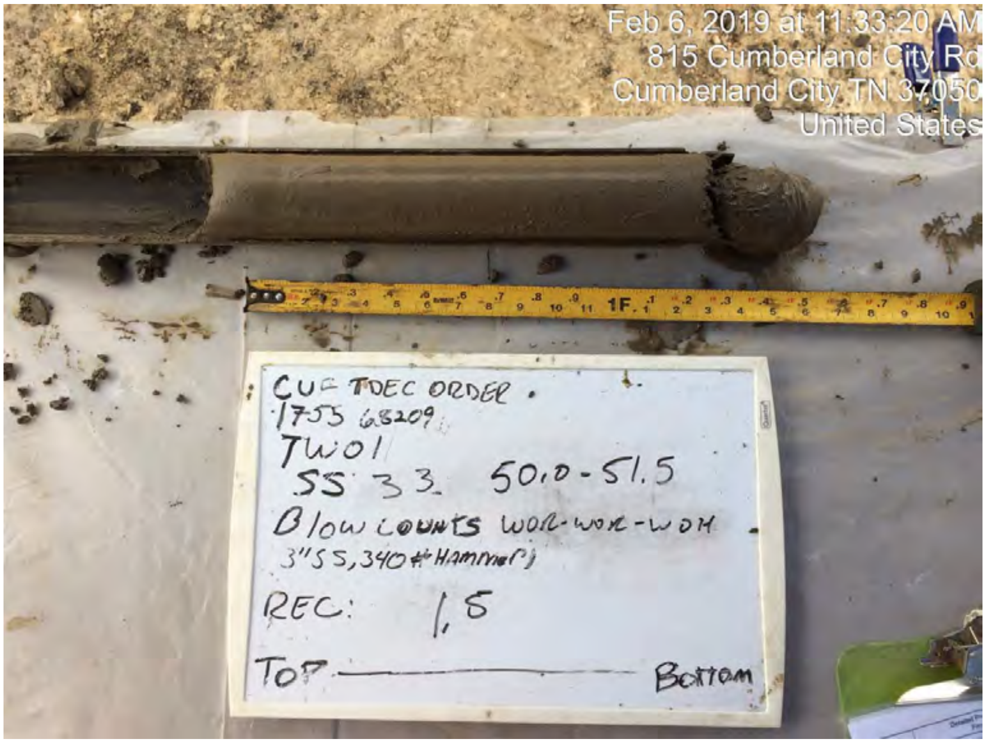
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 35

Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Interval (50.0-51.5 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

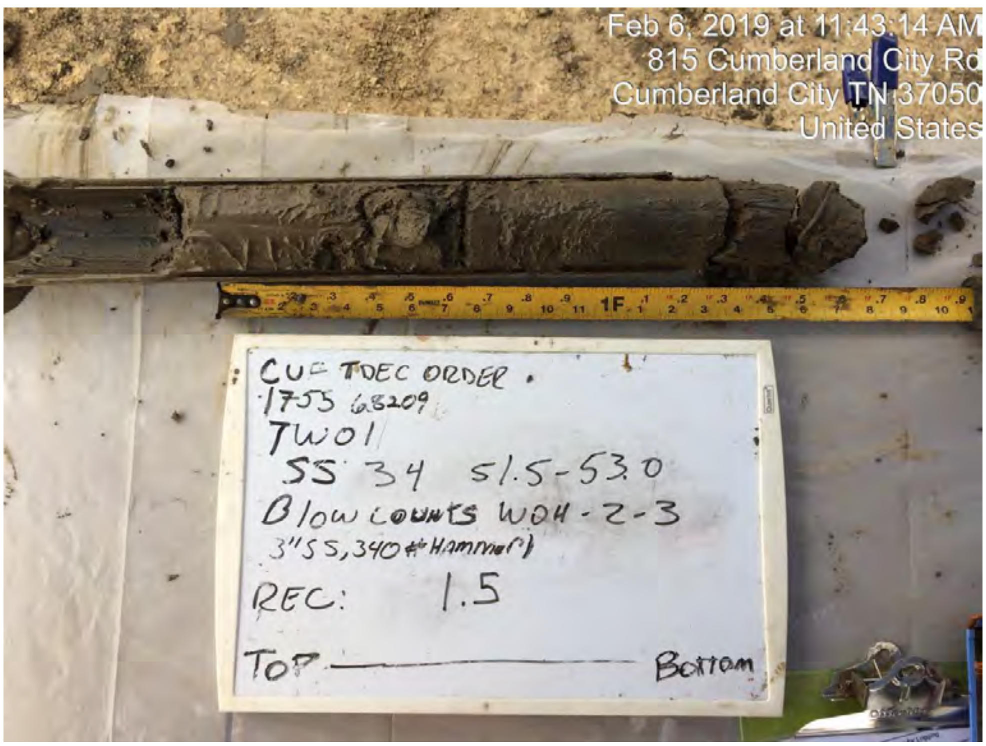


Photograph ID: 36

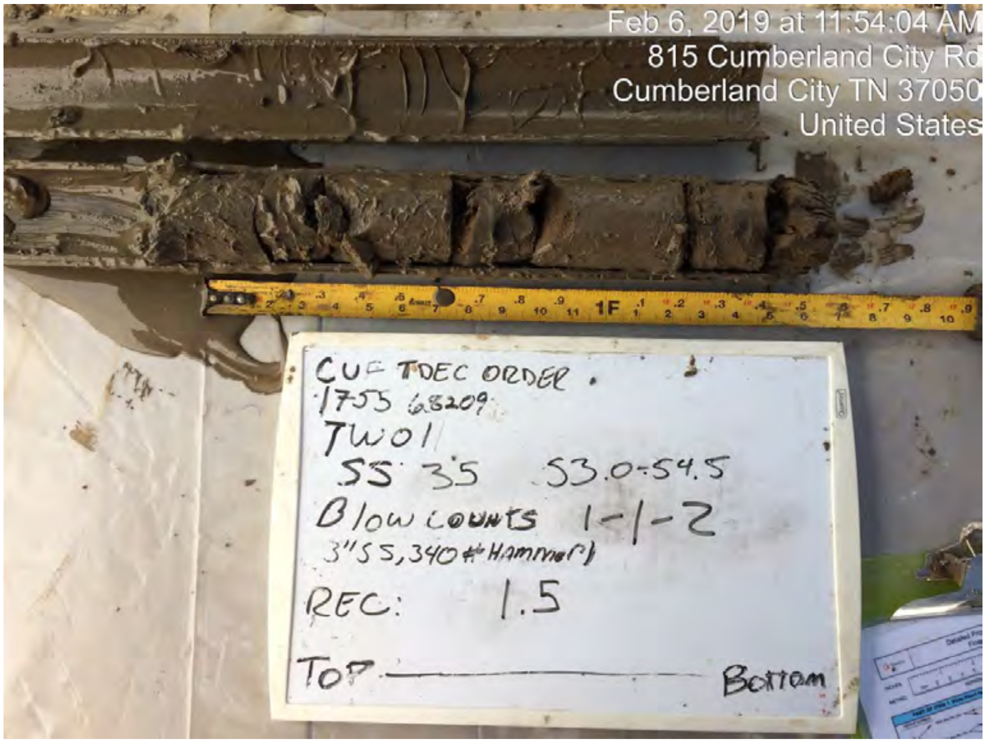
Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Interval (51.5-53.0 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 37 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Interval (53.0-54.5 feet).	
Photograph ID: 38 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Interval (54.5-56.0 feet).	

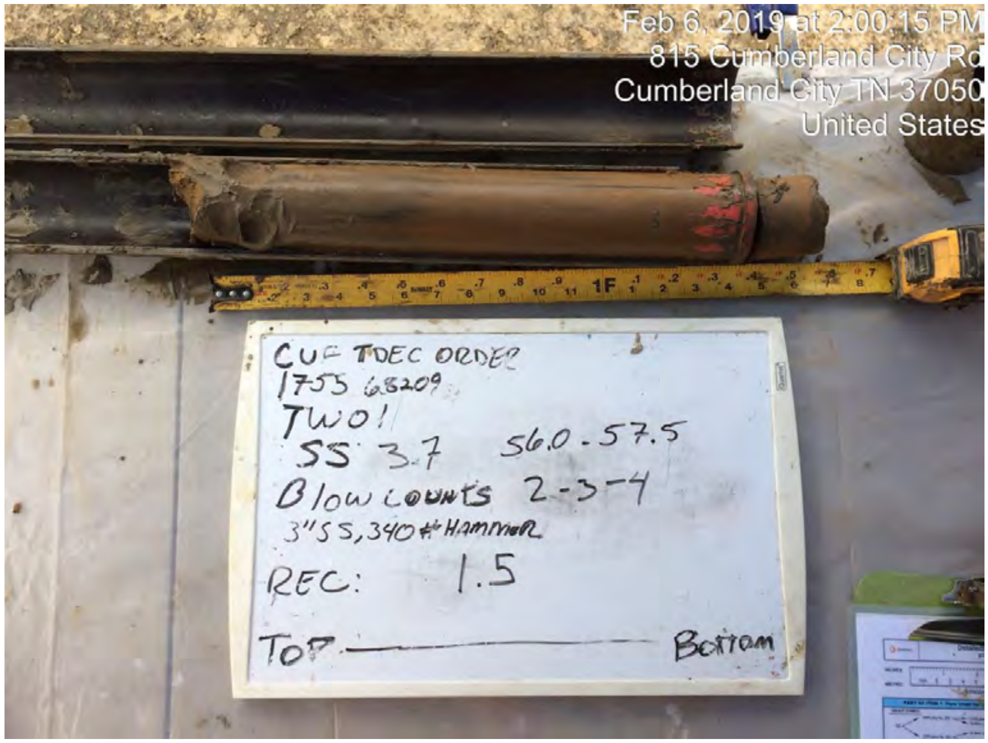
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 39

Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Interval (56.0-57.5 feet).



Photograph ID: 40

Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Photo of interval (57.5-59.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec **Photographic Log**

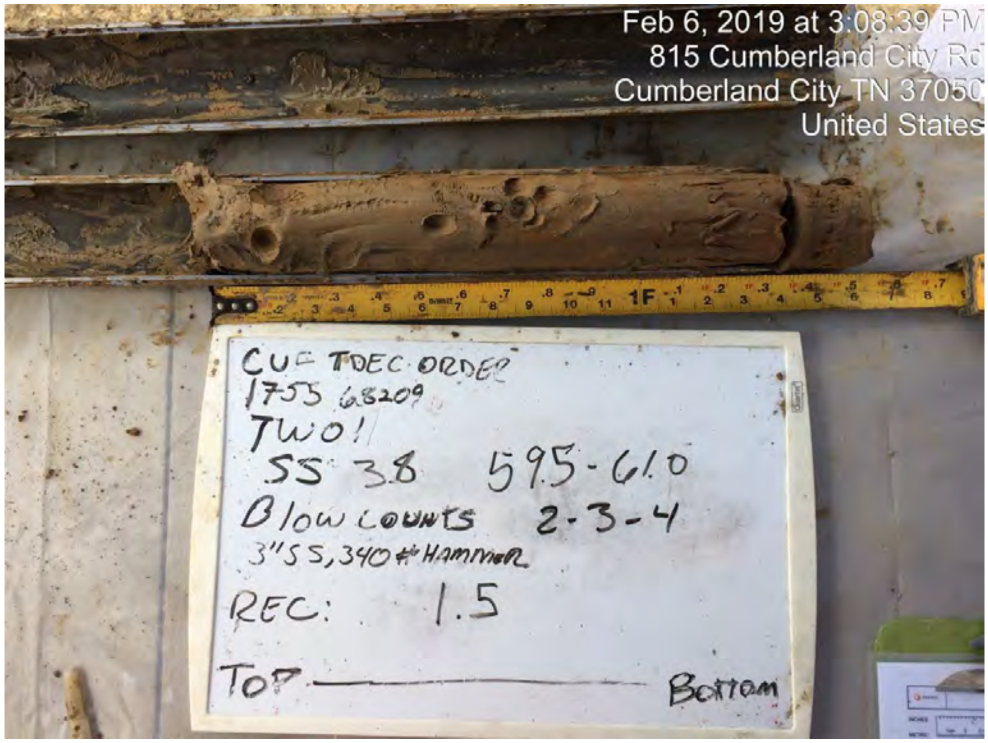
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 41

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (59.5-61.0 feet).



Photograph ID: 42

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (61.0-62.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 43

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Photo of interval (62.5-62.7 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photograph ID: 44

Photo Location:
CUF-TW01

Photo Date:
2/7/2019

Comments:
Interval (62.7-64.0 feet).

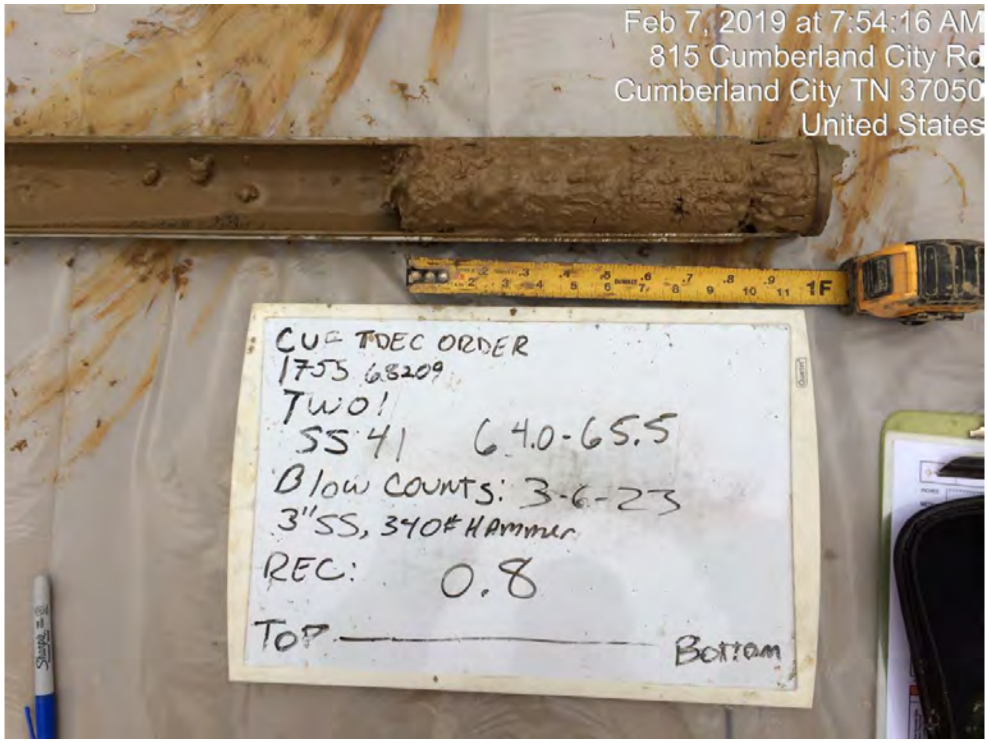
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 45

Photo Location: CUF-TW01

Photo Date: 2/7/2019

Comments: Interval (64.0-65.5 feet).

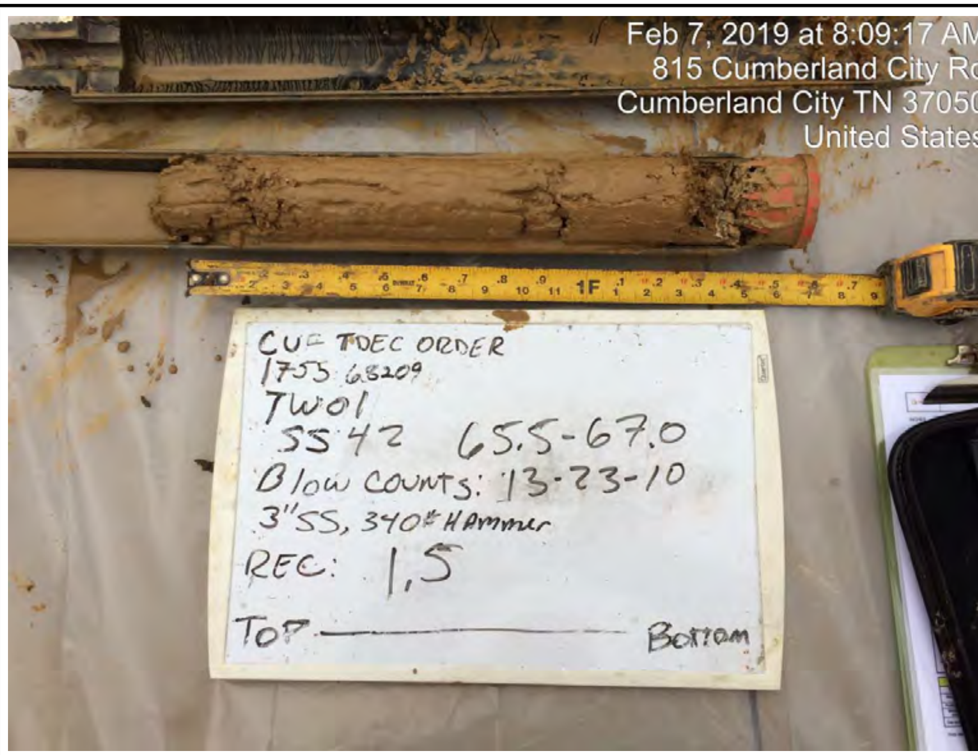


Photograph ID: 46

Photo Location: CUF-TW01

Photo Date: 2/7/2019

Comments: Interval (65.5-67.0 feet).



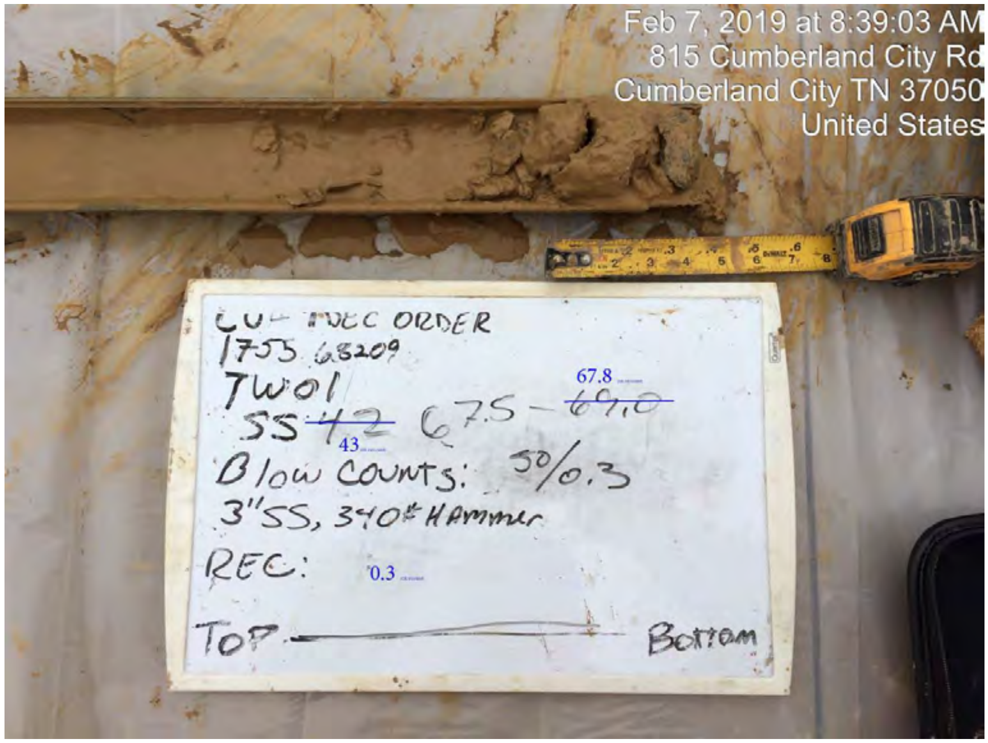
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 47

Photo Location:
CUF-TW01

Photo Date:
2/7/2019

Comments:
Interval (67.0-67.3 feet). Interval on white board should be 67.0 to 67.3 feet.



Photograph ID: 48

Photo Location:
CUF-TW01

Photo Date:
2/12/2019

Comments:
Interval (70.0-90.4 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 49

Photo Location: CUF-TW02

Photo Date: 3/5/2019

Comments: Interval (0.0-1.5 feet). Interval shown on white board should be 0.0-1.5.

Photograph ID: 50

Photo Location: CUF-TW02

Photo Date: 3/5/2019

Comments: Interval (1.5-3.0 feet).

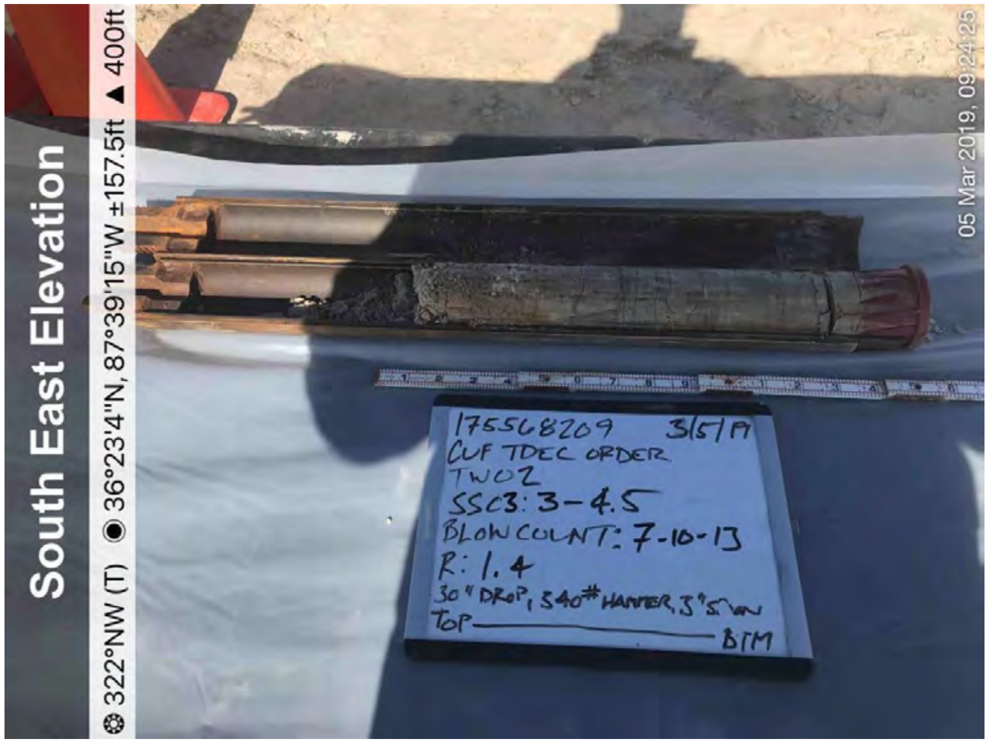
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 51

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Interval (3.0-4.5 feet). Interval shown on white board should be 3.0-4.5 feet.



Photograph ID: 52

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Photo of interval (4.5-5.2 feet) unavailable because sample collected with shelby tube. Sampler refusal at 5.2 feet.

No Photo Applicable

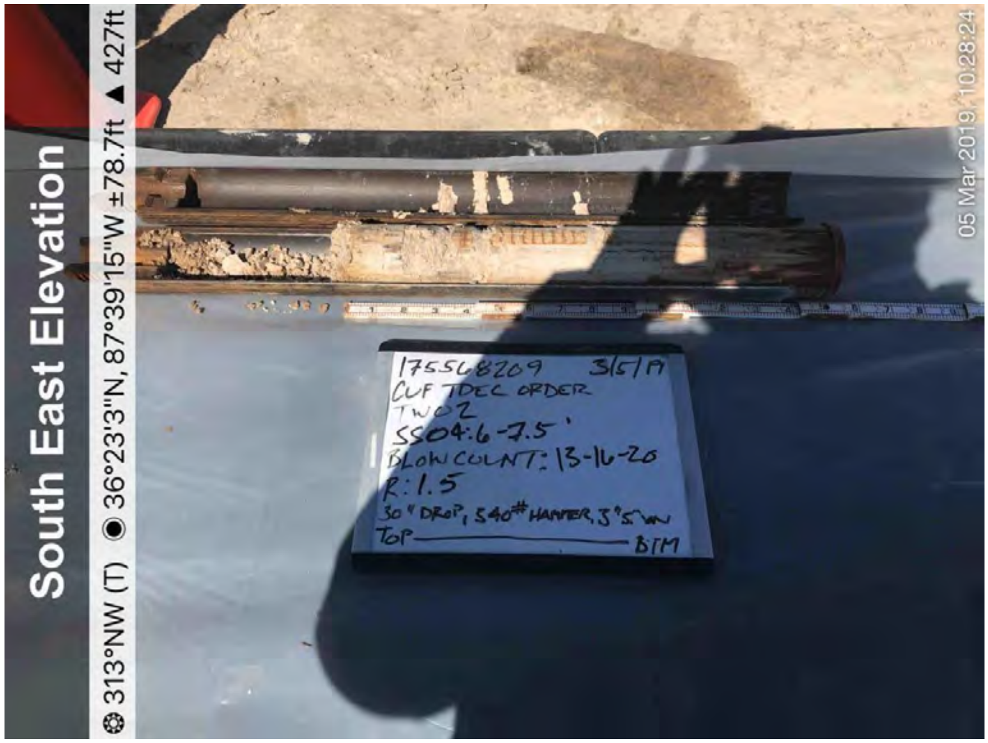
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 53

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Interval (6.0-7.5 feet). Interval shown on white board should be 6.0-7.5 feet.

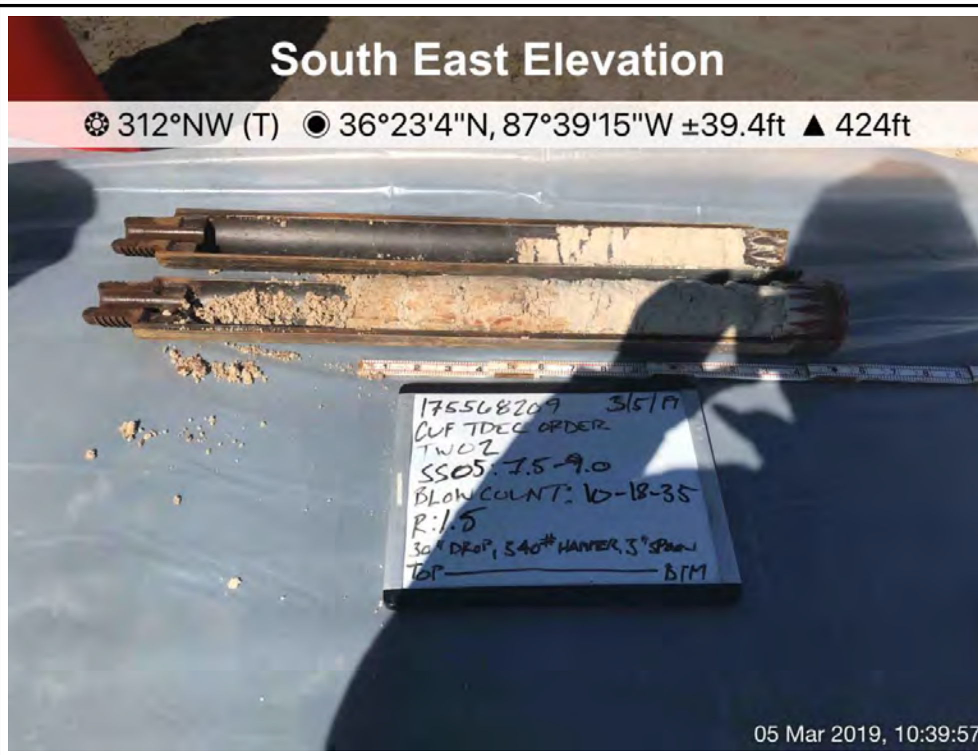


Photograph ID: 54

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Interval (7.5-9.0 feet).



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 55 **Photo Location:** CUF-TW02 **Photo Date:** 3/6/2019 **Comments:** Interval (9.0-9.8 feet). Interval shown on white board should be 9.0-9.8 feet. Sampler refusal at 9.8 feet.	
Photograph ID: 56 **Photo Location:** CUF-TW02 **Photo Date:** 3/6/2019 **Comments:** Interval (10.5-11.4 feet). Interval shown on white board should be 10.5-11.4. Sampler refusal at 11.4 feet.	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 57

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (12.0-12.9 feet). Interval shown on white board should be 12.0-12.9. Sampler refusal at 12.9 feet.

Photograph ID: 58

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (13.5-15.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 59

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (15.0-16.5 feet). Interval shown on white board should be 15.0-16.5. Blowcount shown on white board is 22-33-40.

Photograph ID: 60

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (16.5-18.0 feet). Interval shown on white board should be 16.5-18.0.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 61

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (18.0-19.5 feet). Interval shown on white board should be 18.0-19.5.

Photograph ID: 62

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Photo of interval (19.5-20.7 feet) unavailable. Sampler refusal at 20.7 feet.

No Photo Applicable

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 63

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (21.0-22.5 feet). Interval shown on white board should be 21.0-22.5.

Photograph ID: 64

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (22.5-23.3 feet). Interval shown on white board should be 22.5-23.3. Sampler refusal at 23.3 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 65

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (24.0-25.5 feet). Interval shown on white board should be 24.0-25.5.

Photograph ID: 66

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (25.5-27.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 67

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (0.0-1.5 feet). Interval shown on white board should be 0.0-1.5.

Photograph ID: 68

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (1.5-3.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 69 **Photo Location:** CUF-TW03 **Photo Date:** 2/13/2019 **Comments:** Interval (3.0-4.5 feet).	
Photograph ID: 70 **Photo Location:** CUF-TW03 **Photo Date:** 2/13/2019 **Comments:** Interval (4.5-6.0 feet). Interval shown on white board should be 4.5-6.0.	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 71

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

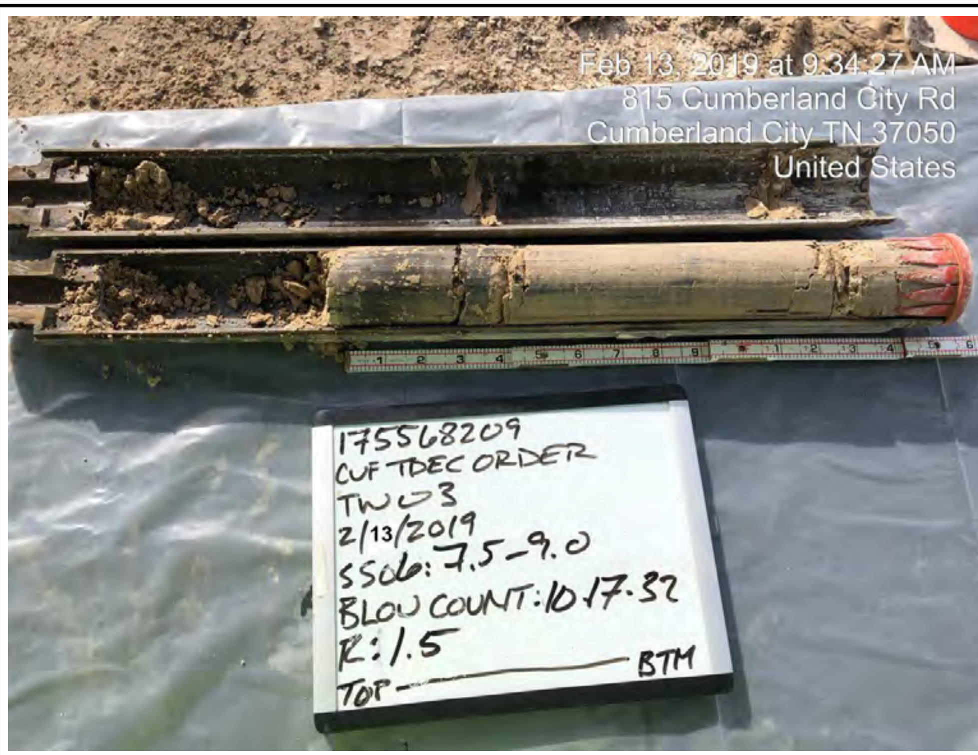
Comments:
Interval (6.0-7.5 feet).

Photograph ID: 72

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (7.5-9.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 73 **Photo Location:** CUF-TW03 **Photo Date:** 2/13/2019 **Comments:** Interval (9.0-10.5 feet).	
Photograph ID: 74 **Photo Location:** CUF-TW03 **Photo Date:** 2/13/2019 **Comments:** Interval (10.5-12.0 feet).	

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 75

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (12.0-13.5 feet). Interval shown on white board should be 12.0-13.5.

Photograph ID: 76

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (13.5-15.0 feet). Interval shown on white board should be 13.5-15.0.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 77

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (15.0-16.5 feet). Interval shown on white board should be 15.0-16.5.

Photograph ID: 78

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (16.5-18.0 feet). Interval shown on white board should be 16.5-18.0.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 79

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (18.0-19.5 feet). Interval shown on white board should be 18.0-19.5.

Photograph ID: 80

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (19.5-21.0 feet). Interval shown on white board should be 19.5-21.0.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 81

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (21.0-22.0 feet). Interval shown on white board should be 21.0-22.0. Blowcount shown on white board should be 16-50.

Photograph ID: 82

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (22.5-24.0 feet). Interval shown on white board should be 22.5-24.0.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 83 **Photo Location:** CUF-TW03 **Photo Date:** 2/13/2019 **Comments:** Interval (24.0-25.5 feet). Interval shown on white board should be 24.0-25.5.	
Photograph ID: 84 **Photo Location:** CUF-TW03 **Photo Date:** 2/13/2019 **Comments:** Interval (25.5-27.0 feet). Interval shown on white board should be 25.5-27.0.	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 85

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (27.0-28.5 feet). Interval shown on white board should be 27.0-28.5. WOH on white board is the same as WH on the boring log.

Photograph ID: 86

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Photo of interval (28.5-30.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 87

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (30.5-32.0 feet). Interval shown on white board should be 30.5-32.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 88

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Photo of interval (32.0-33.5 feet) unavailable.

No Photo Applicable

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 89

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (33.5-35.0 feet). Interval shown on white board should be 33.5-35.0. Blowcount shown on white board should be 2-1-WH.

Photograph ID: 90

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (35.0-36.5 feet). Interval shown on white board should be 35.0-36.5. WOH on white board is the same as WH on the boring log.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 91

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (36.5-38.0 feet). Interval shown on white board should be 36.5-38.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 92

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (38.0-39.5 feet). Interval shown on white board should be 38.0-39.5. Blow count shown on white board should be WH-1-WH.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 93

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (39.5-41.0 feet). Interval shown on white board should be 39.5-41.0. Blowcount shown on white board should be WR-1-WH.

Photograph ID: 94

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Photo of interval (41.0-42.5 feet) unavailable.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 95

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

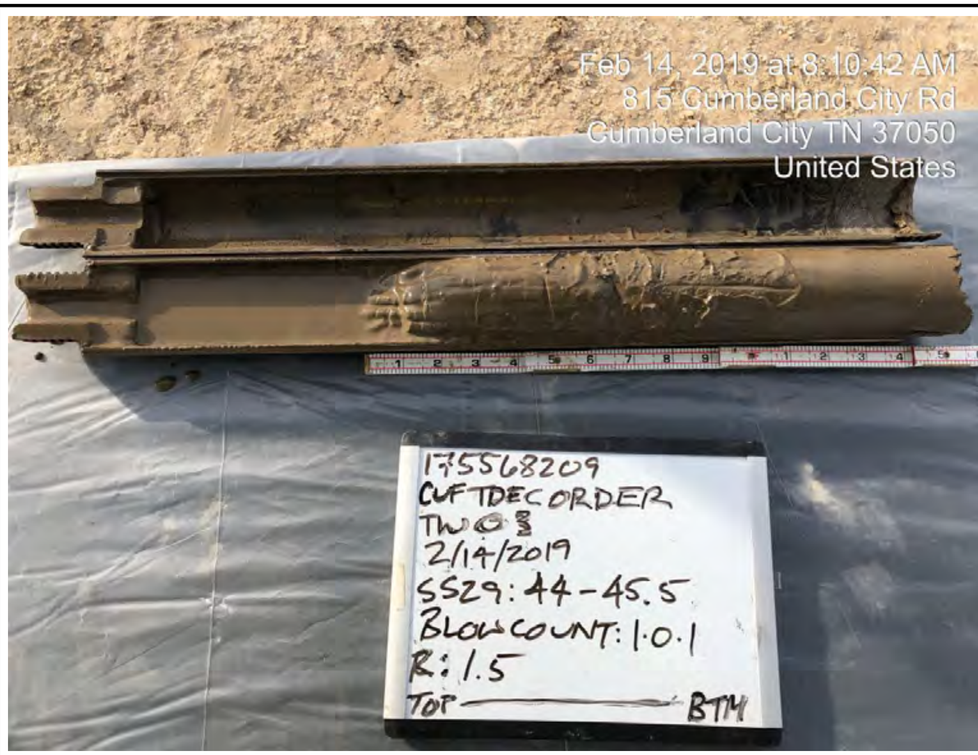
Comments:
Interval (42.5-44.0 feet). Interval shown on white board should be 42.5-44.0. Blowcount shown on white board should be WR-1-WH.

Photograph ID: 96

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (44.0-45.5 feet). Interval shown on white board should be 44.0-45.5. Blowcount shown on white board should be 1-WH-1.



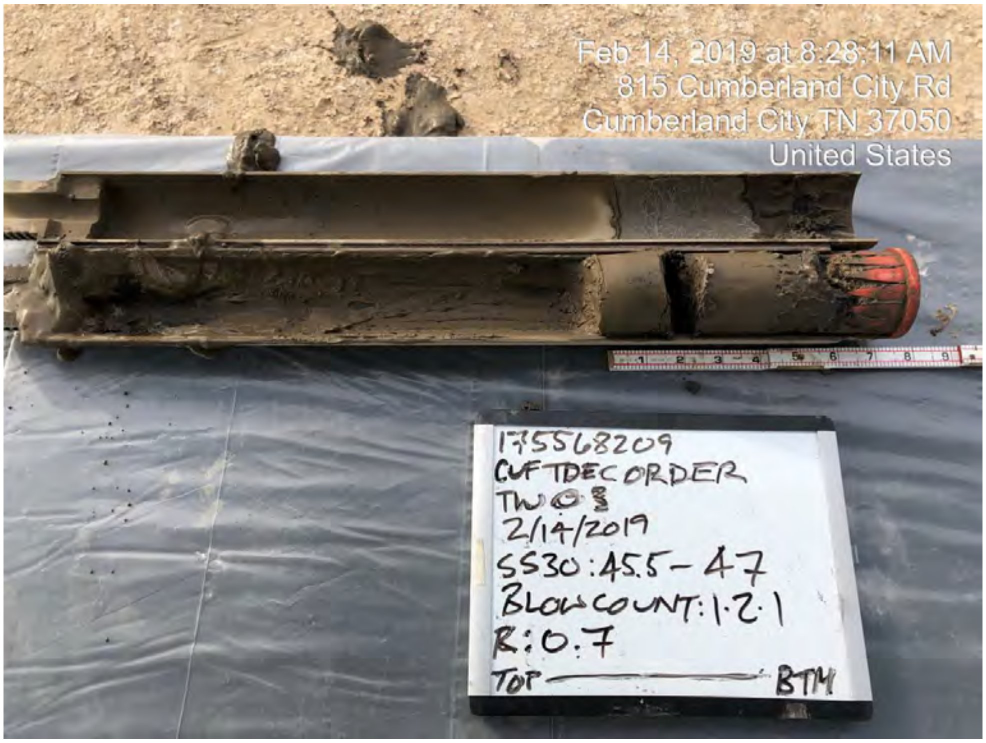
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 97

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (45.5-47.0 feet). Interval shown on white board should be 45.5-47.0.



Photograph ID: 98

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (47.0-48.5 feet). Interval shown on white board should be 47.0-48.5. Blowcount shown on white board should be 1-WH-WH.

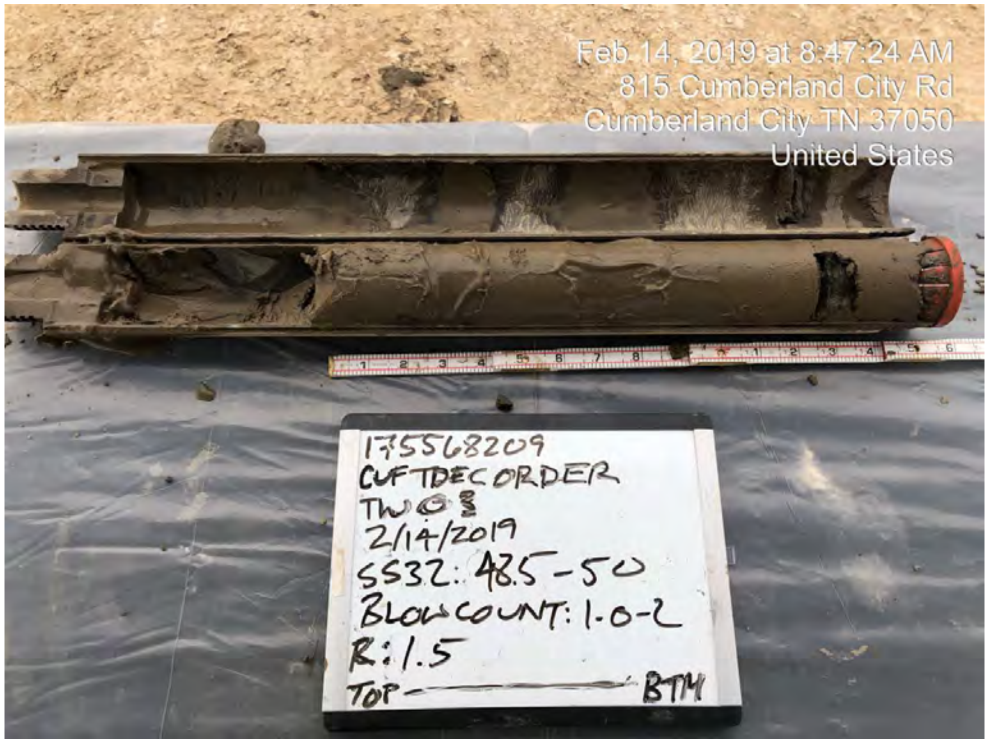
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 99

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (48.5-50.0 feet). Interval shown on white board should be 48.5-50.0. Blowcount shown on white board should be 1-WH-2.

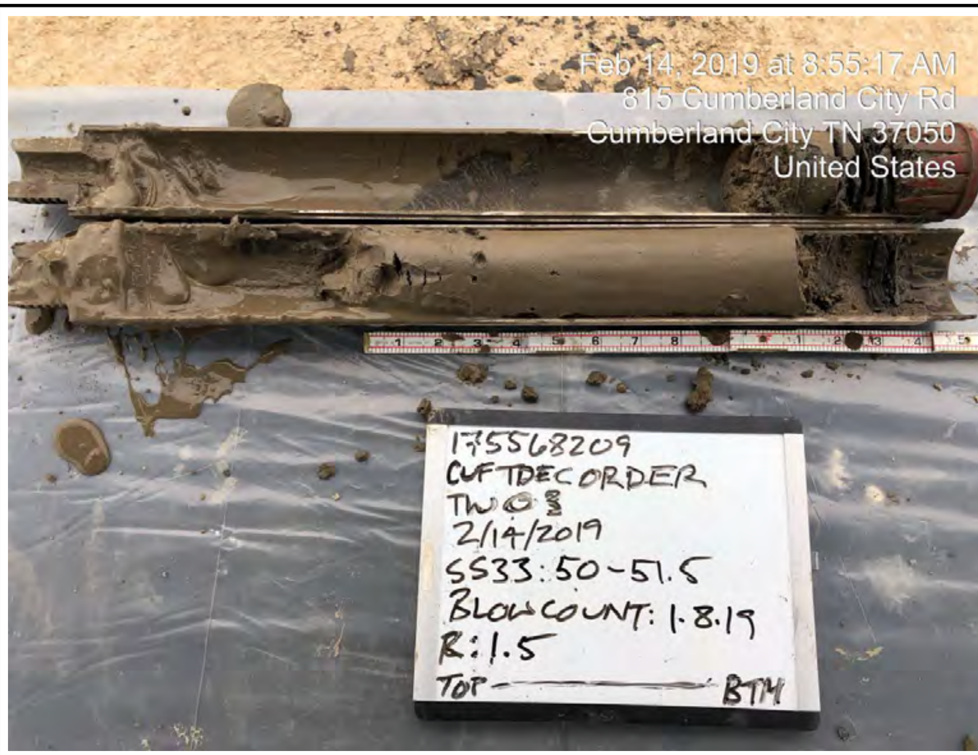


Photograph ID: 100

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (50.0-51.5 feet). Interval shown on white board should be 50.0-51.5.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 101

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (51.5-53.0 feet). Interval shown on white board should be 51.5-53.0.

Photograph ID: 102

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (53.0-54.5 feet). Interval shown on white board should be 53.0-54.5. WOH on white board is the same as WH on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 103

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

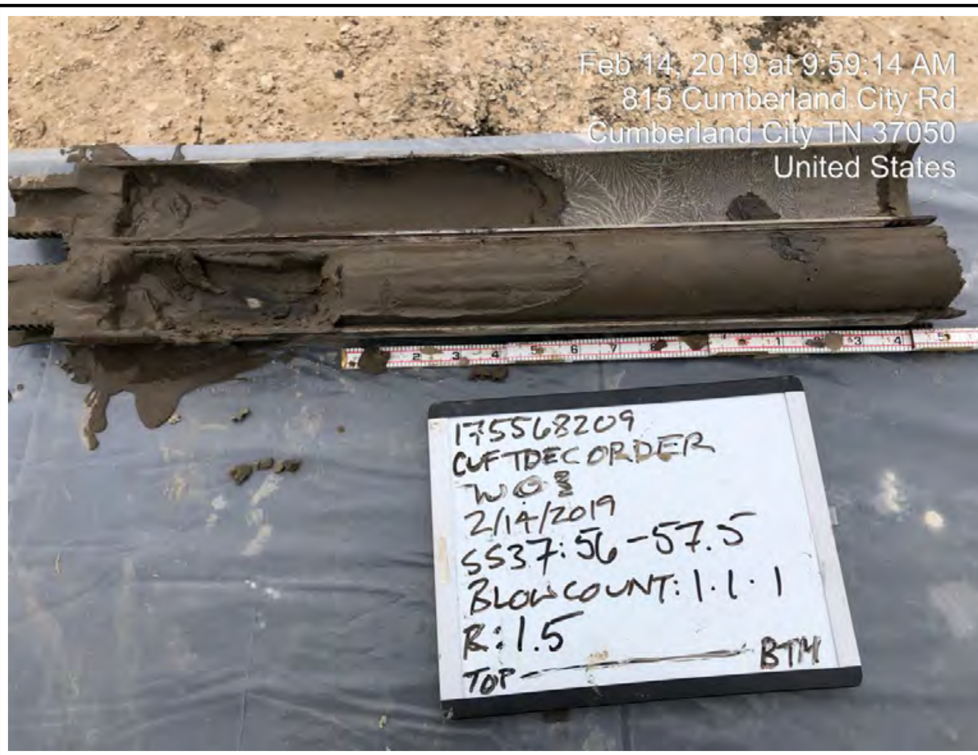
Comments:
Interval (54.5-56.0 feet). Interval shown on white board should be 54.5-56.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 104

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (56.0-57.5 feet). Interval shown on white board should be 56.0-57.5.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 105

Photo Location: CUF-TW03

Photo Date: 2/14/2019

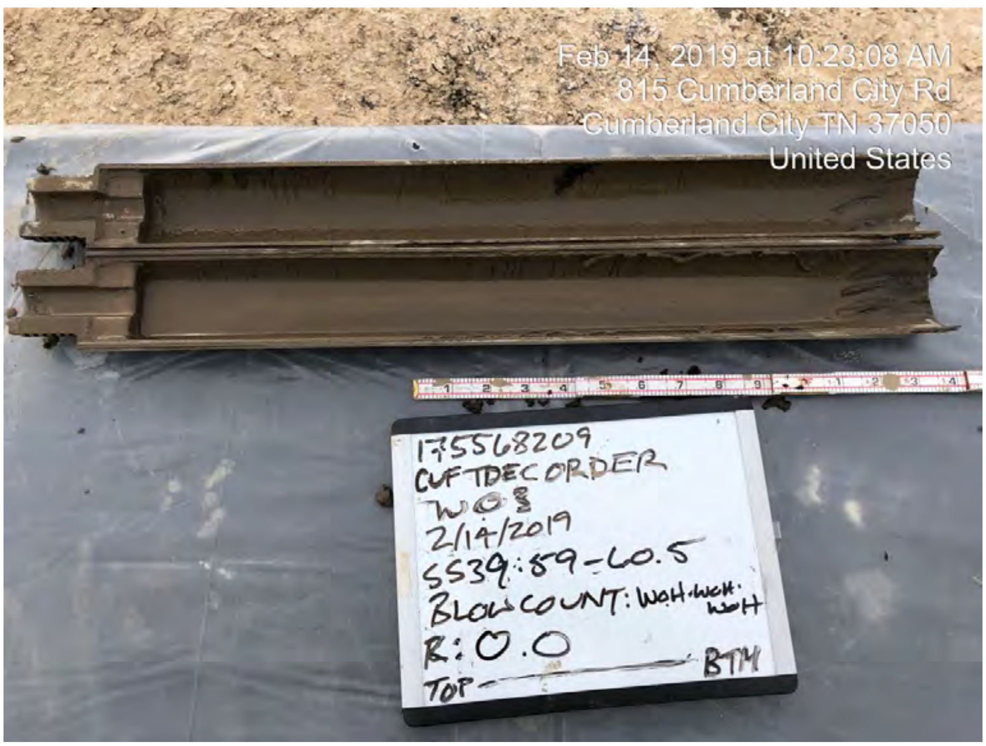
Comments: Interval (57.5-59.0 feet). Interval shown on white board should be 57.5-59.0. Blow count shown on white board should be 1-WH-1.

Photograph ID: 106

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (59.0-60.5 feet). Interval shown on white board should be 59.0-60.5. WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 107

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (60.5-62.0 feet). Interval shown on white board should be 60.5-62.0. WOR on white board is the same as WR on the boring log.

Photograph ID: 108

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (62.0-63.5 feet). Interval shown on white board should be 62.0-63.5. Blowcount shown on white board should be 1-WH-1.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 109

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (63.5-65.0 feet)WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

Photograph ID: 110

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (65.0-66.5 feet). Interval shown on white board should be 65.0-66.5. WOR on white board is the same as WR on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 111

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (66.5-68.0 feet). Interval shown on white board should be 66.5-68.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 112

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Photo of interval (68.0-70.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 113

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

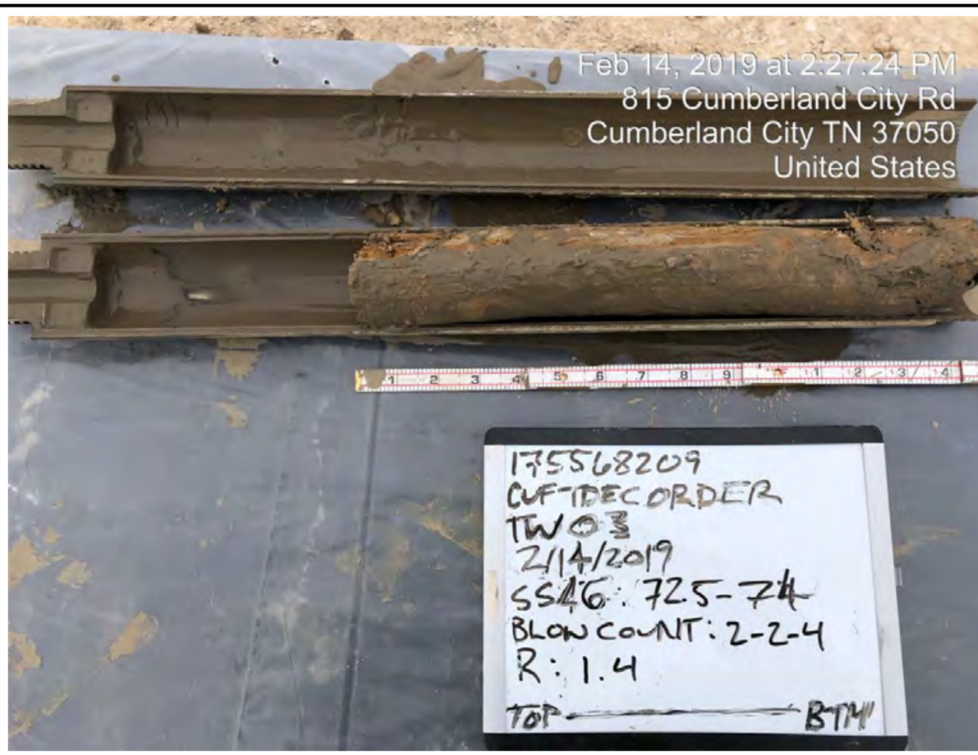
Comments:
Interval (70.0-71.5 feet).

Photograph ID: 114

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (72.5-74.0 feet). Interval shown on white board should be 72.5-74.0. Recovery shown on white board should be 1.5.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 115

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (75.0-76.5 feet). Interval shown on white board should be 75.0-76.5.

Photograph ID: 116

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (77.5-78.9 feet). Sampler refusal at 78.9 feet.

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 117

Photo Location:
CUF-TW03

Photo Date:
2/18/2019

Comments:
Interval (79.2-93.3 feet).

Photograph ID: 118

Photo Location:
CUF-TW03

Photo Date:
2/19/2019

Comments:
Interval (93.3-99.4 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 119

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (0.0-1.5 feet). Interval shown on white board should be 0.0-1.5.

Photograph ID: 120

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (1.5-3.0 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 121

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

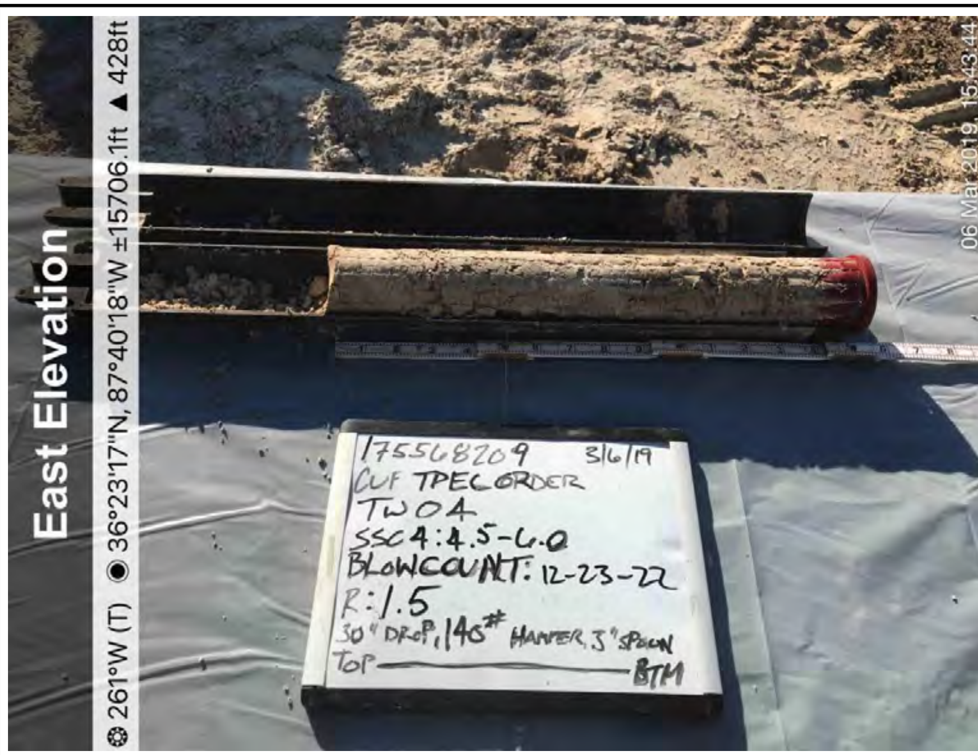
Comments:
Interval (3.0-4.5 feet). Blowcount shown on white board is 25-42-45.

Photograph ID: 122

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (4.5-6.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 123

Photo Location: CUF-TW04

Photo Date: 3/6/2019

Comments: Interval (6.0-6.9 feet). Interval shown on white board should be 6.0-6.9. Sampler refusal at 6.9 feet.

Photograph ID: 124

Photo Location: CUF-TW04

Photo Date: 3/6/2019

Comments: Interval (7.0-7.9 feet). Interval shown on white board should be 7.0-7.9. Sampler refusal at 7.9 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 125

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (9.0-10.2 feet). Interval shown on white board should be 9.0-10.2. Sampler refusal at 10.2 feet.

Photograph ID: 126

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (10.5-11.4 feet). Interval shown on white board should be 10.5-11.4. Sampler refusal at 11.4 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 127

Photo Location: CUF-TW04

Photo Date: 3/6/2019

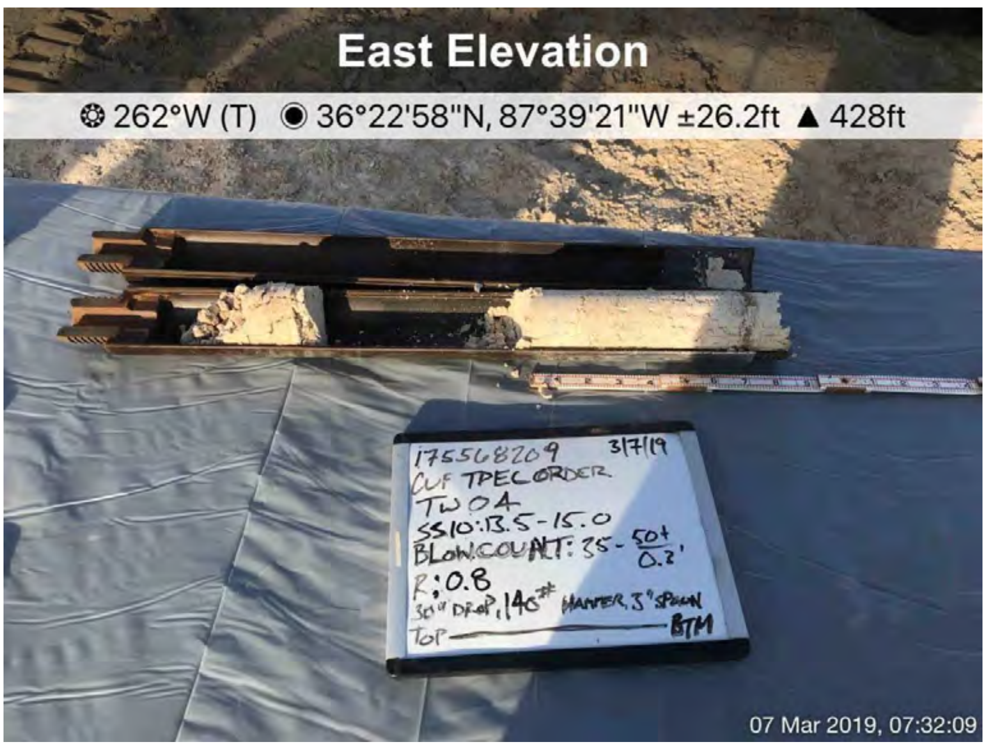
Comments: Interval (12.0-12.8 feet). Interval shown on white board should be 12.0-12.8. Sampler refusal at 12.8 feet.

Photograph ID: 128

Photo Location: CUF-TW04

Photo Date: 3/7/2019

Comments: Interval (13.5-14.3 feet). Interval shown on white board should be 13.5-14.3. Sampler refusal at 14.3 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 129

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (15.0-16.4 feet). Interval shown on white board should be 15.0-16.4. Sampler refusal at 16.4 feet.

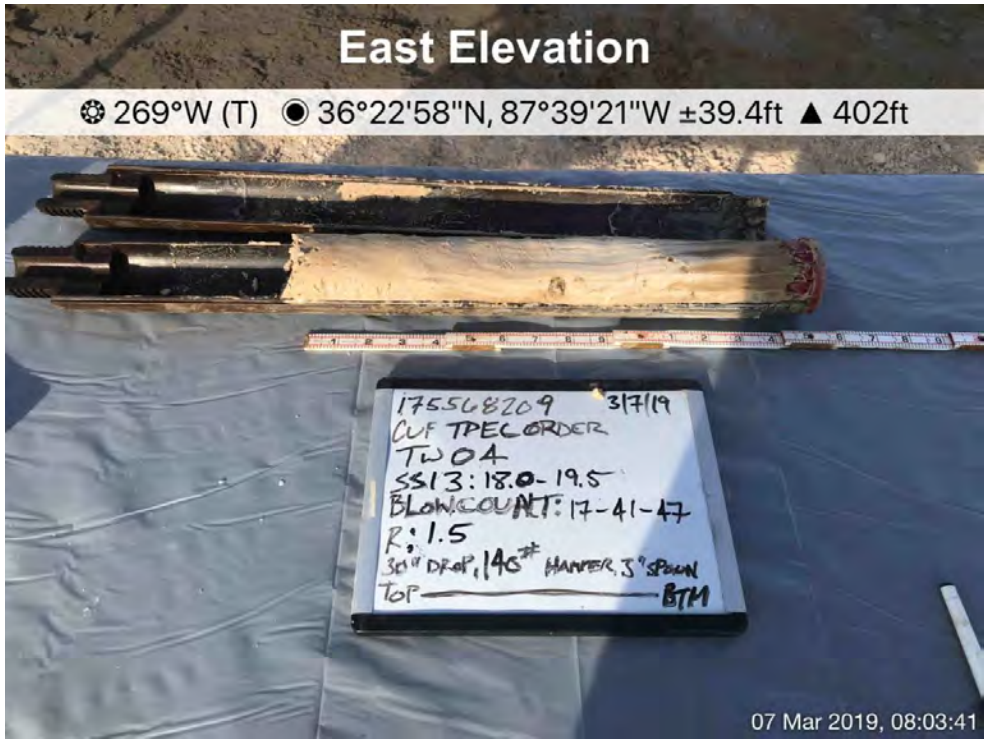
Photograph ID: 130

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (16.5-17.9 feet). Interval shown on white board should be 16.5-17.9. Sampler refusal at 17.9 feet.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 131 **Photo Location:** CUF-TW04 **Photo Date:** 3/7/2019 **Comments:** Interval (18.0-19.5 feet).	
Photograph ID: 132 **Photo Location:** CUF-TW04 **Photo Date:** 3/7/2019 **Comments:** Photo of interval (19.5-20.0 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 133

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (20.0-20.8 feet). Interval shown on white board should be 20.0-20.8. Sampler refusal at 20.8 feet.

Photograph ID: 134

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (21.5-23.0 feet). Interval shown on white board should be 21.5-23.0.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 135

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (23.0-24.5 feet). Interval shown on white board should be 23.0-24.5.

Photograph ID: 136

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (24.5-26.0 feet). Interval shown on white board should be 24.5-26.0.

Stantec **Photographic Log**

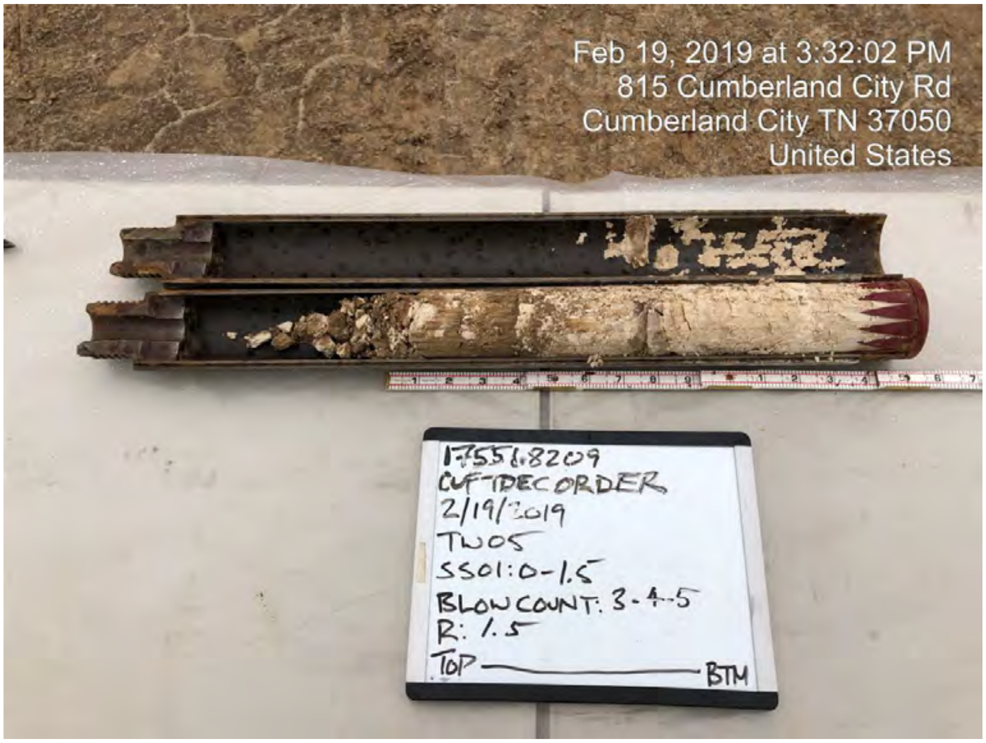
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 137

Photo Location:
CUF-TW05

Photo Date:
2/19/2019

Comments:
Interval (0.0-1.5 feet). Interval shown on white board should be 0.0-1.5.

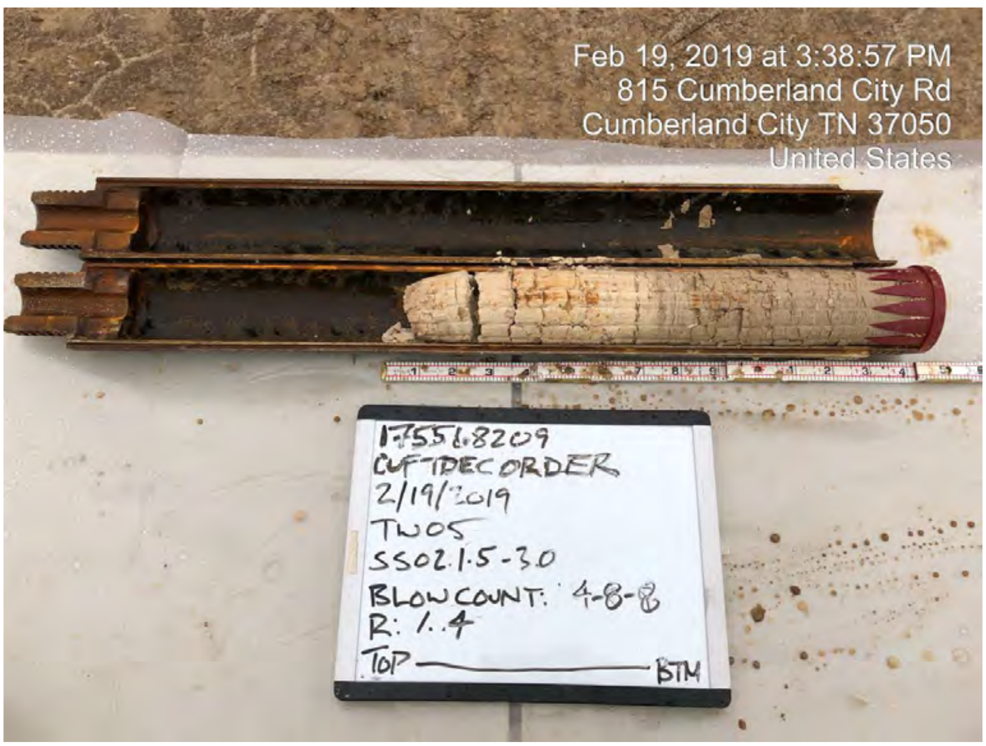


Photograph ID: 138

Photo Location:
CUF-TW05

Photo Date:
2/19/2019

Comments:
Interval (1.5-3.0 feet).



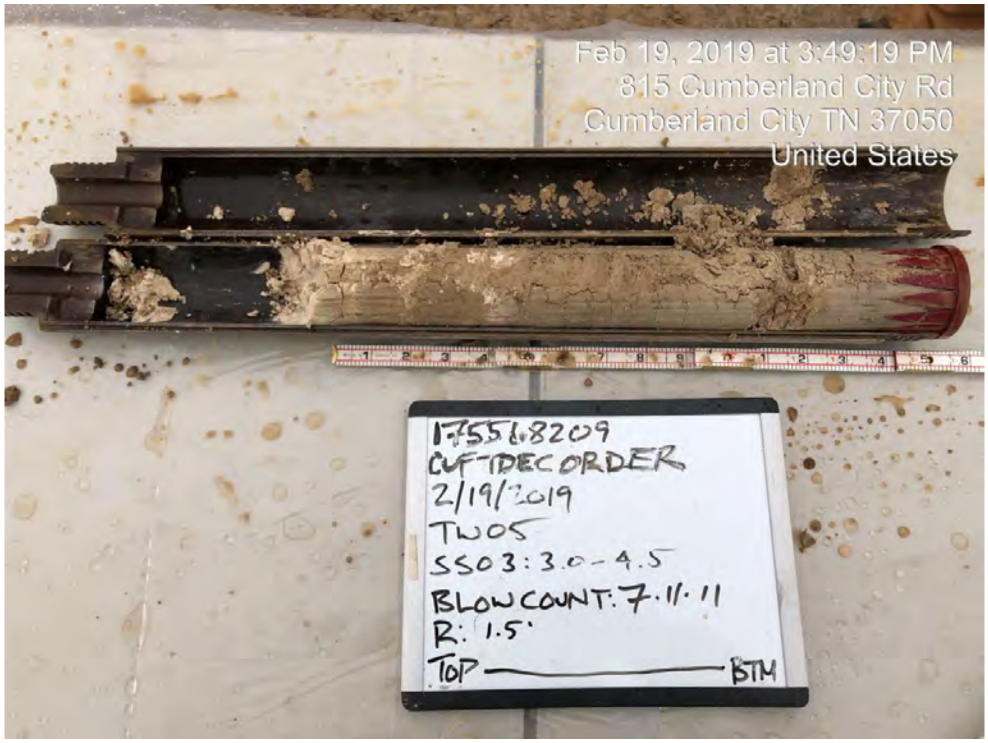
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 139

Photo Location: CUF-TW05

Photo Date: 2/19/2019

Comments: Interval (3.0-4.5 feet).



Photograph ID: 140

Photo Location: CUF-TW05

Photo Date:

Comments: Photo of interval (4.5-6.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

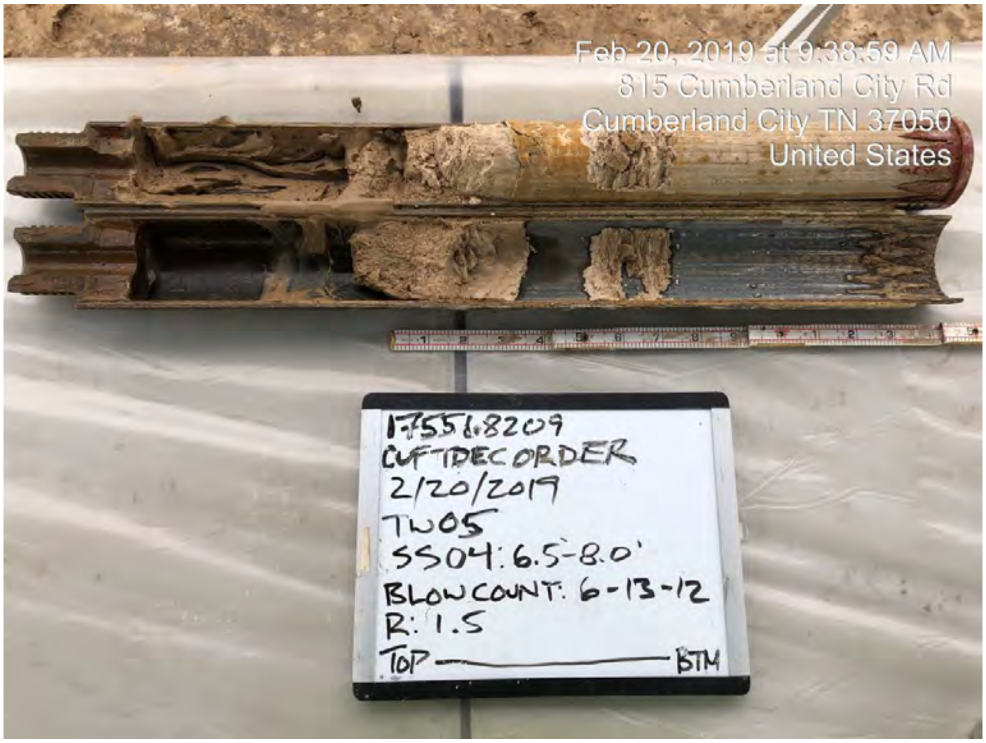
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 141

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (6.5-8.0 feet).

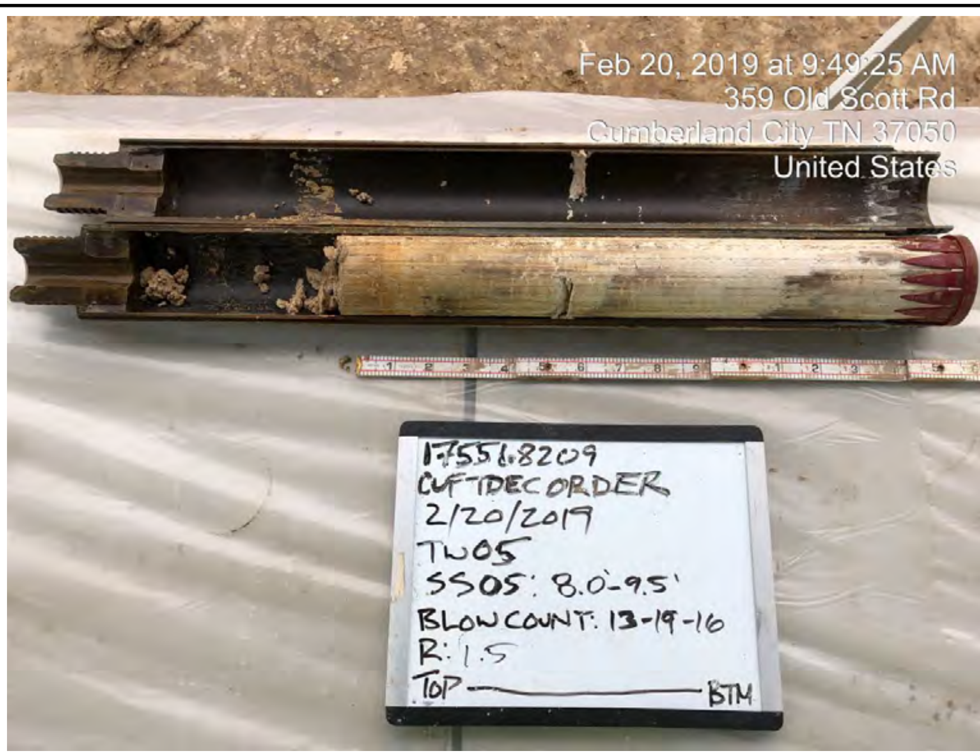


Photograph ID: 142

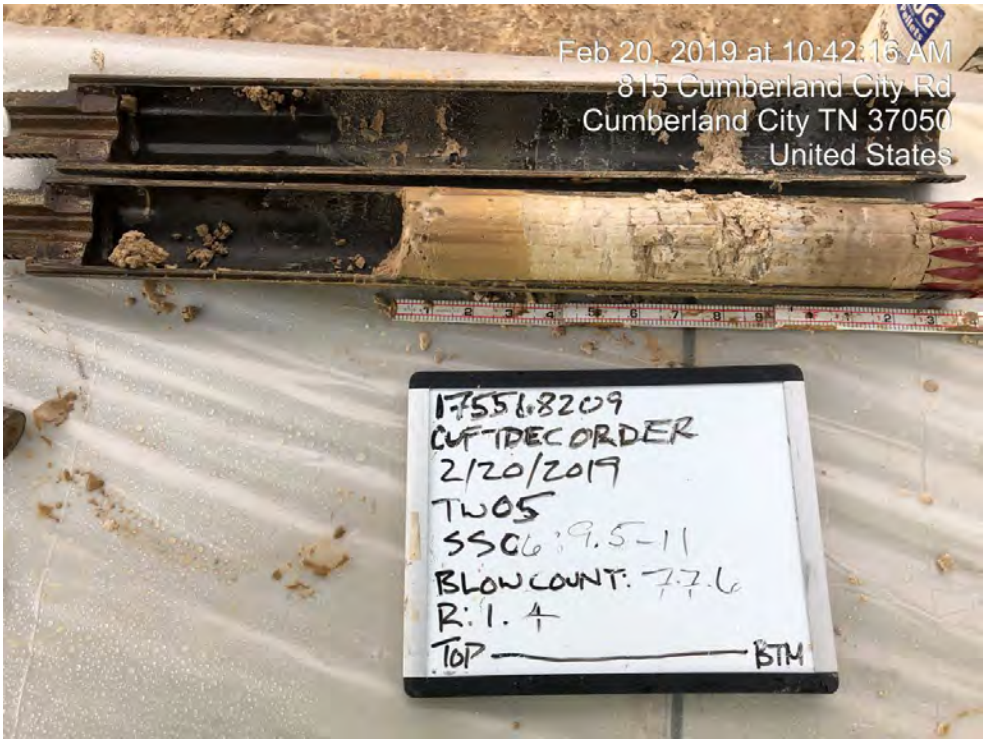
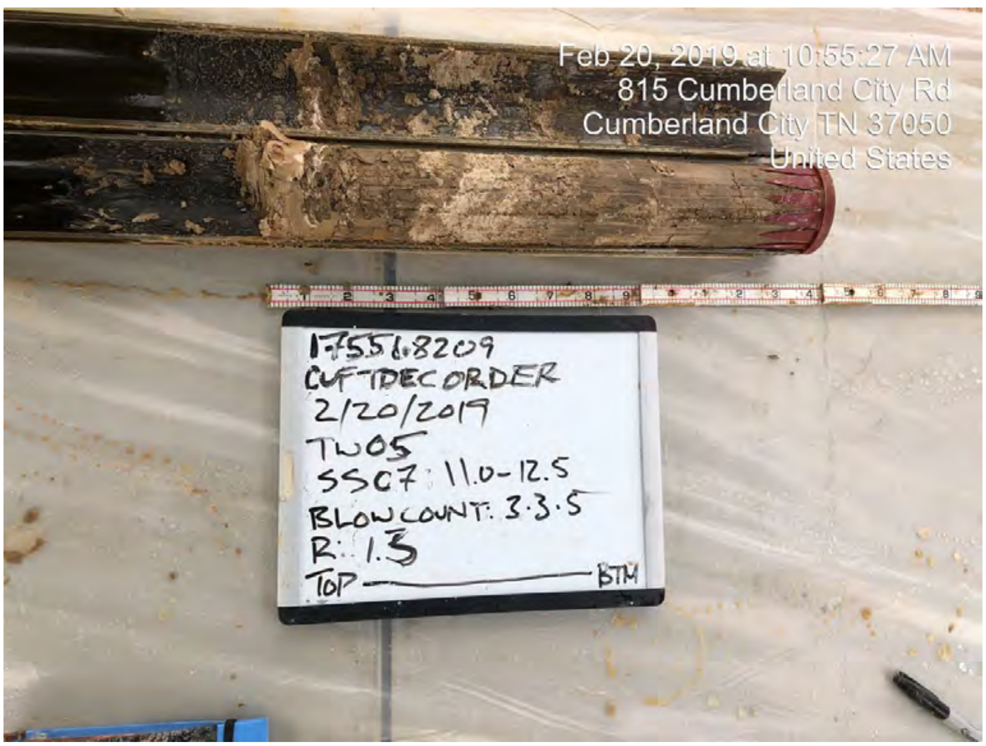
Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (8.0-9.5 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 143 **Photo Location:** CUF-TW05 **Photo Date:** 2/20/2019 **Comments:** Interval (9.5-11.0 feet). Interval shown on white board should be 9.5-11.0.	
Photograph ID: 144 **Photo Location:** CUF-TW05 **Photo Date:** 2/20/2019 **Comments:** Interval (11.0-12.5 feet).	

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 145

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (12.5-14.0 feet). Interval shown on white board should be 12.5-14.0.

Photograph ID: 146

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Photo of interval (14.0-15.5 feet) unavailable.

No Photo Applicable

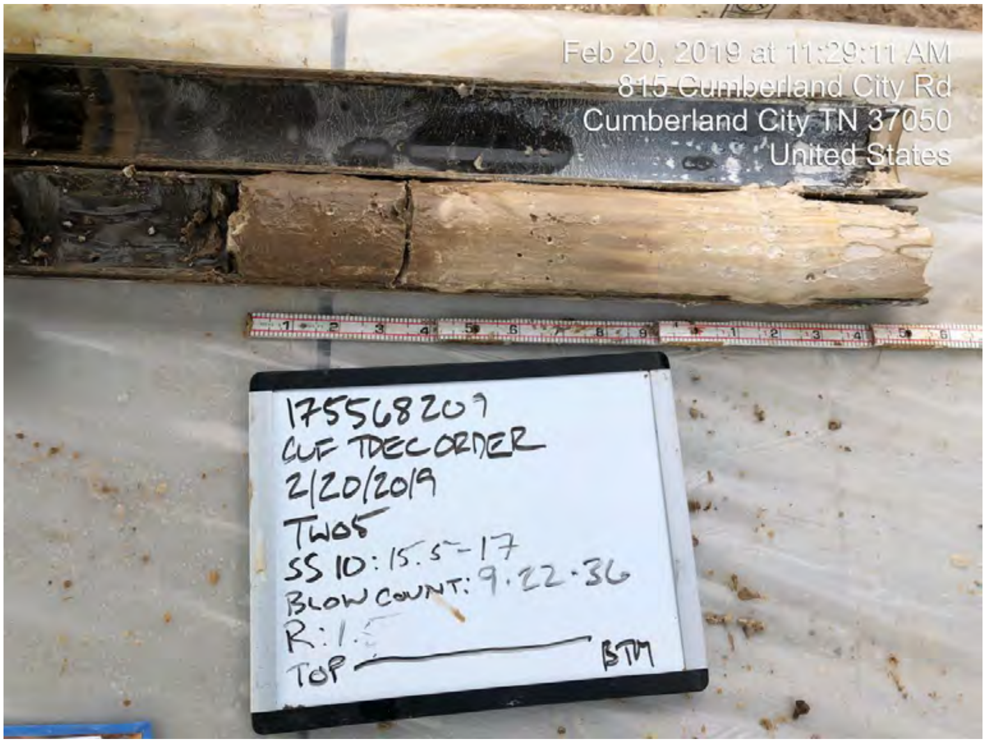
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 147

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (15.5-17.0 feet). Interval shown on white board should be 15.5-17.0. Recovery shown on white board is 1.5'.

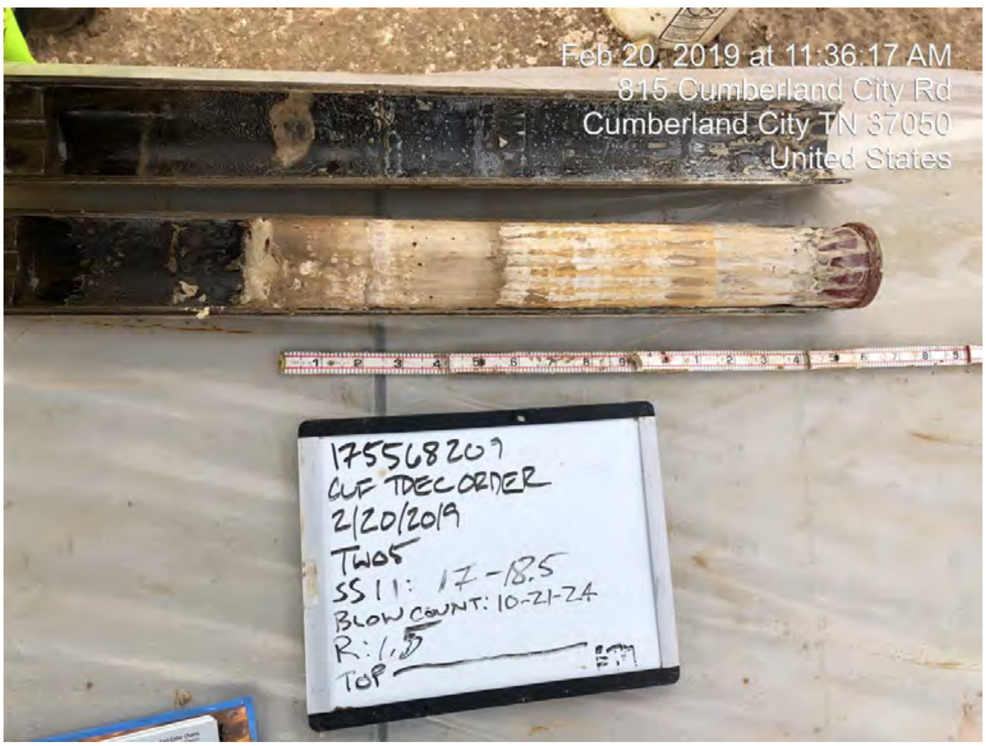


Photograph ID: 148

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (17.0-18.5 feet). Interval shown on white board should be 17.0-18.5.



Stantec **Photographic Log**

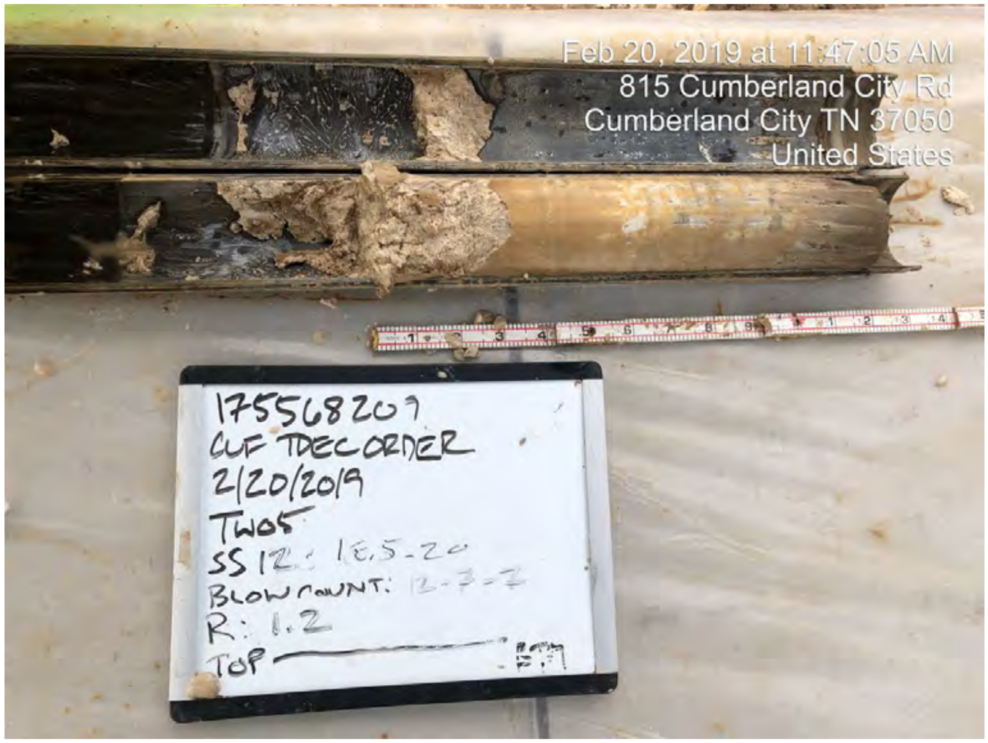
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 149

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (18.5-20.0 feet). Interval shown on white board should be 18.5-20.0. Blowcount shown on white board is 12-7-7.

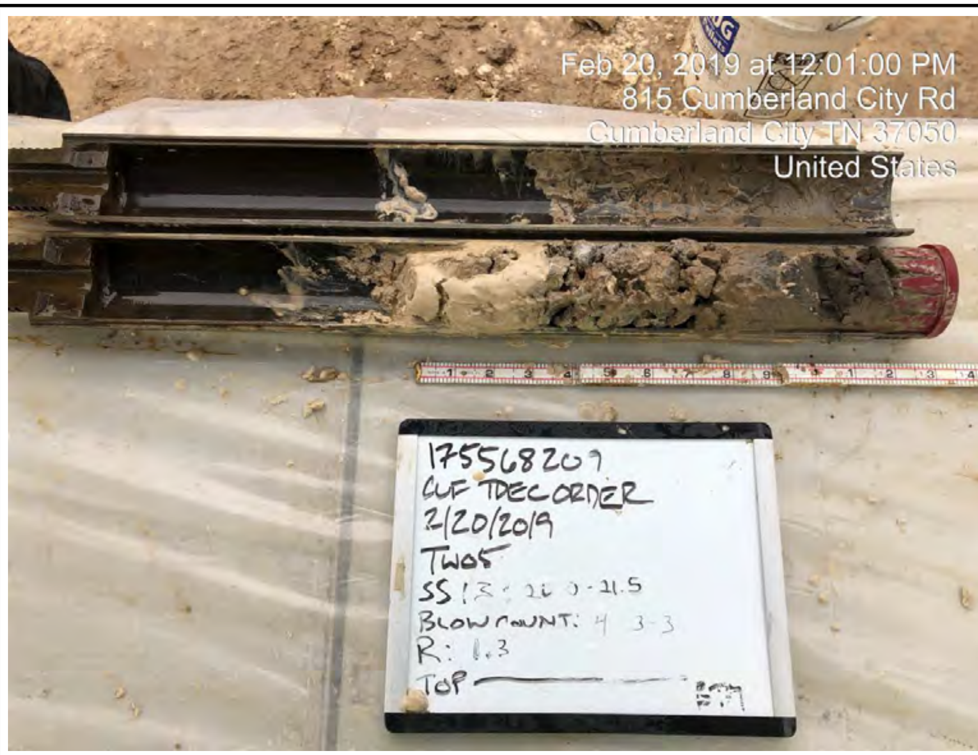


Photograph ID: 150

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (20.0-21.5 feet). Interval shown on white board is 20.0-21.5. Blow count shown on white board is 4-3-3.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 151

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

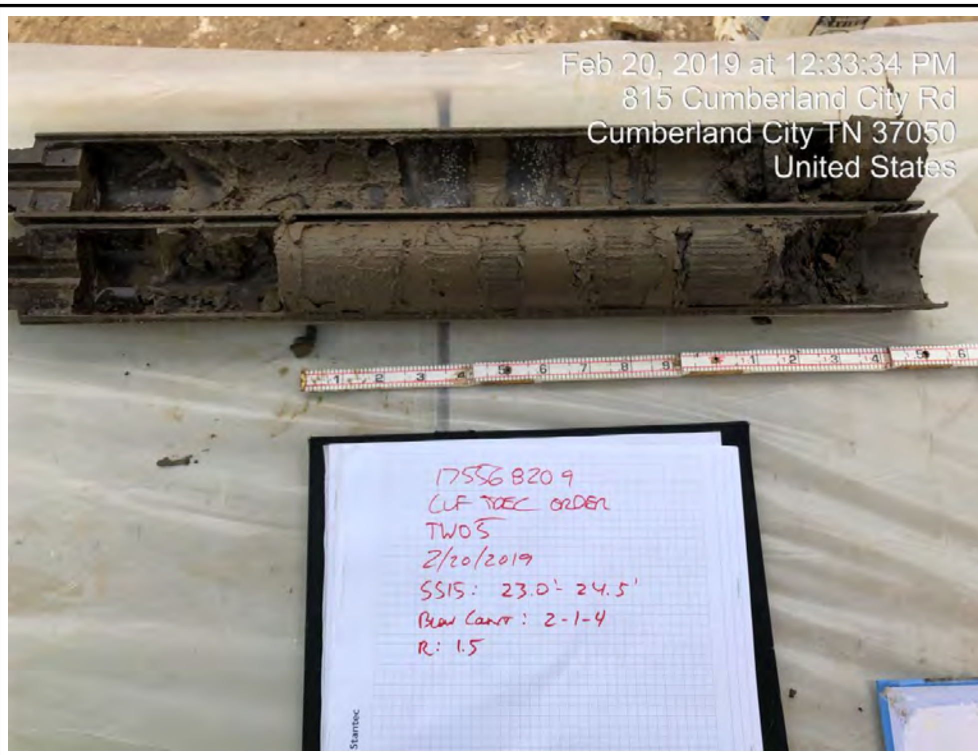
Comments:
Interval (21.5-23.0 feet).

Photograph ID: 152

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (23.0-24.5 feet).



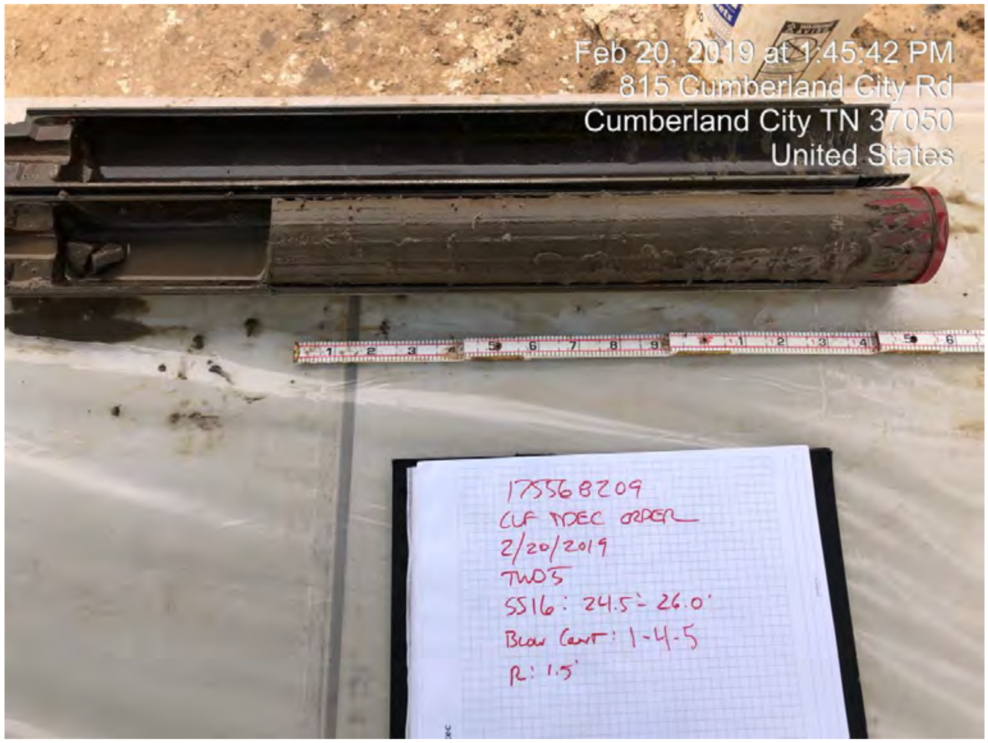
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 153

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (24.5-26.0 feet).

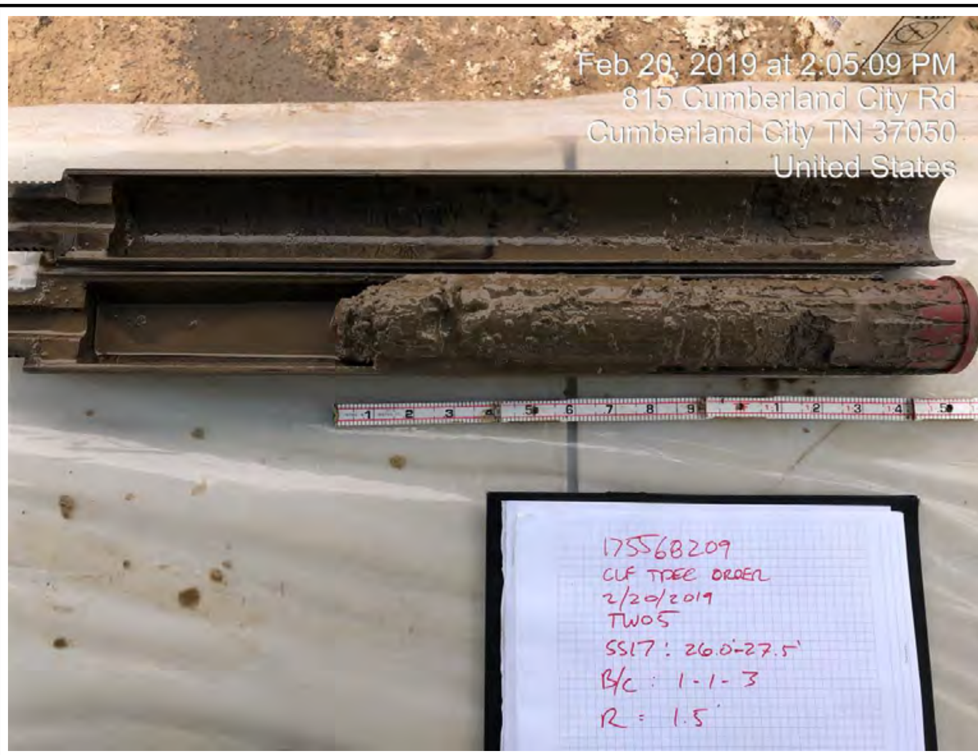


Photograph ID: 154

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (26.0-27.5 feet).



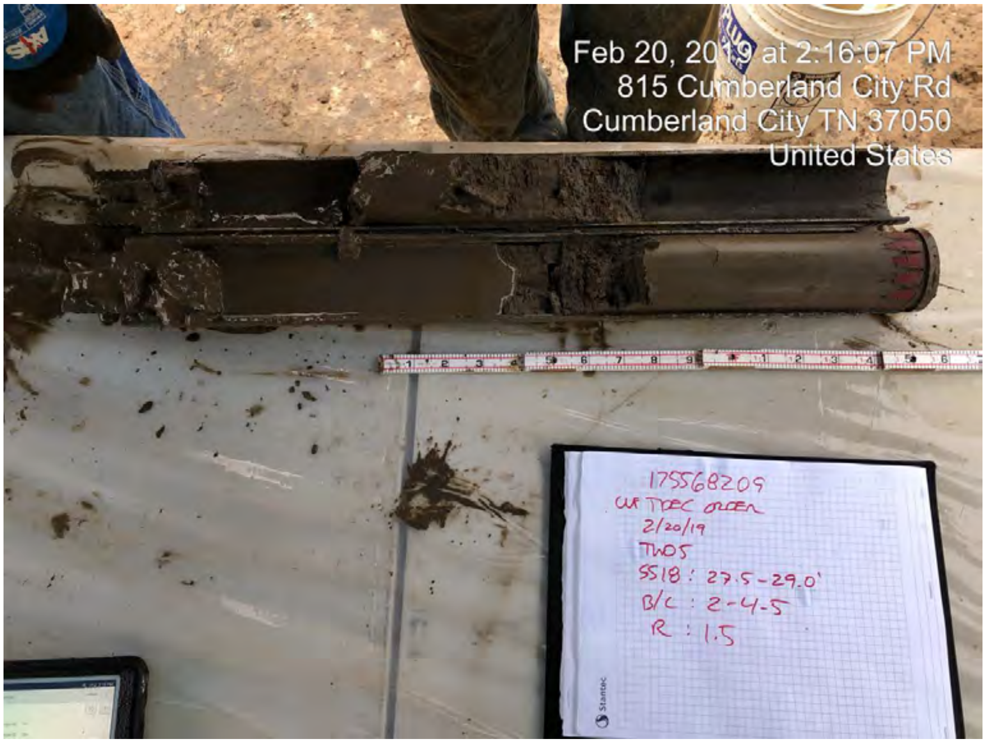
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 155

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (27.5-29.0 feet).



Photograph ID: 156

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Photo of interval (29.0-31.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec

Photographic Log

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 157

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (31.0-32.5 feet).

Photograph ID: 158

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (32.5-34.0 feet).

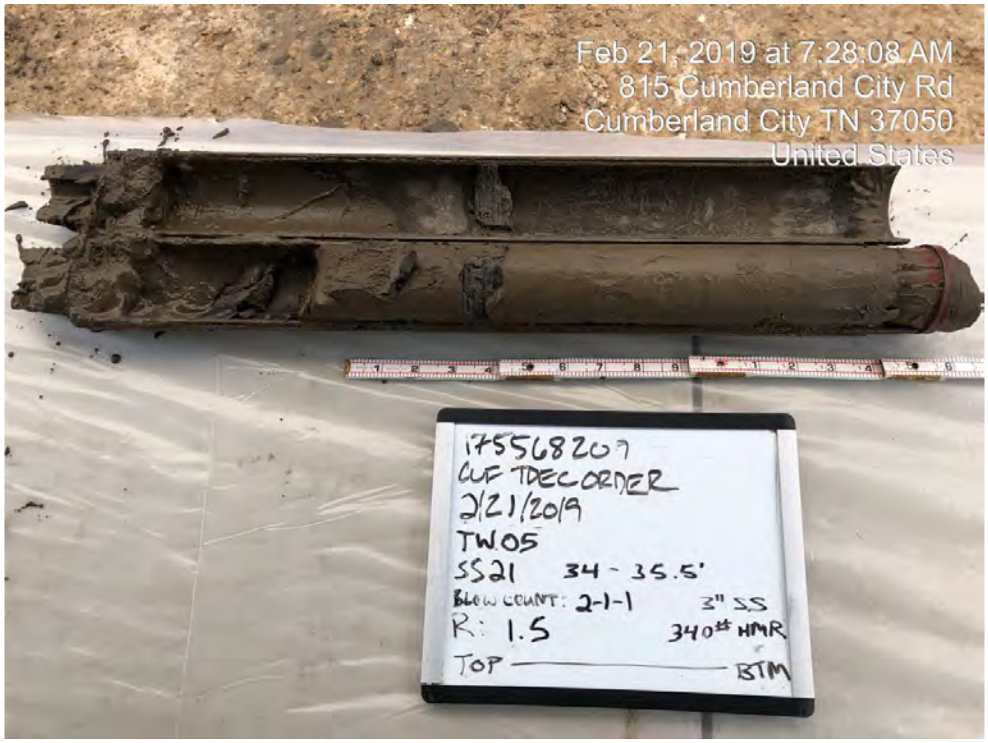
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 159

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (34.0-35.5 feet). Interval shown on white board should be 34.0-35.5.

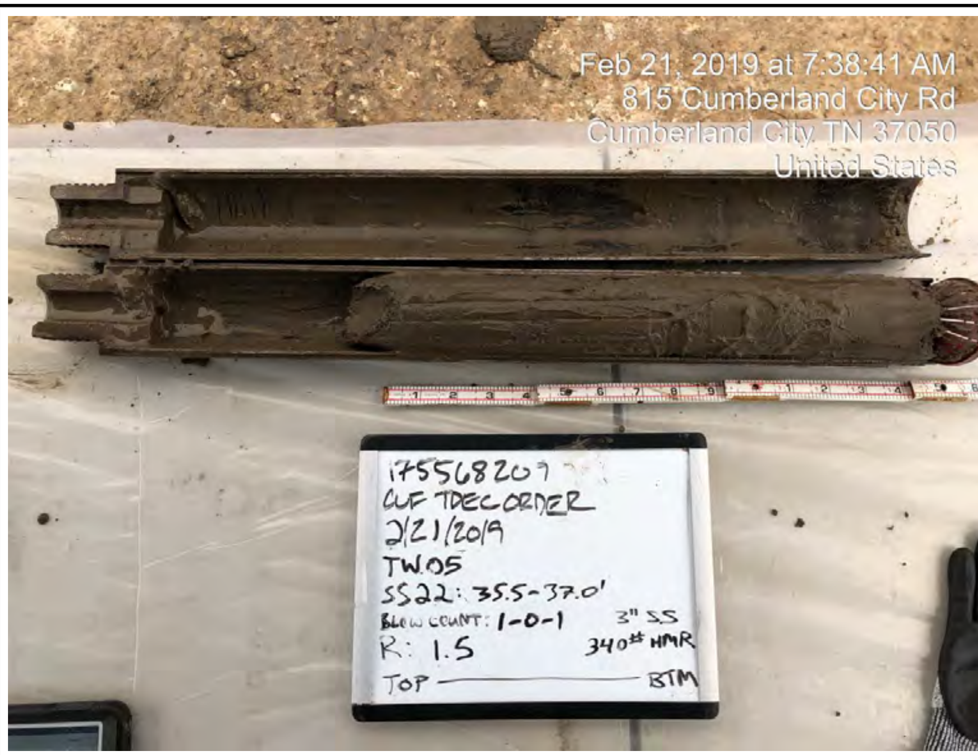


Photograph ID: 160

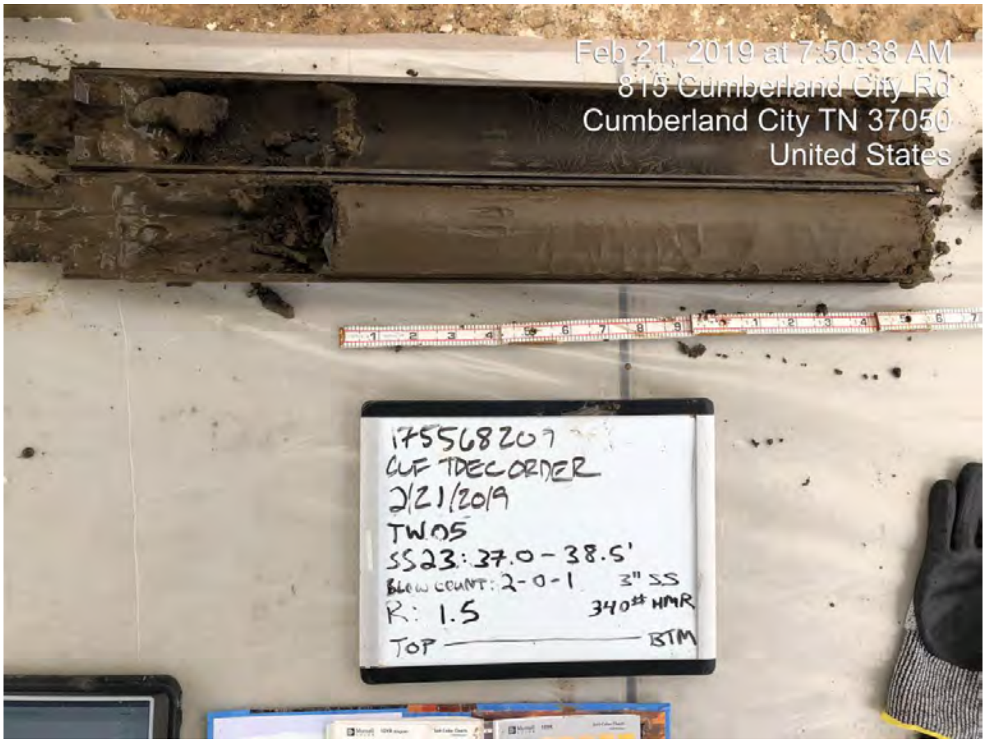
Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (35.5-37.0 feet). Blowcount shown on white board should be 1-WH-1.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 161 **Photo Location:** CUF-TW05 **Photo Date:** 2/21/2019 **Comments:** Interval (37.0-38.5 feet). Blowcount shown on white board should be 2-WH-1.	
Photograph ID: 162 **Photo Location:** CUF-TW05 **Photo Date:** 2/21/2019 **Comments:** Interval (38.5-40.0 feet). Interval shown on white board should be 38.5-40.0. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 163

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Photo of interval (40.0-41.5 feet) unavailable.

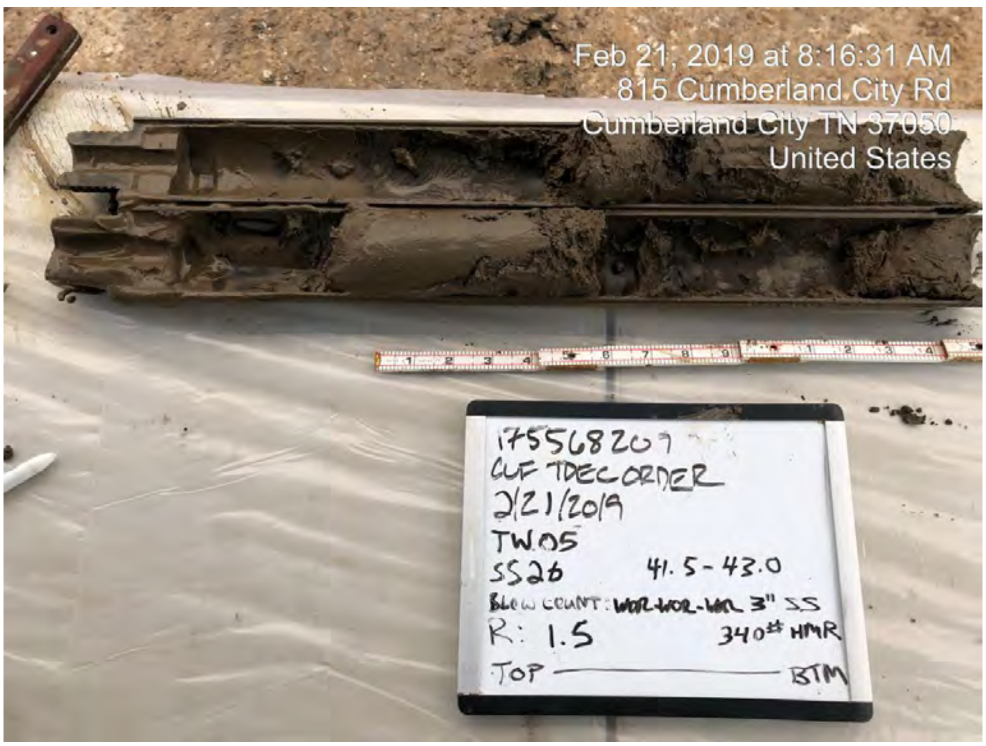
No Photo Applicable

Photograph ID: 164

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (41.5-43.0 feet). WOR on white board is the same as WR on the boring log.



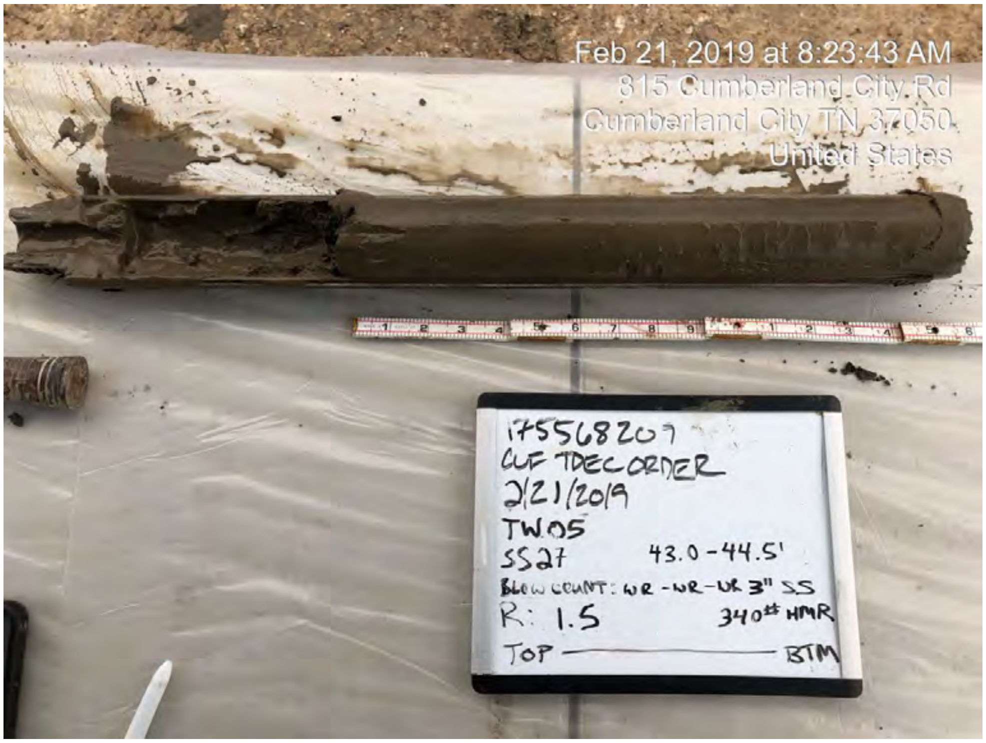
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 165

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (43.0-44.5 feet).

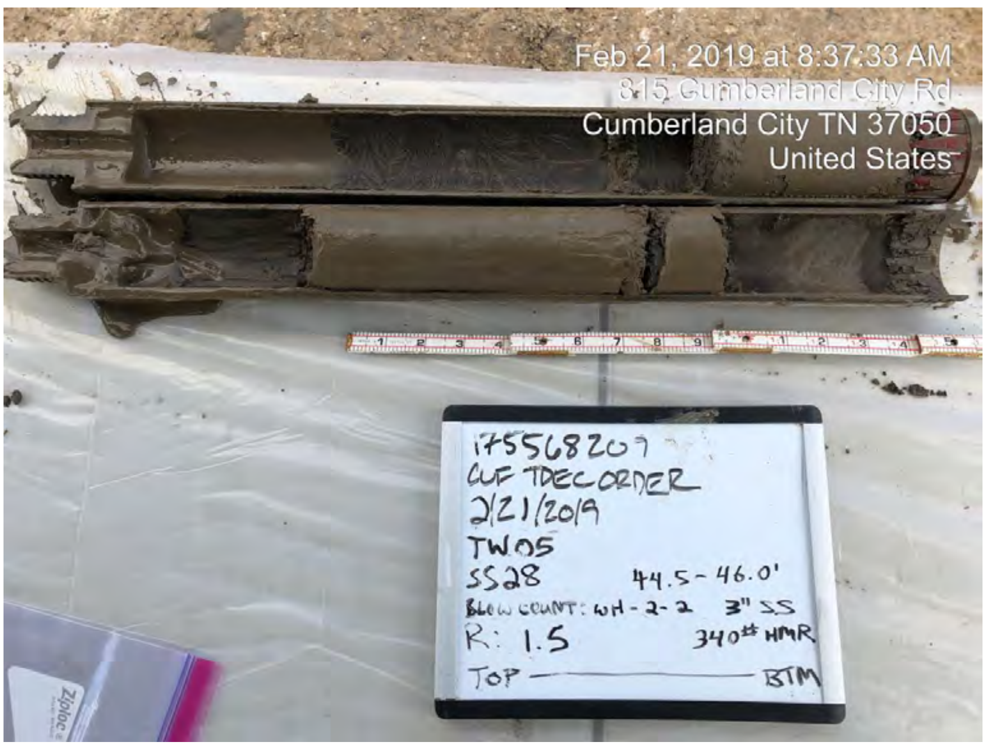


Photograph ID: 166

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (44.5-46.0 feet).



Stantec **Photographic Log**

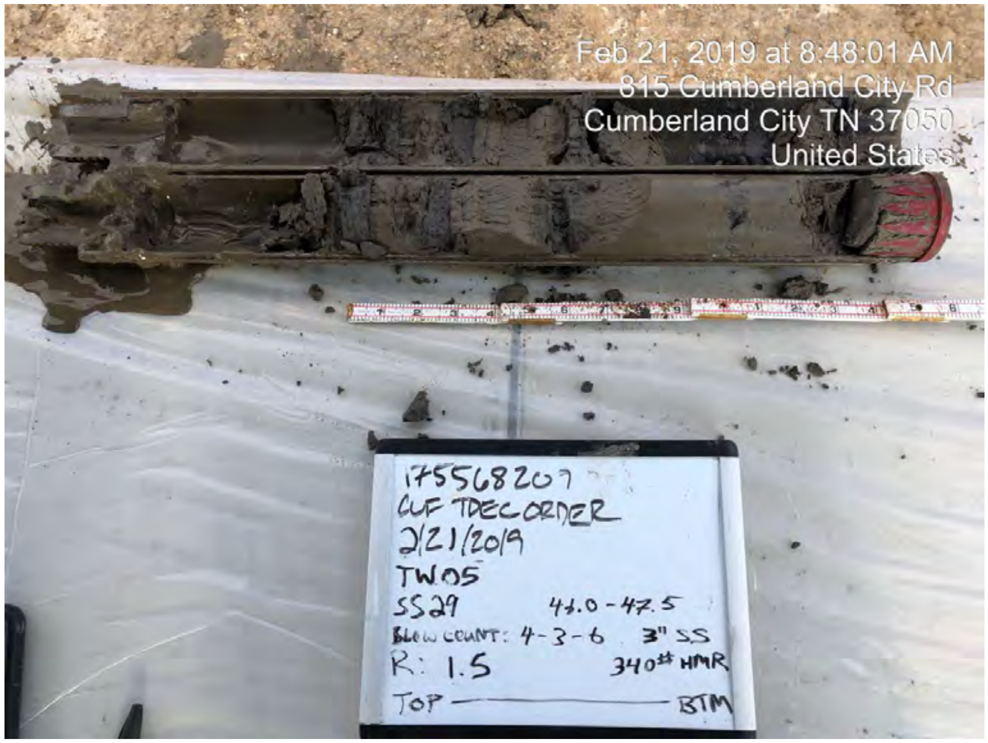
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 167

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (46.0-47.5 feet).

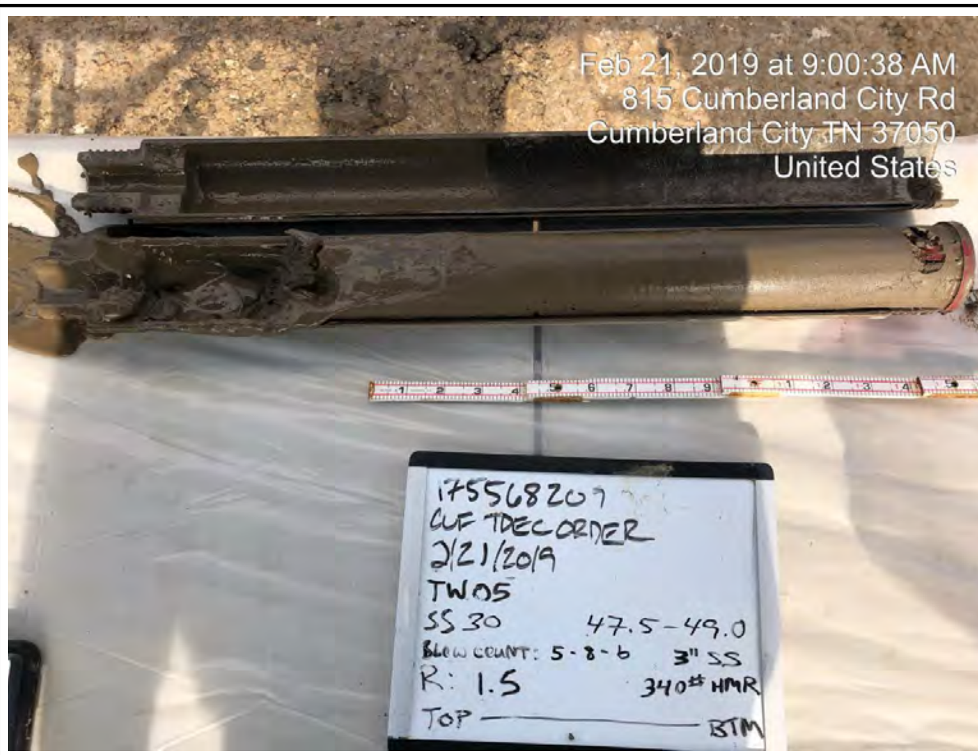


Photograph ID: 168

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (47.5-49.0 feet).



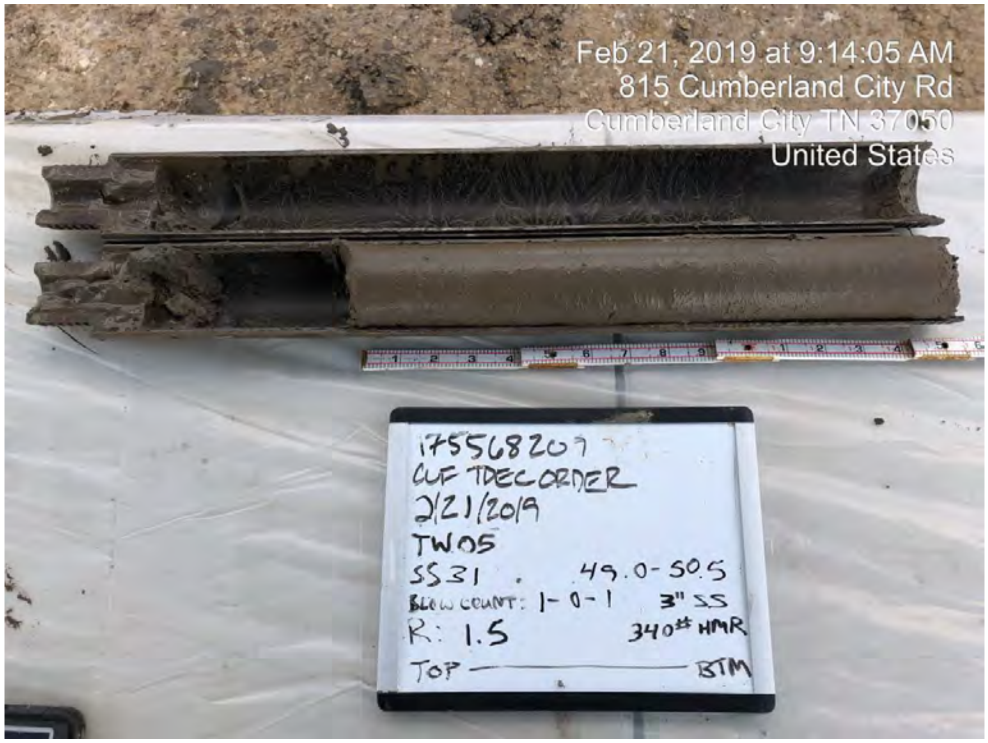
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 169

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (49.0-50.5 feet). Blow count shown on white board should be 1-WH-1.



Photograph ID: 170

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (50.5-52.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 171

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (52.0-53.5 feet).

Photograph ID: 172

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (53.5-55.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 173

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (55.0-56.5 feet).

Photograph ID: 174

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (56.5-58.0 feet). Blow count shown on white board should be 1-WH-1.

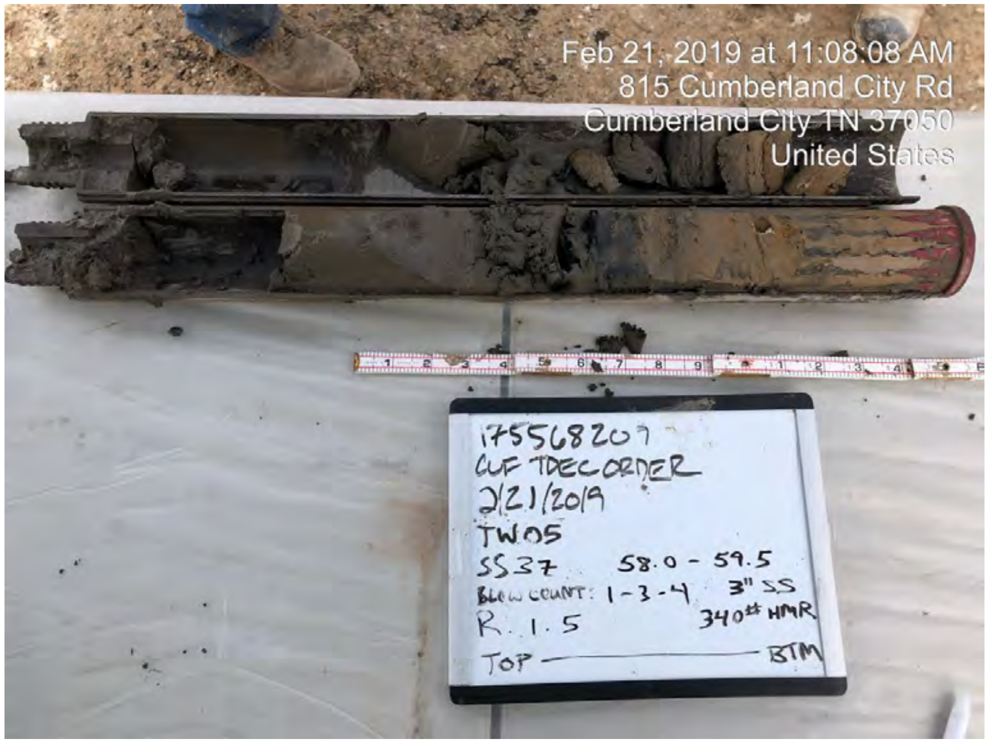
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 175

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (58.0-59.5 feet).



Photograph ID: 176

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Photo of interval (59.5-61.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 177

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (61.5-63.0 feet).

Photograph ID: 178

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (63.0-64.5 feet).
Interval shown on white board should be 63.0-64.5.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 179 **Photo Location:** CUF-TW05 **Photo Date:** 2/21/2019 **Comments:** Photo of interval (65.5-67.5 feet)unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 180 **Photo Location:** CUF-TW05 **Photo Date:** 2/21/2019 **Comments:** Interval (68.0-69.5 feet). Interval shown on white board should be 68.0-69.5.	

Photographic Log

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 181

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (70.5-72.0 feet). Interval shown on white board should be 70.5-72.0. Recovery shown on white board should be 1.5.

Photograph ID: 182

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (73.0-74.5 feet). Interval shown on white board should be 73.0-74.5.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 183

Photo Location:
CUF-TW05

Photo Date:
2/25/2019

Comments:
Interval (75.0-85.5 feet).

Photograph ID: 184

Photo Location:
CUF-TW05

Photo Date:
2/26/2019

Comments:
Interval (85.5-95.7 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 185

Photo Location: CUF-TW06

Photo Date: 3/7/2019

Comments: Interval (0.0-1.5 feet). Interval shown on white board should be 0.0-1.5 feet.

Photograph ID: 186

Photo Location: CUF-TW06

Photo Date: 3/7/2019

Comments: Interval (1.5-3.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 187 **Photo Location:** CUF-TW06 **Photo Date:** 3/7/2019 **Comments:** Interval (3.0-4.5 feet).	
Photograph ID: 188 **Photo Location:** CUF-TW06 **Photo Date:** 3/7/2019 **Comments:** Interval (4.5-6.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 189

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (6.0-7.5 feet).

Photograph ID: 190

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (7.5-9.0 feet). Blow count shown on white board is 27-45-49.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 191

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (9.0-10.5 feet).

Photograph ID: 192

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Photo interval (10.5-12.3 feet) unavailable because sample collected with shelby tube. Sampler refusal at 12.3 feet.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 193

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (12.5-14.0 feet).

Photograph ID: 194

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (14.0-15.5 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 195

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (15.5-16.9 feet). Interval shown on white board should be 15.5-16.9. Sampler refusal at 16.9 feet.

Photograph ID: 196

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (17.0-17.9 feet). Interval shown on white board should be 17.0-17.9. Sampler refusal at 17.9 feet.

Stantec

Photographic Log

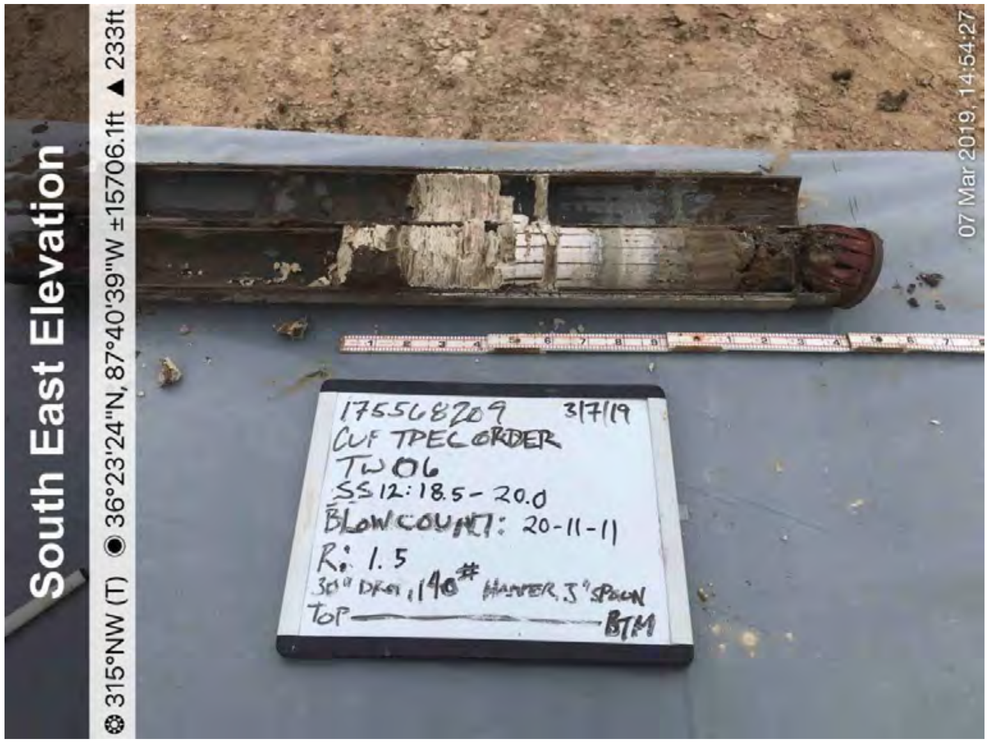
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 197

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (18.5-20.0 feet).



Photograph ID: 198

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (20.0-21.5 feet).

Stantec **Photographic Log**

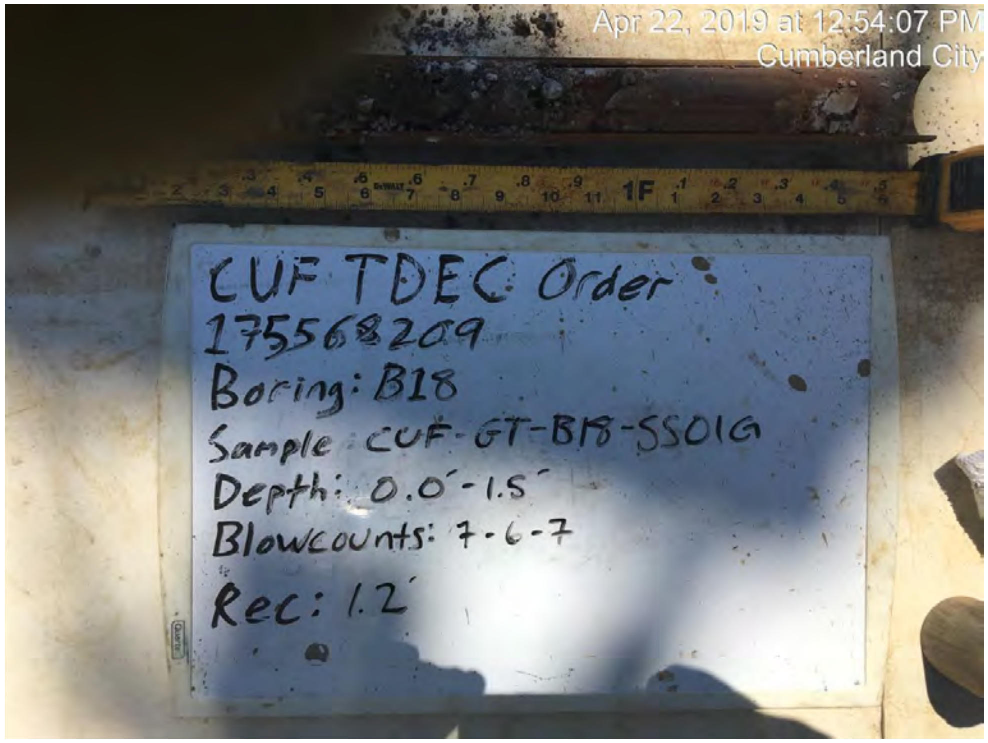
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 199

Photo Location:
CUF-B18

Photo Date:
4/22/2019

Comments:
Interval (0.0-1.5 feet).

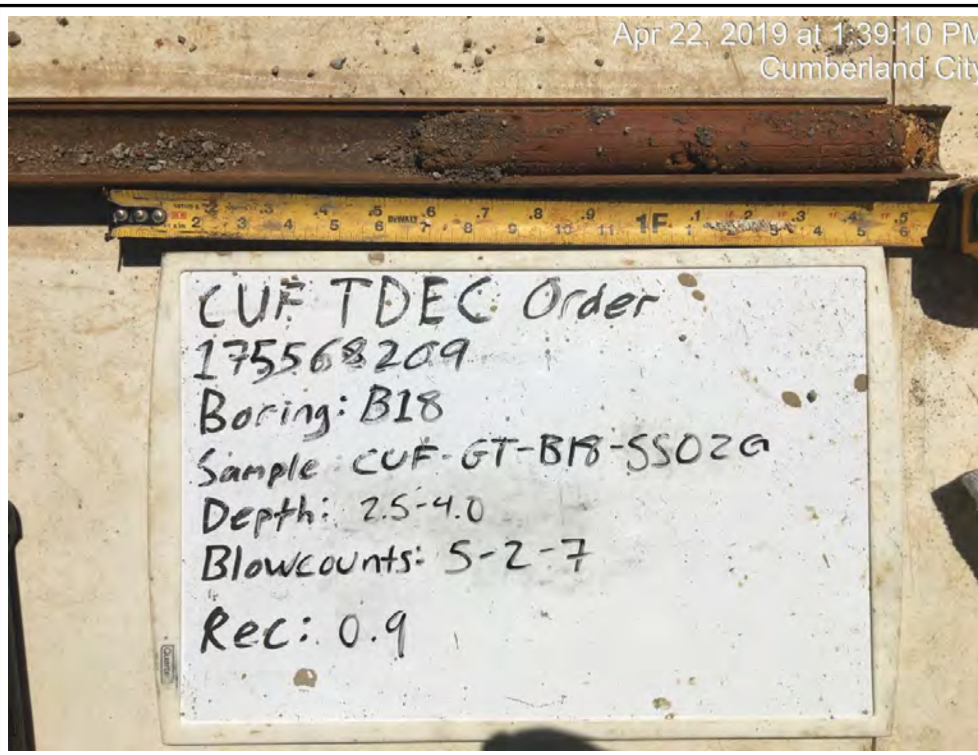


Photograph ID: 200

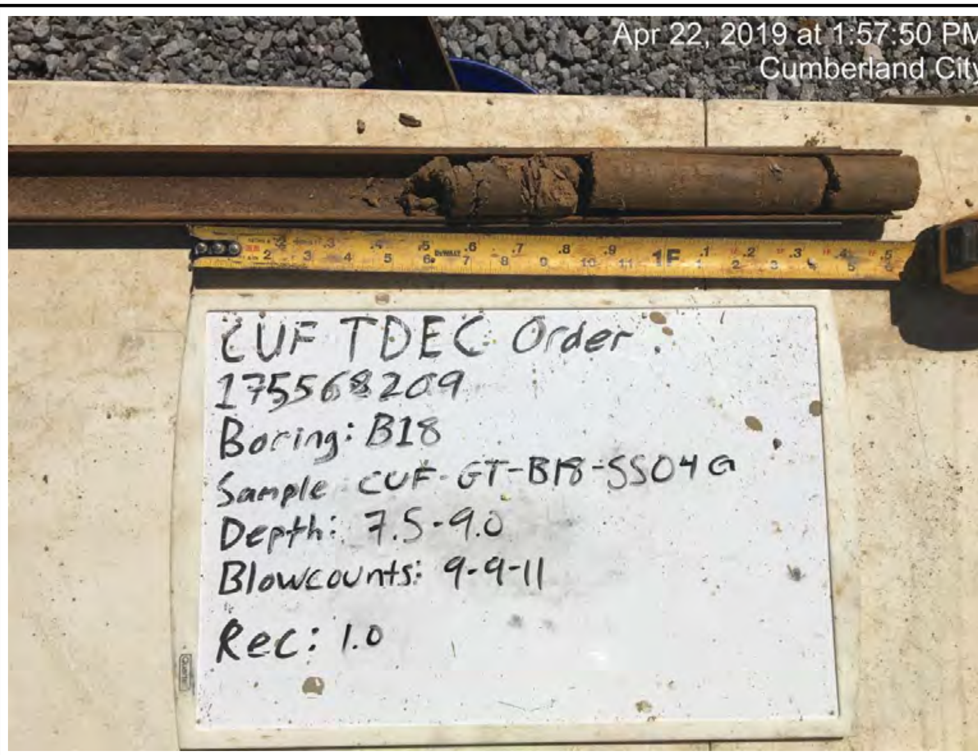
Photo Location:
CUF-B18

Photo Date:
4/22/2019

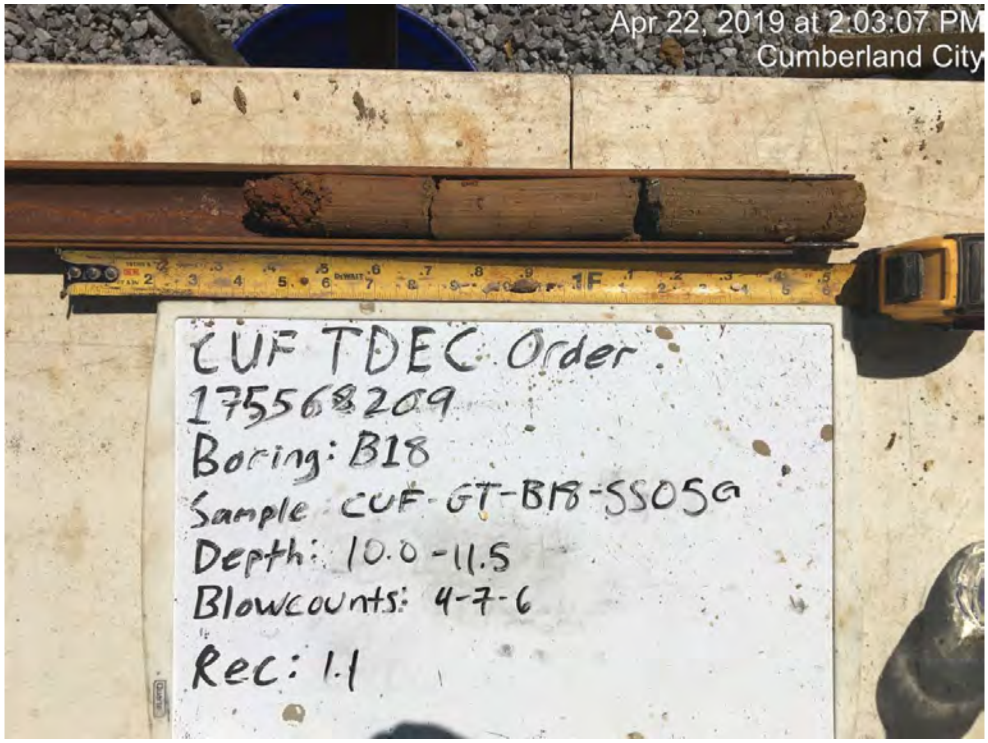
Comments:
Interval (2.5-4.0 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 201 **Photo Location:** CUF-B18 **Photo Date:** 4/22/2019 **Comments:** Interval (5.0-6.5 feet).	
Photograph ID: 202 **Photo Location:** CUF-B18 **Photo Date:** 4/22/2019 **Comments:** Interval (7.5-9.0 feet).	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 203 **Photo Location:** CUF-B18 **Photo Date:** 4/22/2019 **Comments:** Interval (10.0-11.5 feet).	
Photograph ID: 204 **Photo Location:** CUF-B18 **Photo Date:** 4/22/2019 **Comments:** Photo of interval (12.0-14.0 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

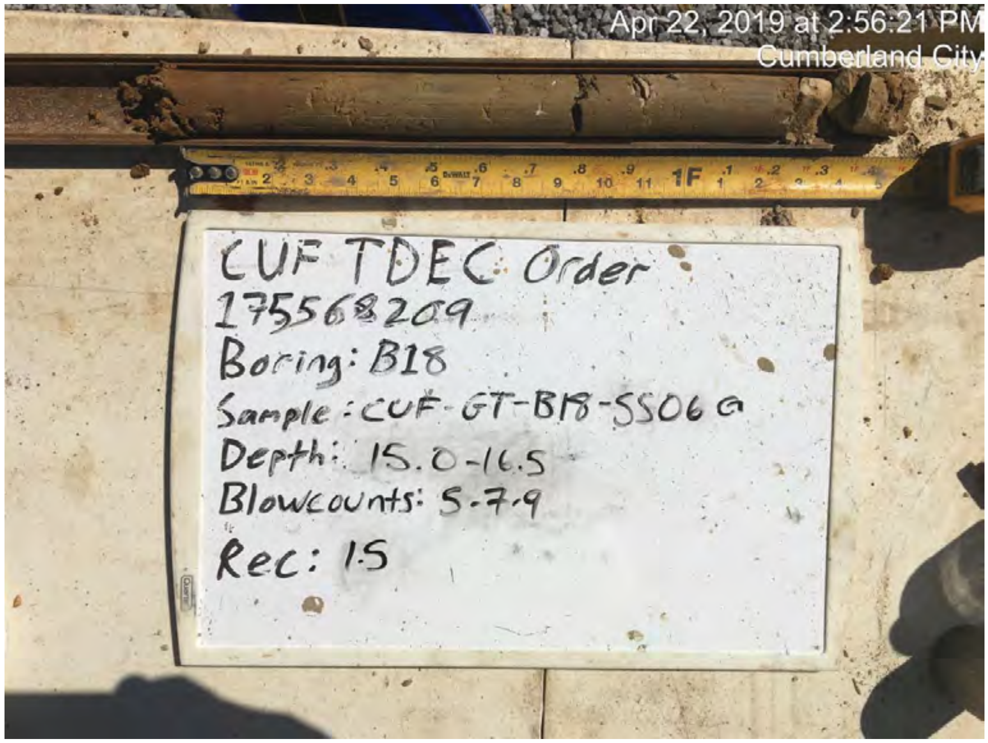
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 205

Photo Location:
CUF-B18

Photo Date:
4/22/2019

Comments:
Interval (15.0-16.5 feet).

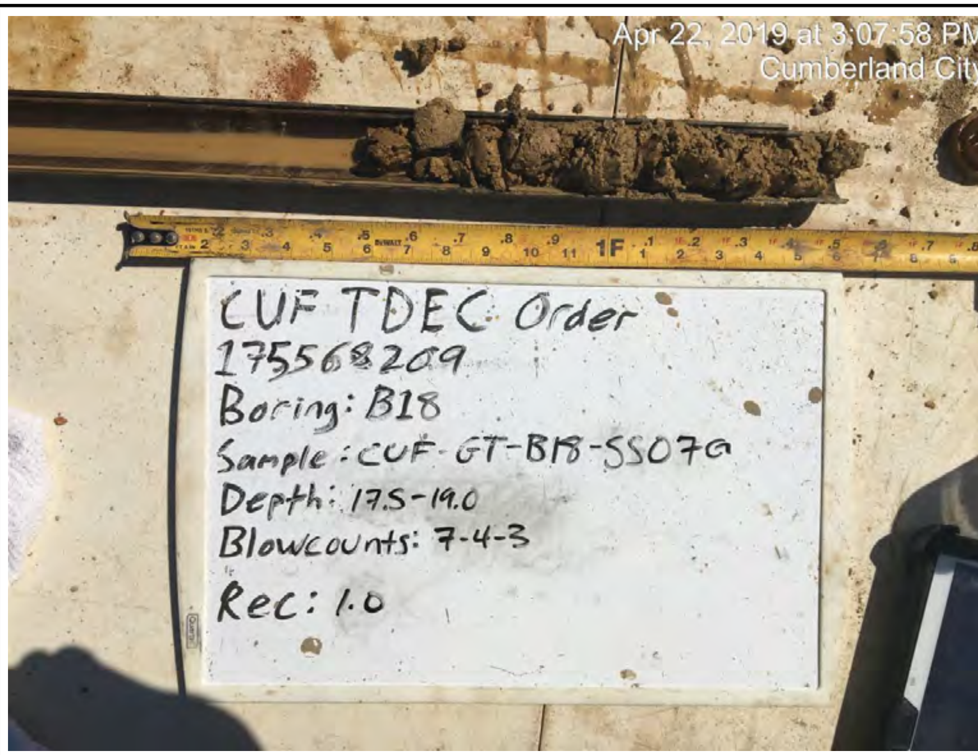


Photograph ID: 206

Photo Location:
CUF-B18

Photo Date:
4/22/2019

Comments:
Interval (17.5-19.0 feet).



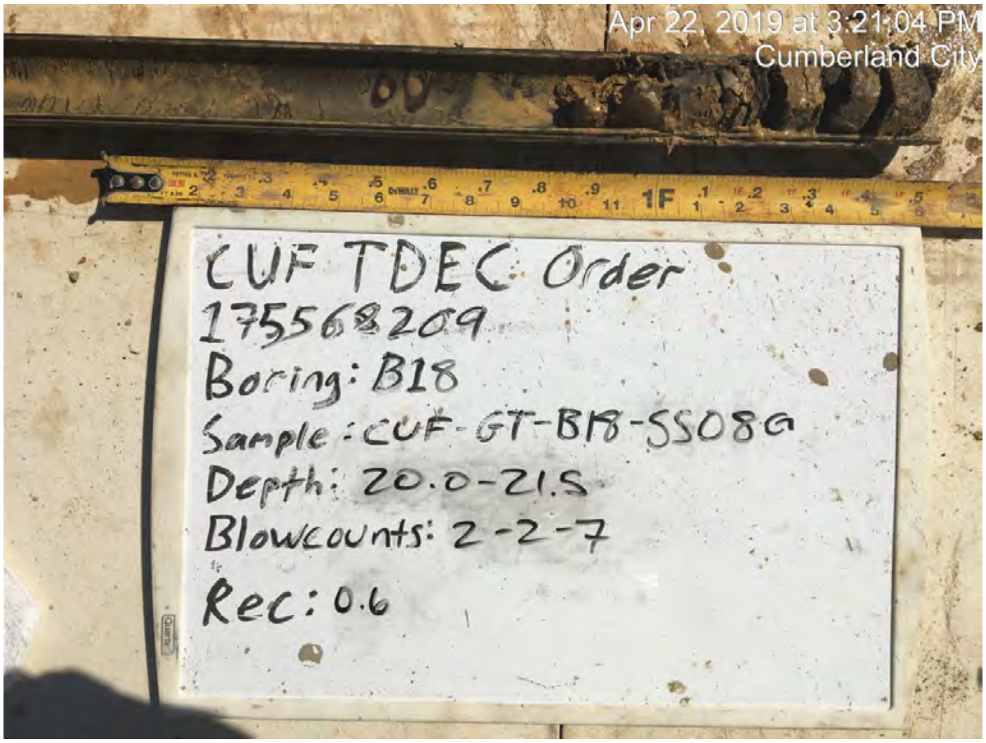
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 207

Photo Location: CUF-B18

Photo Date: 4/22/2019

Comments: Interval (20.0-21.5 feet). Recovery shown on white board should be 0.7 feet. Blowcount on white board should be 2-3-7 feet.

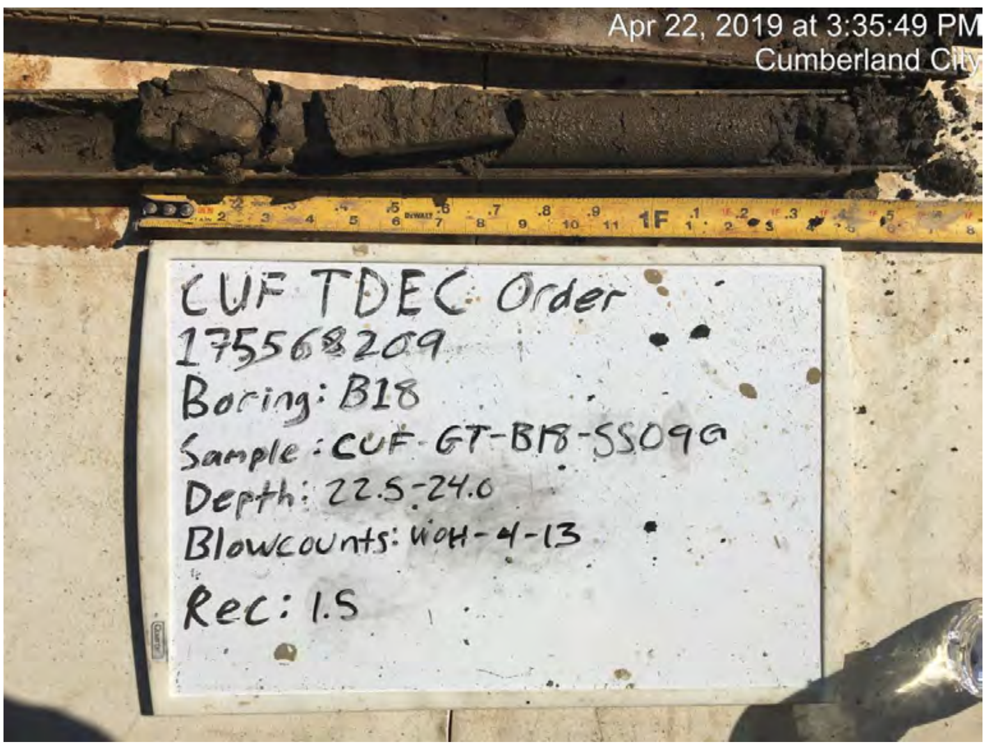


Photograph ID: 208

Photo Location: CUF-B18

Photo Date: 4/22/2019

Comments: Interval (22.5-24.0 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 209 **Photo Location:** CUF-B18 **Photo Date:** 4/22/2019 **Comments:** Photo of interval (25.0-26.7 feet) unavailable because sample collected with shelby tube. Sampler refusal at 26.7 feet.	No Photo Applicable
Photograph ID: 210 **Photo Location:** CUF-B18 **Photo Date:** 4/22/2019 **Comments:** Interval (27.5-29.0 feet).	

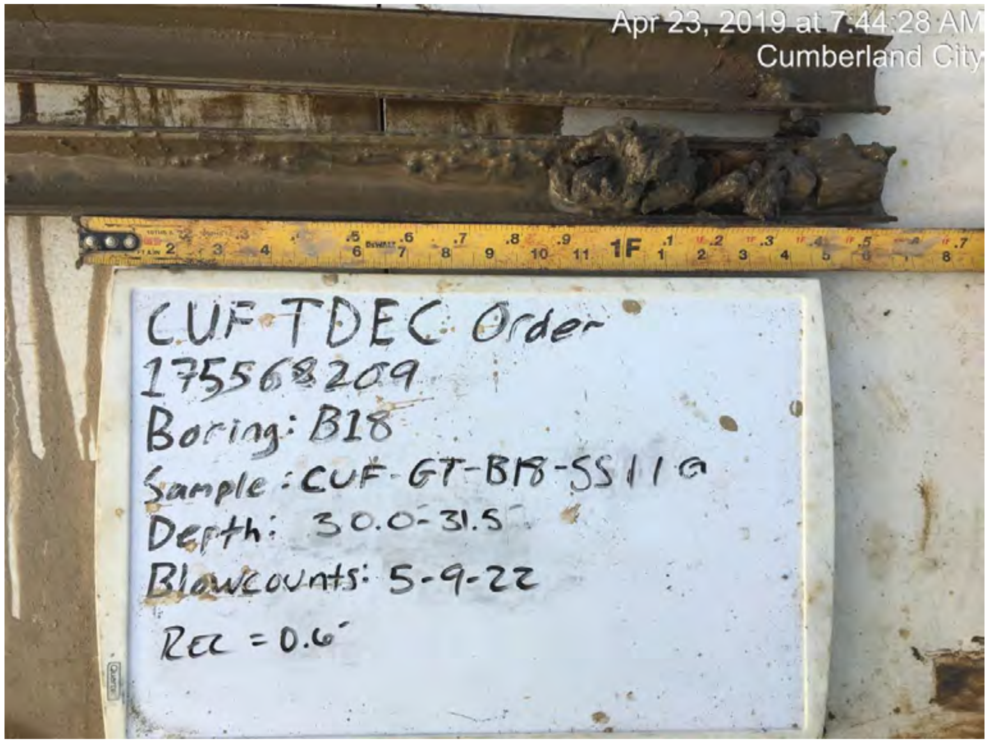
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 211

Photo Location:
CUF-B18

Photo Date:
4/23/2019

Comments:
Interval (30.0-31.5 feet).

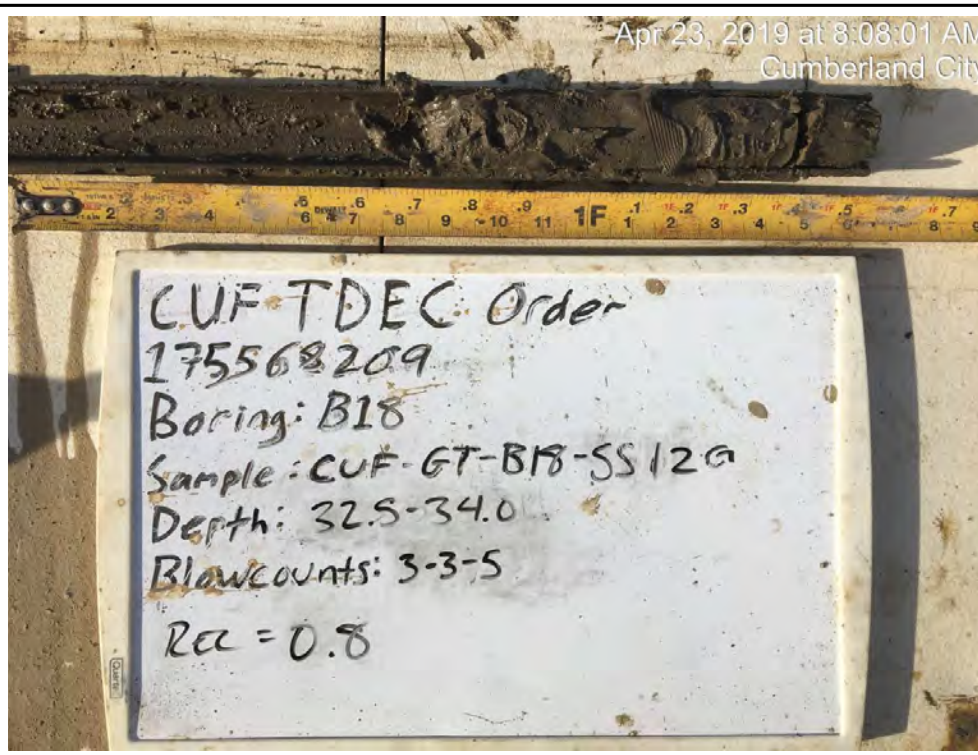


Photograph ID: 212

Photo Location:
CUF-B18

Photo Date:
4/23/2019

Comments:
Interval (32.5-34.0 feet).



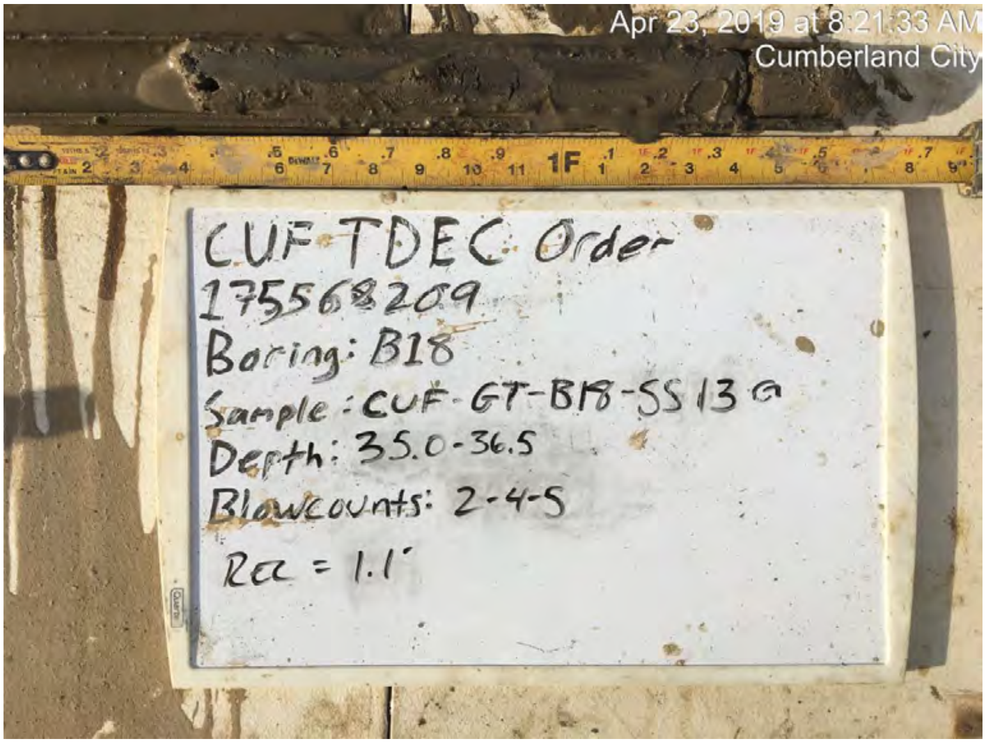
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 213

Photo Location:
CUF-B18

Photo Date:
4/23/2019

Comments:
Interval (35.0-36.5 feet).



Photograph ID: 214

Photo Location:
CUF-B18

Photo Date:
4/23/2019

Comments:
Photo of interval (37.0-38.9 feet) unavailable because sample collected with shelby tube. Sampler refusal at 38.9 feet.

No Photo Applicable

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 215

Photo Location:
CUF-B18

Photo Date:
4/23/2019

Comments:
Interval (40.0-40.3 feet).

Photograph ID: 216

Photo Location:
CUF-B18

Photo Date:
4/24/2019

Comments:
Interval (41.0-55.6 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 217

Photo Location: CUF-B18

Photo Date: 4/24/2019

Comments: Interval (55.6-70.0 feet).

Photograph ID: 218

Photo Location: CUF-B18

Photo Date: 4/25/2019

Comments: Interval (70.0-84.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 219

Photo Location:
CUF-B18

Photo Date:
4/25/2019

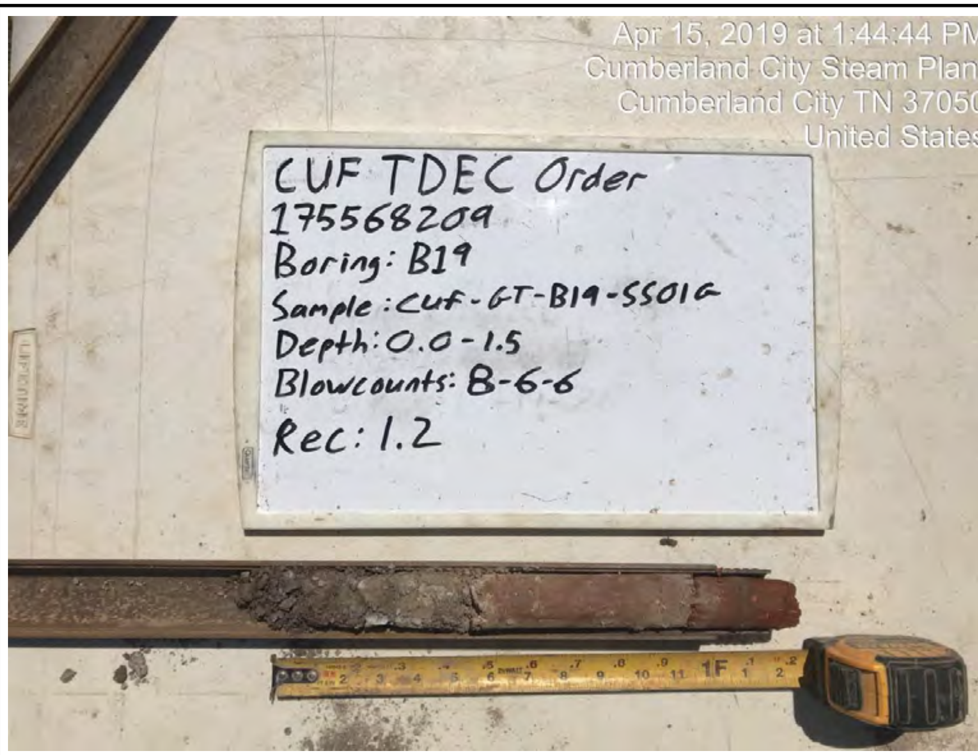
Comments:
Interval (84.0-91.4 feet).

Photograph ID: 220

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Interval (0.0-1.5 feet).



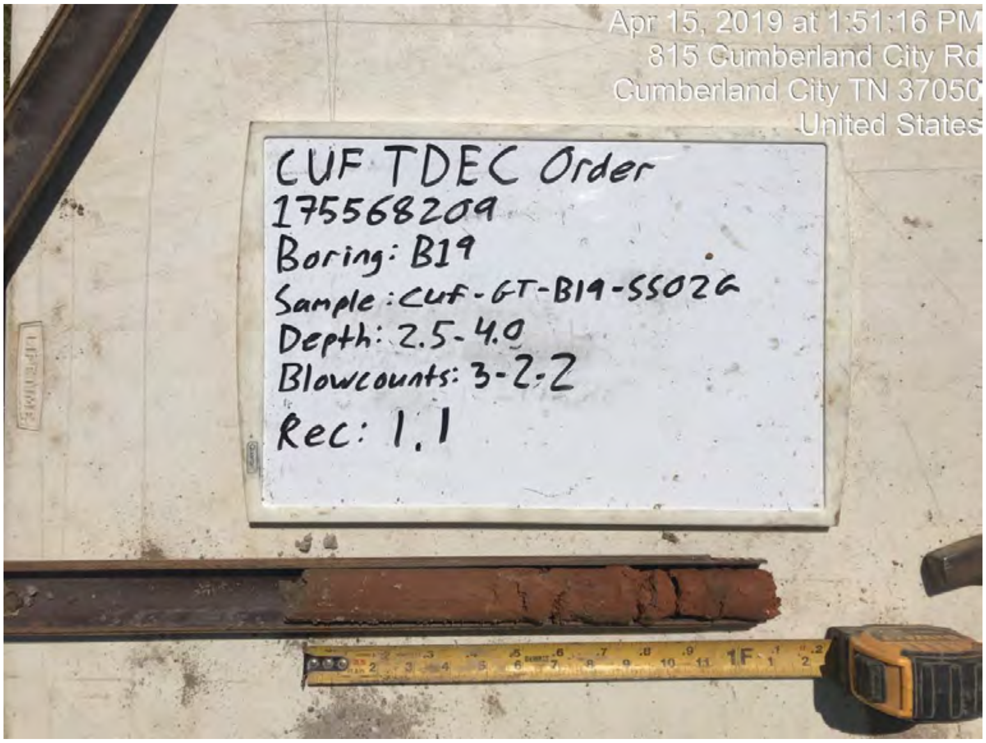
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 221

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Interval (2.5-4.0 feet).

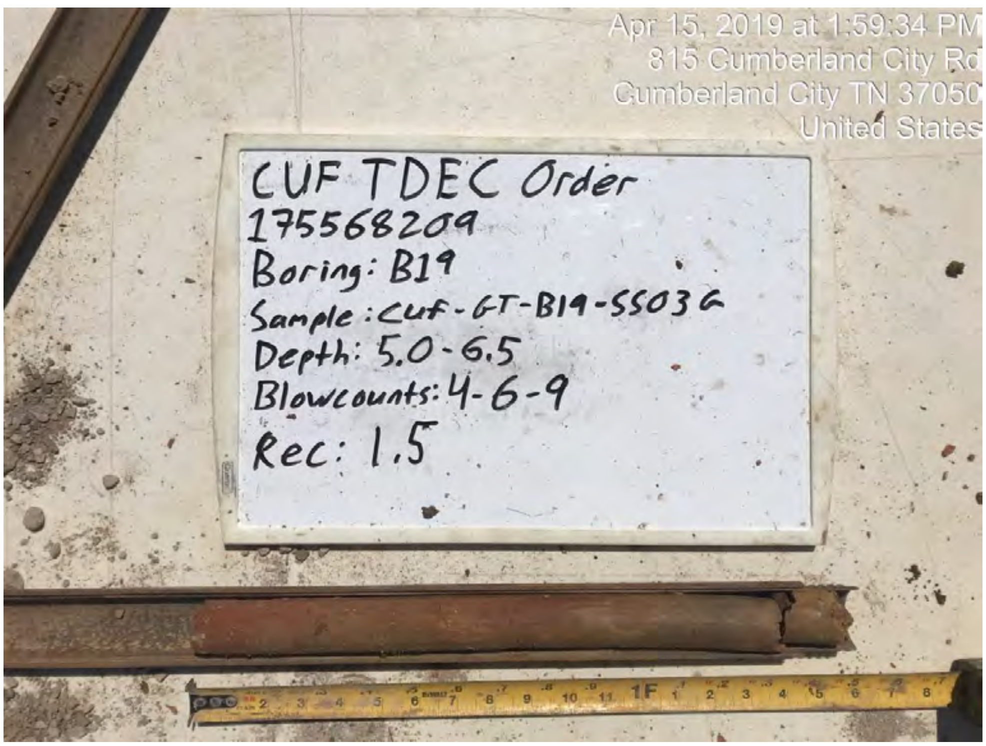


Photograph ID: 222

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Interval (5.0-6.5 feet).



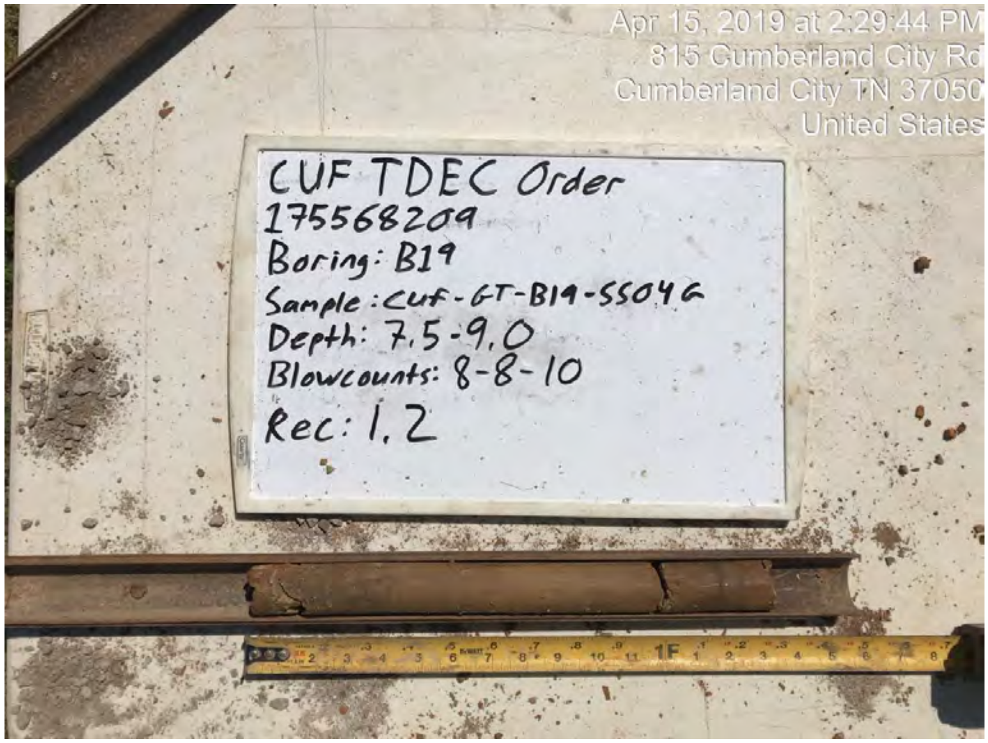
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 223

Photo Location: CUF-B19

Photo Date: 4/15/2019

Comments: Interval (7.5-9.0 feet).



Photograph ID: 224

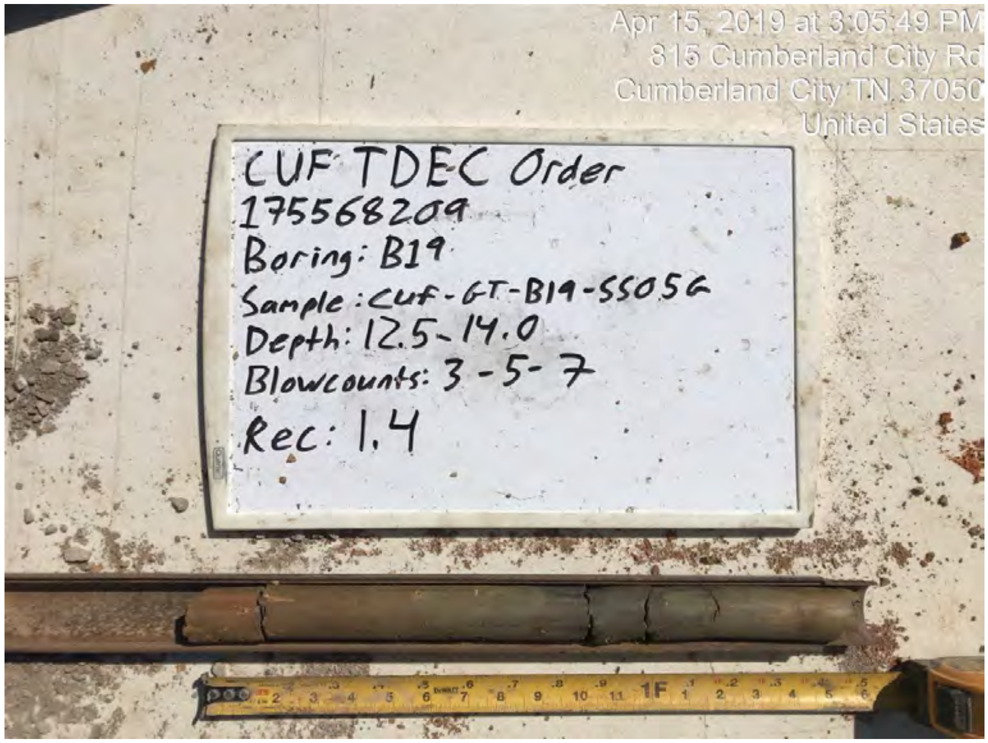
Photo Location: CUF-B19

Photo Date: 4/15/2019

Comments: Photo of interval (10.0-12.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 225 **Photo Location:** CUF-B19 **Photo Date:** 4/15/2019 **Comments:** Interval (12.5-14.0 feet).	
Photograph ID: 226 **Photo Location:** CUF-B19 **Photo Date:** 4/15/2019 **Comments:** Interval (15.0-16.5 feet).	

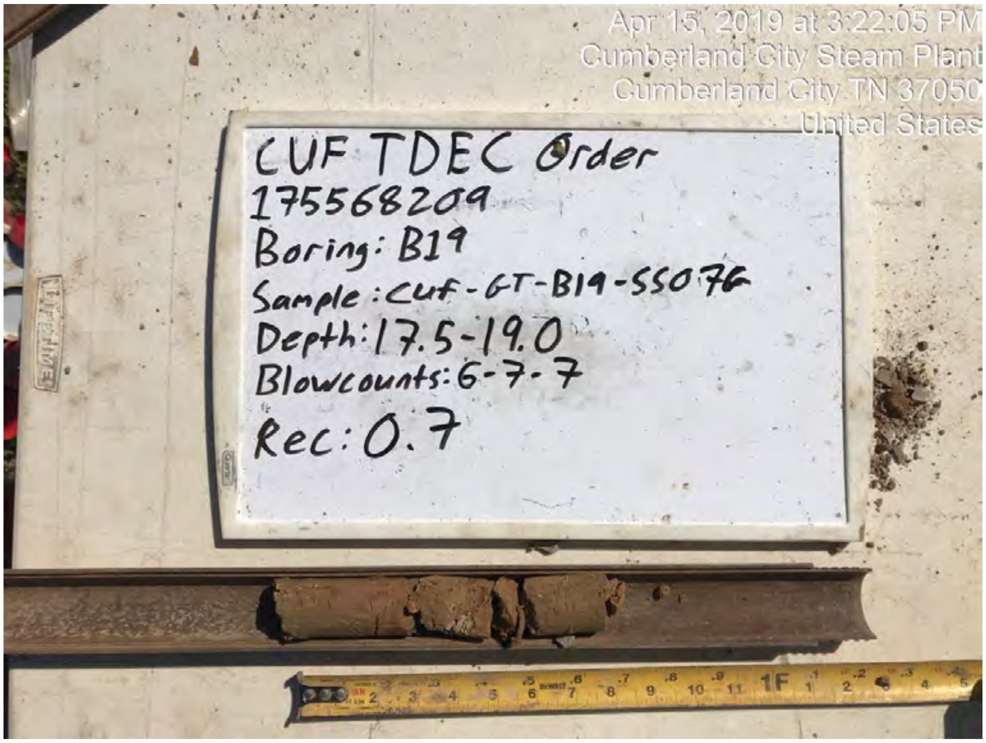
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 227

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Interval (17.5-19.0 feet).

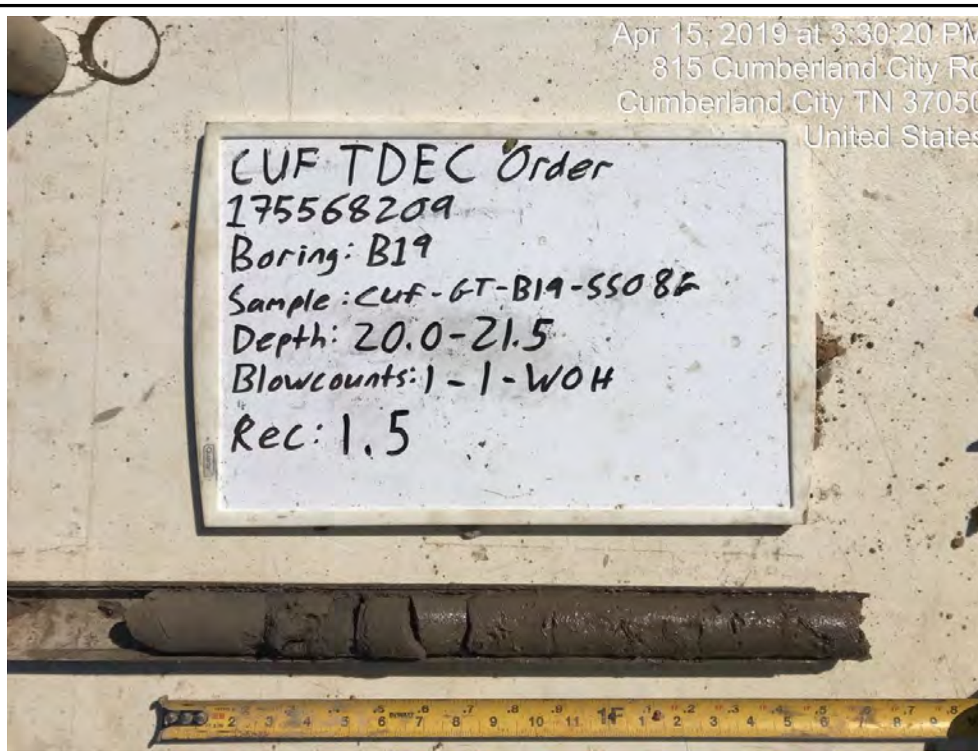


Photograph ID: 228

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Interval (20.0-21.5 feet). WOH on white board is the same as WH on the boring log.



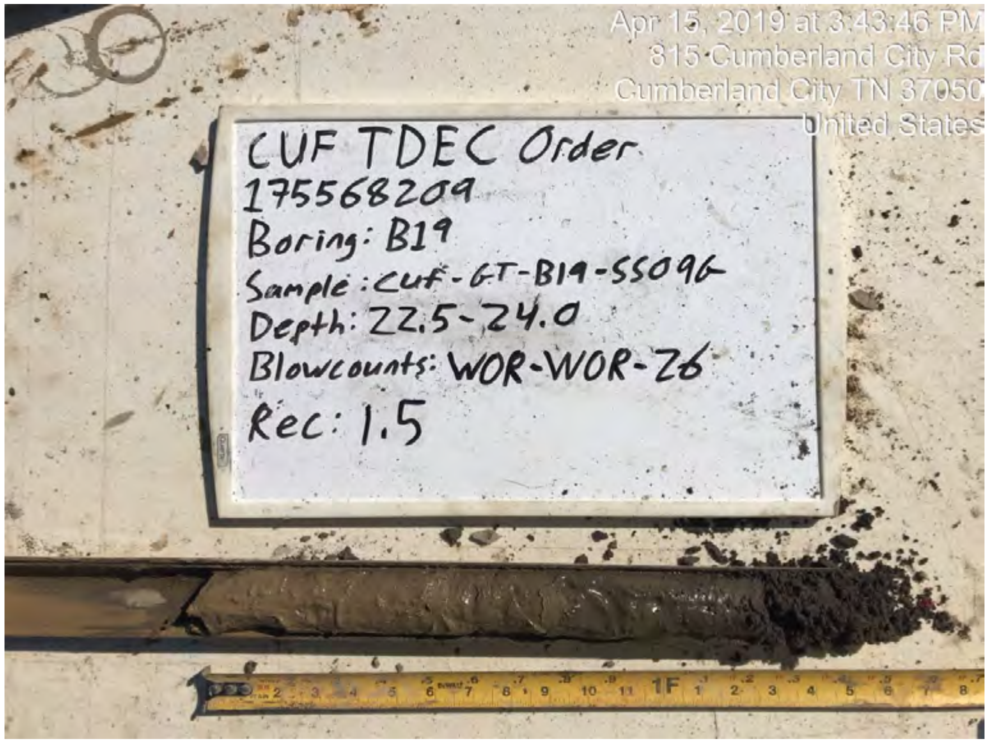
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 229

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Interval (22.5-24.0 feet). WOR on white board is the same as WR on the boring log.

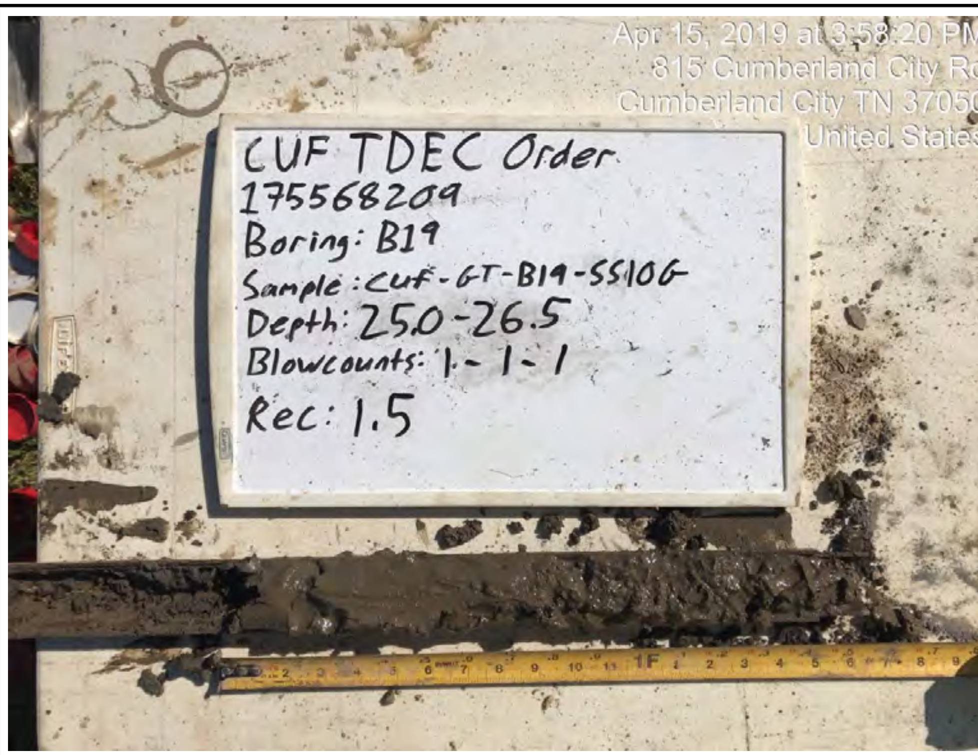


Photograph ID: 230

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Interval (25.0-26.5 feet).



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 231

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Photo of interval (27.5-29.5 feet) unavailable because sample collected with shelby tube.

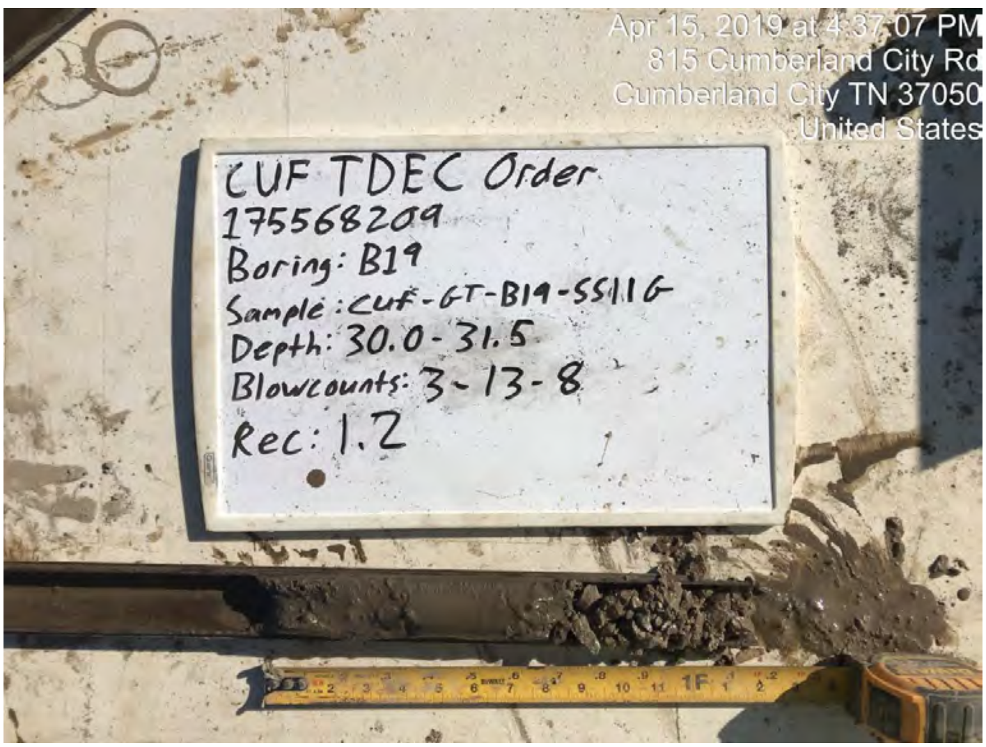
No Photo Applicable

Photograph ID: 232

Photo Location:
CUF-B19

Photo Date:
4/15/2019

Comments:
Interval (30.0-31.5 feet). Blowcount shown on white board should be 3-8-13.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 233

Photo Location:
CUF-B19

Photo Date:
4/16/2019

Comments:
Interval (32.5-34.0 feet).

Photograph ID: 234

Photo Location:
CUF-B19

Photo Date:
4/16/2019

Comments:
Photo of interval (35.0-37.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

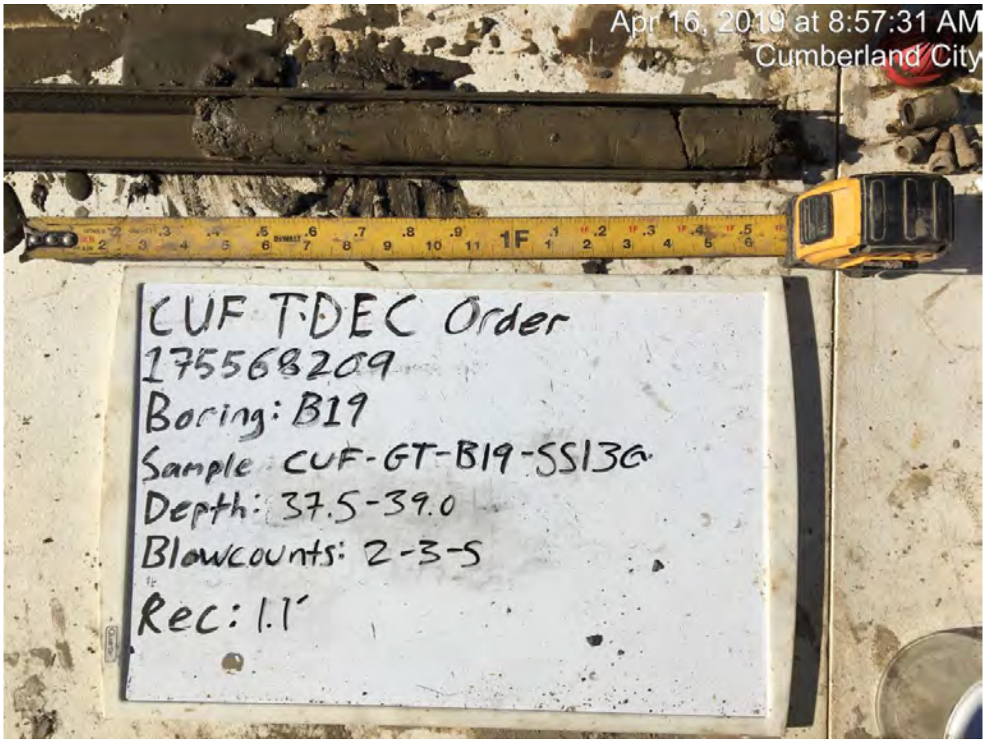
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 235

Photo Location: CUF-B19

Photo Date: 4/16/2019

Comments: Interval (37.5-39.0 feet).

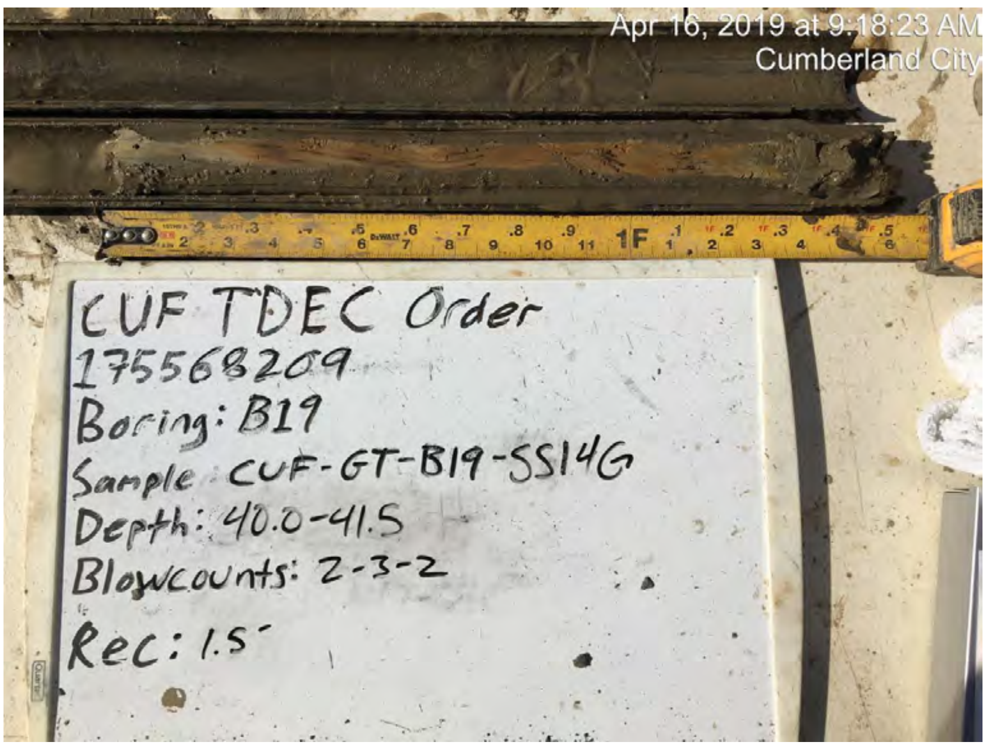


Photograph ID: 236

Photo Location: CUF-B19

Photo Date: 4/16/2019

Comments: Interval (40.0-41.5 feet).



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 237

Photo Location:
CUF-B19

Photo Date:
4/16/2019

Comments:
Interval (42.5-44.0 feet).

Photograph ID: 238

Photo Location:
CUF-B19

Photo Date:
4/17/2019

Comments:
Interval (45.3-59.8 feet). Metadata date reflects the date the photo was taken, not the date the core was drilled.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 239

Photo Location:
CUF-B19

Photo Date:
4/17/2019

Comments:
Interval (59.8-73.5 feet). Metadata date reflects the date the photo was taken, not the date the core was drilled.

Photograph ID: 240

Photo Location:
CUF-B19

Photo Date:
4/17/2019

Comments:
Interval (73.5-88.3 feet). Metadata date reflects the date the photo was taken, not the date the core was drilled.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 241

Photo Location:
CUF-B19

Photo Date:
4/18/2019

Comments:
Interval (88.3-101.8 feet).

Photograph ID: 242

Photo Location:
CUF-B19

Photo Date:
4/18/2019

Comments:
Interval (101.8-116.3 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 243

Photo Location:
CUF-B19

Photo Date:
4/18/2019

Comments:
Interval (116.3-119.5 feet).

ATTACHMENT D.1.2

Photographic Log of Dry Ash Stack Samples

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 1

Photo Location: CUF-TW07

Photo Date: 12/13/2018

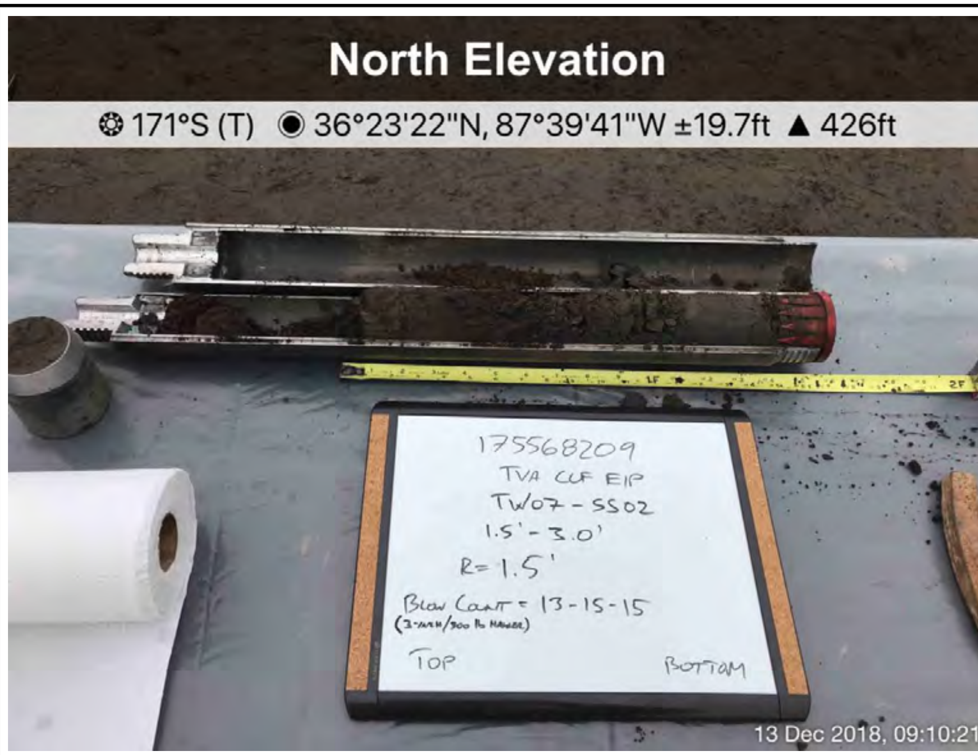
Comments: Interval (0.0-1.5 feet).

Photograph ID: 2

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (1.5-3.0 feet).



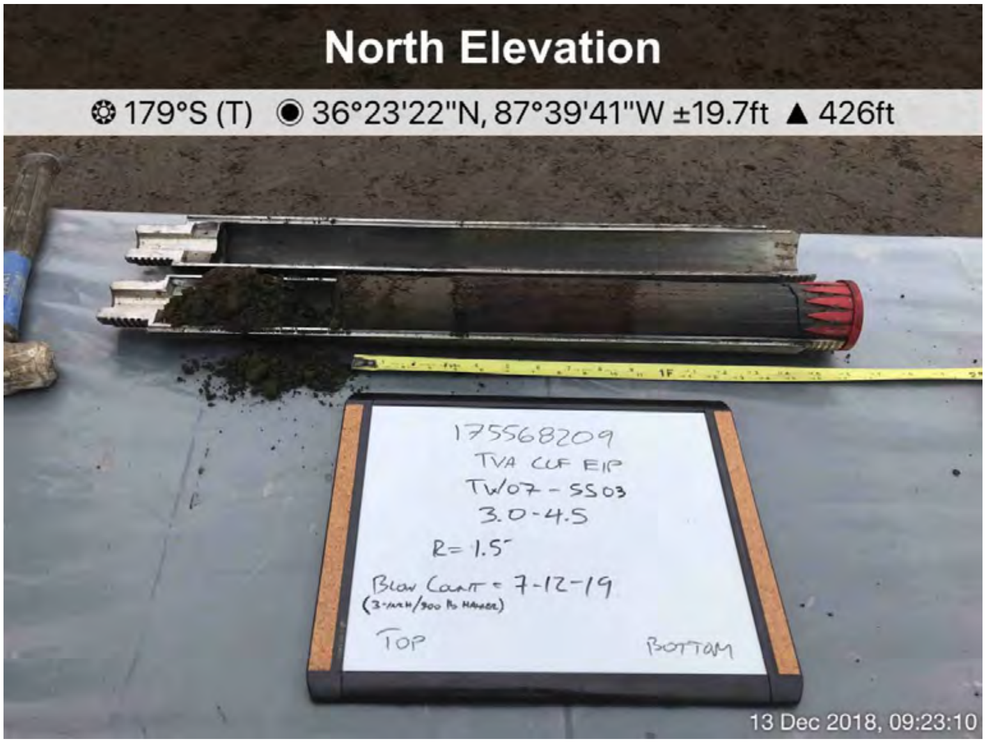
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 3

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (3.0-4.5 feet).

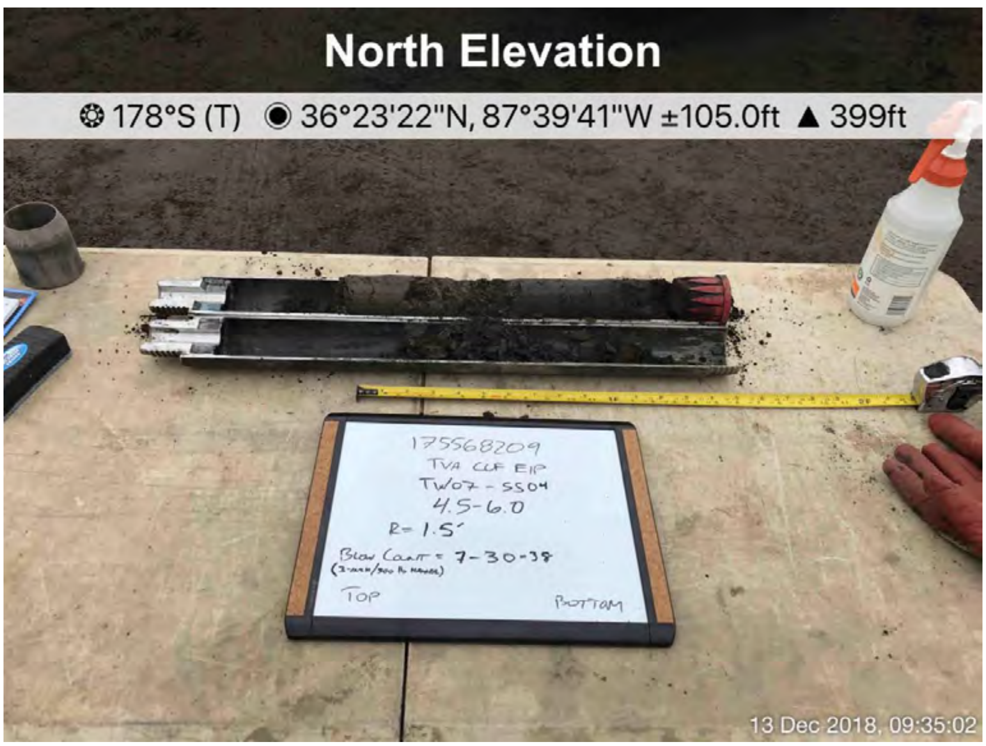


Photograph ID: 4

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (4.5-6.0 feet).



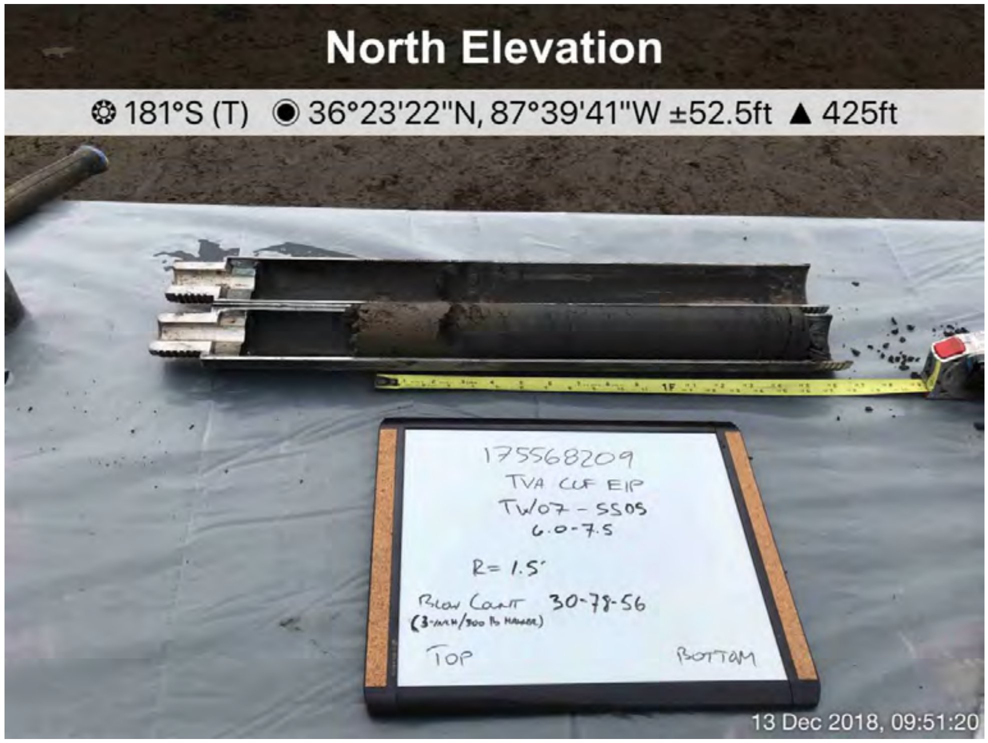
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 5

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (6.0-7.5 feet).

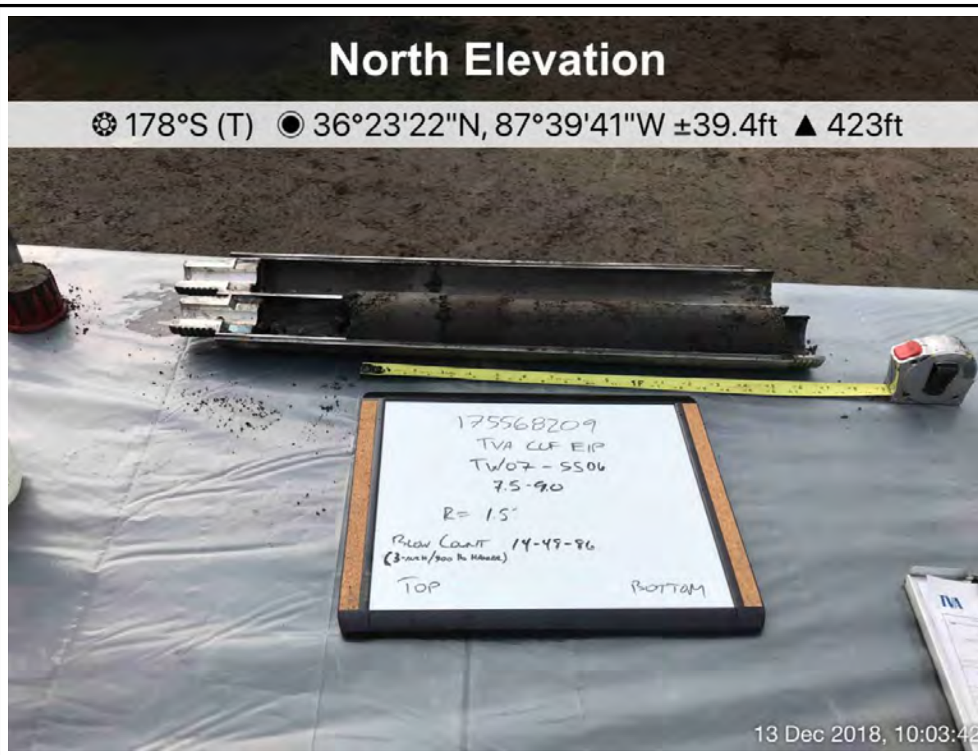


Photograph ID: 6

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (7.5-9.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 7

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

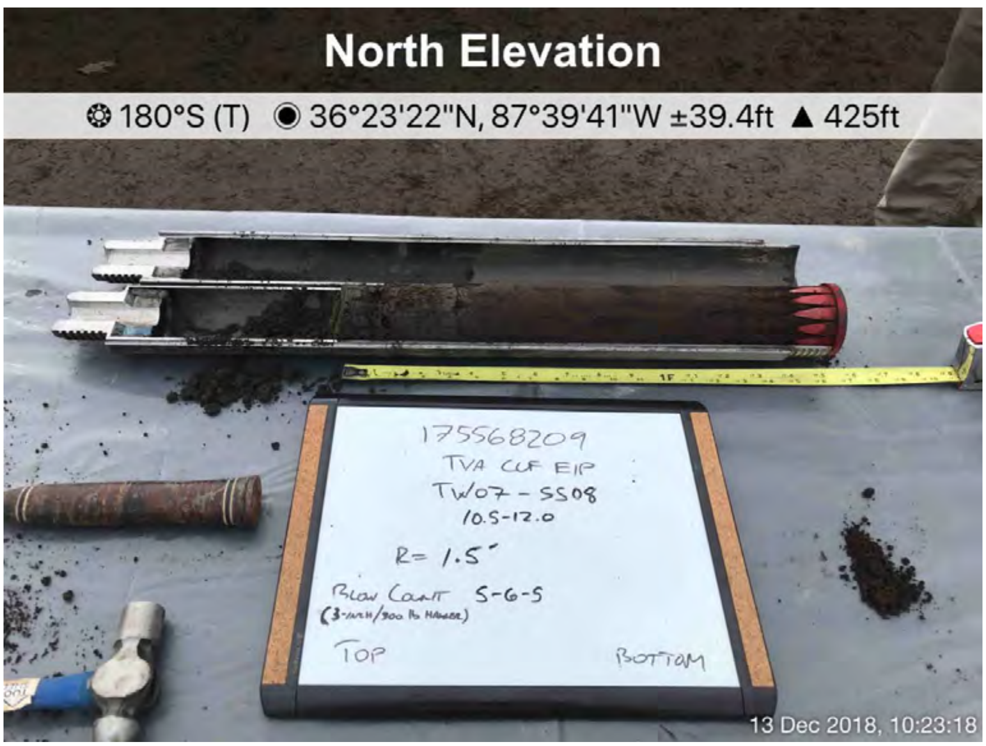
Comments:
Interval (9.0-10.5 feet).

Photograph ID: 8

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (10.5-12.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 9

Photo Location: CUF-TW07

Photo Date: 12/13/2018

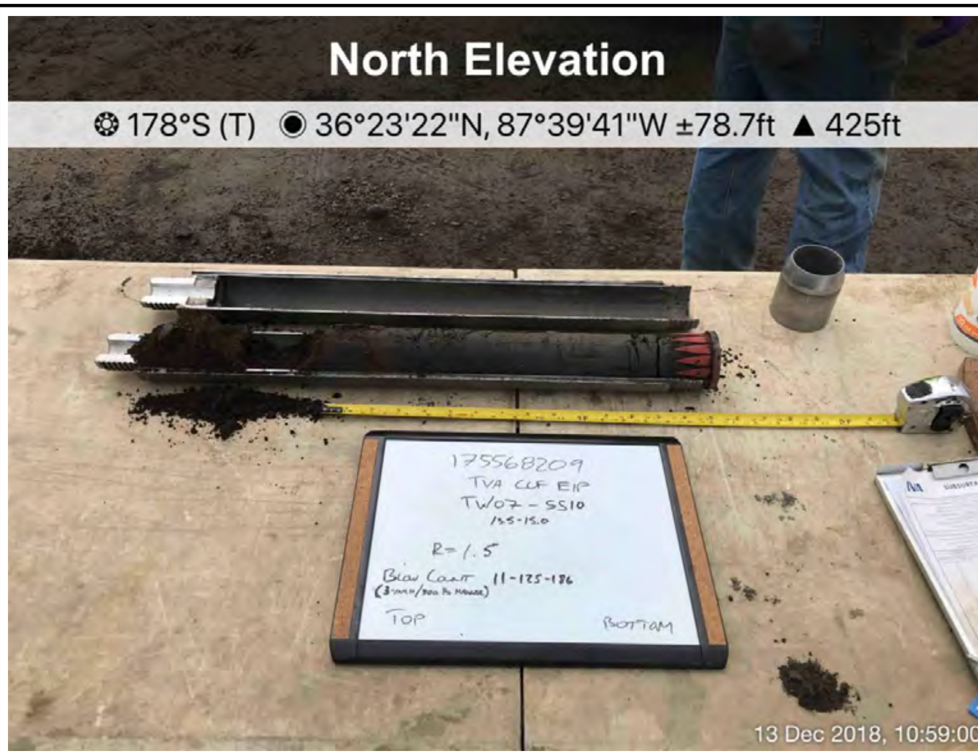
Comments: Interval (12.0-13.5 feet).

Photograph ID: 10

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (13.5-15.0 feet).



Stantec

Photographic Log

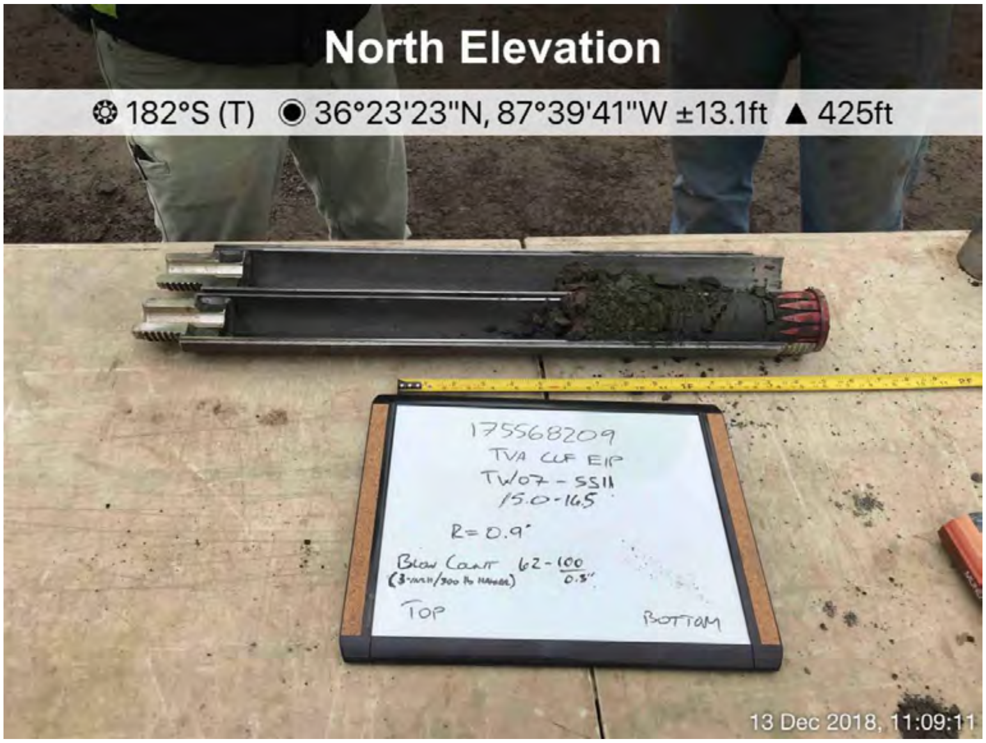
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 11

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (15.0-16.5 feet). Interval shown on white board should be 15.0-15.8 feet. Blowcount shown on white board should be 62-100/0.3'.Sampler refusal at 15.8 feet.



Photograph ID: 12

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (16.5-17.9 feet). Interval shown on white board should be 16.5-17.9 feet. Sampler refusal at 17.9 feet.

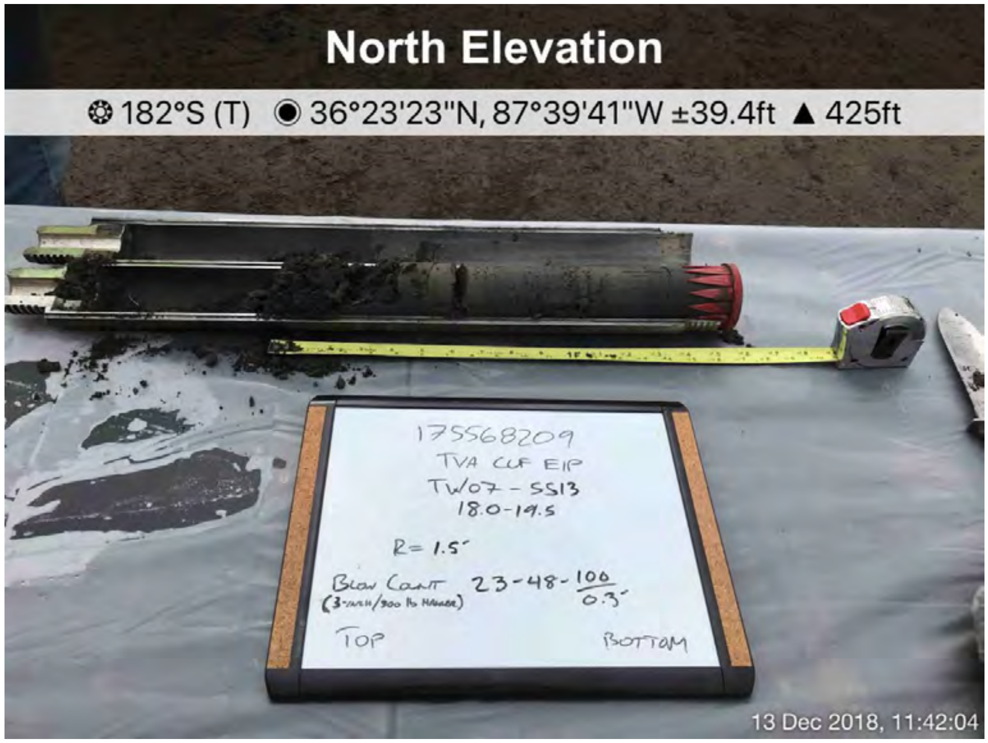
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 13

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (18.0-19.3 feet). Interval shown on white board should be 18.0-19.3 feet. Sampler refusal at 19.3 feet.



Photograph ID: 14

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (19.5-20.4 feet). Interval shown on white board should be 19.5-20.4 feet. Sampler refusal at 20.4 feet.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 15

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (21.0-21.6 feet). Interval shown on white board should be 21.0-21.6 feet. Sampler refusal at 21.6 feet.

Photograph ID: 16

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (22.5-23.4 feet). Interval shown on white board should be 22.5-23.4 feet. Sampler refusal at 23.4 feet.

Stantec **Photographic Log**

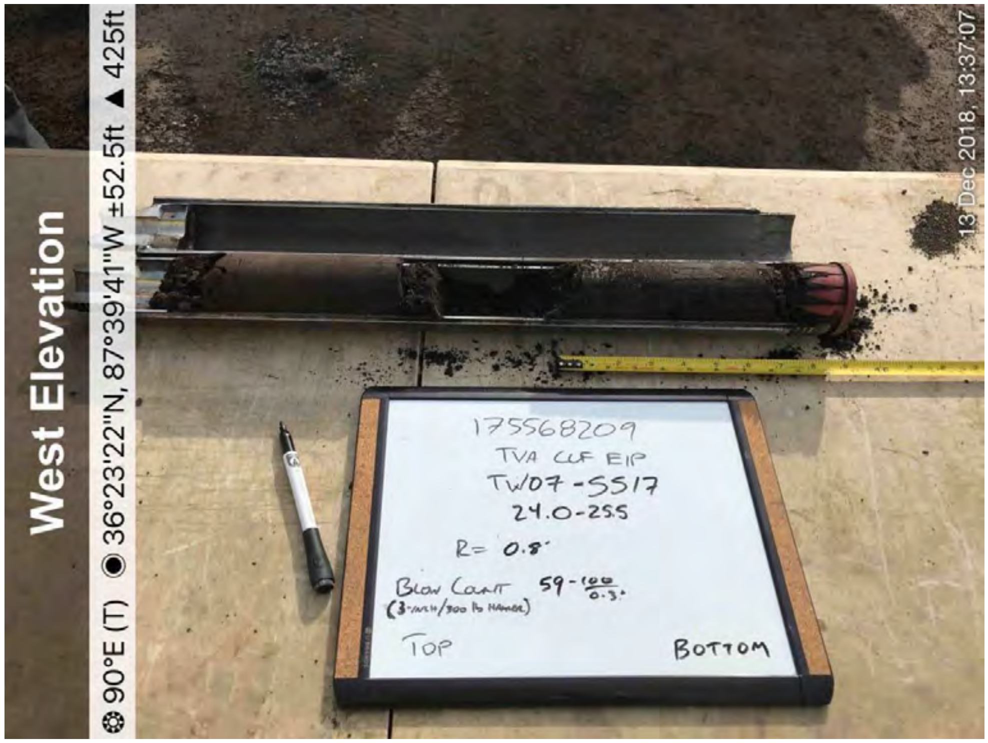
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 17

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (24.0-24.8 feet). Interval shown on white board should be 24.0-24.8 feet. Sampler refusal at 24.8 feet.

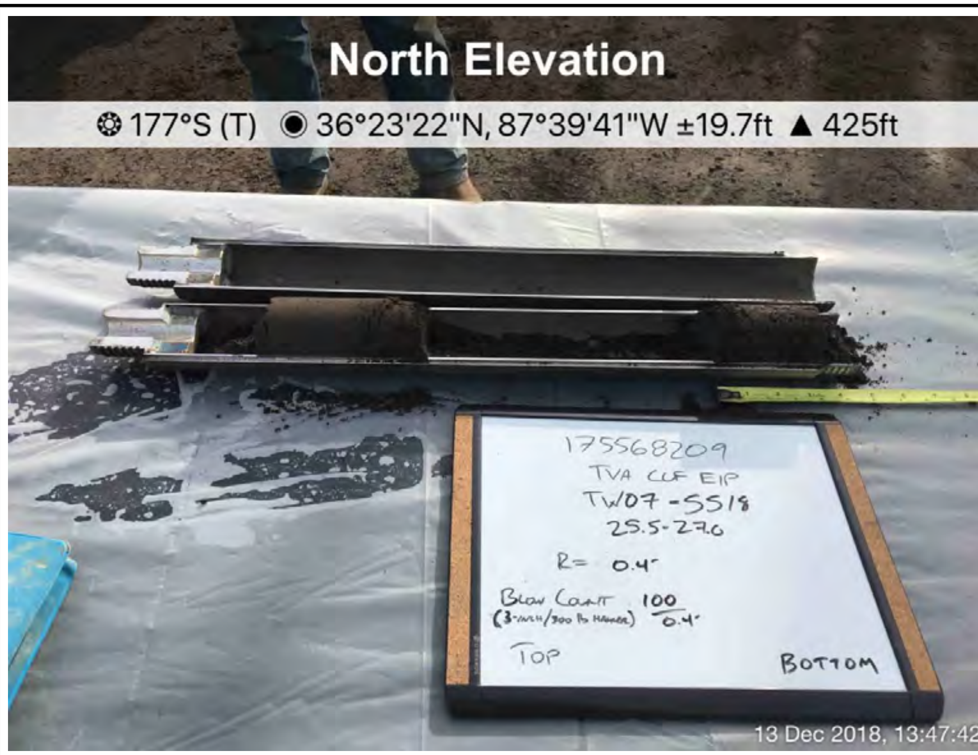


Photograph ID: 18

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (25.5-25.9 feet). Interval shown on white board should be 25.5 -25.9. Sampler refusal at 25.9 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 19

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (27.0-27.8 feet). Interval shown on white board should be 27.0-27.8 feet. Sampler refusal at 27.8 feet.

Photograph ID: 20

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (28.5-30.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 21

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (30.0-31.3 feet). Interval shown on white board should be 30.0-31.3 feet. Sampler refusal at 31.3 feet.

Photograph ID: 22

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (31.5-33.0 feet).

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Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 23

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (33.0-34.5 feet). Interval shown on white board should be 33.0-34.5 feet.

Photograph ID: 24

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Photo of interval (34.5-36.0 feet) unavailable.

No Photo Applicable

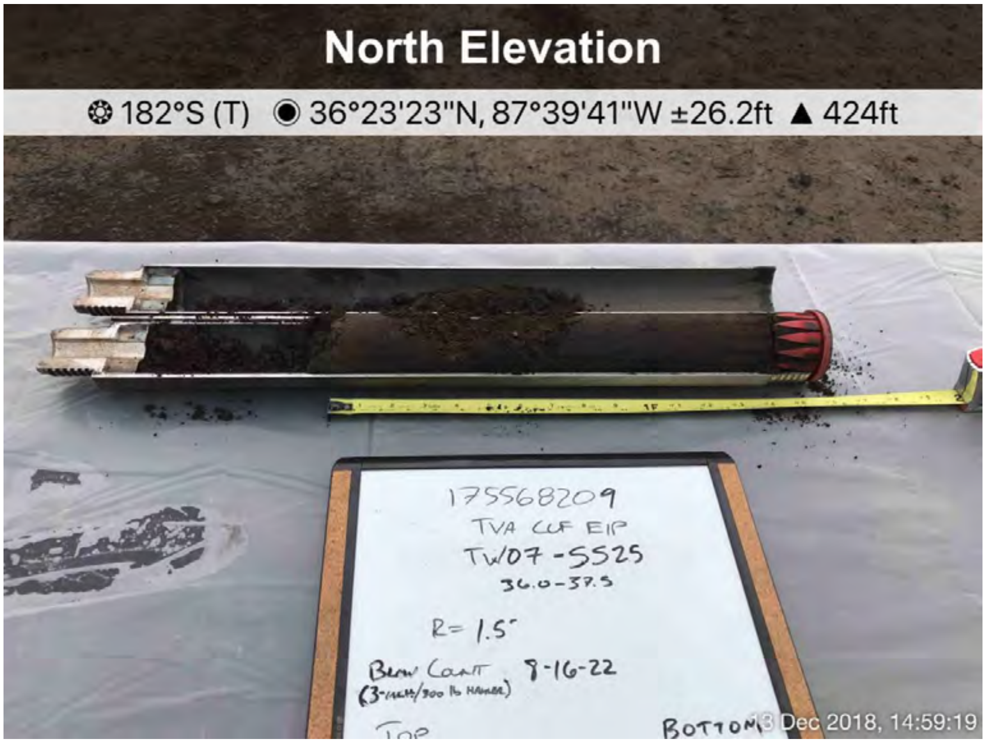
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 25

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (36.0-37.5 feet).



Photograph ID: 26

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (37.5-39.0 feet).

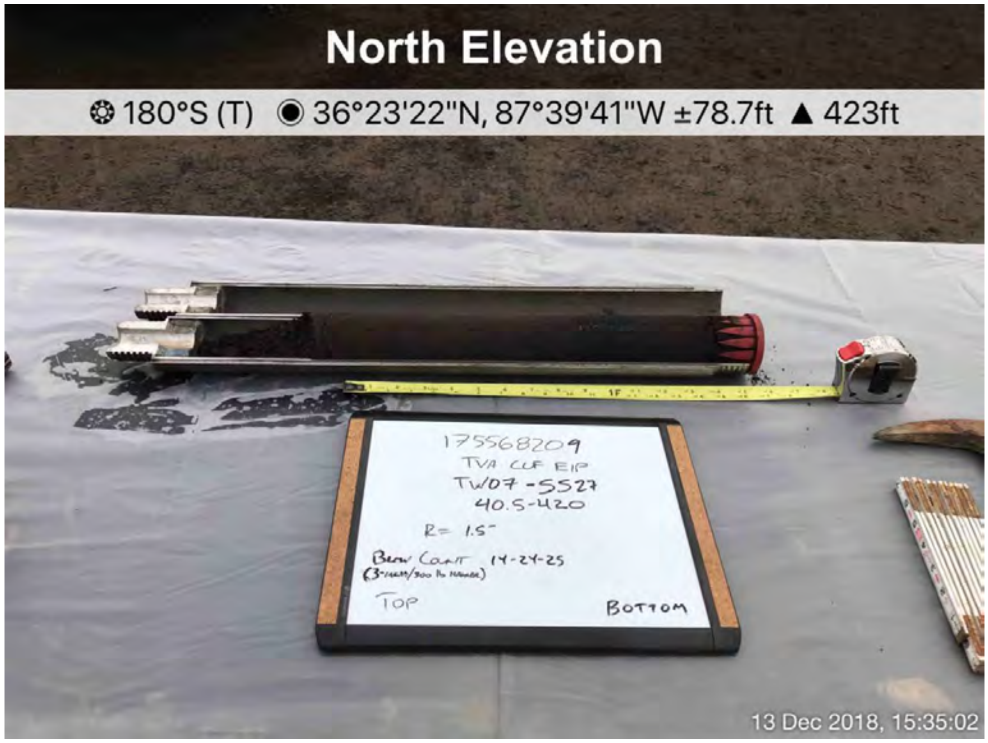
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 27

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (40.5-42.0 feet).



Photograph ID: 28

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (42.0-43.5 feet).

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Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 29

Photo Location: CUF-TW07

Photo Date: 12/17/2018

Comments: Interval (43.5-45.0 feet).

Photograph ID: 30

Photo Location: CUF-TW07

Photo Date: 12/17/2018

Comments: Interval (45.0-46.5 feet).

Stantec

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 31

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (46.5-48.0 feet).

Photograph ID: 32

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (48.0-49.5 feet).

Stantec

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 33

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (49.5-51.0 feet).

Photograph ID: 34

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (51.0-52.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 35

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Photo of interval (52.5-54.0 feet) unavailable.

No Photo Applicable

Photograph ID: 36

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (54.0-55.5 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 37

Photo Location: CUF-TW07

Photo Date: 12/17/2018

Comments: Interval (55.5-57.0 feet).

Photograph ID: 38

Photo Location: CUF-TW07

Photo Date: 12/17/2018

Comments: Interval (57.0-58.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 39

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (58.5-60.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 40

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Photo of interval (60.0-62.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 41

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

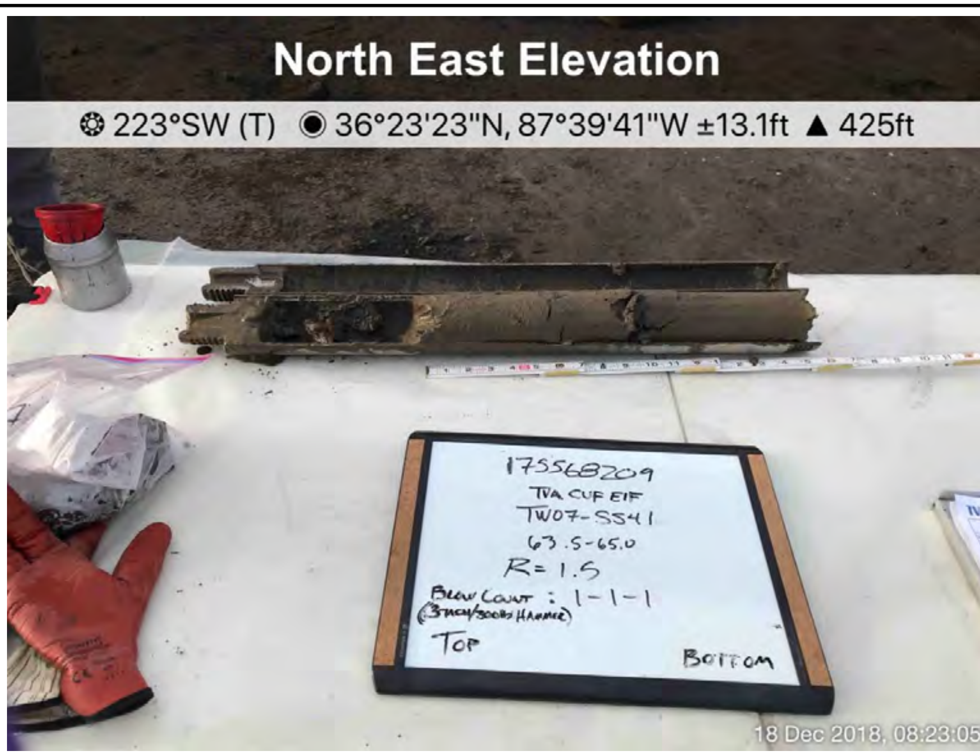
Comments:
Interval (62.0-63.5 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 42

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (63.5-65.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 43

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (65.0-66.5 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 44

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (66.5-68.0 feet). WOR on white board is the same as WR on the boring log.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 45 **Photo Location:** CUF-TW07 **Photo Date:** 12/18/2018 **Comments:** Interval (68.0-69.5 feet). WOR on white board is the same as WR on the boring log.	
Photograph ID: 46 **Photo Location:** CUF-TW07 **Photo Date:** 12/18/2018 **Comments:** Interval (69.5-71.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 47

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (71.0-72.5 feet).

Photograph ID: 48

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (72.5-74.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 49

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (74.0-75.5 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 50

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (75.5-77.0 feet). WOR on white board is the same as WR on the boring log.

Stantec

Photographic Log

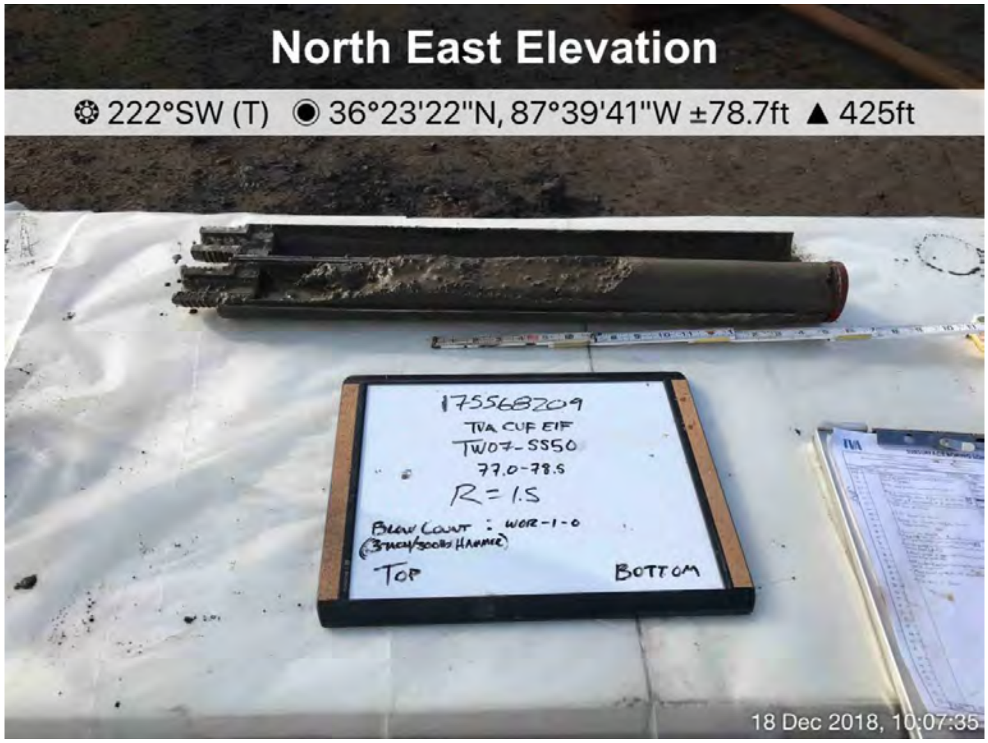
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 51

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (77.0-78.5 feet). Blow count shown on white board should be WR-1-WH. WOR on white board is the same as WR on the boring log.



Photograph ID: 52

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (78.5-80.0 feet). Blow count shown on white board should be WR-1-WH. WOR on white board is the same as WR on the boring log.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 53

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (80.0-81.5 feet).

Photograph ID: 54

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (81.5-83.0 feet). Blow count shown on white board should be WR-1-WH. WOR on white board is the same as WR on the boring log.

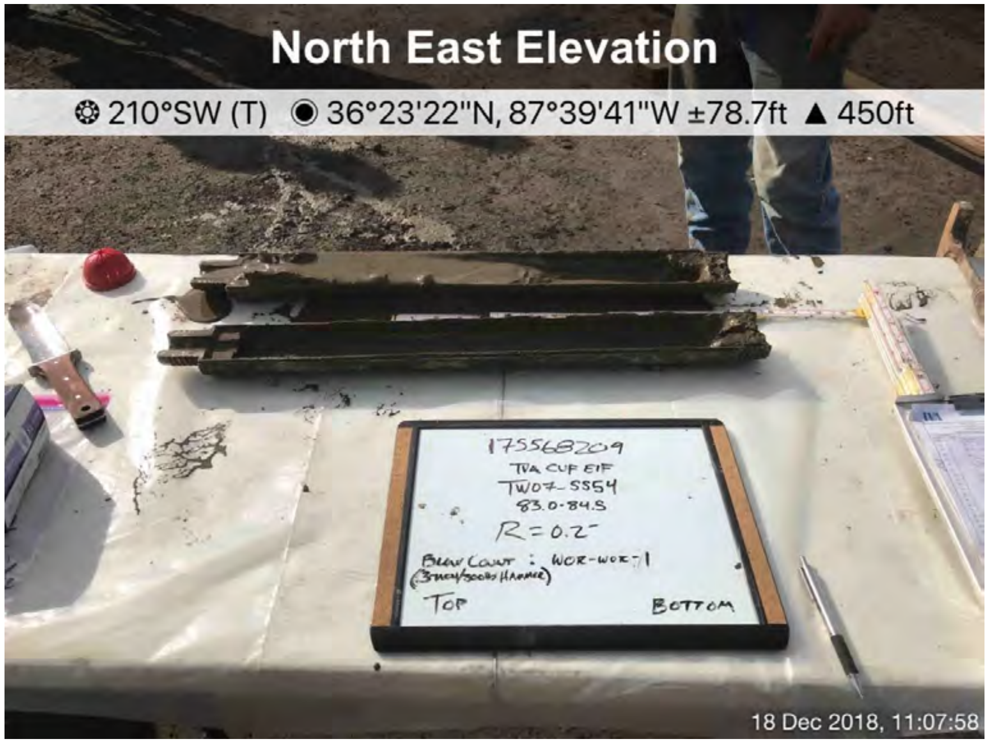
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 55

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (83.0-84.5 feet). WOR on white board is the same as WR on the boring log.



Photograph ID: 56

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (84.5-86.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 57

Photo Location: CUF-TW07

Photo Date: 12/18/2018

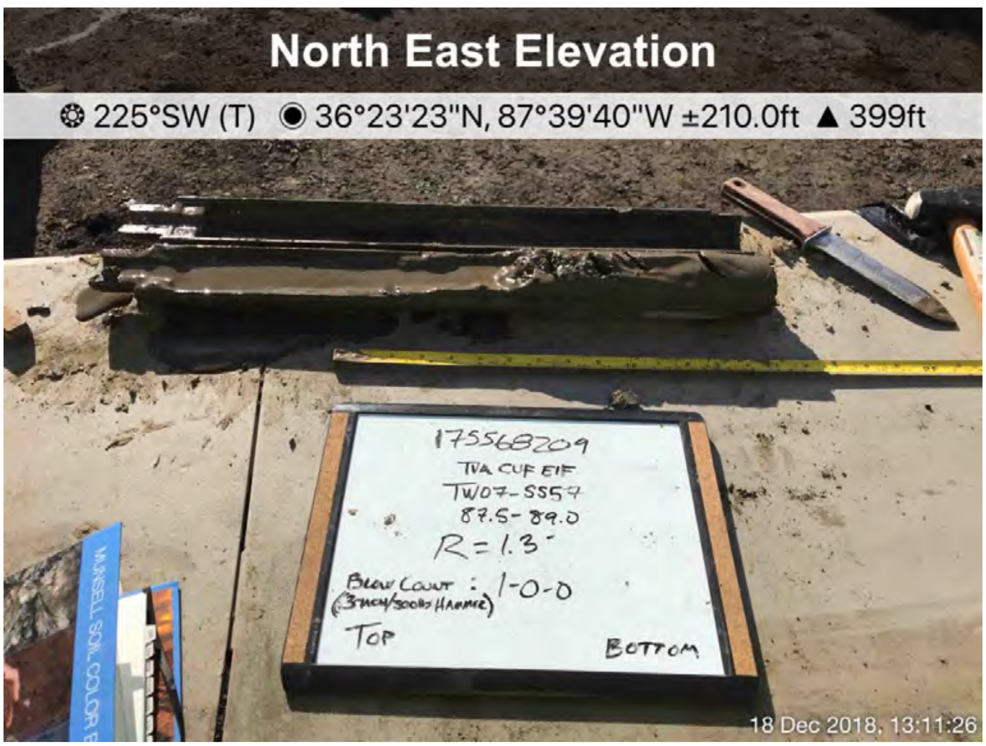
Comments: Interval (86.0-87.5 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 58

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (87.5-89.0 feet). Blow count shown on white board should be 1-WH-WH.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 59

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

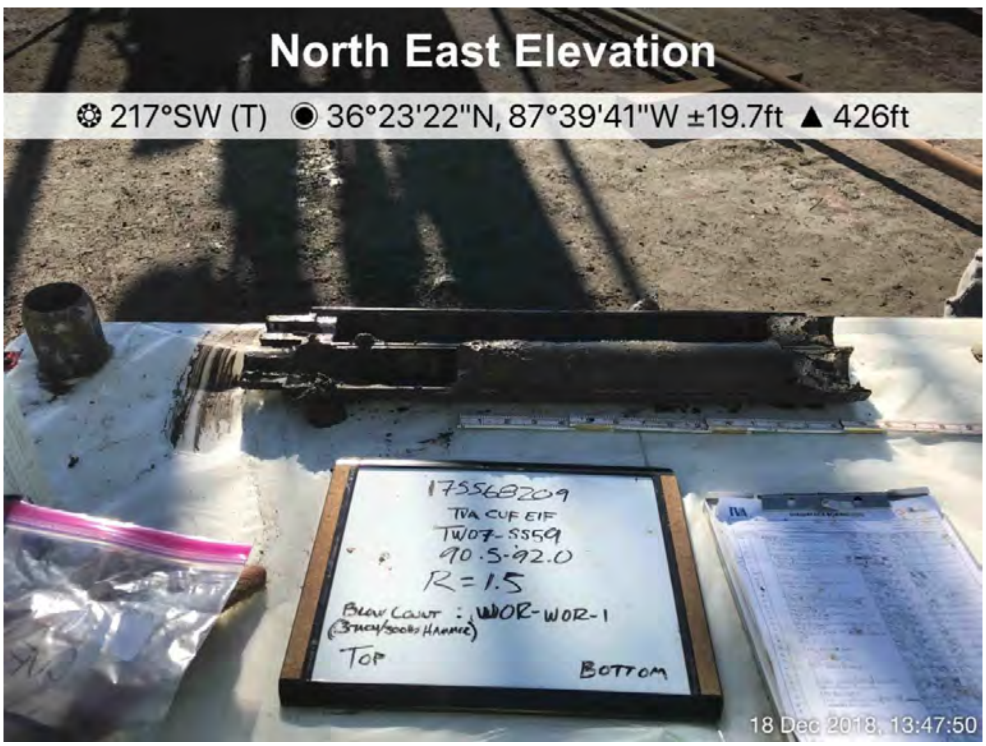
Comments:
Interval (89.0-90.5 feet). Blow count shown on white board should be WH-WH-1.

Photograph ID: 60

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (90.5-92.0 feet). WOR on white board is the same as WR on the boring log.



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 61

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (92.0-94.0 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 62

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (94.0-95.5 feet). WOR on white board is the same as WR on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 63

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (95.5-97.0 feet). Blow count shown on white board should be 1-WH-2.

Photograph ID: 64

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Photo of shelby tube interval (97.0-98.3 feet) unavailable.

No Photo Applicable

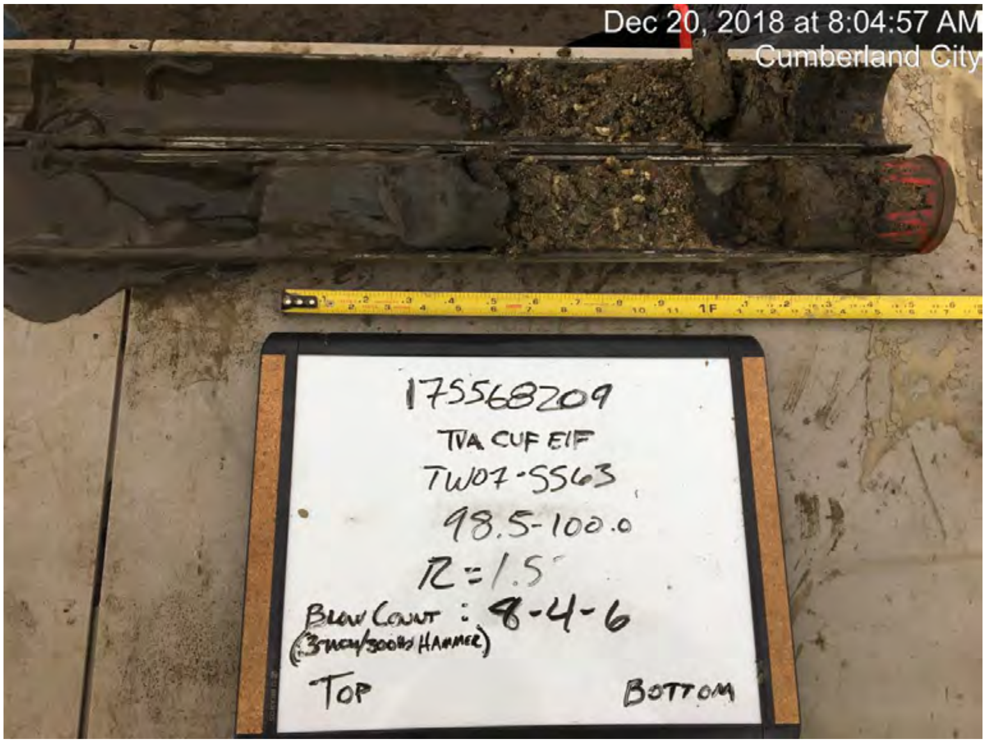
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 65

Photo Location:
CUF-TW07

Photo Date:
12/20/2018

Comments:
Interval (98.5-100.0 feet).

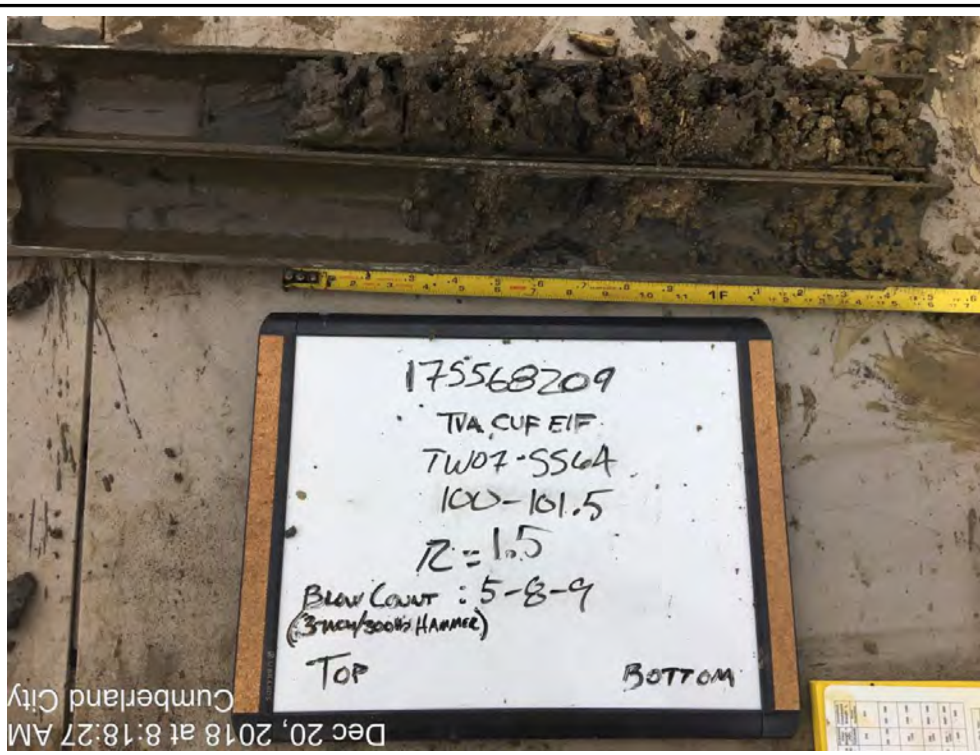


Photograph ID: 66

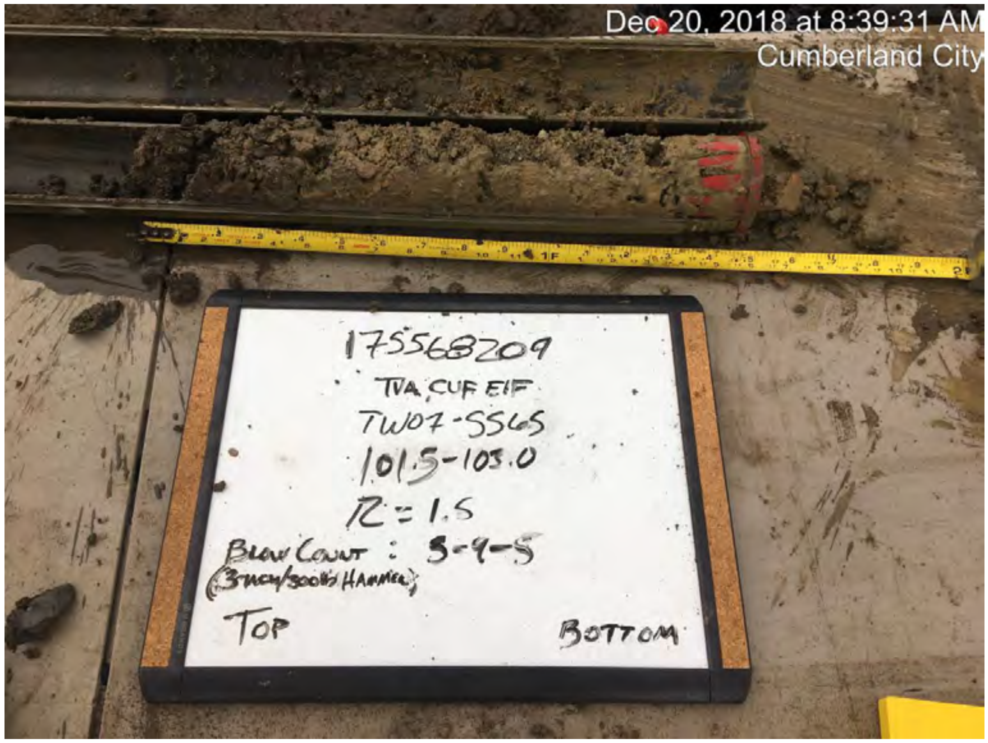
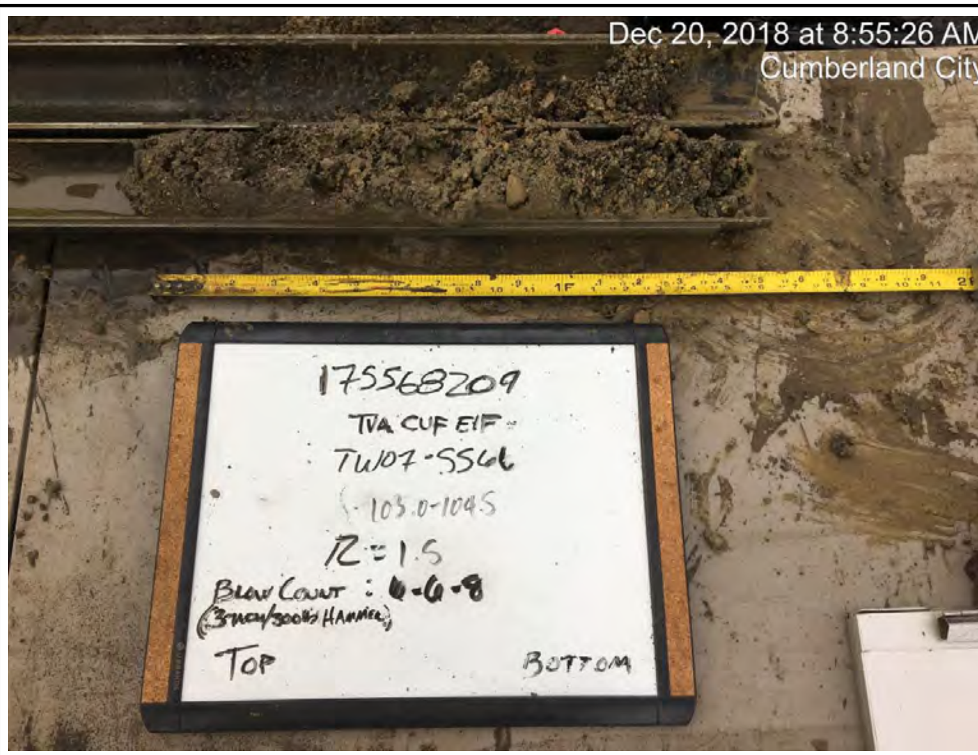
Photo Location:
CUF-TW07

Photo Date:
12/20/2018

Comments:
Interval (100.0-101.5 feet). Interval shown on white board should be 100.0-101.5 feet.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 67 **Photo Location:** CUF-TW07 **Photo Date:** 12/20/2018 **Comments:** Interval (101.5-103.0 feet). Blow count shown on white board is 5-9-5.	
Photograph ID: 68 **Photo Location:** CUF-TW07 **Photo Date:** 12/20/2018 **Comments:** Interval (103.0-104.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 69

Photo Location:
CUF-TW07

Photo Date:
12/20/2018

Comments:
Interval (104.5-106.0 feet).

Photograph ID: 70

Photo Location:
CUF-TW07

Photo Date:
12/20/2018

Comments:
Interval (106.0-107.5 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 71

Photo Location: CUF-TW07

Photo Date: 1/2/2019

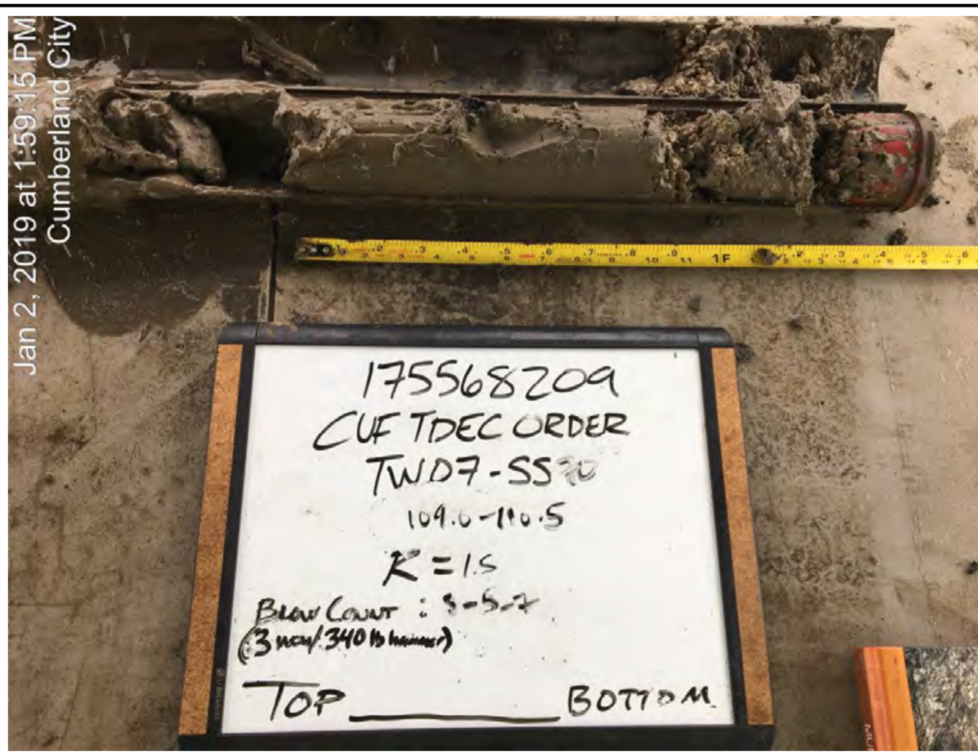
Comments: Interval (107.5-109.0 feet).

Photograph ID: 72

Photo Location: CUF-TW07

Photo Date: 1/2/2019

Comments: Interval (109.0-110.5 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 73 **Photo Location:** CUF-TW07 **Photo Date:** 1/2/2019 **Comments:** Interval (110.5-112.0 feet).	
Photograph ID: 74 **Photo Location:** CUF-TW07 **Photo Date:** 1/2/2019 **Comments:** Interval (112.0-113.5 feet).	

Stantec **Photographic Log**

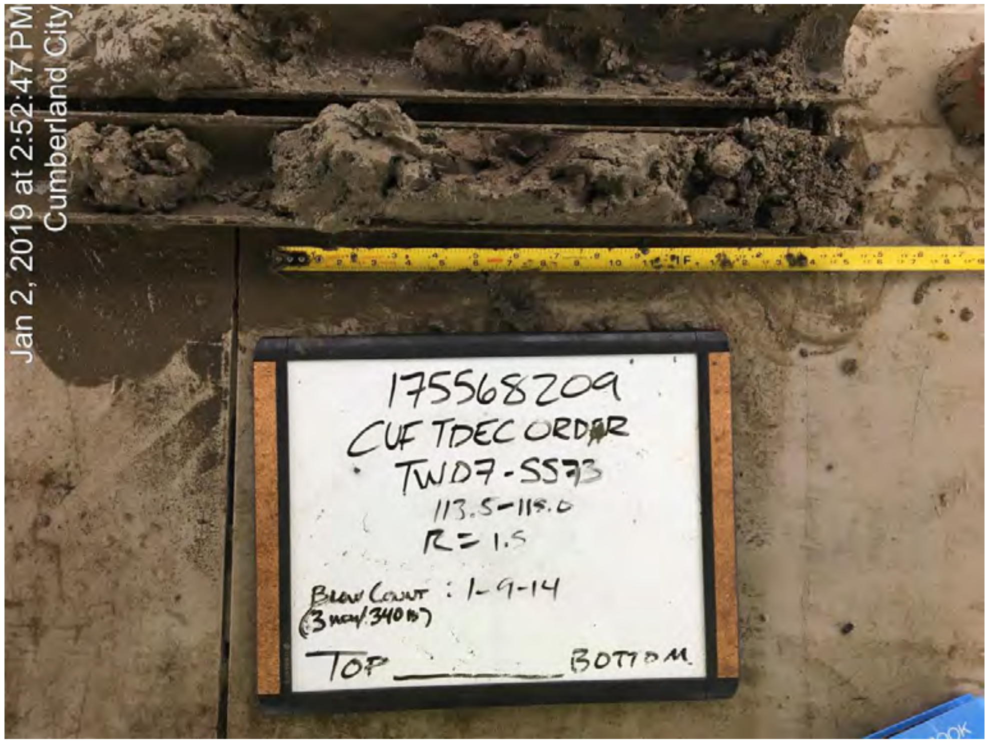
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 75

Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (113.5-115.0 feet).

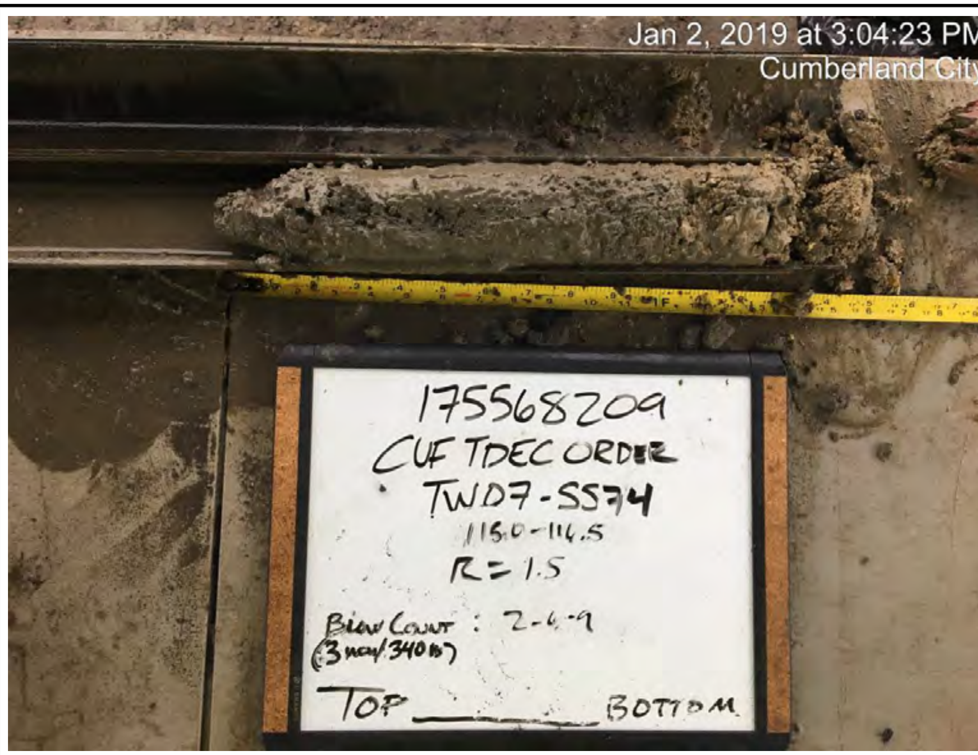


Photograph ID: 76

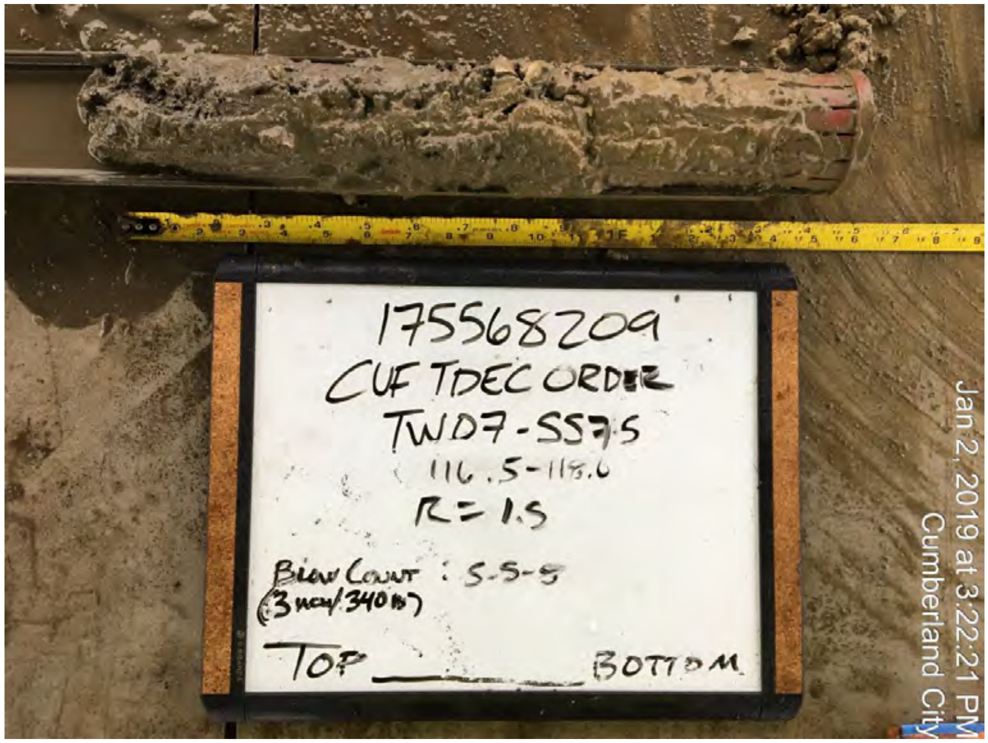
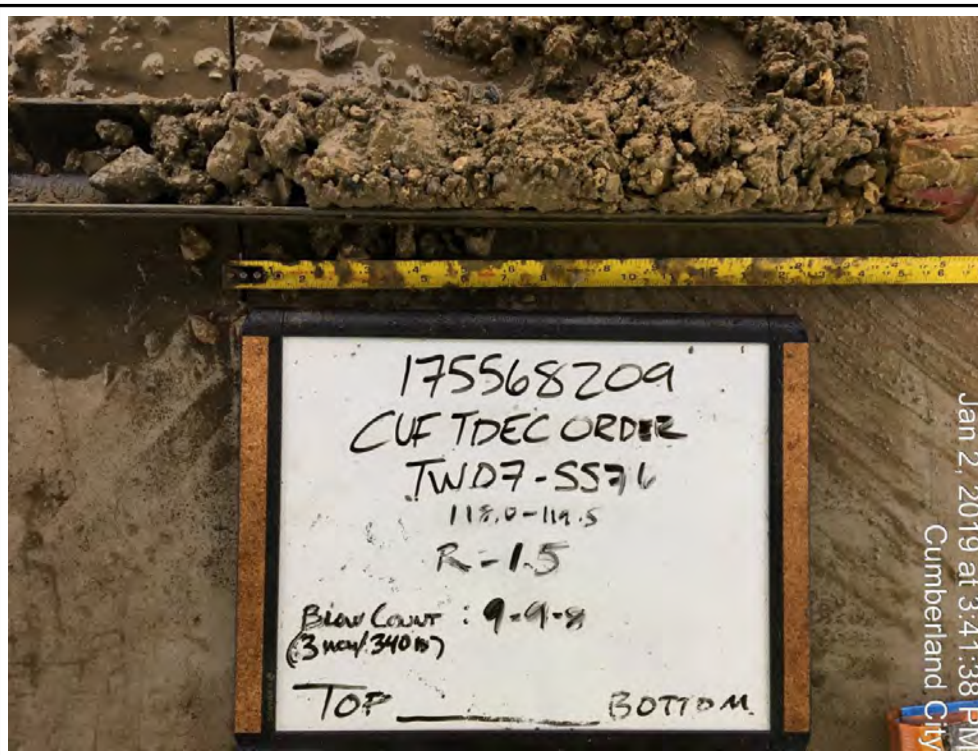
Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (115.0-116.5 feet). Blow count shown on white board is 2-6-9.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 77 **Photo Location:** CUF-TW07 **Photo Date:** 1/2/2019 **Comments:** Interval (116.5-118.0 feet). Blow count on white board is 5-5-8.	
Photograph ID: 78 **Photo Location:** CUF-TW07 **Photo Date:** 1/2/2019 **Comments:** Interval (118.0-119.5 feet).	

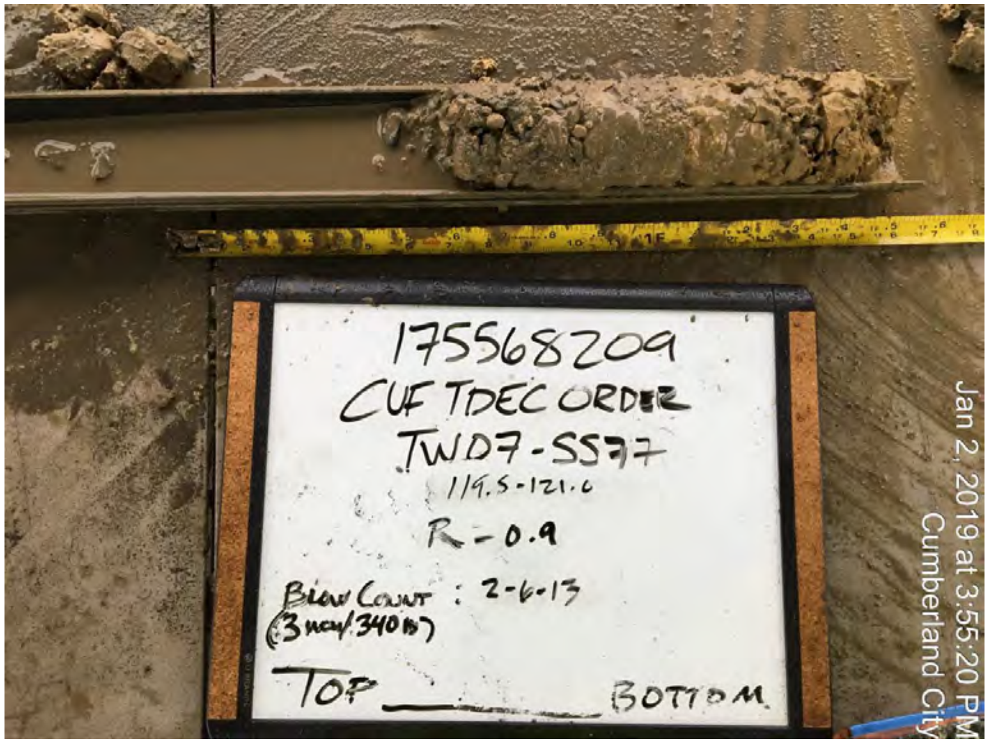
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 79

Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (119.5-121.0 feet).



Photograph ID: 80

Photo Location:
CUF-TW07

Photo Date:
1/3/2019

Comments:
Interval (121.0-122.5 feet).

Stantec

Photographic Log

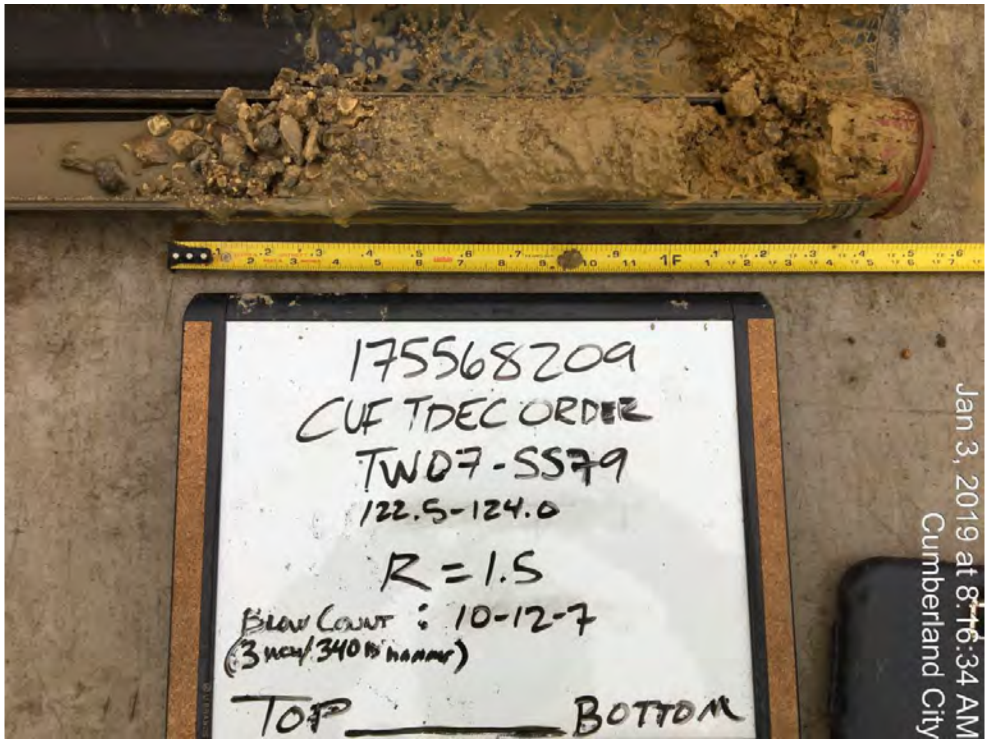
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 81

Photo Location:
CUF-TW07

Photo Date:
1/3/2019

Comments:
Interval (122.5-124.0 feet).



Photograph ID: 82

Photo Location:
CUF-TW07

Photo Date:
1/3/2019

Comments:
Interval (124.0-125.2 feet). Sampler refusal at 125.2 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 83

Photo Location: CUF-TW07

Photo Date: 1/8/2019

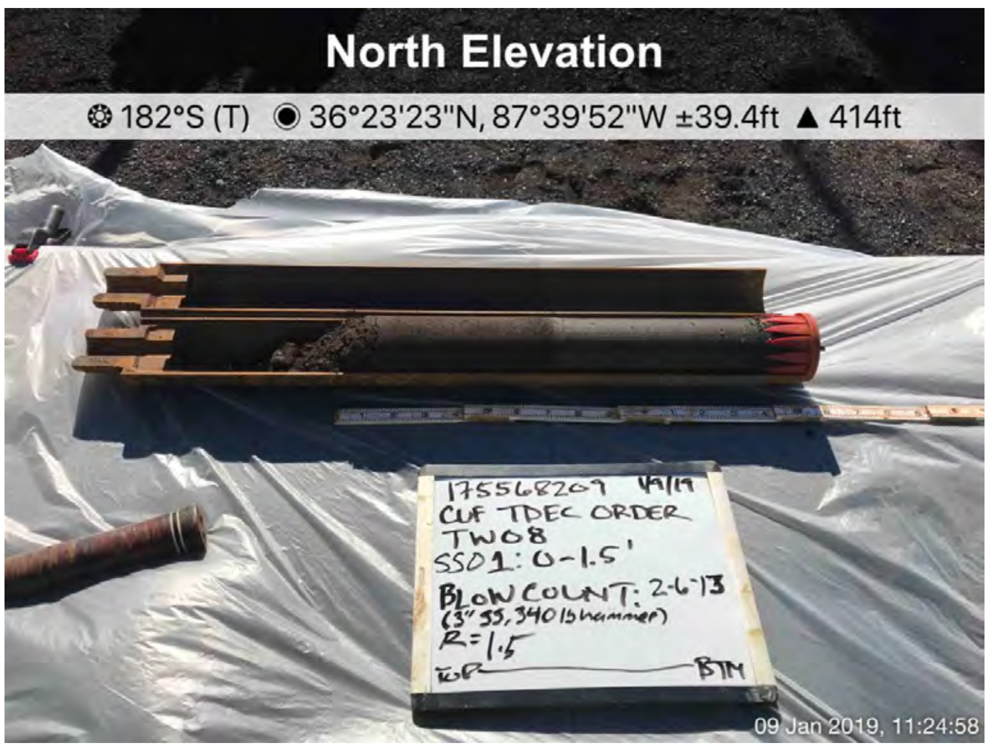
Comments: Interval (125.5-145.5 feet).

Photograph ID: 84

Photo Location: CUF-TW08

Photo Date: 1/9/2019

Comments: Interval (0.0-1.5 feet). Interval shown on white board should be 0.0-1.5 feet.



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 85

Photo Location: CUF-TW08

Photo Date: 1/9/2019

Comments: Interval (1.5-3.0 feet).

Photograph ID: 86

Photo Location: CUF-TW08

Photo Date: 1/9/2019

Comments: Interval (3.0-4.5 feet). Interval shown on white board should be 3.0-4.5 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 87

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Photo of interval (4.5-6.0 feet) unavailable.

No Photo Applicable

Photograph ID: 88

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (6.0-7.5 feet). Interval shown on white board should be 6.0-7.5 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 89

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

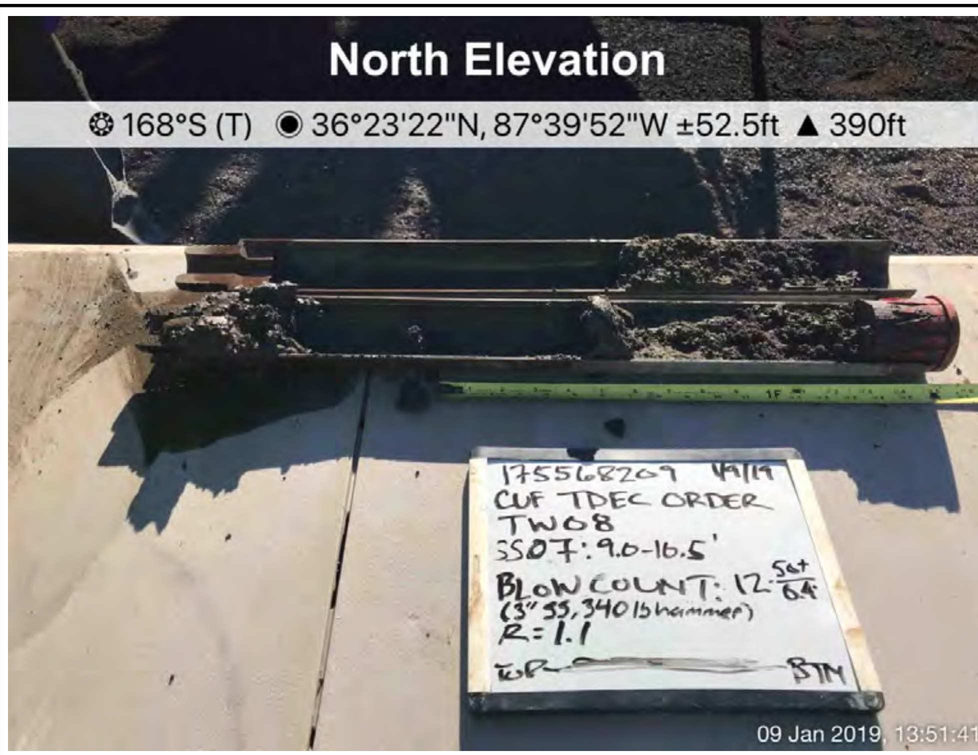
Comments:
Interval (7.5-7.8 feet). Sample identifier shown on white board should be SS06. Interval shown on white board should be 7.5-7.8 feet. Sampler refusal at 7.8 feet.

Photograph ID: 90

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (9.0-9.9 feet). Interval shown on white board should be 9.0-9.9 feet. Sampler refusal at 9.9 feet.



Stantec

Photographic Log

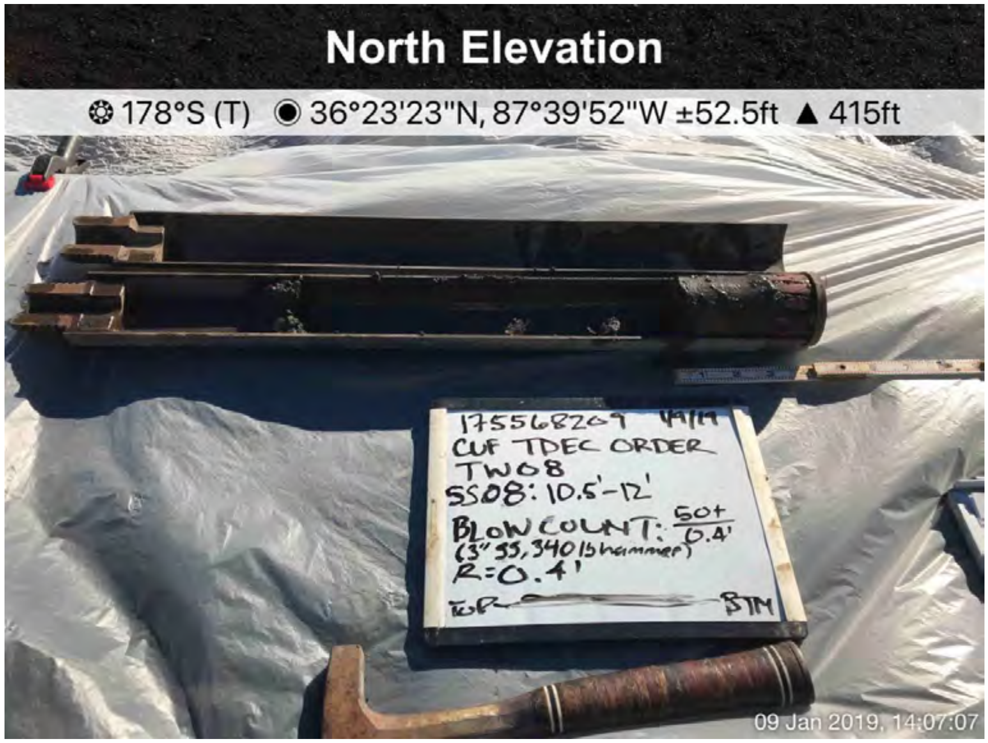
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 91

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (10.5-10.9 feet). Interval shown on white board should be 10.5-10.9 feet. Sampler refusal at 10.9 feet.



Photograph ID: 92

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Photo of interval (12.0-12.1 feet) unavailable.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 93

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (13.5-15.0 feet). Interval shown on white board should be 13.5-15.0 feet.

Photograph ID: 94

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (15.0-15.6 feet). Interval shown on white board should be 15.0-15.6 feet. Recovery on whiteboard should be 0.6. Sampler refusal at 15.6 feet.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 95

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

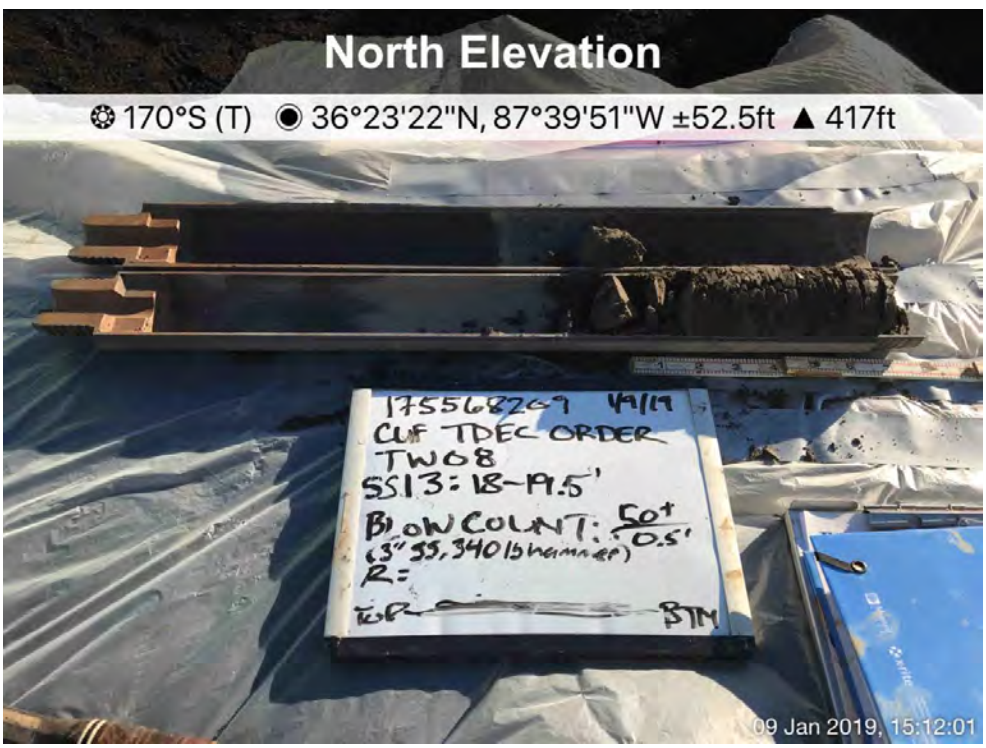
Comments:
Interval (16.5-17.3 feet). Interval shown on white board should be 16.5-17.3 feet. Recovery on whiteboard should be 0.8. Sampler refusal at 17.3 feet.

Photograph ID: 96

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (18.0-18.5 feet). Interval on white board should be 18.0-18.5 feet. Recovery on white board should be 0.5 feet. Sampler refusal at 18.5 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 97

Photo Location: CUF-TW08

Photo Date: 1/9/2019

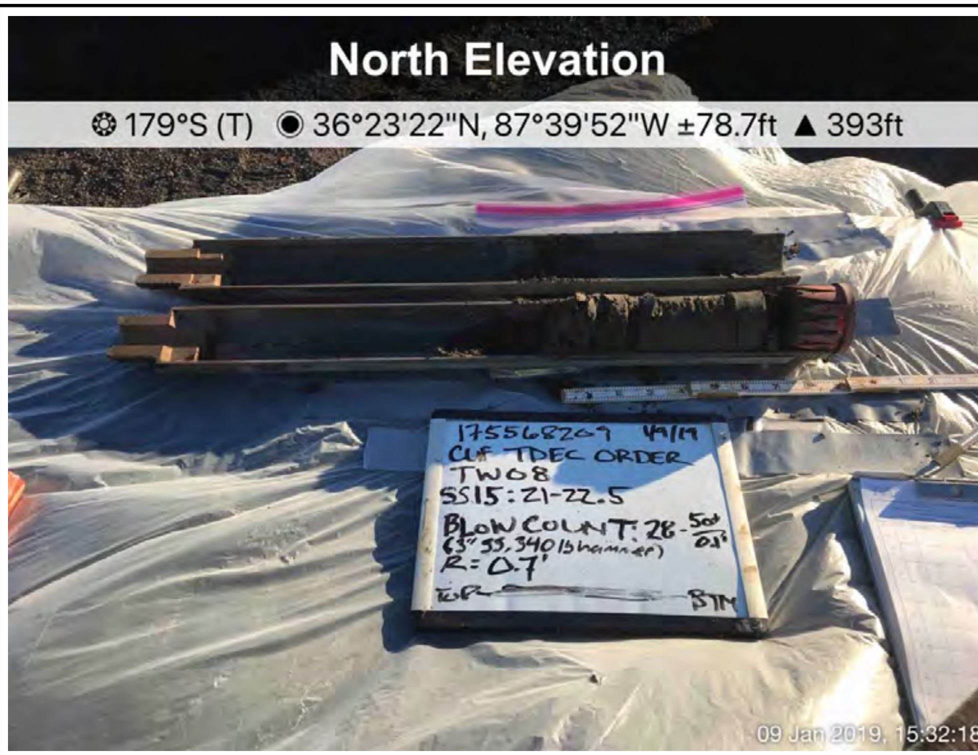
Comments: Interval (19.5-19.9 feet). Interval on white board should be 19.5-19.9 feet.

Photograph ID: 98

Photo Location: CUF-TW08

Photo Date: 1/9/2019

Comments: Interval (21.0-21.6 feet). Interval shown on white board should be 21.0-21.6. Recovery shown on white board should be 0.6. Sampler refusal at 21.6 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 99

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

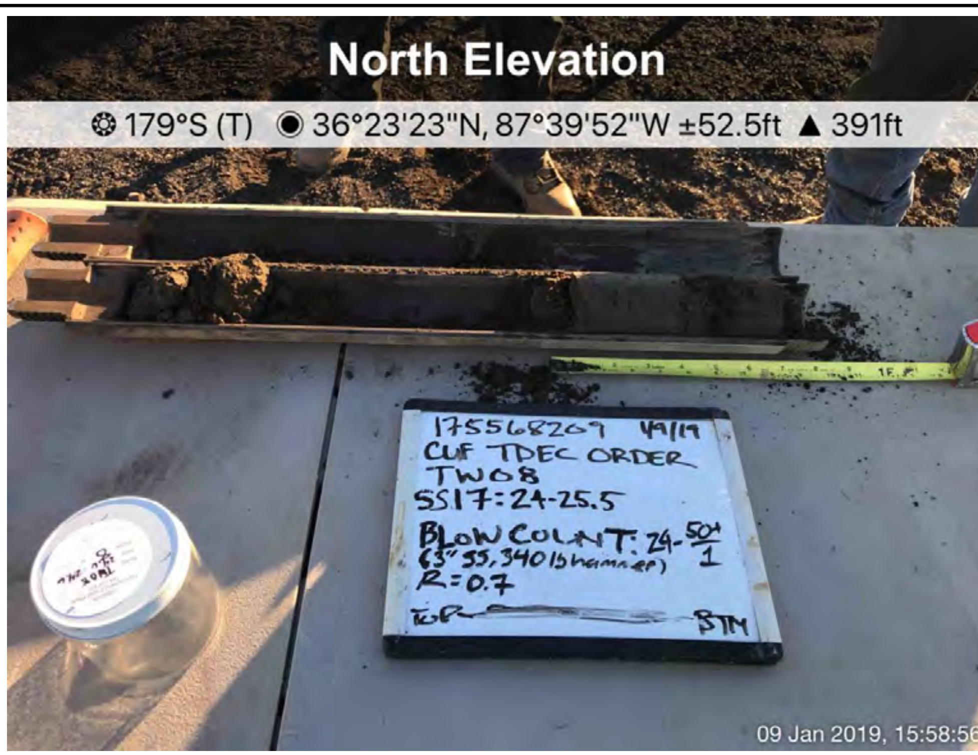
Comments:
Interval (22.5-23.0 feet). Interval shown on white board should be 22.5-23.0. Recovery shown on white board should be 0.5. Sampler refusal at 23.0 feet.

Photograph ID: 100

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (24.0-24.6 feet). Interval shown on white board should be 24.0-24.6. Recovery shown on white board should be 0.6. Sampler refusal at 24.6 feet.



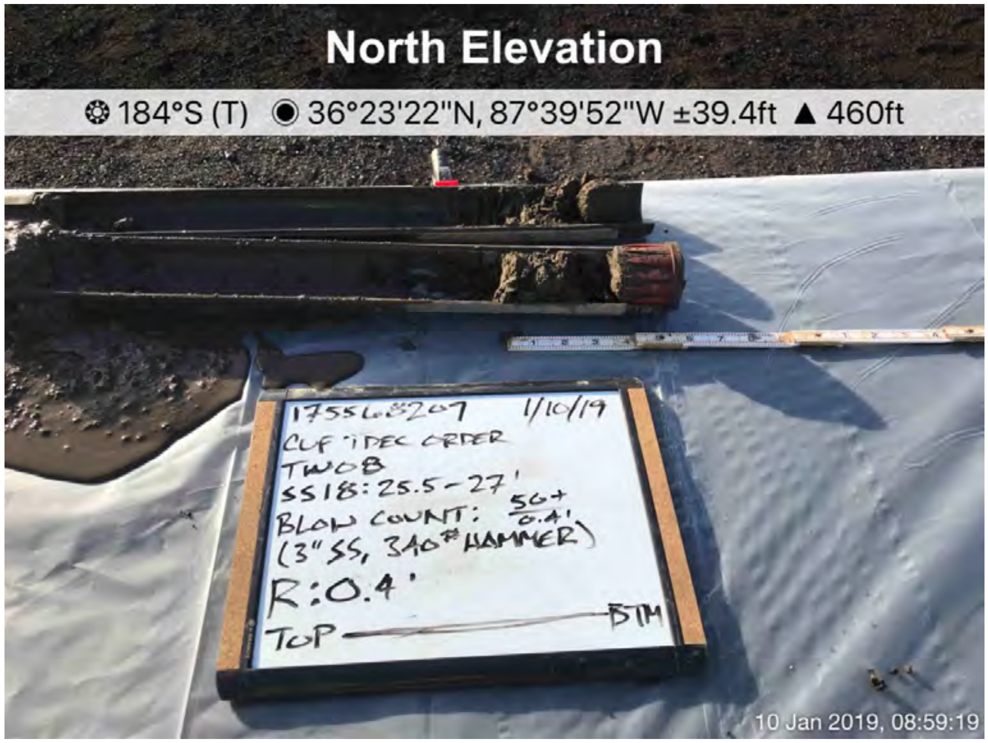
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 101

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (25.5-25.9 feet). Project number shown on white board is 175568209. Interval shown on white board should be 25.5-25.9. Sampler refusal at 25.9 feet.

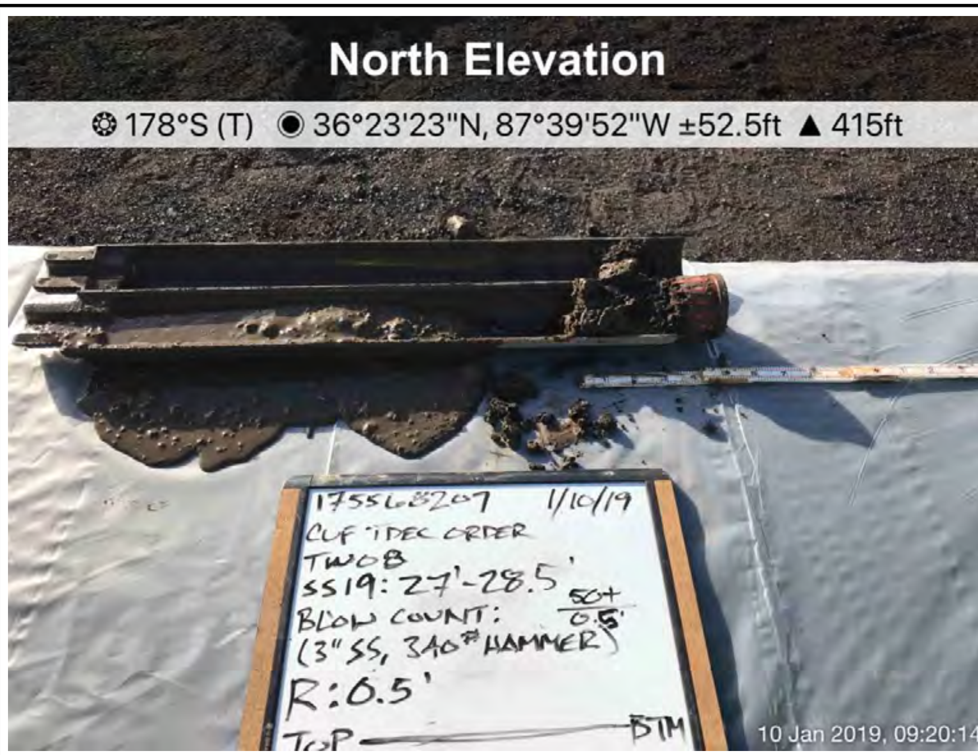


Photograph ID: 102

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

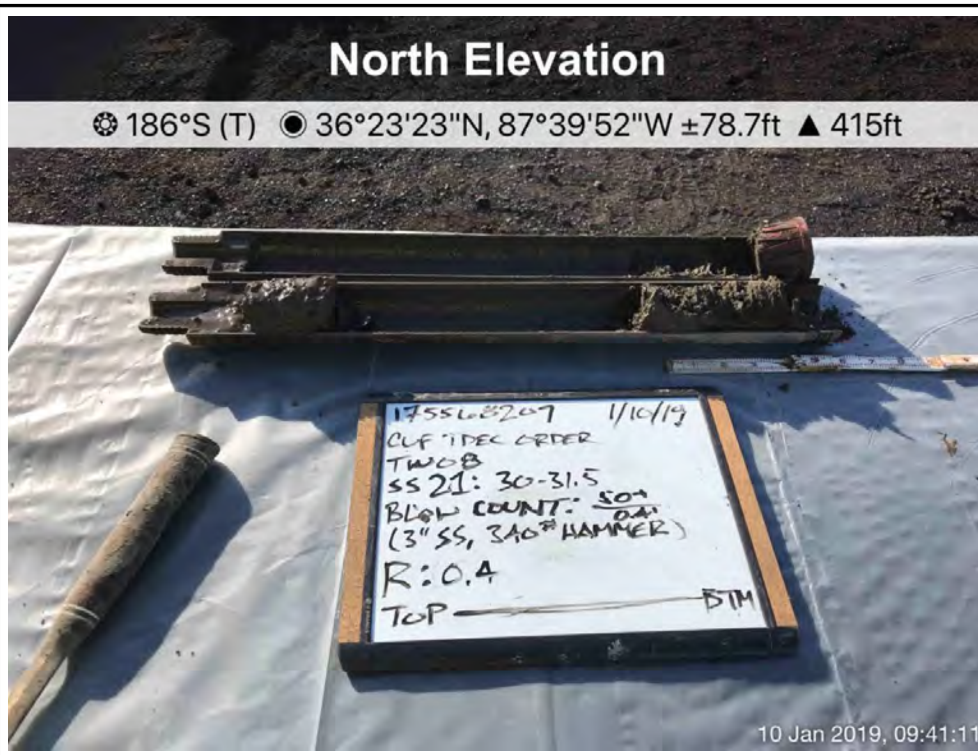
Comments:
Interval (27.0-27.5 feet). Project number shown on white board is 175568209. Interval shown on white board should be 27.0-27.5. Sampler refusal at 27.5 feet.



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 103 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (28.5-28.8 feet). Project number shown on white board is 175568209. Interval shown on white board should be 28.5-28.8. Sampler refusal at 28.8 feet.	
Photograph ID: 104 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (30.0-30.4 feet). Project number shown on white board is 175568209. Interval shown on white board should be 30.0-30.4. Sampler refusal at 30.4 feet.	

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 105

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (31.5-33.0 feet). Project number shown on white board is 175568209. Interval shown on white board should be 31.5-33.0 feet.

Photograph ID: 106

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (33.0-34.5 feet). Project number shown on white board is 175568209. Interval shown on white board should be 33.0-34.5 feet.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 107

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (34.5-36.0 feet). Project number shown on white board is 175568209. Interval shown on white board should be 34.5-36.0 feet.

Photograph ID: 108

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (36.0-37.5 feet). Project number shown on white board is 175568209. Interval shown on white board should be 36.0-37.5 feet.

Stantec

Photographic Log

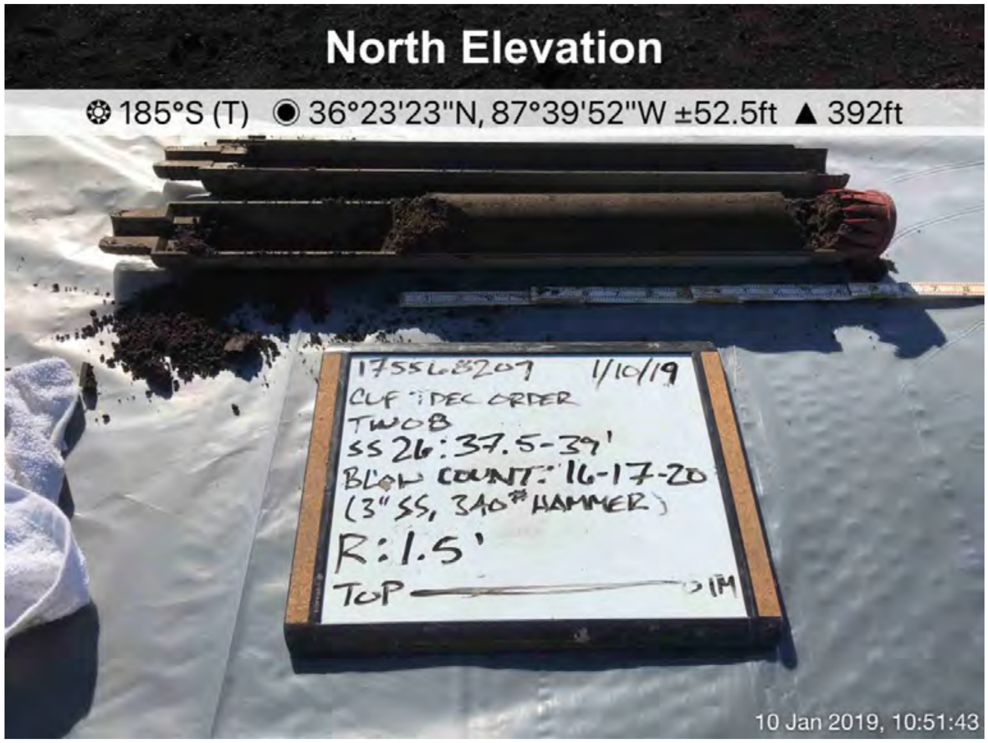
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 109

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (37.5-39.0 feet). Project number shown on white board is 175568209. Interval shown on white board should be 37.5-39.0 feet.



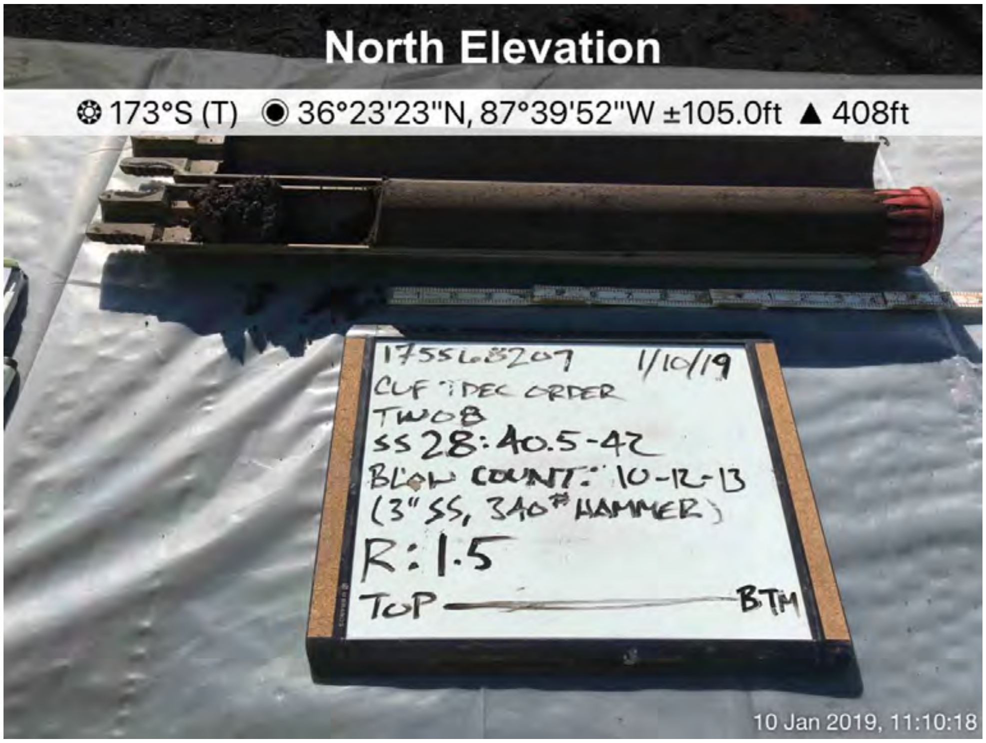
Photograph ID: 110

Photo Location:
CUF-TW08

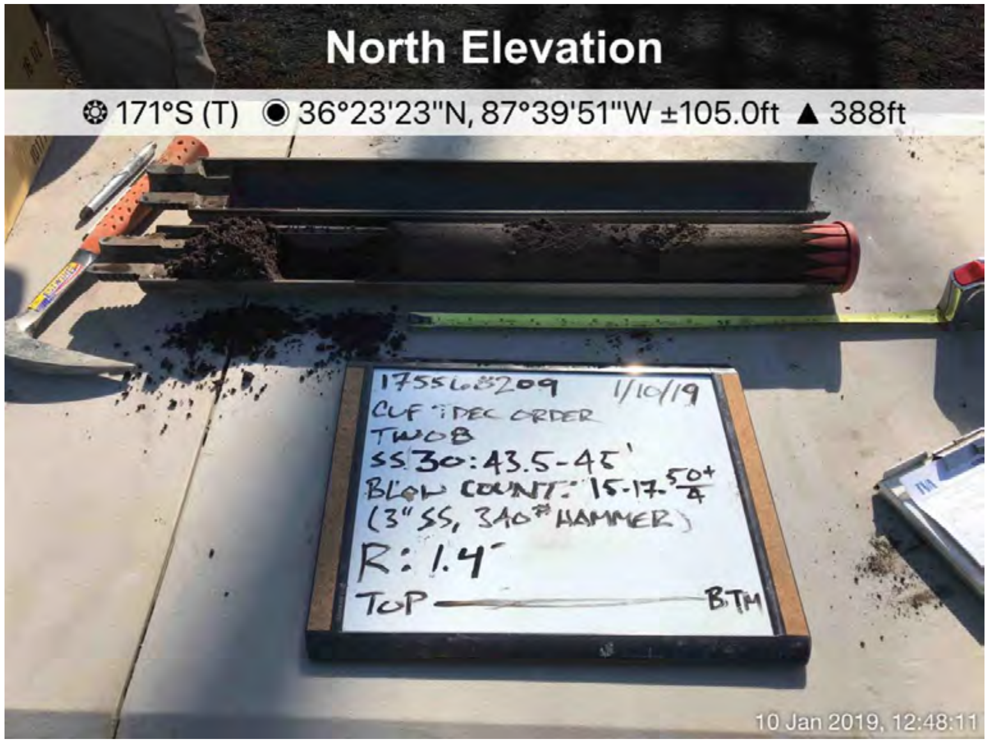
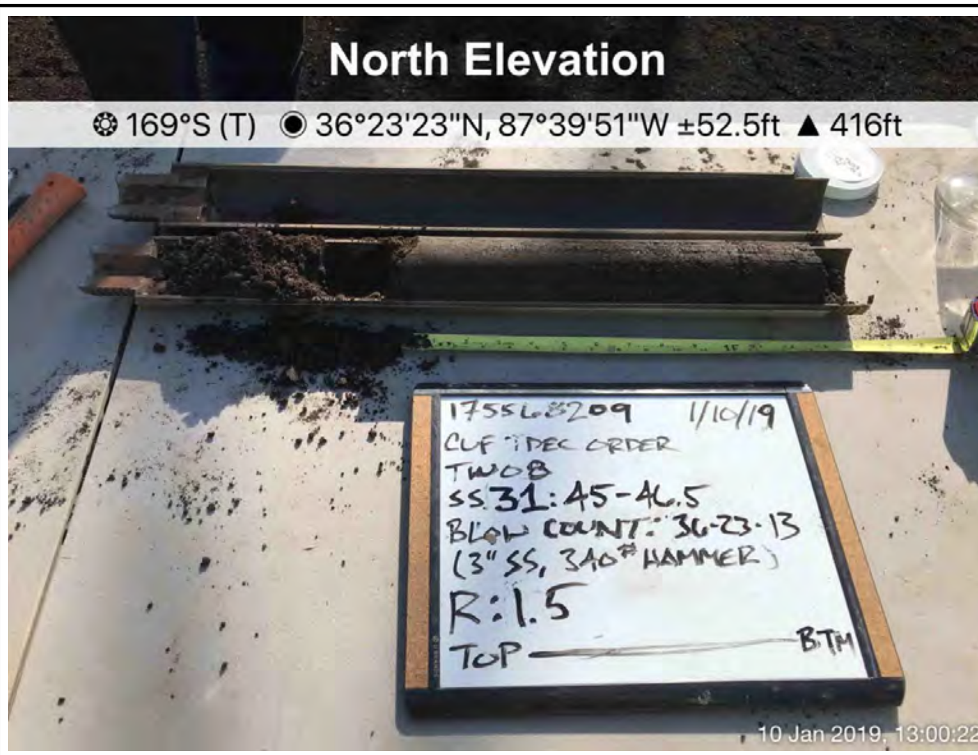
Photo Date:
1/10/2019

Comments:
Interval (39.0-40.5 feet). Project number shown on white board is 175568209. Interval shown on white board should be 39.0-40.5 feet.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 111 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (40.5-42.0 feet). Project number shown on white board is 175568209. Interval shown on white board should be 40.5-42.0 feet.	
Photograph ID: 112 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (42.0-43.5 feet). Interval shown on white board should be 42.0-43.5 feet.	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 113 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (43.5-44.9 feet). Interval shown on white board should be 43.5-44.9 feet. Sampler refusal at 44.9 feet.	
Photograph ID: 114 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (45.0-46.5 feet). Interval shown on white board should be 45.0-46.5 feet.	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 115

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

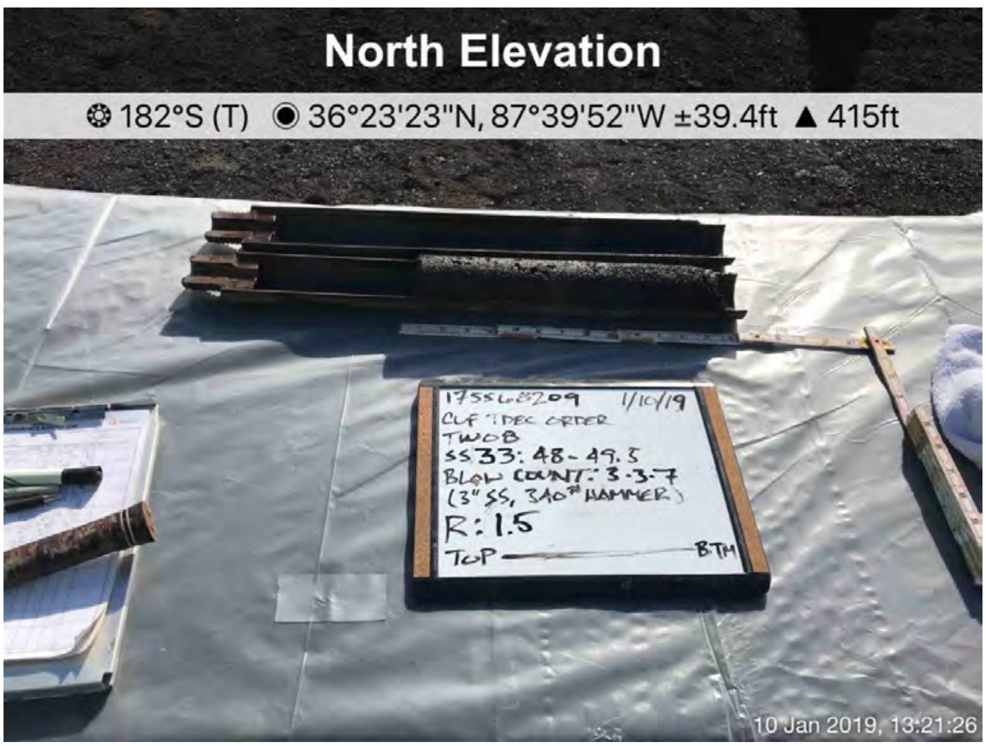
Comments:
Interval (46.5-48.0 feet). Interval shown on white board should be 46.5-48.0 feet.

Photograph ID: 116

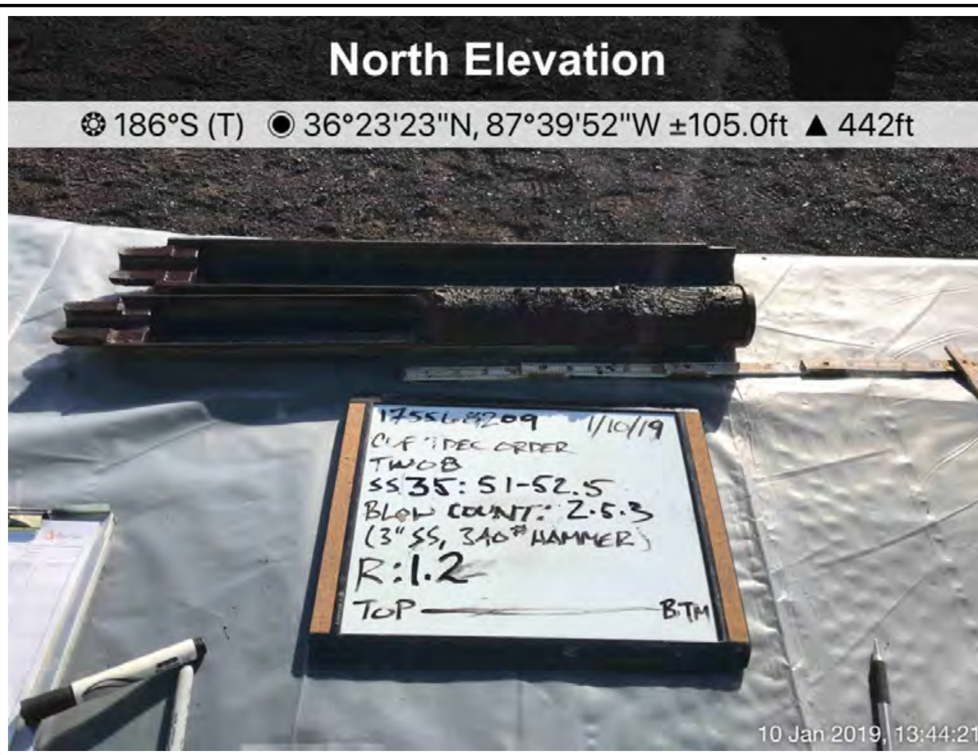
Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (48.0-49.5 feet). Interval shown on white board should be 48.0-49.5 feet.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 117 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (49.5-51.0 feet). Interval shown on white board should be 49.5-51.0 feet.	
Photograph ID: 118 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (51.0-52.5 feet). Interval shown on white board should be 51.0-52.5 feet.	

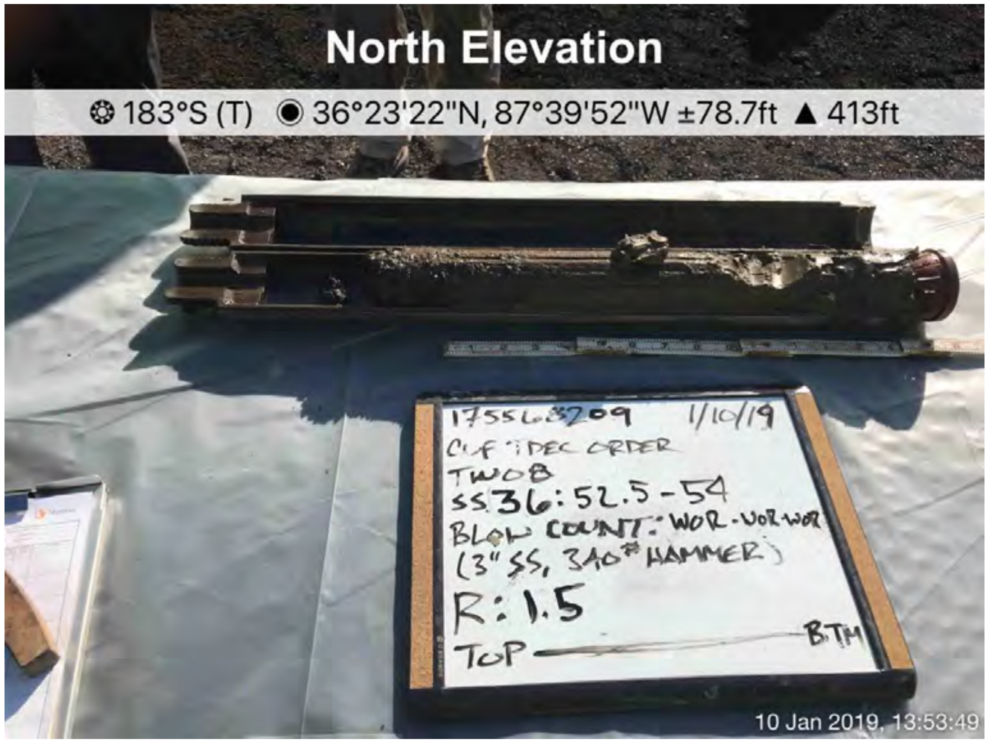
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 119

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (52.5-54.0 feet). Interval shown on white board should be 52.5-54.0 feet. WOR on white board is the same as WR on the boring log.

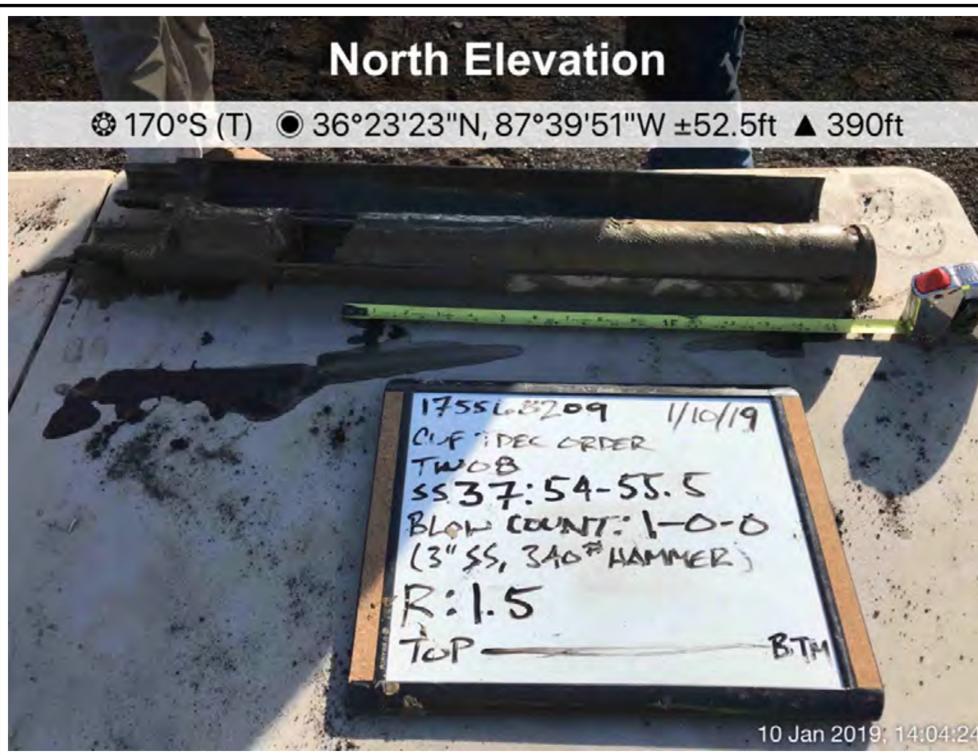


Photograph ID: 120

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (54.0-55.5 feet). Interval shown on white board should be 54.0-55.5 feet. Blowcount on white board should be 1-WH-WH.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 121

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (55.5-57.0 feet). Interval shown on white board should be 55.5-57.0 feet. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log. Recovery on white board should be 1.3 feet.

Photograph ID: 122

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (57.0-58.5 feet). Interval shown on white board should be 57.0-58.5 feet. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

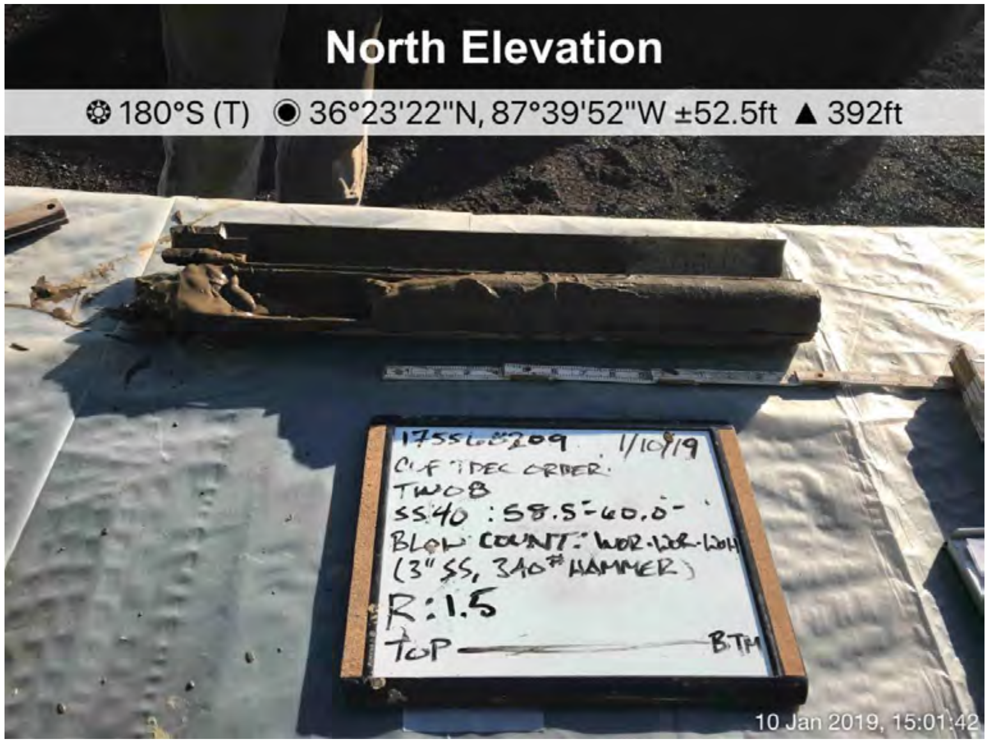
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 123

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (58.5-60.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

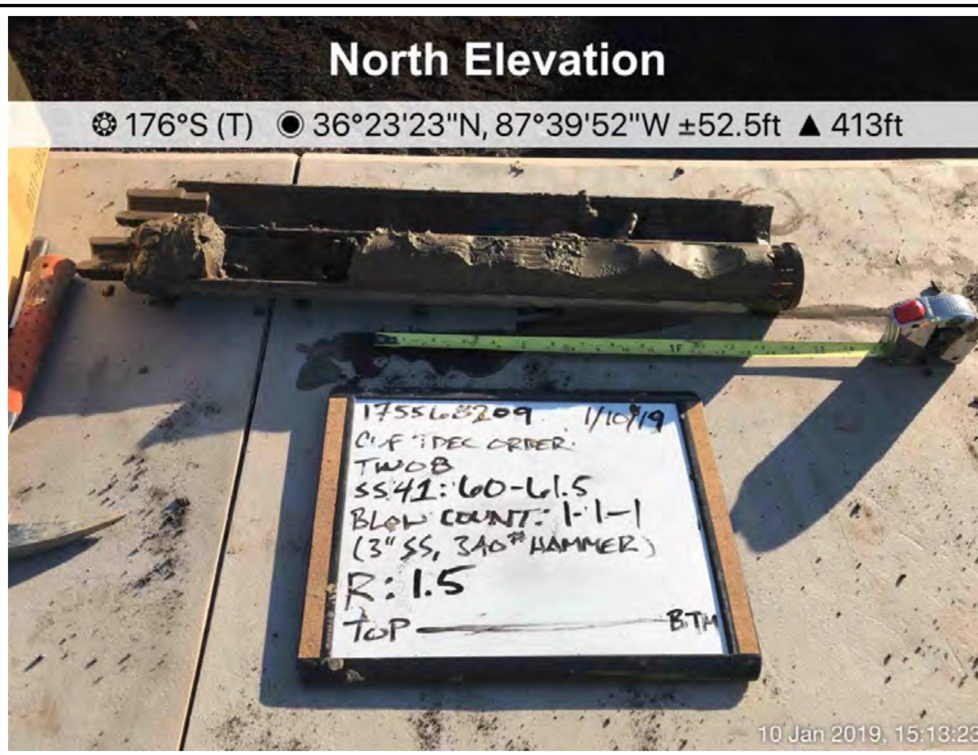


Photograph ID: 124

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (60.0-61.5 feet). Interval shown on white board should be 60.0-61.5 feet.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 125

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

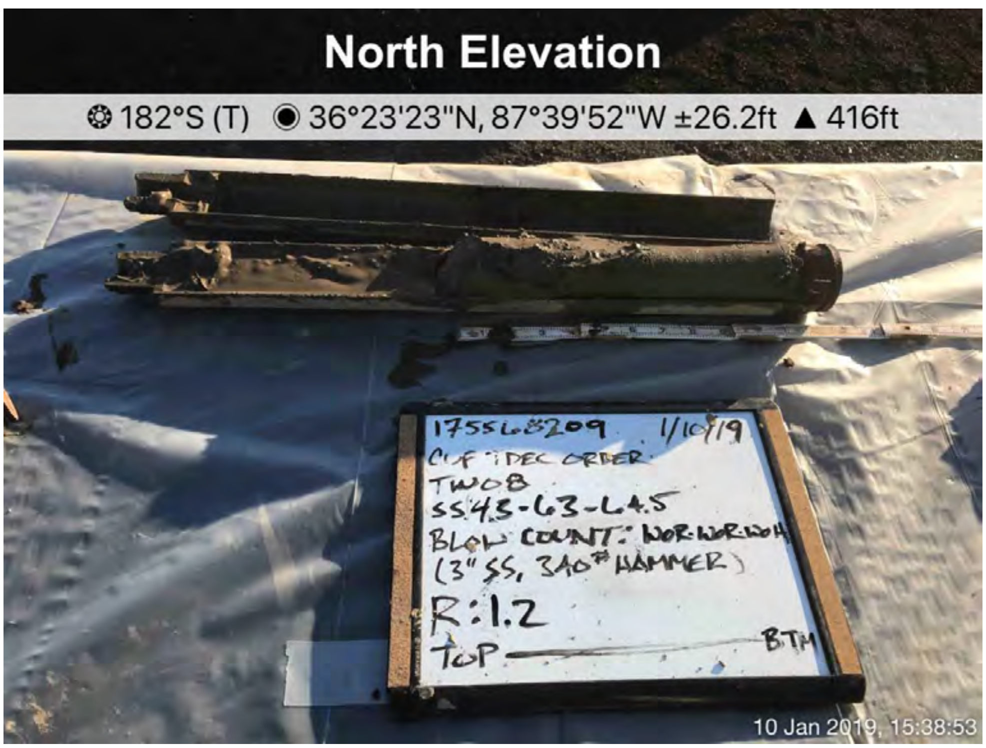
Comments:
Interval (61.5-63.0 feet). Interval shown on white board should be 61.5-63.0 feet. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

Photograph ID: 126

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (63.0-64.5 feet). Interval shown on white board should be 63.0-64.5 feet. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.



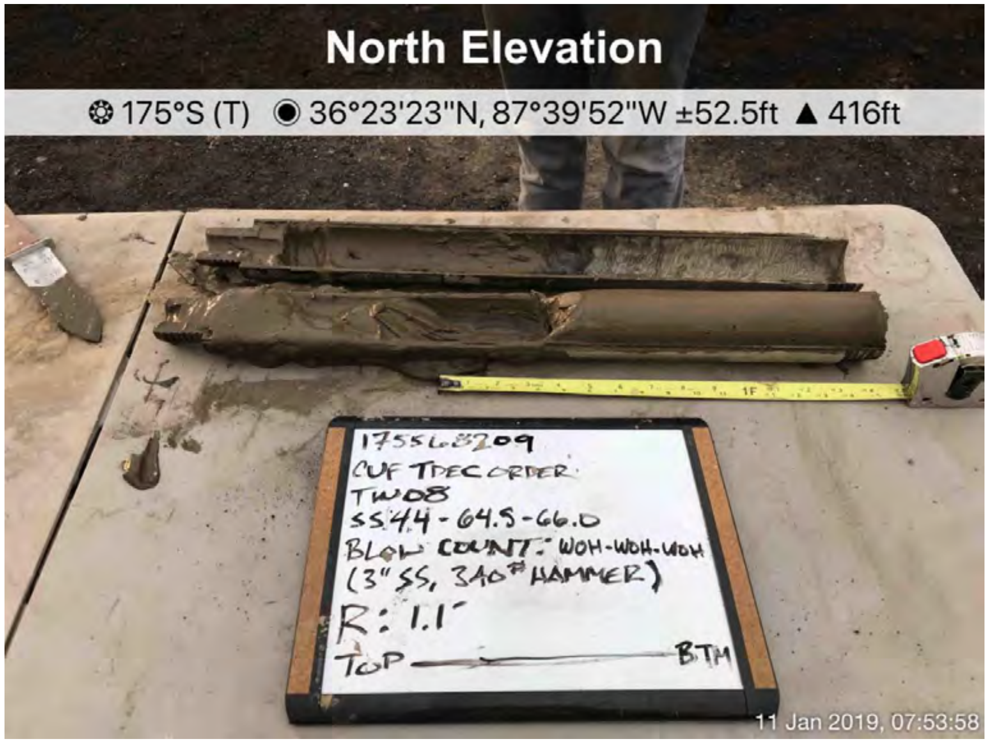
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 127

Photo Location:
CUF-TW08

Photo Date:
1/11/2019

Comments:
Interval (64.5-66.0 feet). WOH on white board is the same as WH on the boring log.

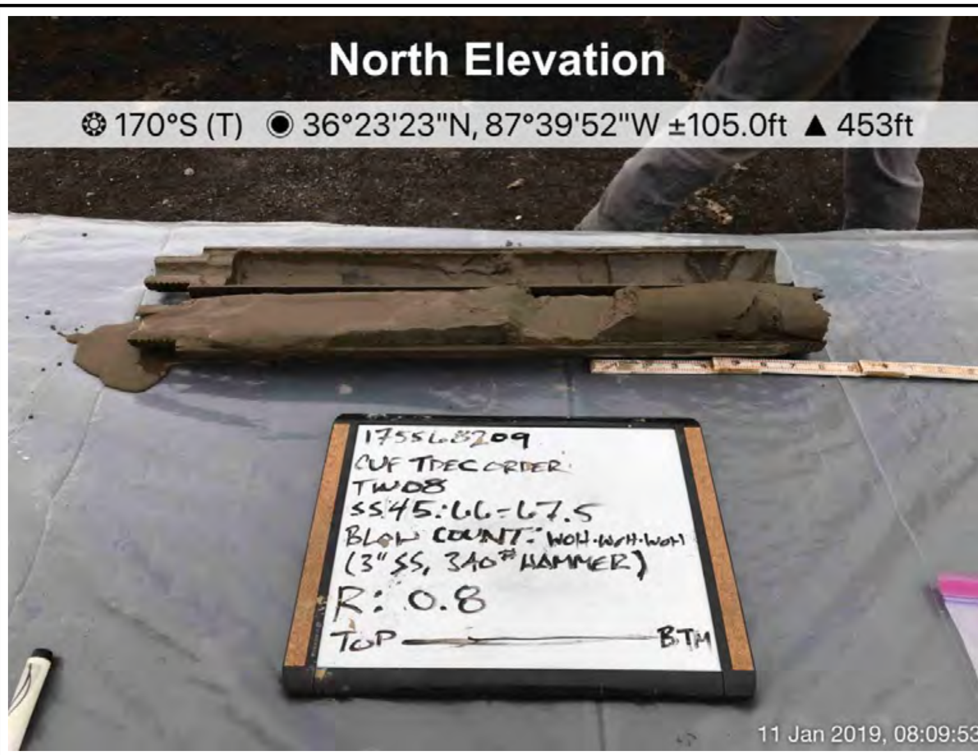


Photograph ID: 128

Photo Location:
CUF-TW08

Photo Date:
1/11/2019

Comments:
Interval (66.0-67.5 feet). Interval shown on white board should be 66.0-67.5 feet. WOH on white board is the same as WH on the boring log.



Stantec

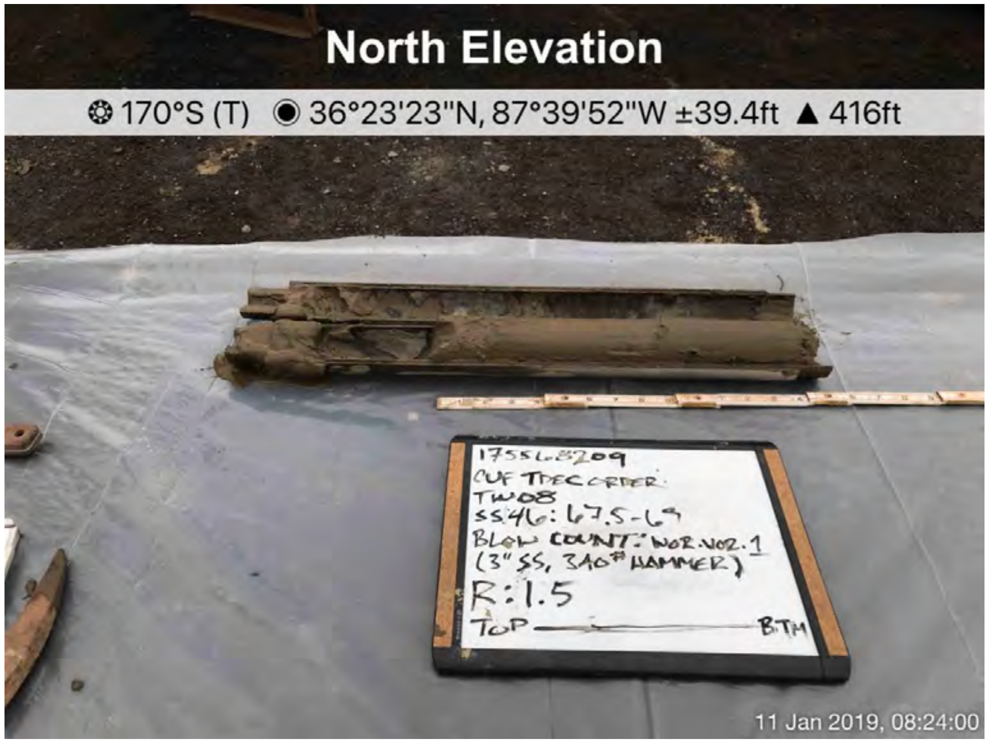
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 129

Photo Location:
CUF-TW08

Photo Date:
1/11/2019

Comments:
Interval (67.5-69.0 feet). Interval shown on white board should be 67.5-69.0 feet. WOR on white board is the same as WR on the boring log.



Photograph ID: 130

Photo Location:
TW08

Photo Date:
1/11/2019

Comments:
Photo of interval (69.0-71.0 feet) unavailable because sample collected with shelby tube..

No Photo Applicable

Stantec

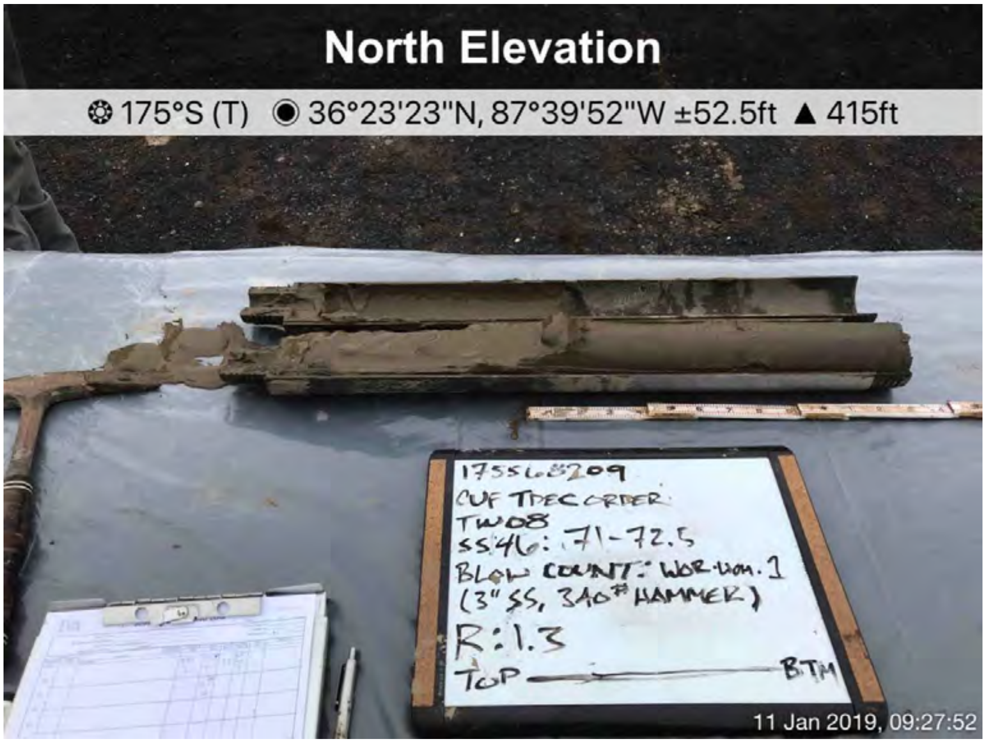
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 131

Photo Location:
CUF-TW08

Photo Date:
1/11/2019

Comments:
Interval (71.0-72.5 feet). Interval shown on white board should be 71.0-72.5 feet. Sample identifier shown on white board should be SS47. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

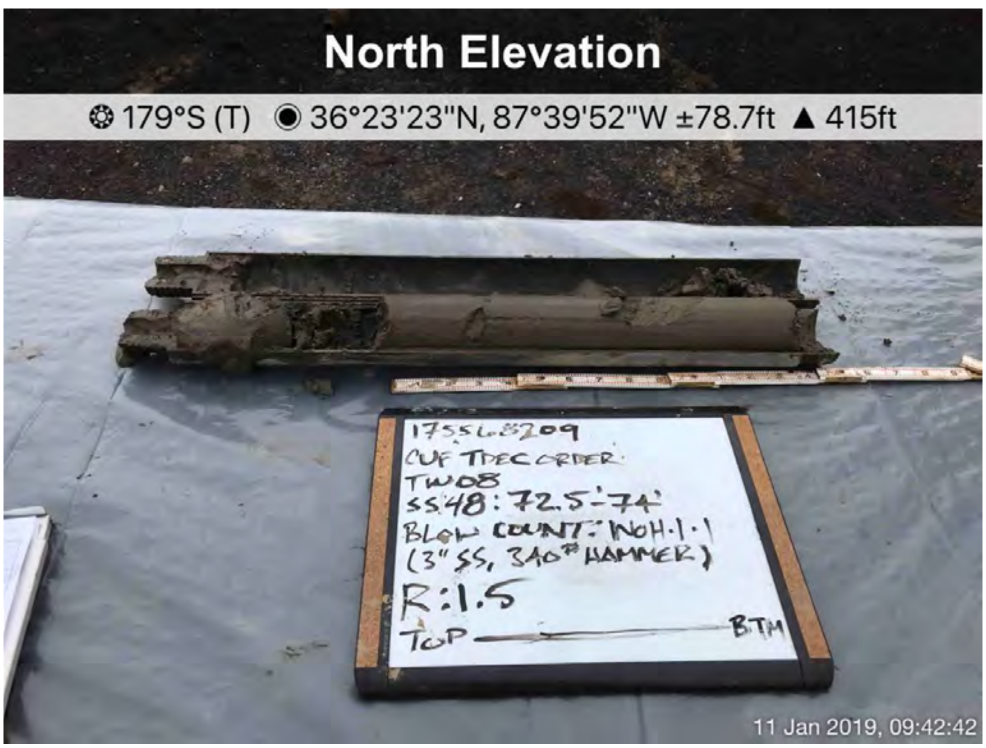


Photograph ID: 132

Photo Location:
CUF-TW08

Photo Date:
1/11/2019

Comments:
Interval (72.5-74.0 feet). Interval shown on white board should be 72.5-74.0 feet. WOH on white board is the same as WH on the boring log.



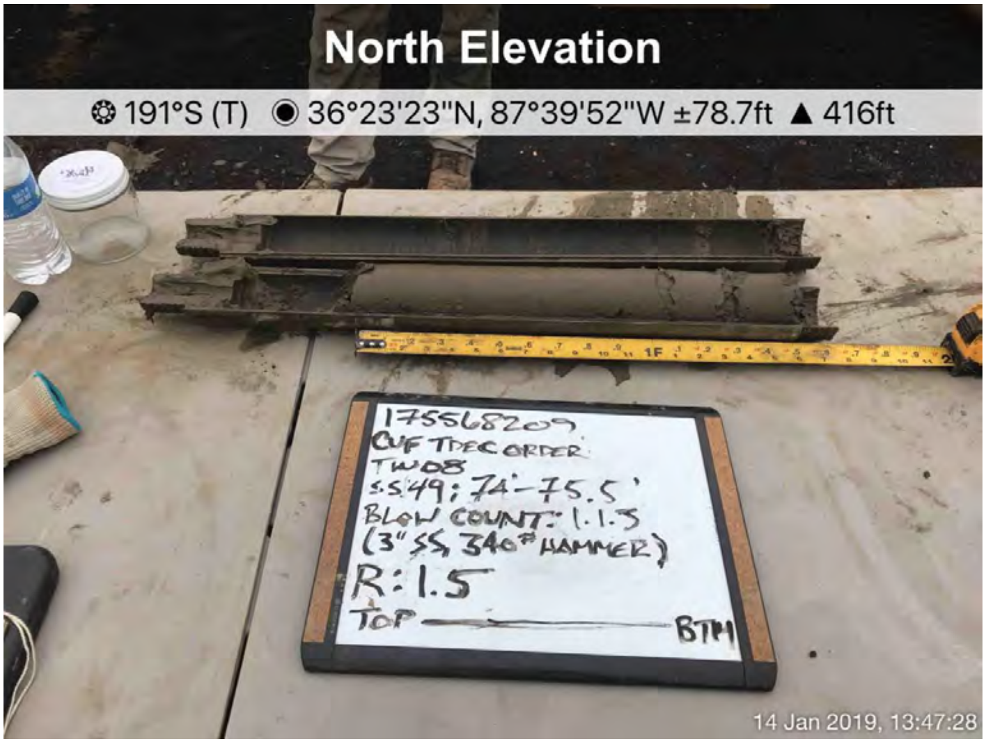
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 133

Photo Location: CUF-TW08

Photo Date: 1/14/2019

Comments: Interval (74.0-75.5 feet). Interval shown on white board should be 74.0-75.5 feet.

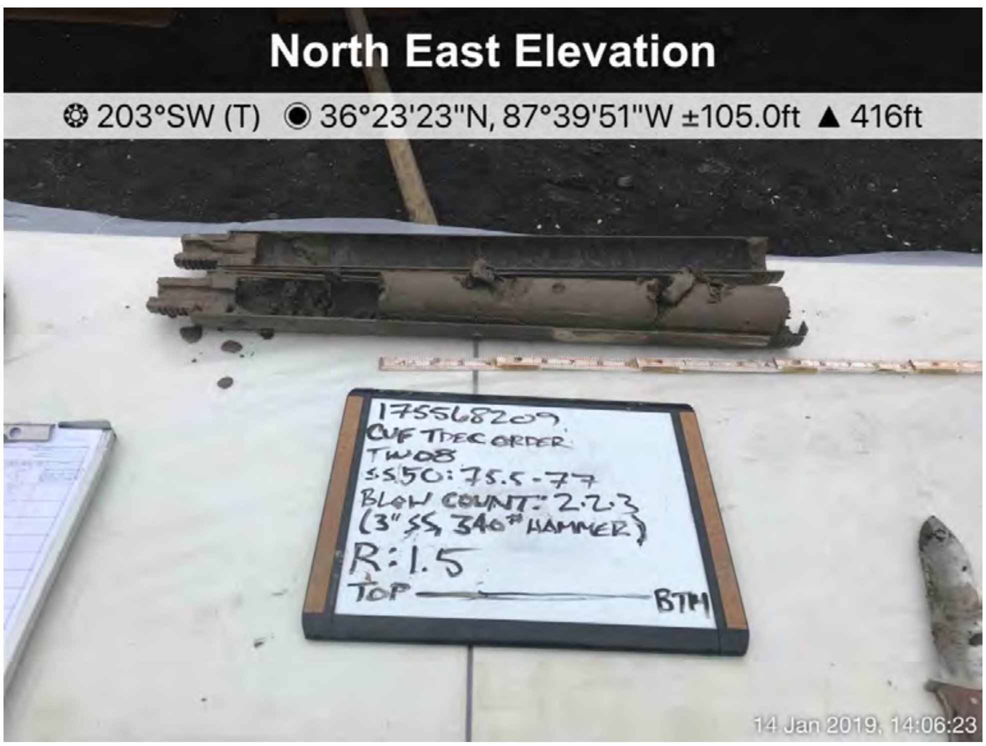


Photograph ID: 134

Photo Location: CUF-TW08

Photo Date: 1/14/2019

Comments: Interval (75.5-77.0 feet). Interval shown on white board should be 75.5-77.0 feet.



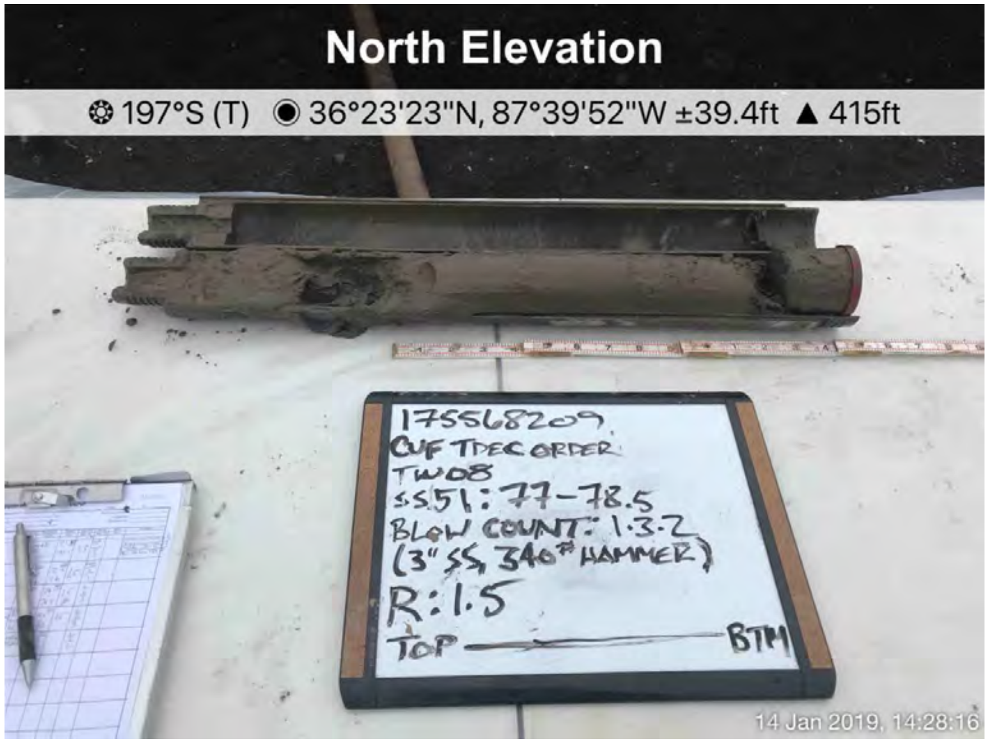
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 135

Photo Location:
CUF-TW08

Photo Date:
1/14/2019

Comments:
Interval (77.0-78.5 feet). Interval shown on white board should be 77.0-78.5 feet.

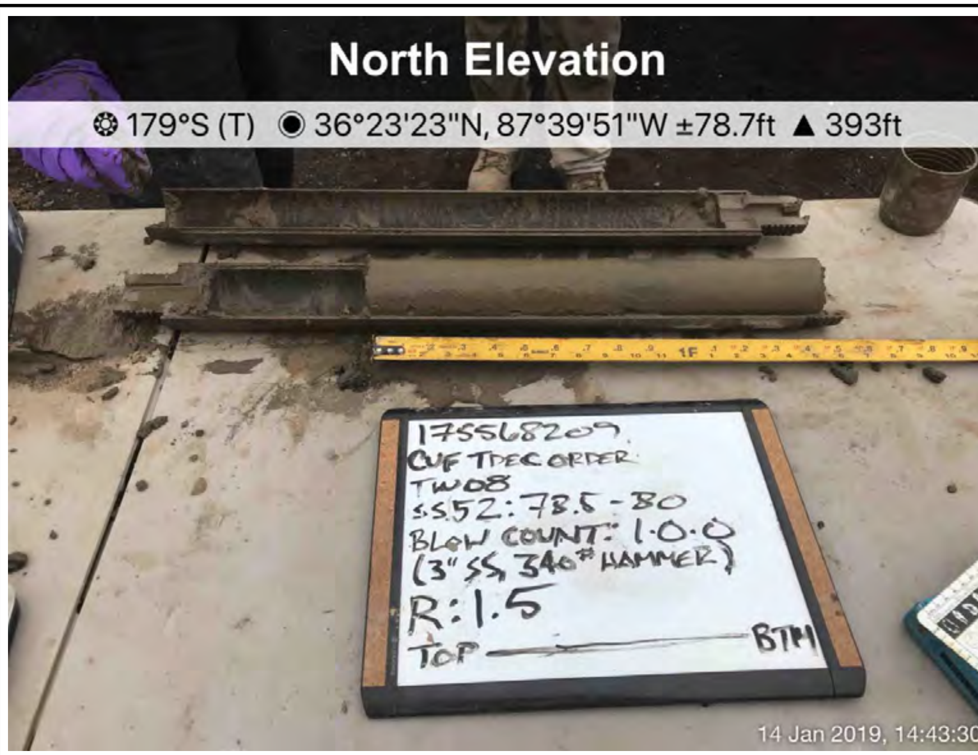


Photograph ID: 136

Photo Location:
CUF-TW08

Photo Date:
1/14/2019

Comments:
Interval (78.5-80.0 feet). Interval shown on white board should be 78.5-80.0 feet. Blowcount shown on white board should be 1-WH-WH.



Stantec

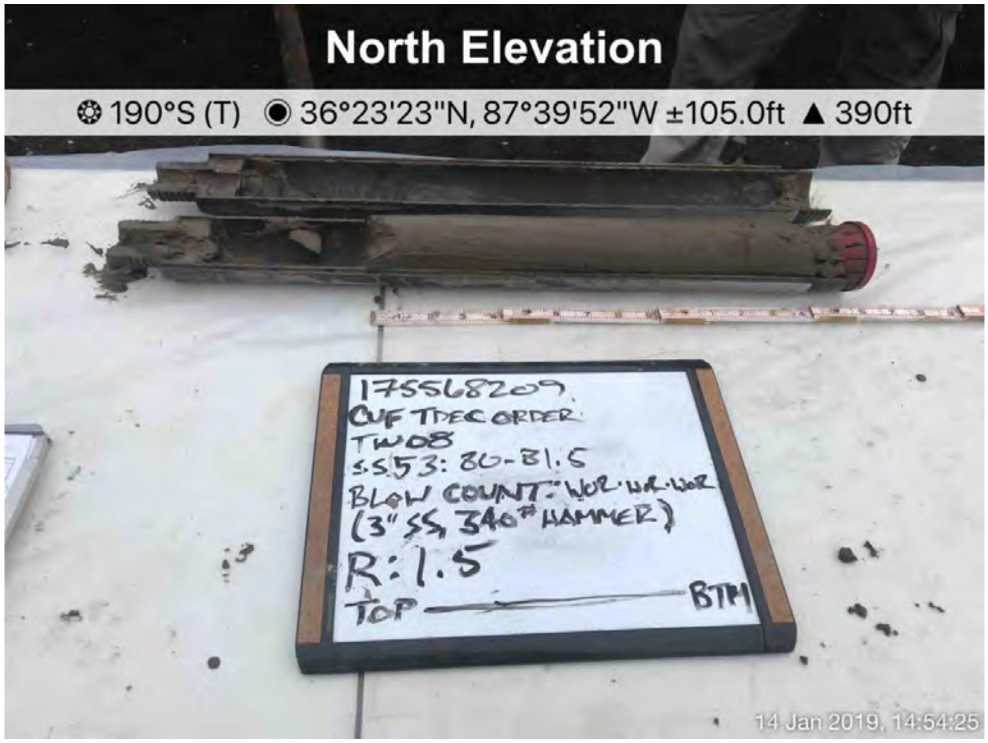
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 137

Photo Location: CUF-TW08

Photo Date: 1/14/2019

Comments: Interval (80.0-81.5 feet). Interval shown on white board should be 80.0-81.5 feet. WOR on white board is the same as WR on the boring log.

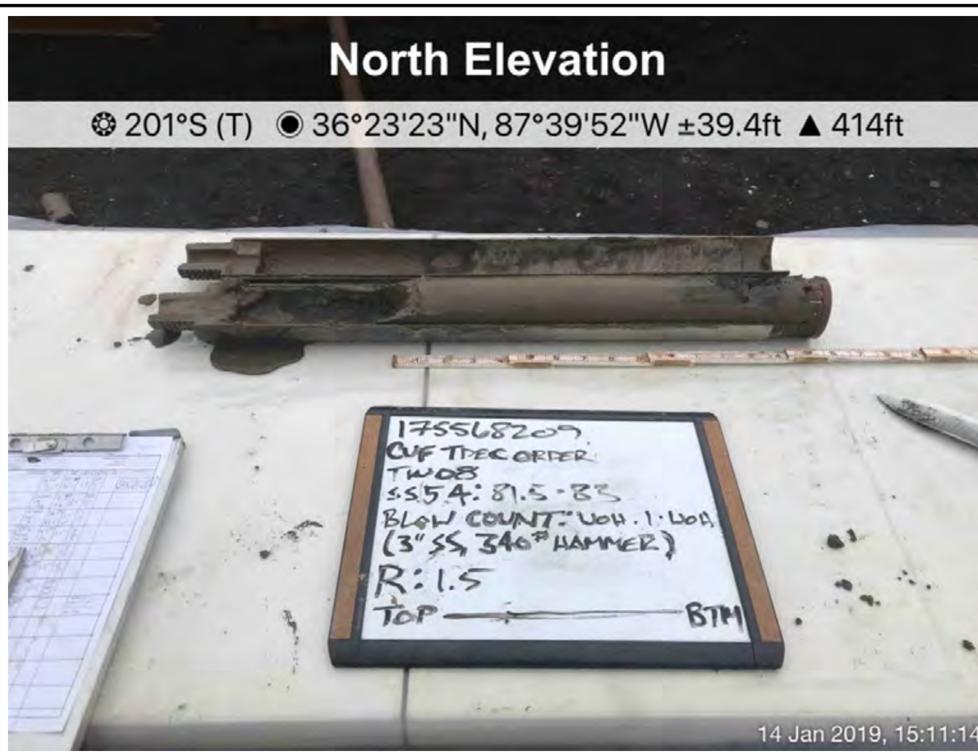


Photograph ID: 138

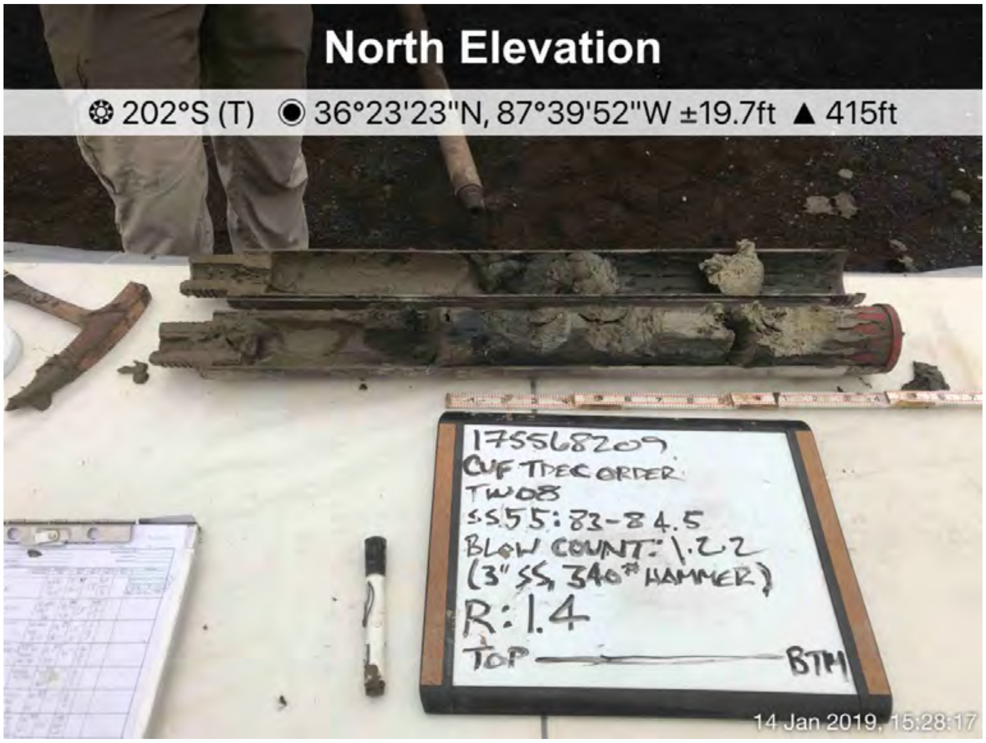
Photo Location: CUF-TW08

Photo Date: 1/14/2019

Comments: Interval (81.5-83.0 feet). Interval shown on white board should be 81.5-83.0 feet. WOH on white board is the same as WH on the boring log.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 139 **Photo Location:** CUF-TW08 **Photo Date:** 1/14/2019 **Comments:** Interval (83.0-84.5 feet). Interval shown on white board should be 83.0-84.5 feet.	
Photograph ID: 140 **Photo Location:** CUF-TW08 **Photo Date:** 1/14/2019 **Comments:** Photo of interval (84.5-86.5 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

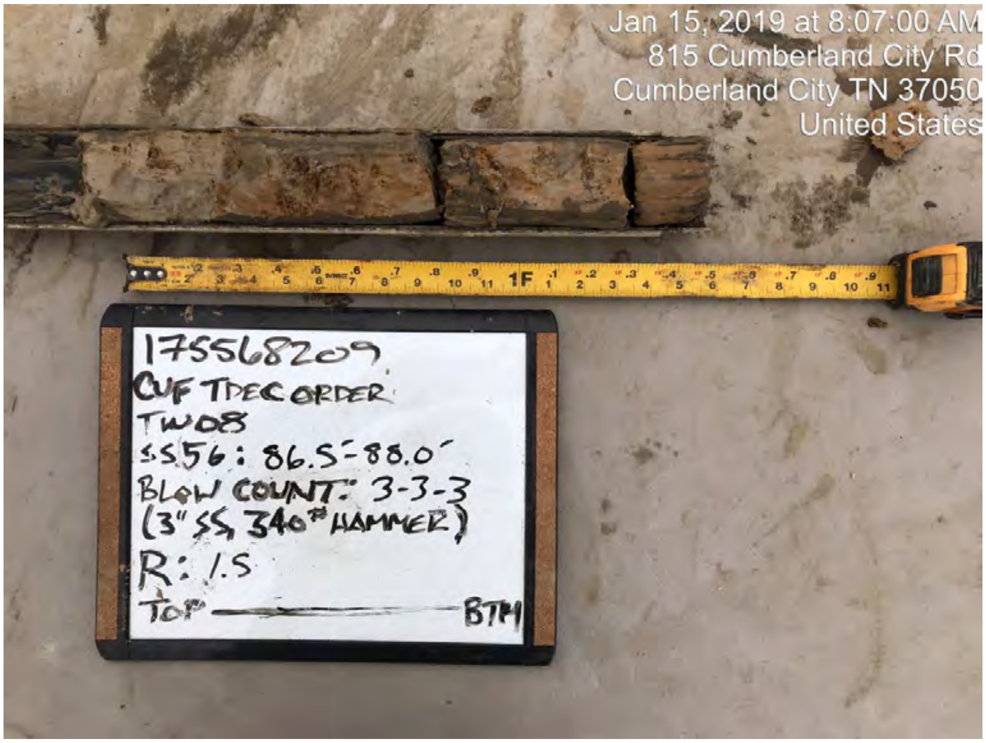
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 141

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (86.5-88.0 feet).



Photograph ID: 142

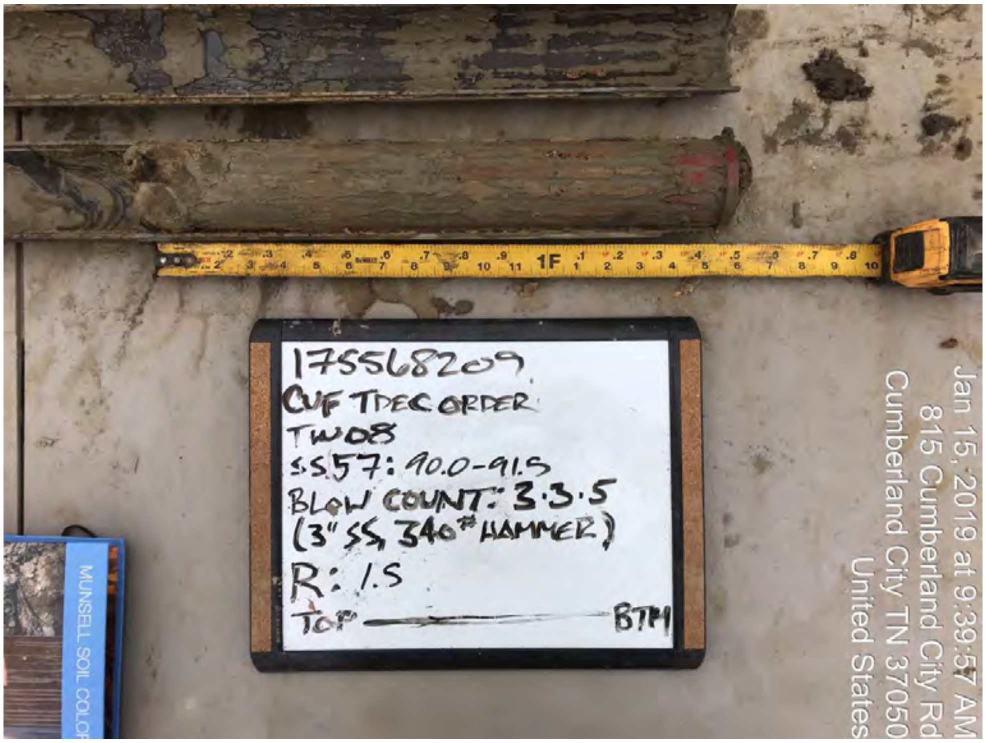
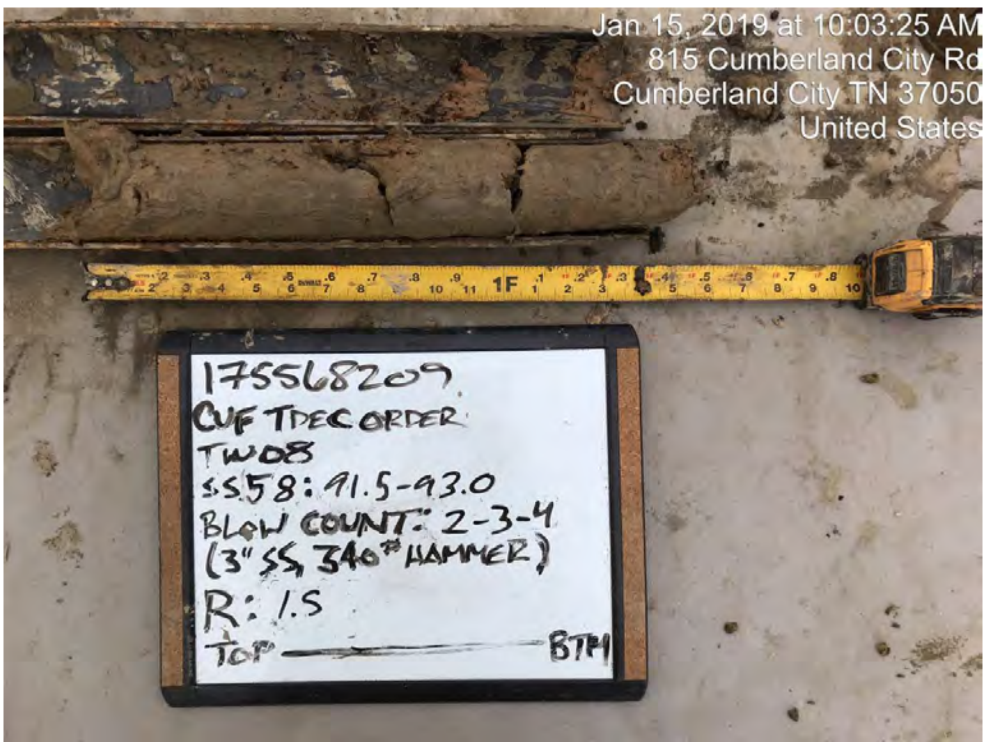
Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Photo of interval (88.0-90.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 143 **Photo Location:** CUF-TW08 **Photo Date:** 1/15/2019 **Comments:** Interval (90.0-91.5 feet).	
Photograph ID: 144 **Photo Location:** CUF-TW08 **Photo Date:** 1/15/2019 **Comments:** Interval (91.5-93.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 145

Photo Location: CUF-TW08

Photo Date: 1/15/2019

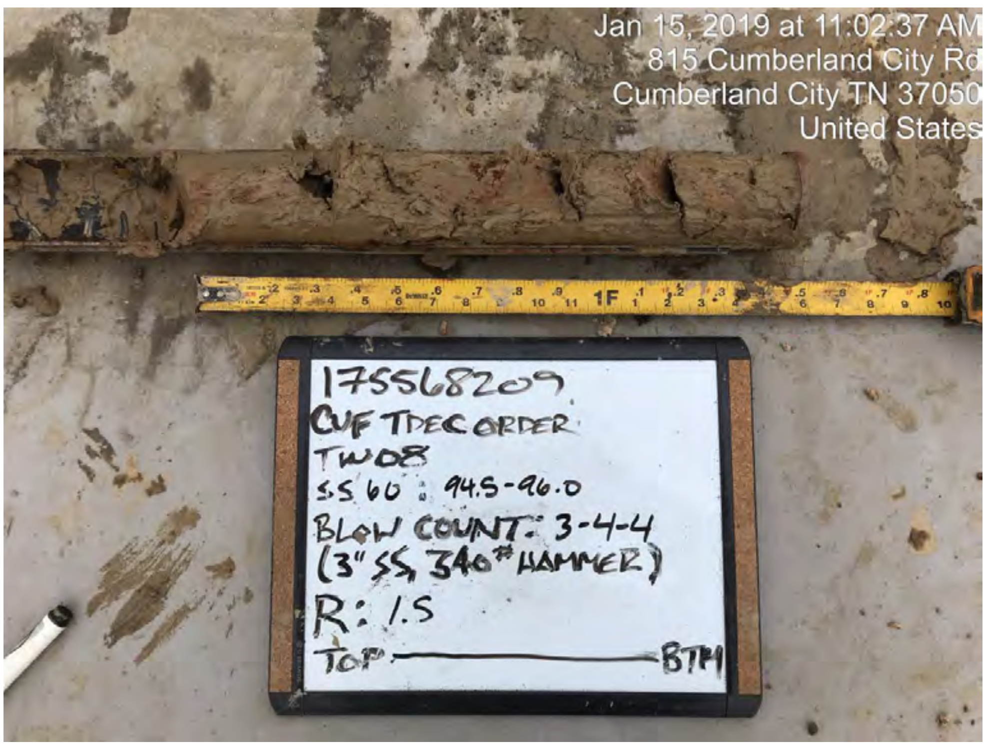
Comments: Interval (93.0-94.5 feet).

Photograph ID: 146

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (94.5-96.0 feet).



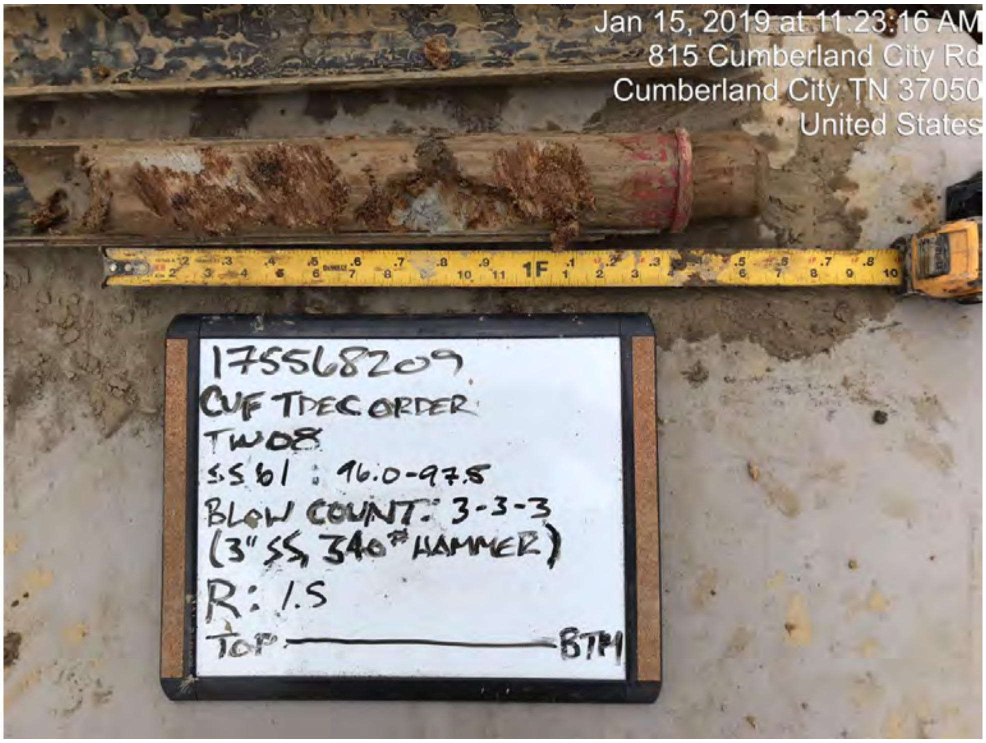
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 147

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (96.0-97.5 feet).

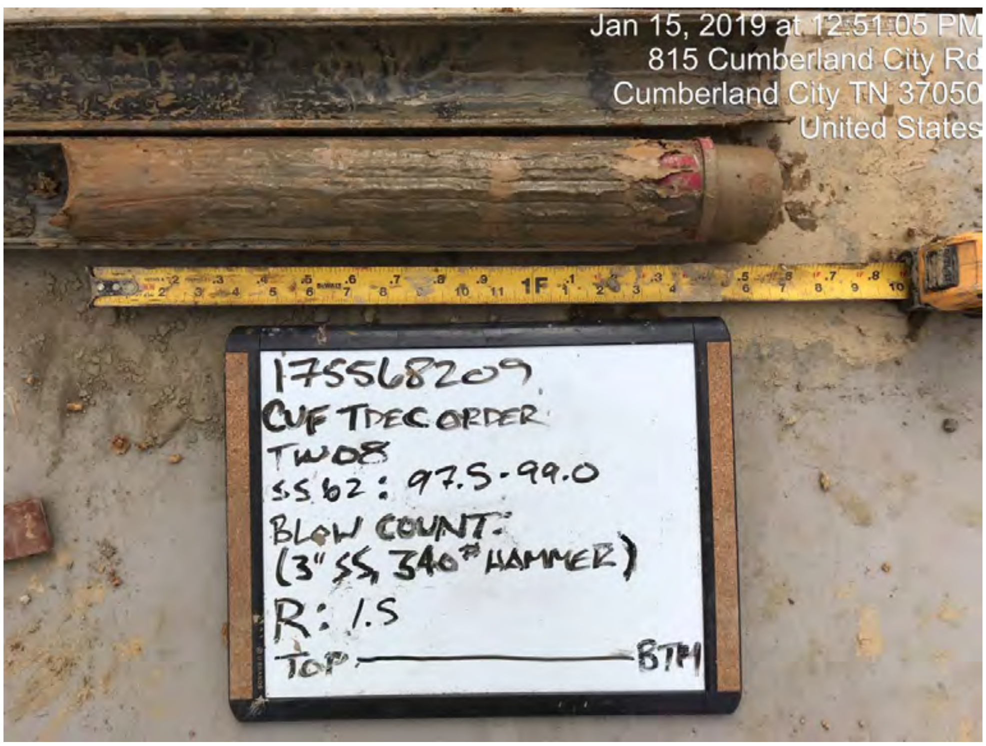


Photograph ID: 148

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (97.5-99.0 feet). Blowcount on white board should be 2-3-3.



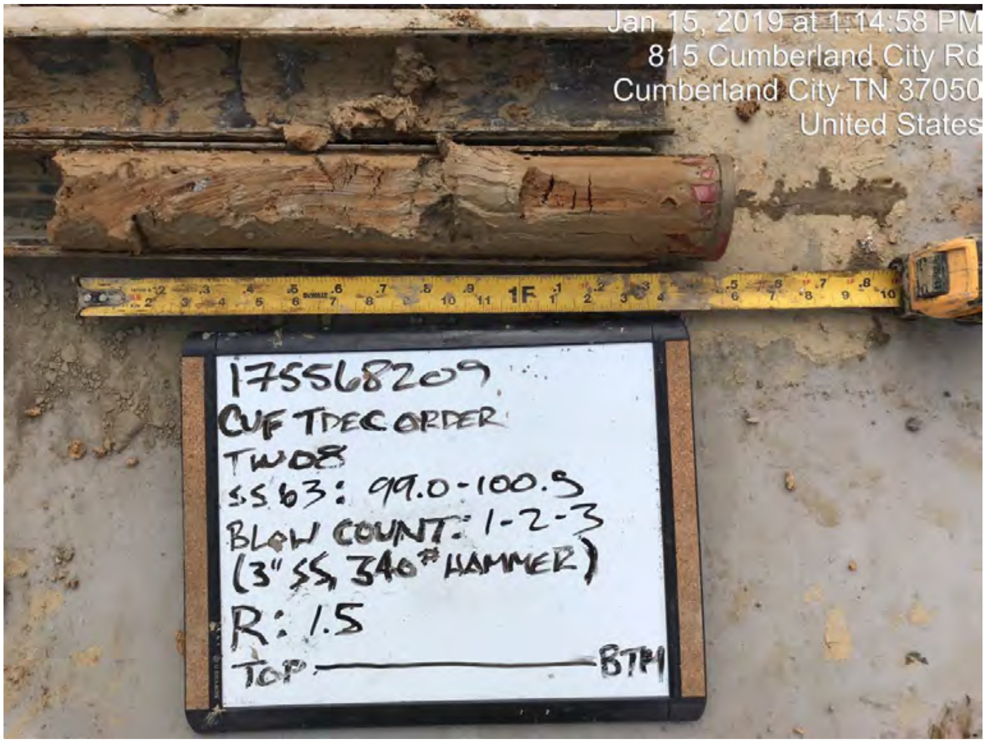
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 149

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (99.0-100.5 feet).

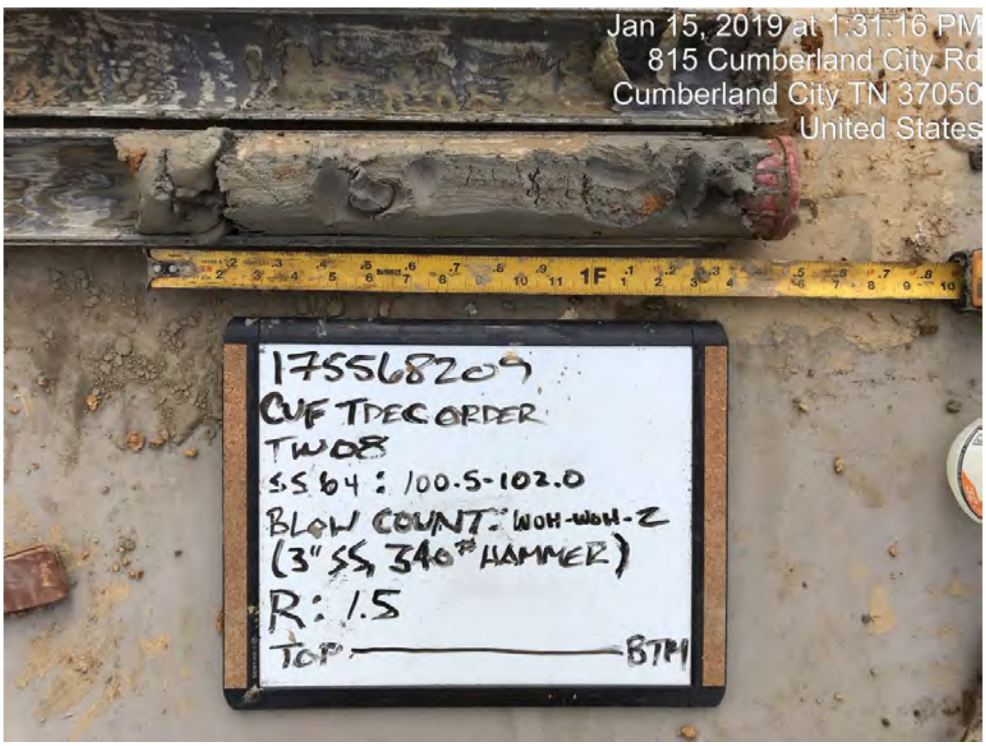


Photograph ID: 150

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (100.5-102.0 feet). WOH on white board is the same as WH on the boring log.



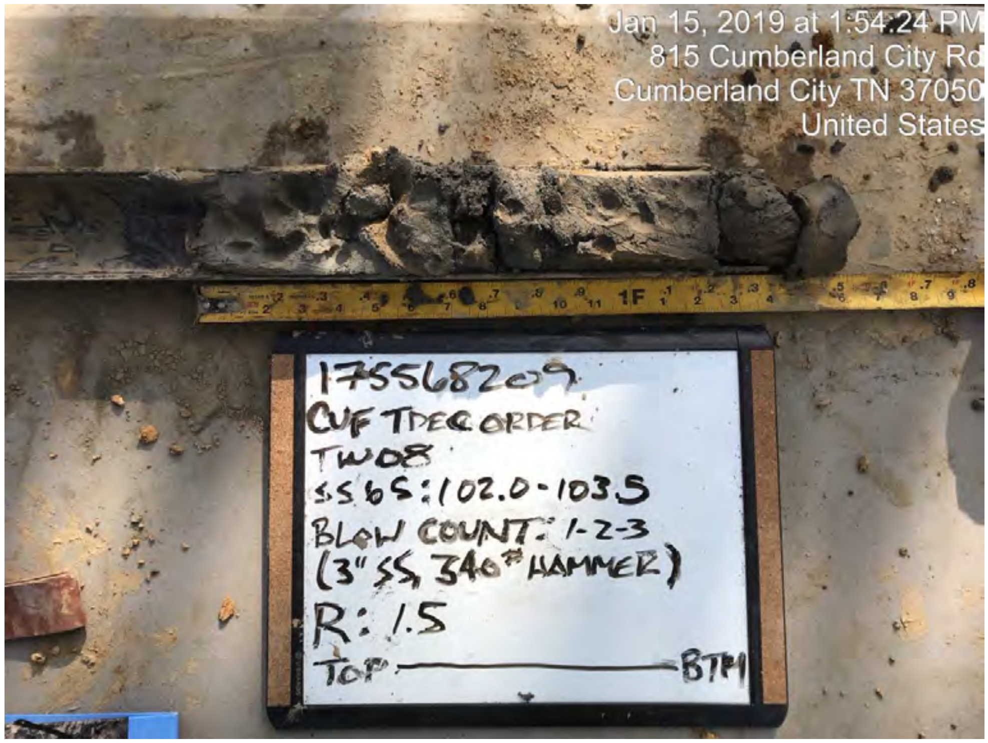
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 151

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (102.0-103.5 feet).

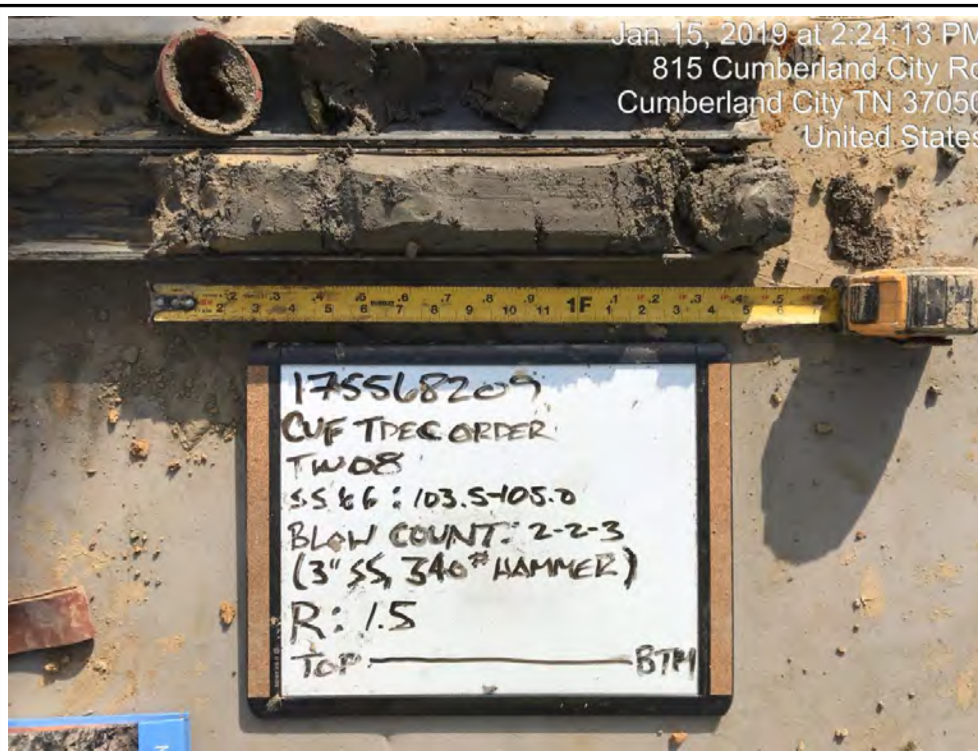


Photograph ID: 152

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (103.5-105.0 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 153 **Photo Location:** CUF-TW08 **Photo Date:** 1/15/2019 **Comments:** Interval (105.0-106.5 feet).	
Photograph ID: 154 **Photo Location:** CUF-TW08 **Photo Date:** 1/15/2019 **Comments:** Interval (106.5-108.0 feet).	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 155

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (108.0-109.5 feet).

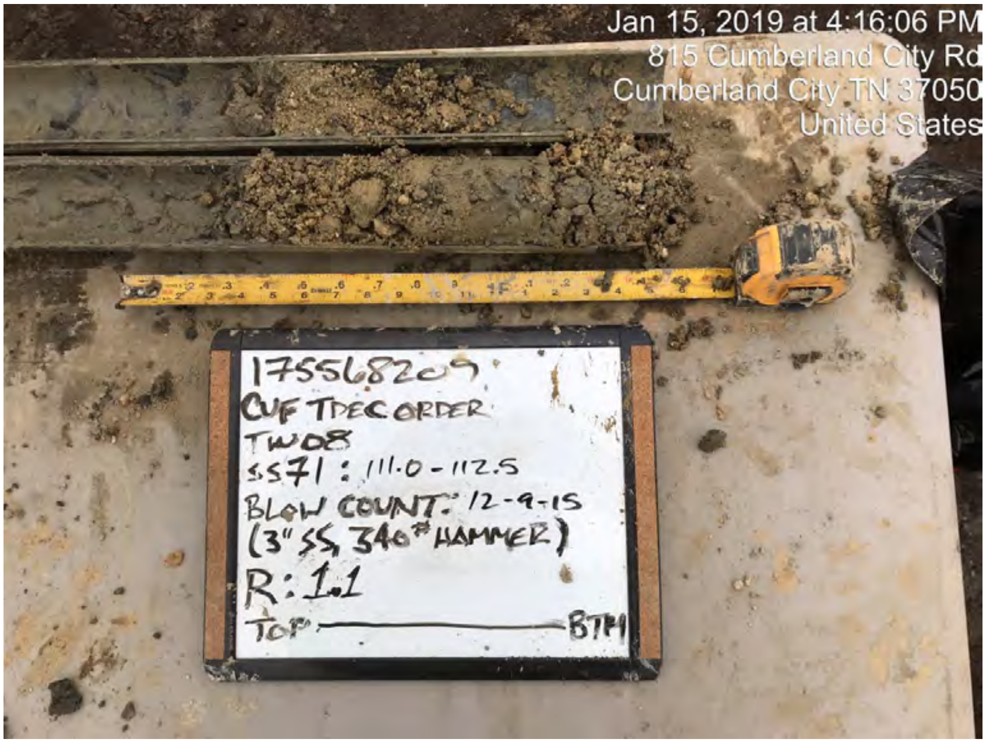
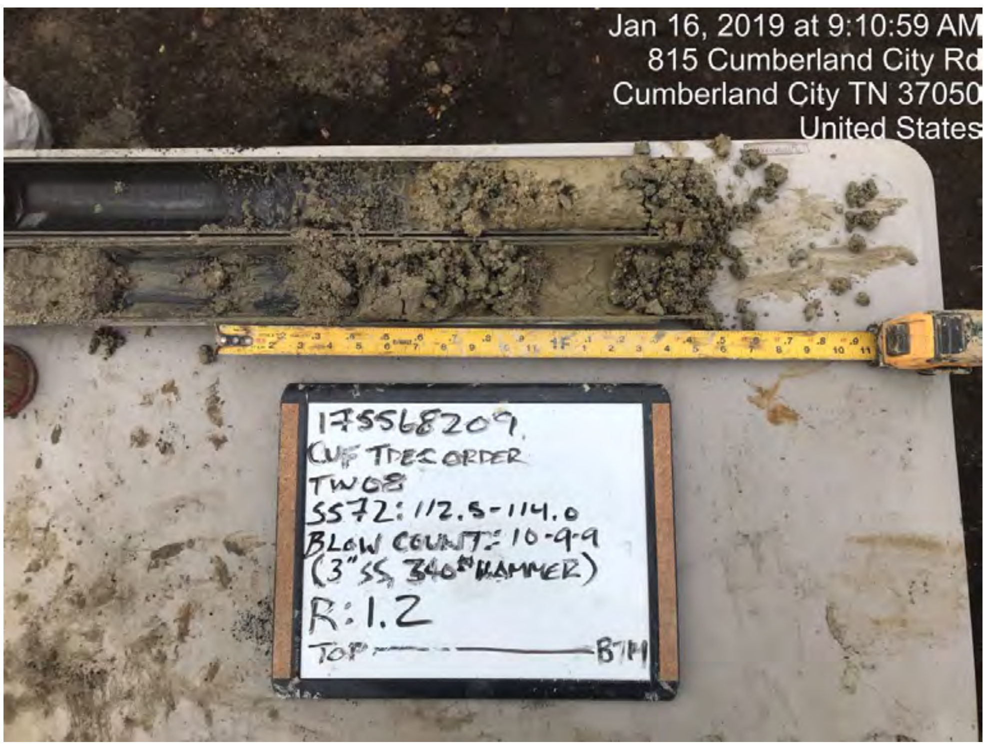
Photograph ID: 156

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (109.5-111.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 157 **Photo Location:** CUF-TW08 **Photo Date:** 1/15/2019 **Comments:** Interval (111.0-112.5 feet).	
Photograph ID: 158 **Photo Location:** CUF-TW08 **Photo Date:** 1/16/2019 **Comments:** Interval (112.5-114.0 feet).	

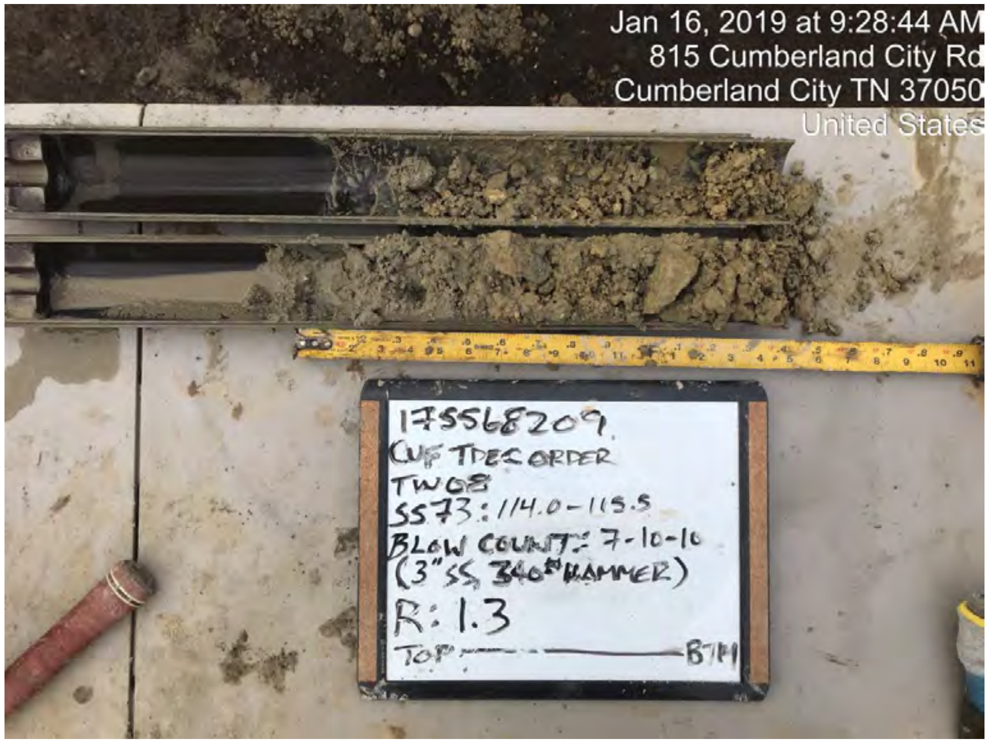
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 159

Photo Location:
CUF-TW08

Photo Date:
1/16/2019

Comments:
Interval (114.0-115.5 feet).



Photograph ID: 160

Photo Location:
CUF-TW08

Photo Date:
1/16/2019

Comments:
Interval (115.5-117.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 161

Photo Location: CUF-TW08

Photo Date: 1/16/2019

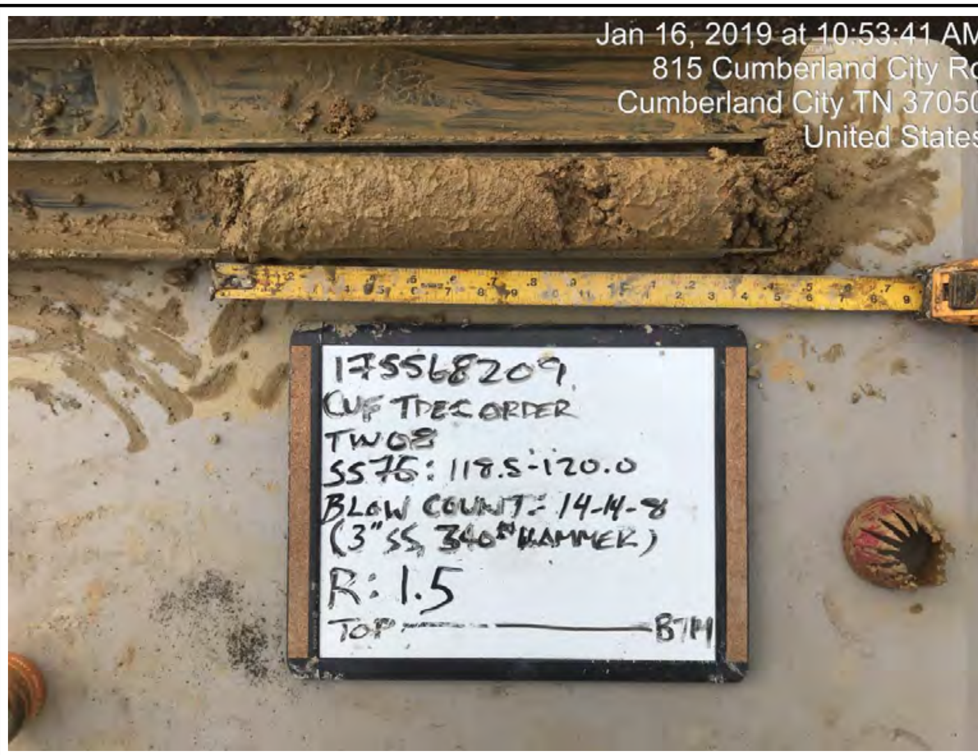
Comments: Interval (117.0-118.5 feet).

Photograph ID: 162

Photo Location: CUF-TW08

Photo Date: 1/16/2019

Comments: Interval (118.5-120.0 feet).



Stantec

Photographic Log

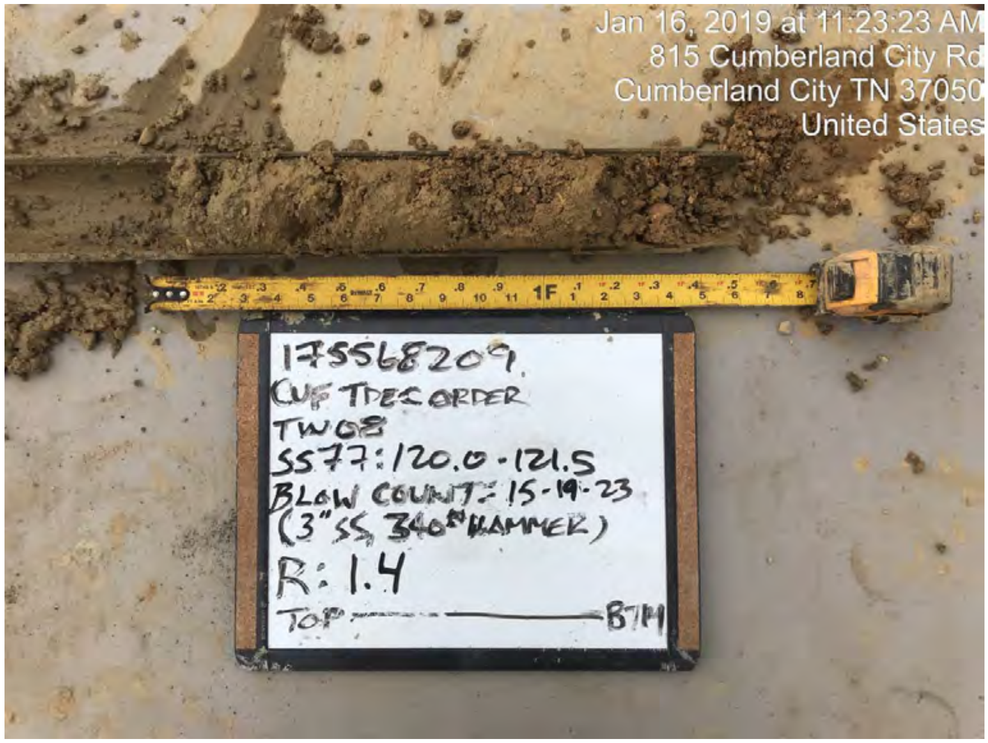
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 163

Photo Location: CUF-TW08

Photo Date: 1/16/2019

Comments: Interval (120.0-121.5 feet).



Photograph ID: 164

Photo Location: CUF-TW08

Photo Date: 1/16/2019

Comments: Interval (121.5-123.0 feet).

Stantec

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 165

Photo Location:
CUF-TW08

Photo Date:
1/16/2019

Comments:
Interval (123.0-124.5 feet).

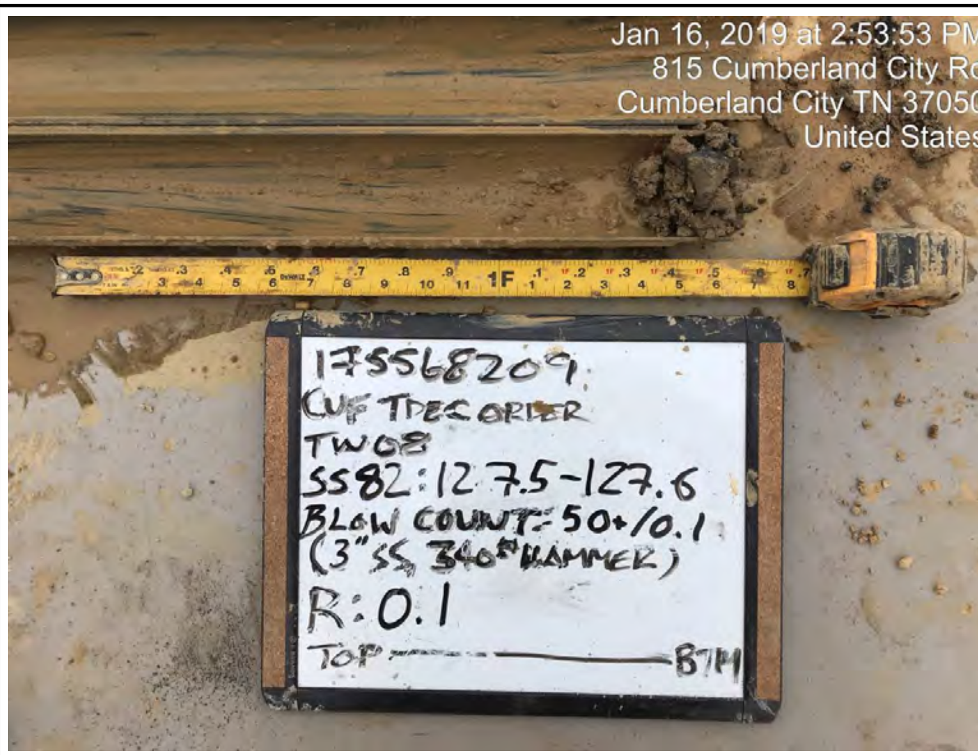
Photograph ID: 166

Photo Location:
CUF-TW08

Photo Date:
1/16/2019

Comments:
Interval (124.5-126.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 167 **Photo Location:** CUF-TW08 **Photo Date:** 1/16/2019 **Comments:** Interval (126.0-127.5 feet).	
Photograph ID: 168 **Photo Location:** CUF-TW08 **Photo Date:** 1/16/2019 **Comments:** Interval (127.5-127.6 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 169

Photo Location:
CUF-TW08

Photo Date:
1/18/2019

Comments:
Interval (128.4-141.8 feet).

Photograph ID: 170

Photo Location:
CUF-TW08

Photo Date:
1/18/2019

Comments:
Interval (141.8-148.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 171

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (0.0-1.5 feet).

Photograph ID: 172

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (1.5-3.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 173

Photo Location: CUF-TW09

Photo Date: 1/22/2019

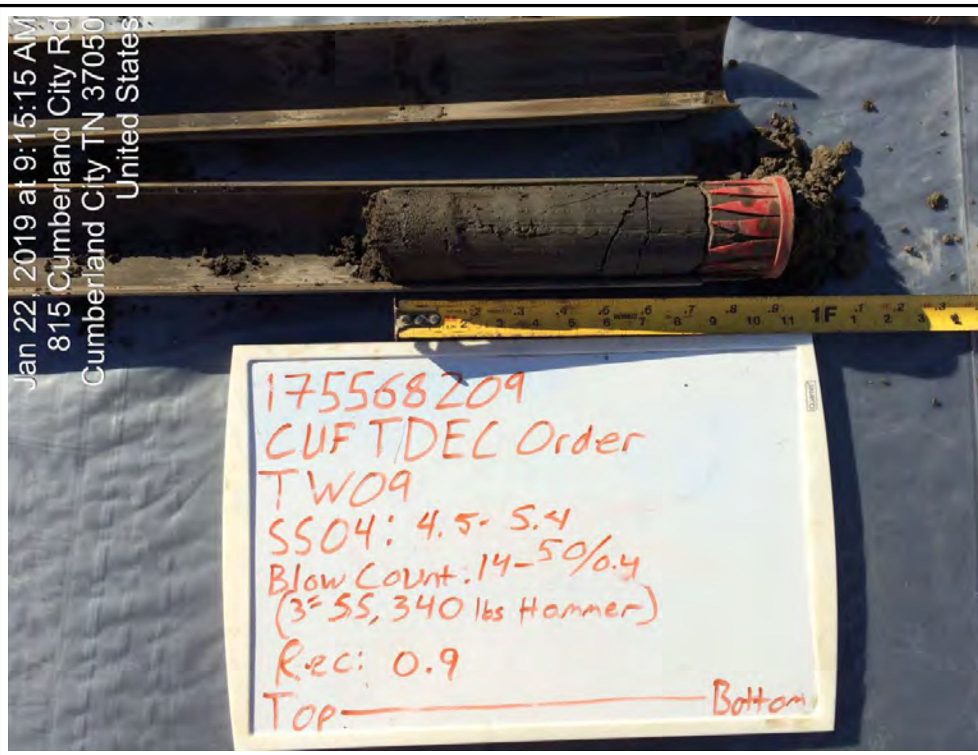
Comments: Interval (3.0-4.5 feet).

Photograph ID: 174

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (4.5-5.4 feet). Sampler refusal at 5.4 feet.



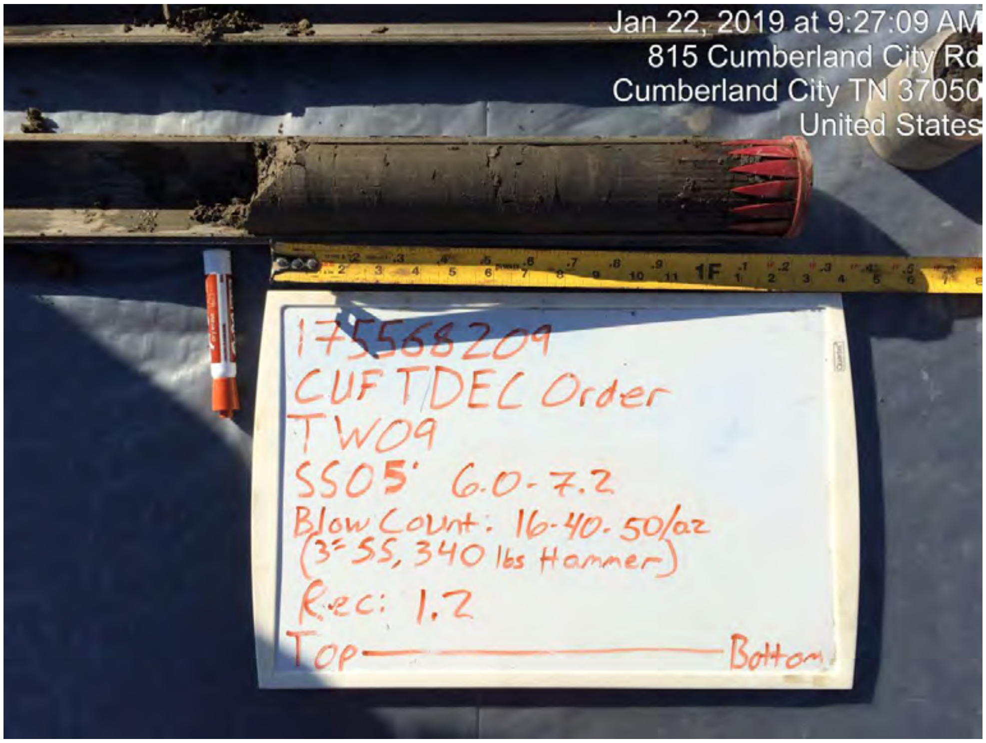
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 175

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (6.0-7.2 feet). Sampler refusal at 7.2 feet.

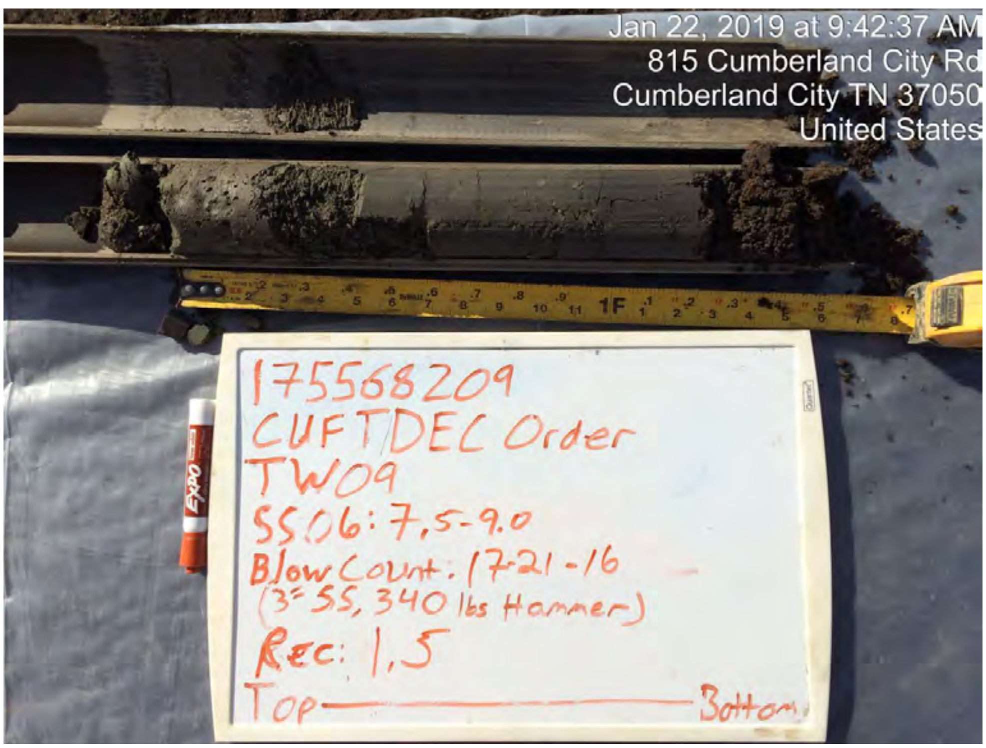


Photograph ID: 176

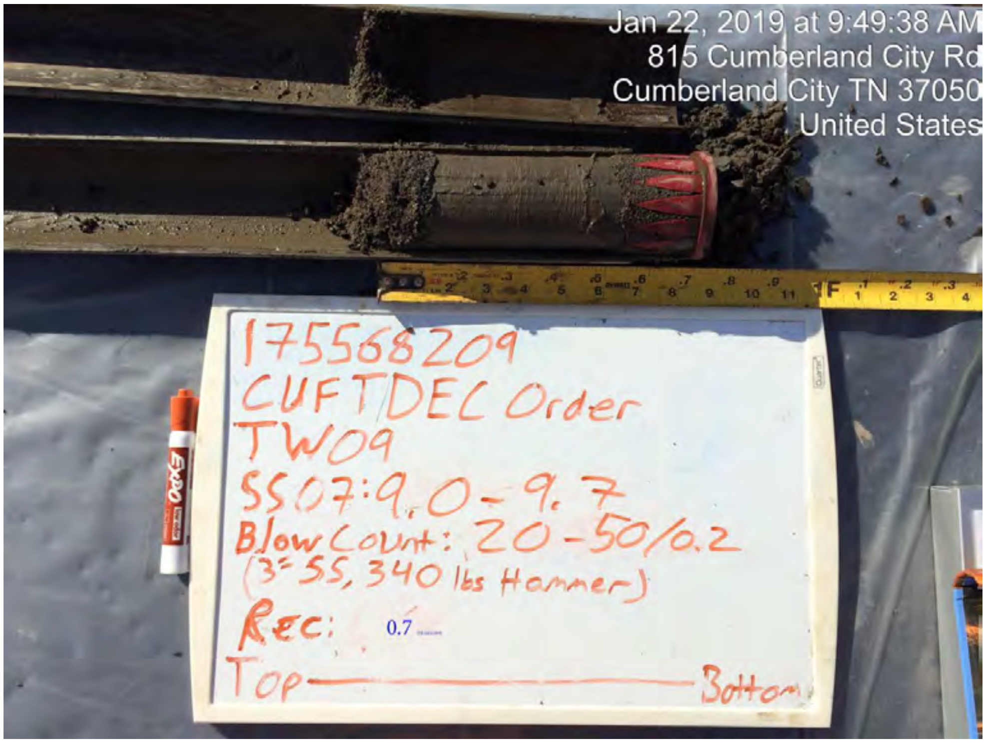
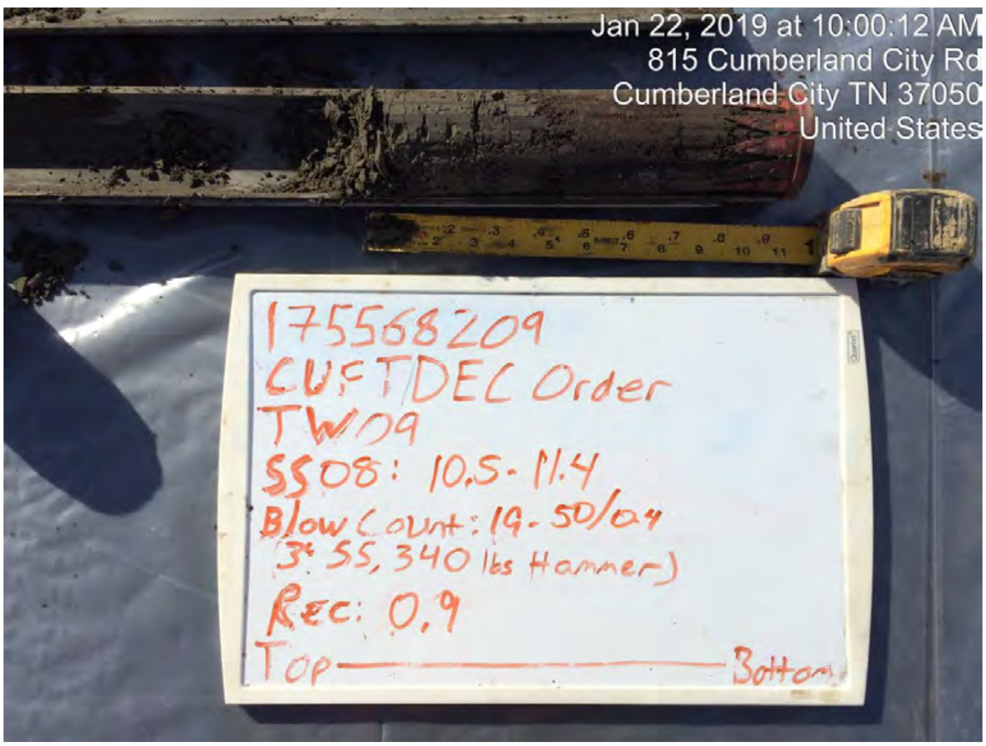
Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (7.5-9.0 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 177 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (9.0-9.7 feet). Sampler refusal at 9.7 feet.	
Photograph ID: 178 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (10.5-11.4 feet). Sampler refusal at 11.4 feet.	

Stantec **Photographic Log**

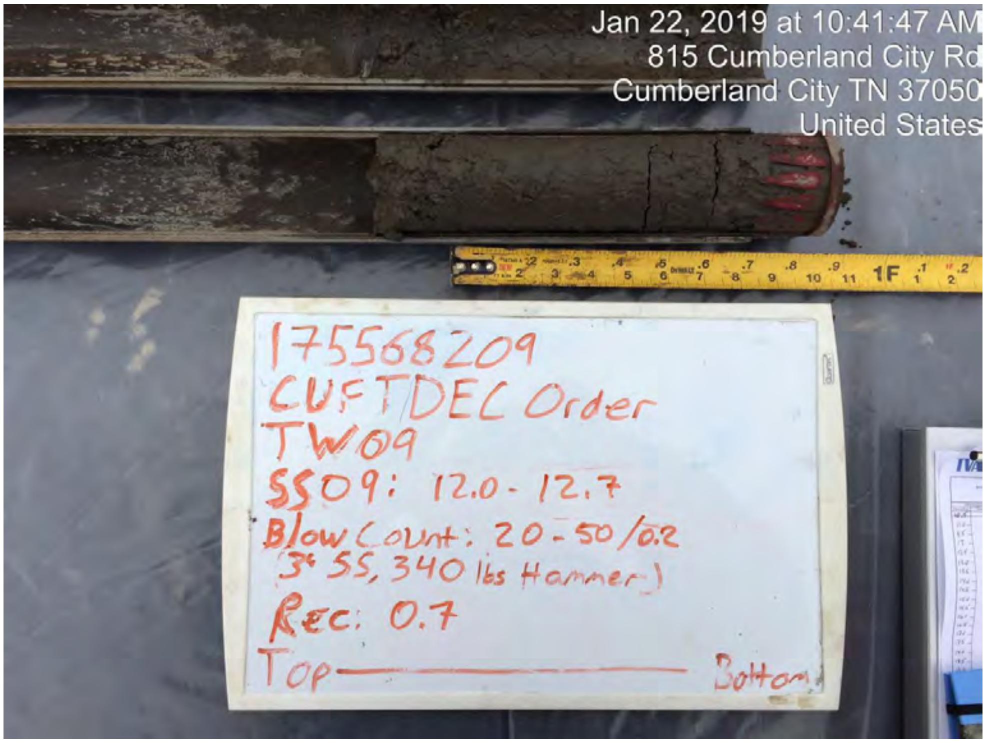
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 179

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (12.0-12.7 feet). Sampler refusal at 12.7 feet.

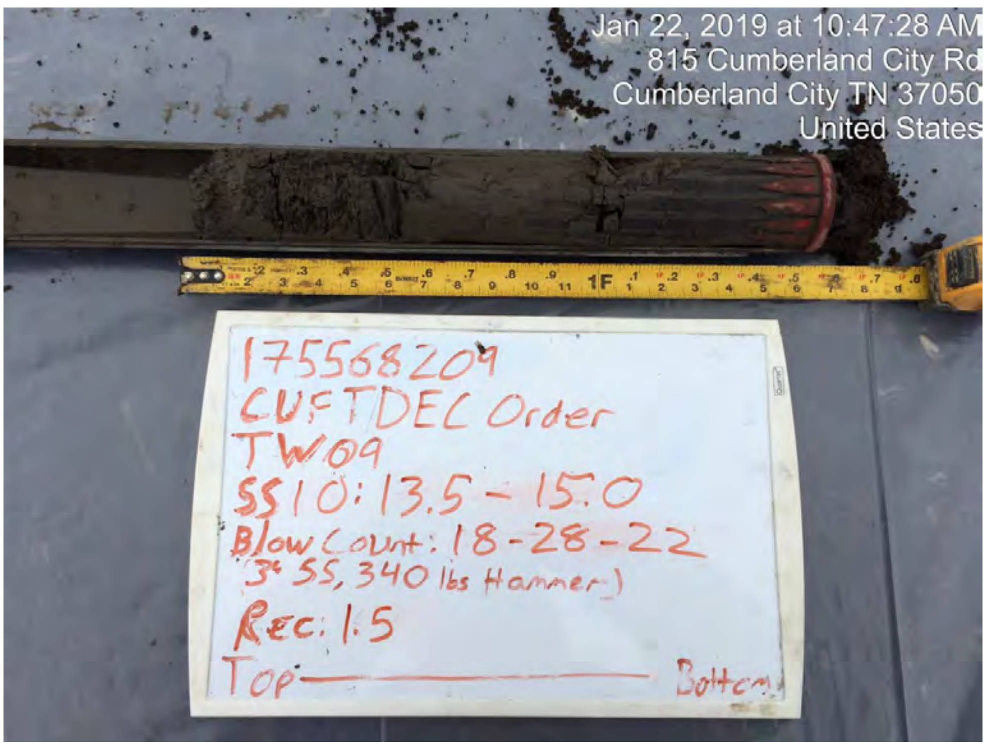


Photograph ID: 180

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (13.5-15.0 feet).



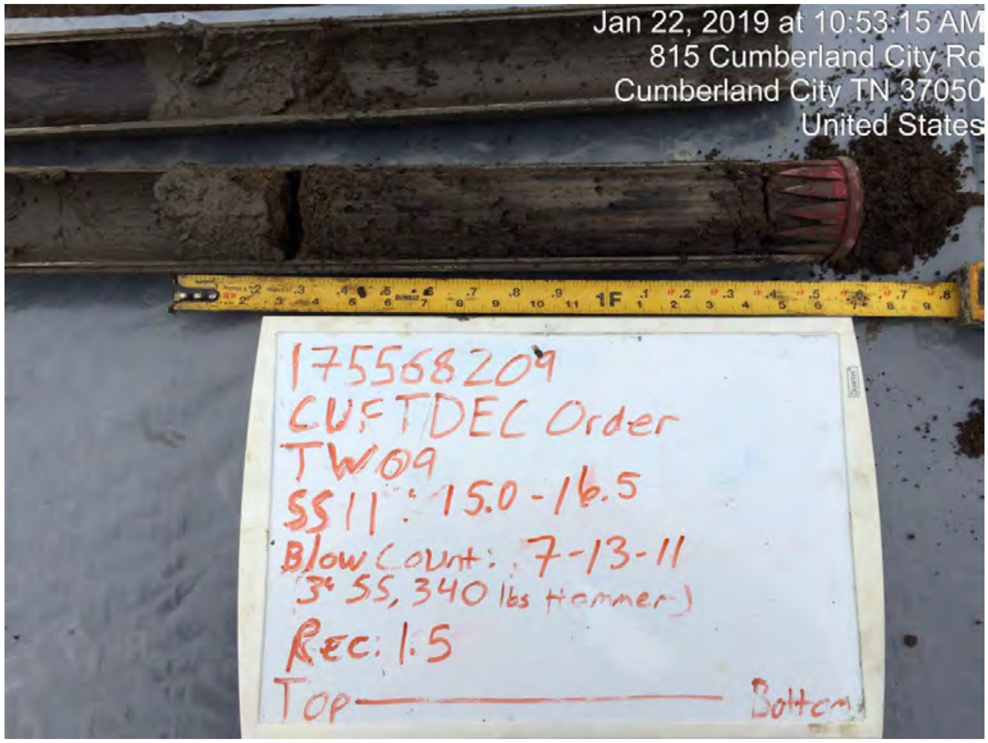
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 181

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (15.0-16.5 feet).

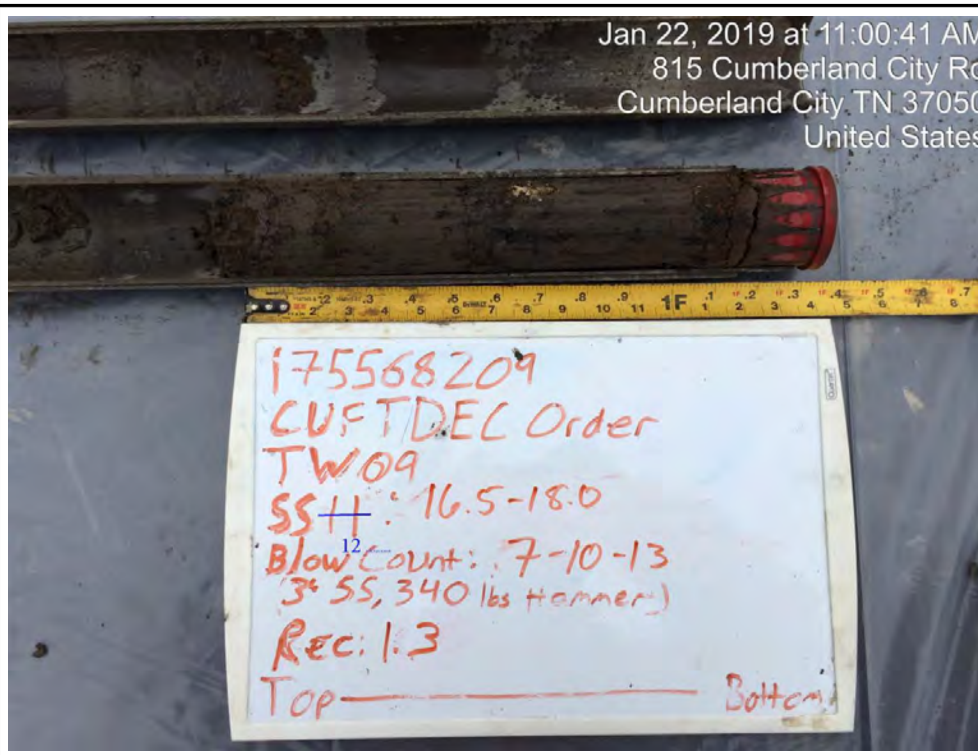


Photograph ID: 182

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (16.5-18.0 feet).



Stantec

Photographic Log

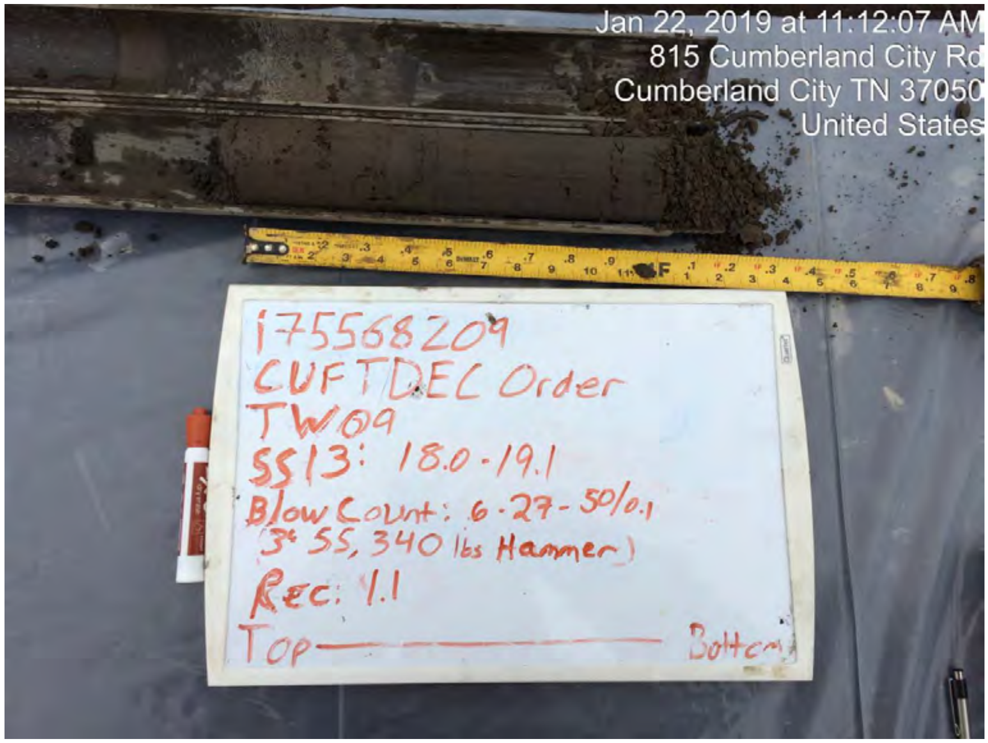
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 183

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (18.0-19.1 feet). Sampler refusal at 19.1 feet.

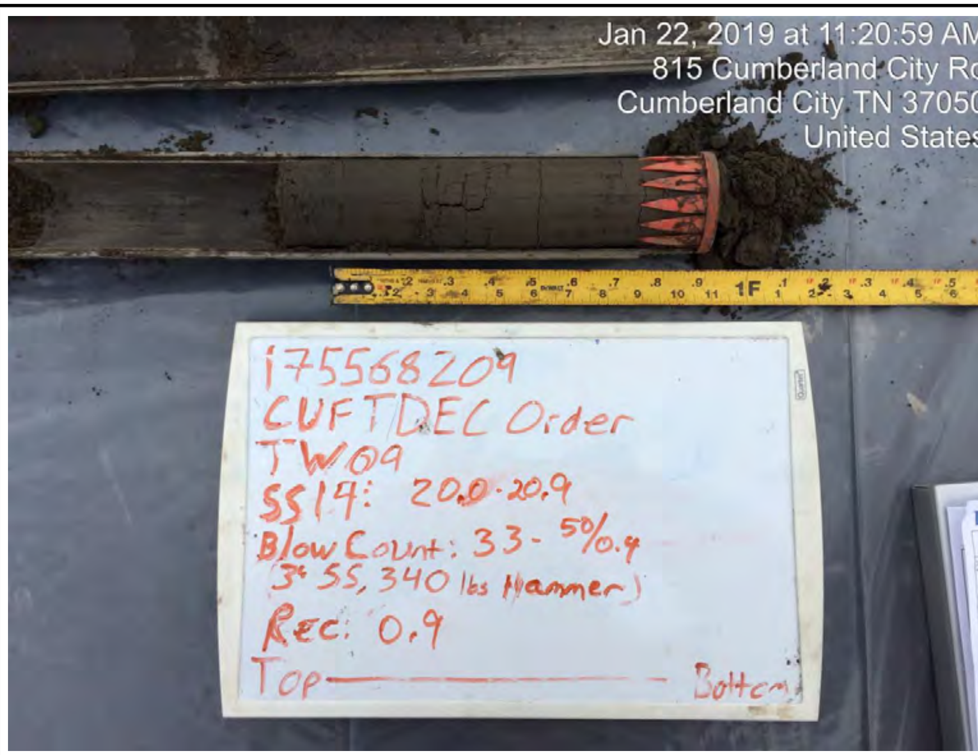


Photograph ID: 184

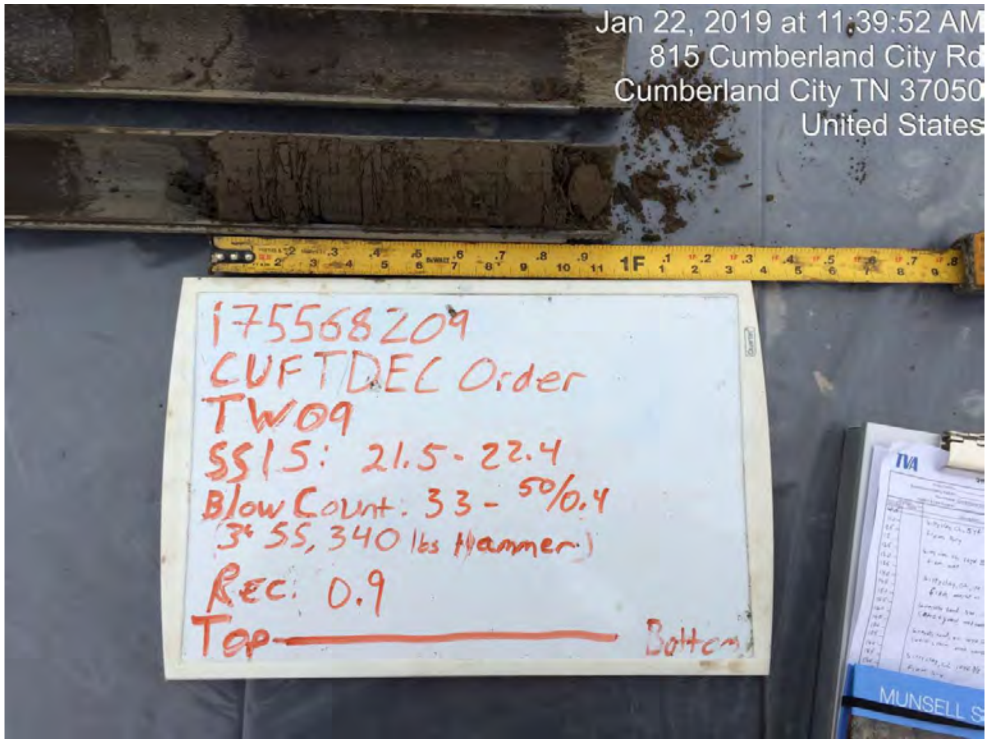
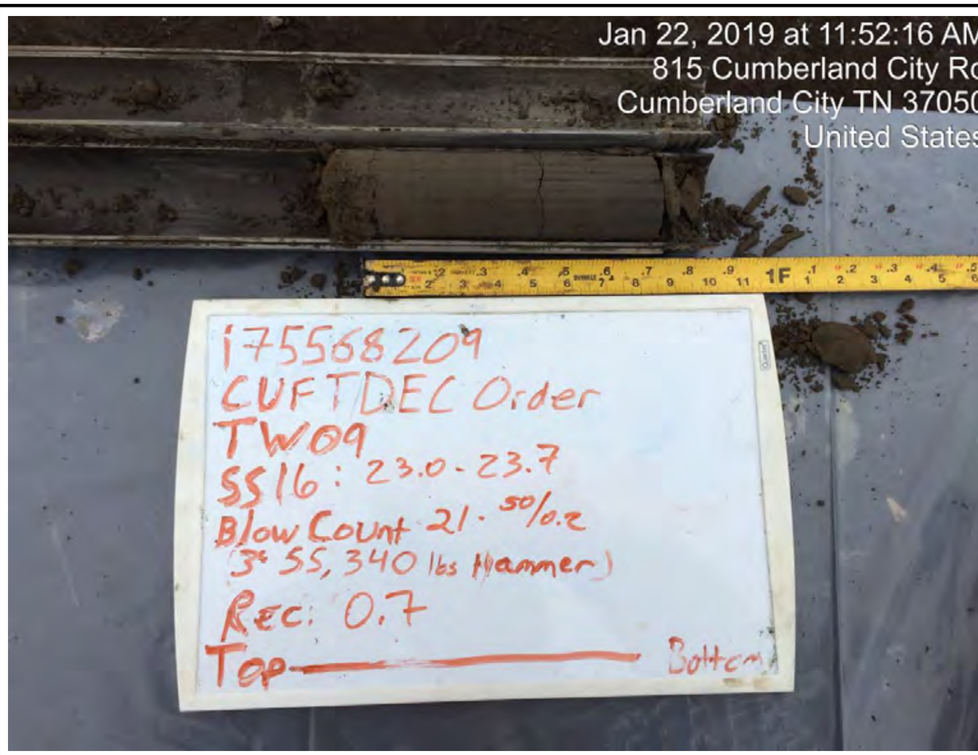
Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (20.0-20.9 feet). Sampler refusal at 20.9 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 185 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (21.5-22.4 feet). Sampler refusal at 22.4 feet.	
Photograph ID: 186 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (23.0-23.7 feet). Sampler refusal at 23.7 feet.	

Stantec **Photographic Log**

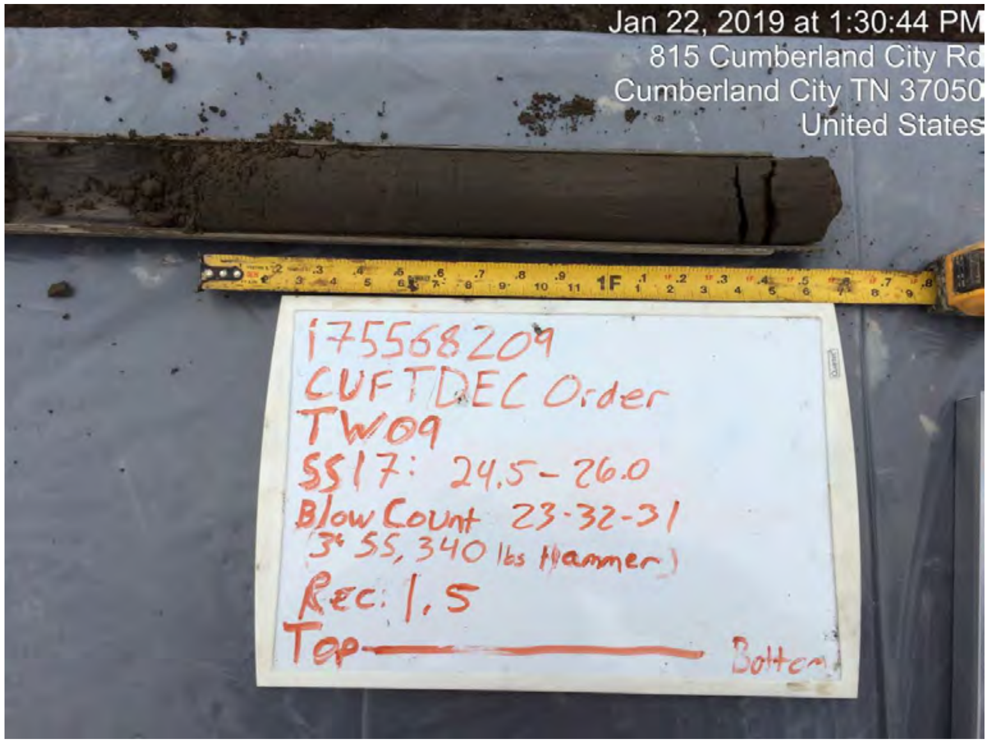
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 187

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (24.5-26.0 feet).

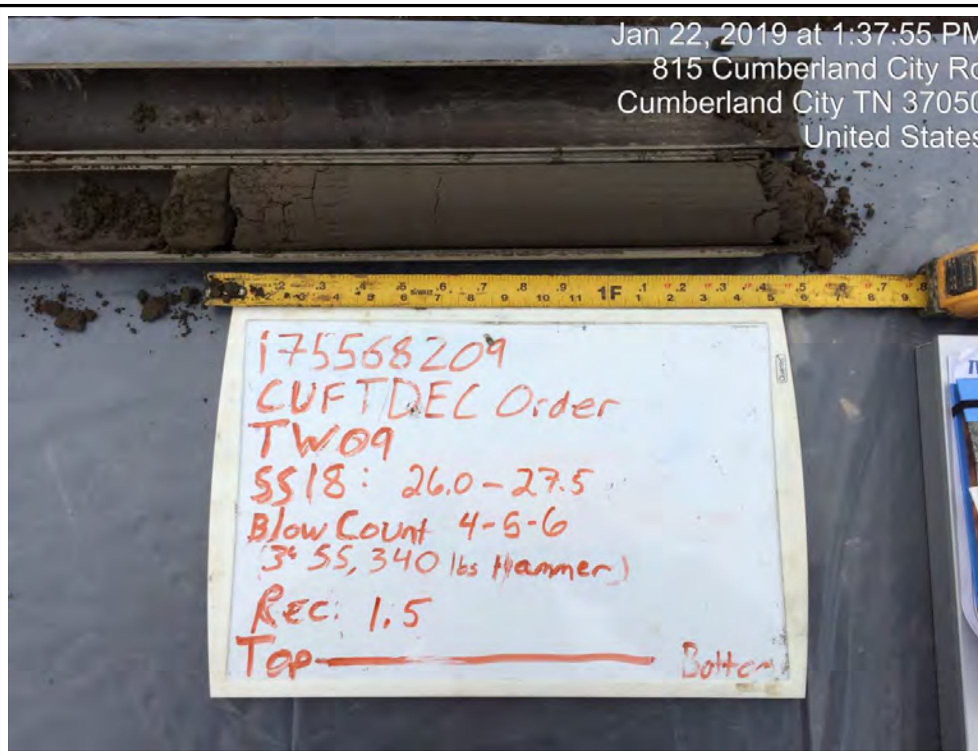


Photograph ID: 188

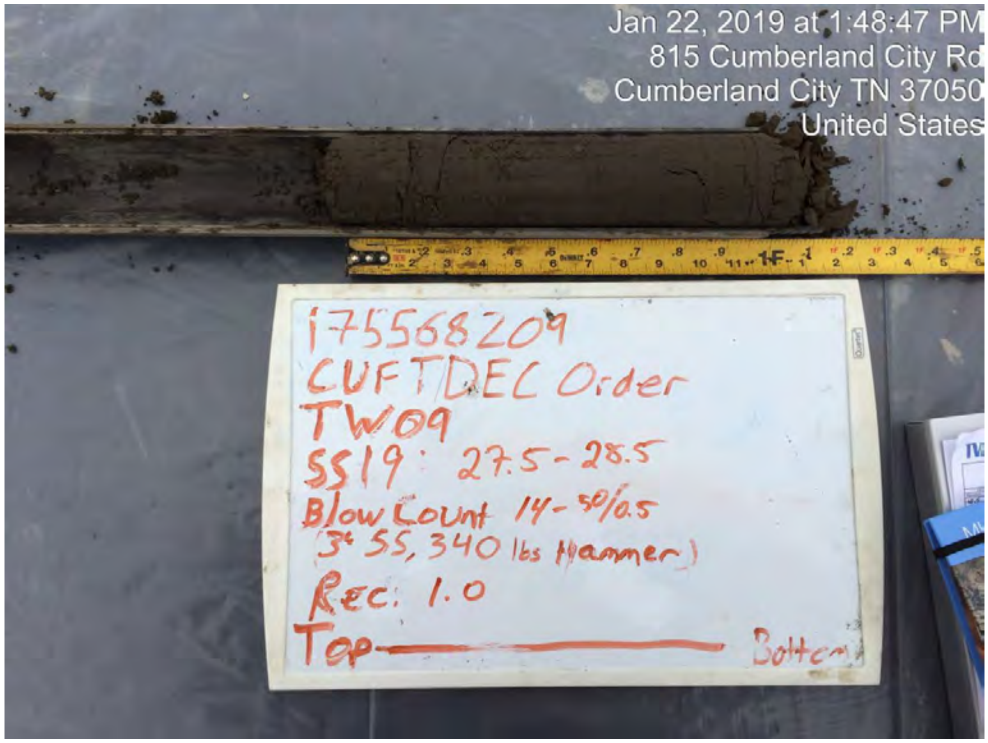
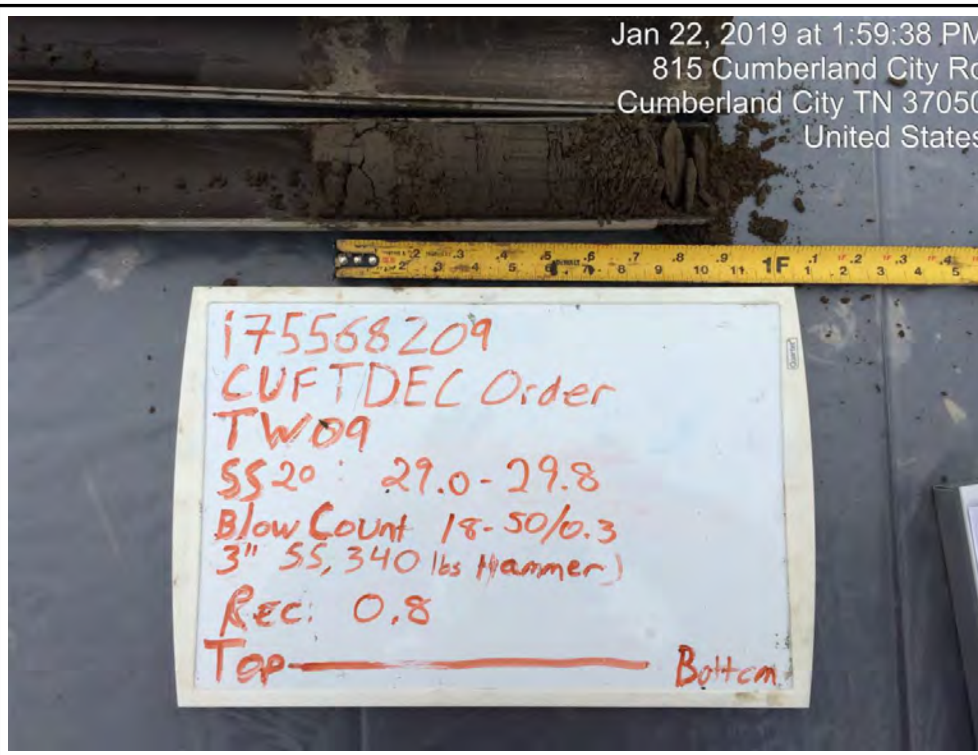
Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (26.0-27.5 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 189 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (27.5-28.5 feet). Sampler refusal at 28.5 feet.	
Photograph ID: 190 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (29.0-29.8 feet). Sampler refusal at 29.8 feet.	

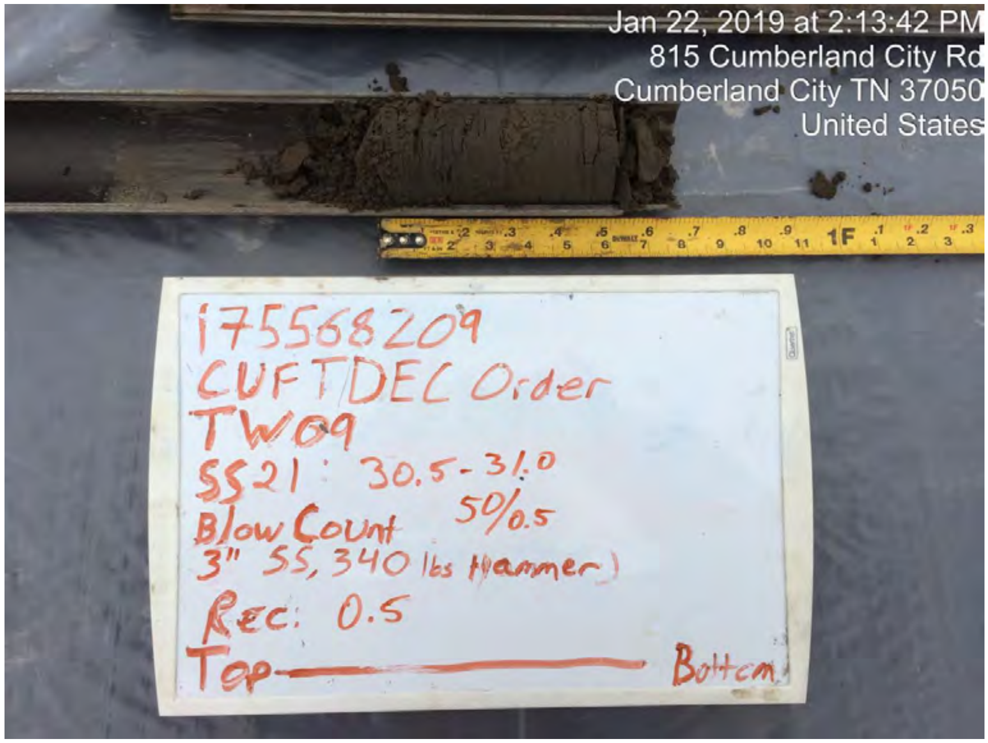
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 191

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (30.5-31.0 feet). Sampler refusal at 31.0 feet.

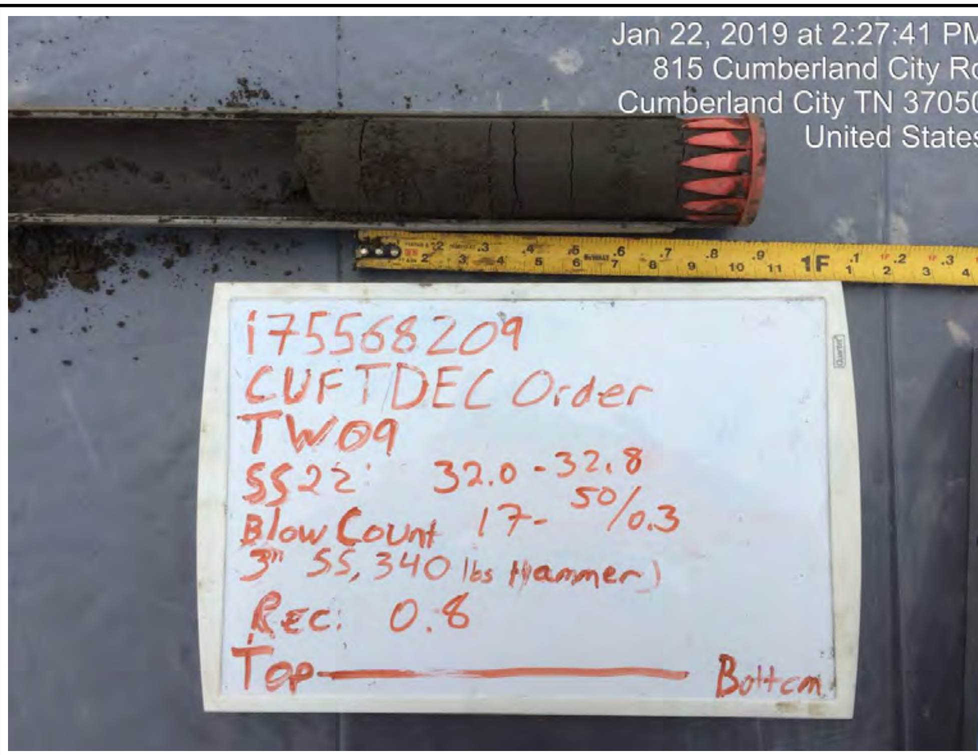


Photograph ID: 192

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (32.0-32.8 feet). Sampler refusal at 32.8 feet.



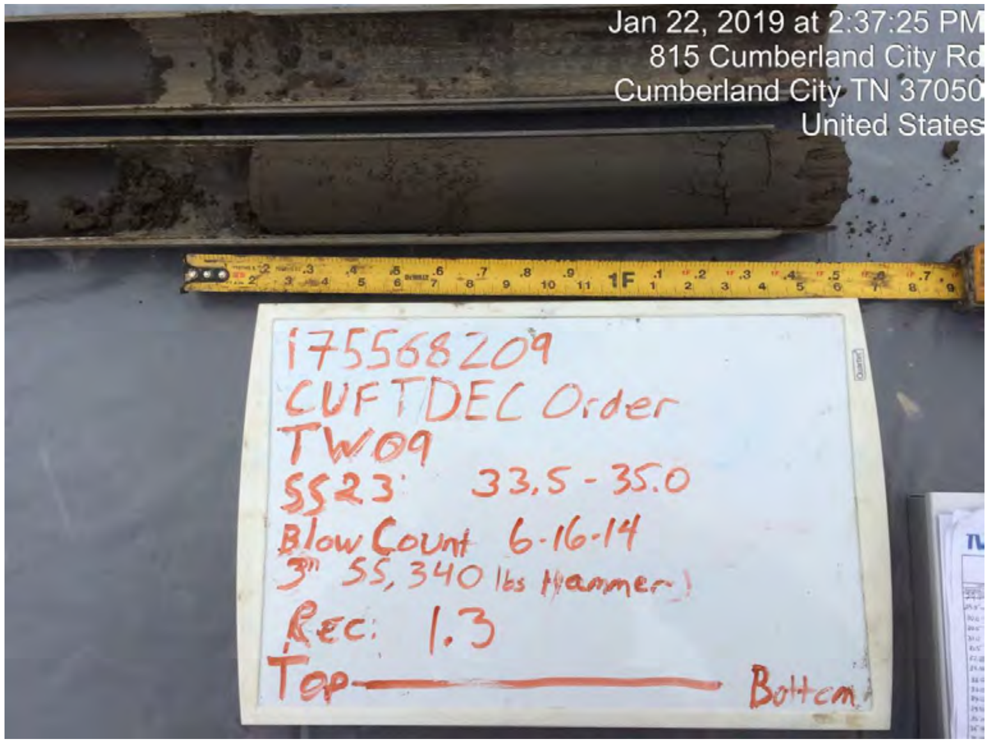
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 193

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (33.5-35.0 feet).

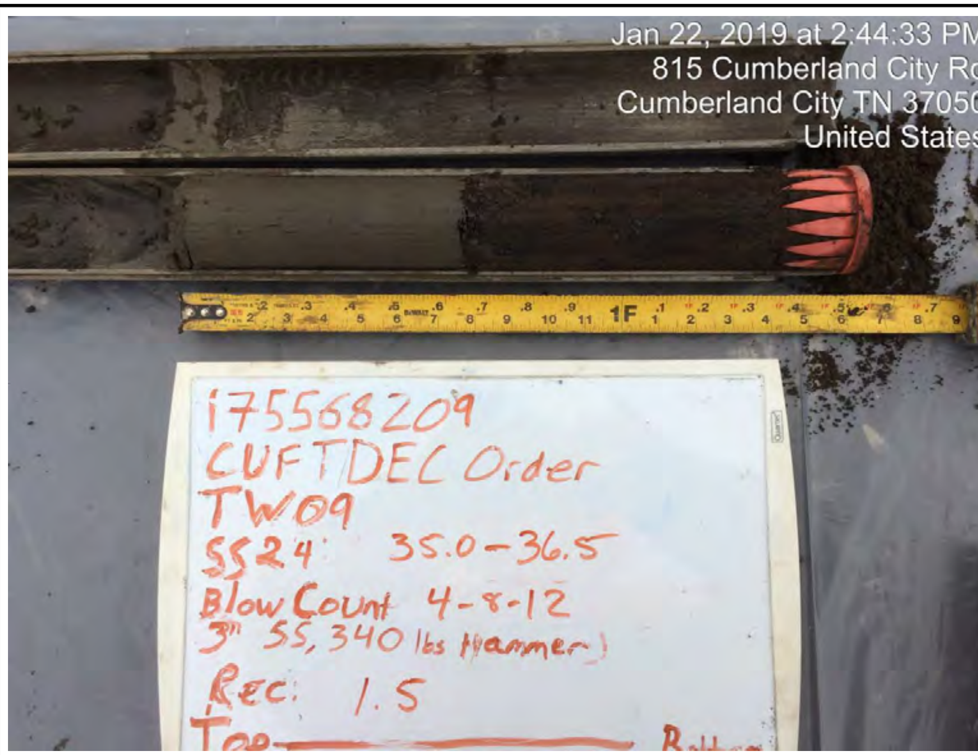


Photograph ID: 194

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (35.0-36.5 feet).



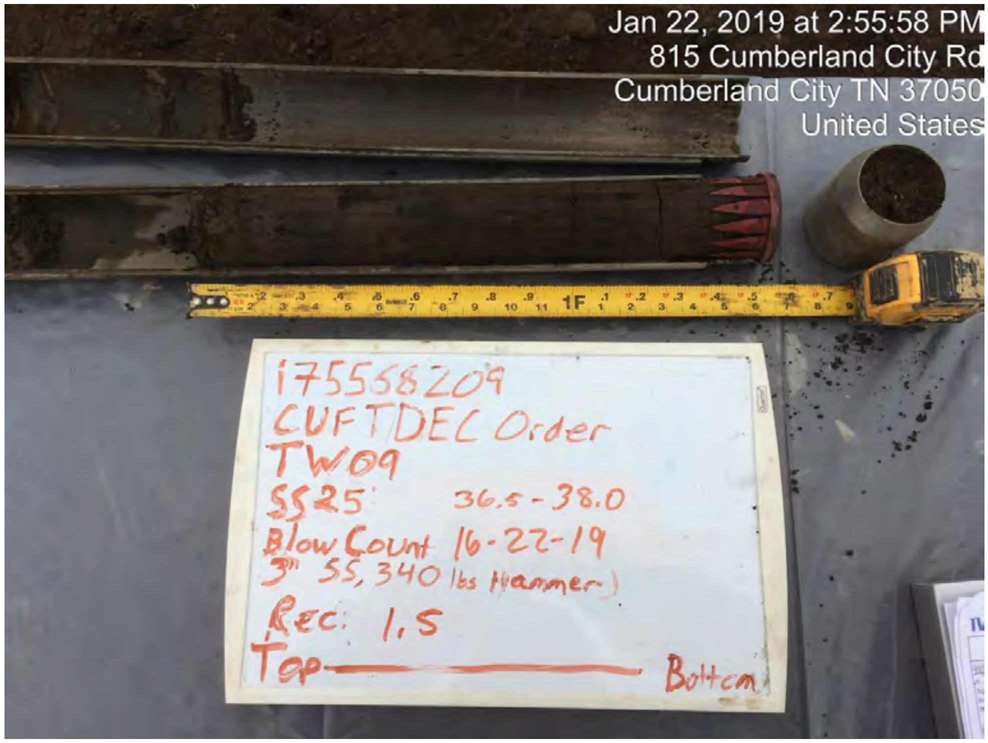
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 195

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (36.5-38.0 feet).

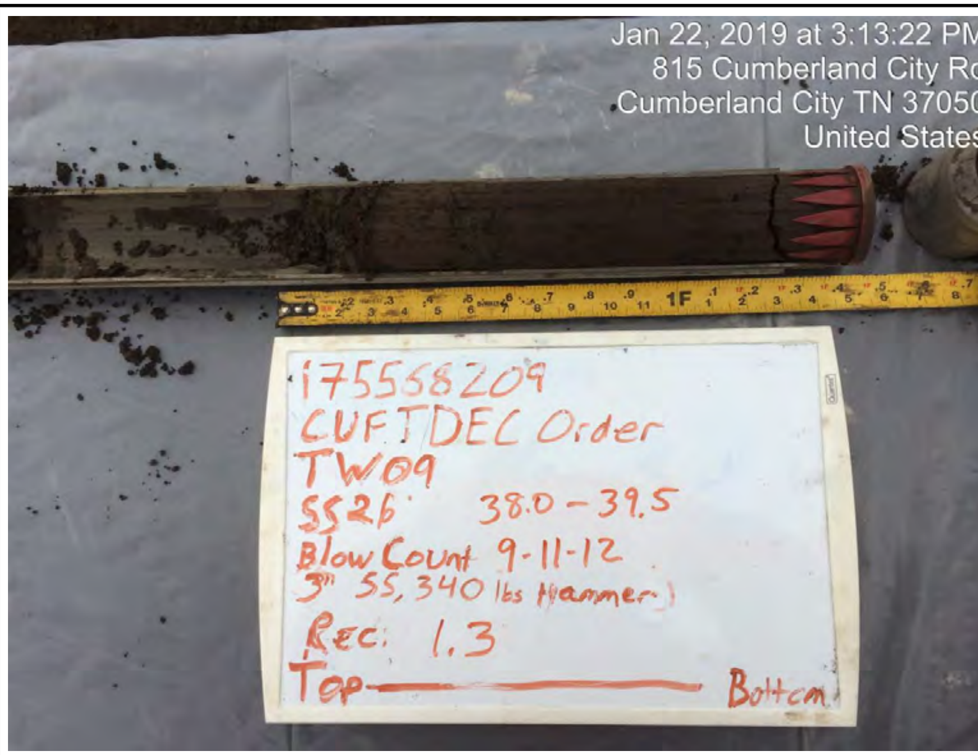


Photograph ID: 196

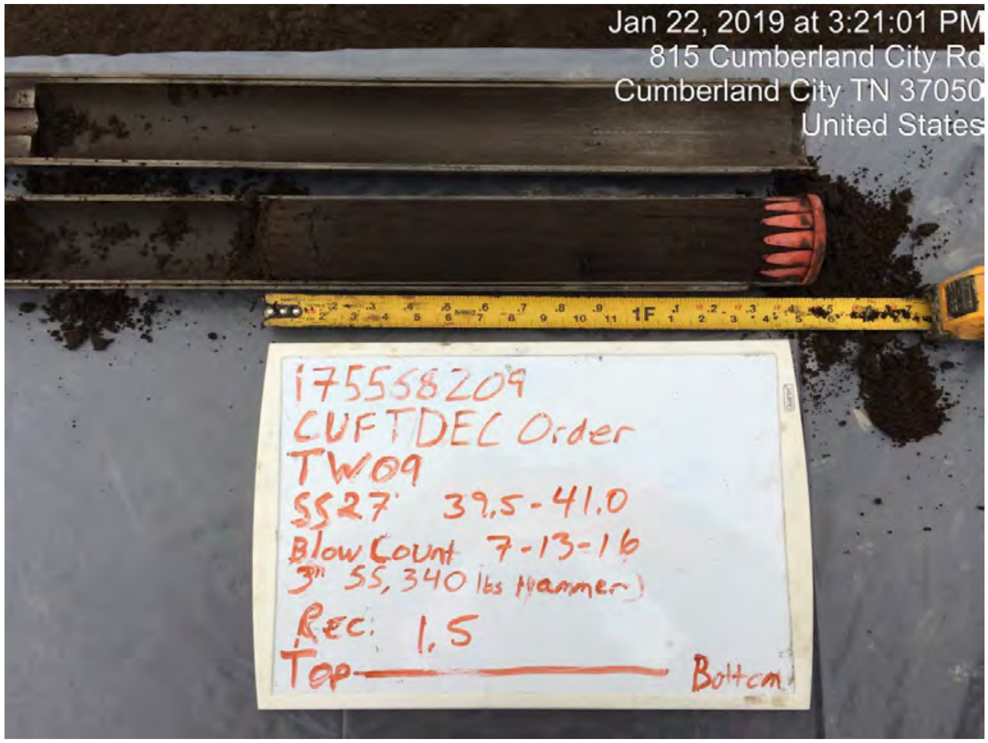
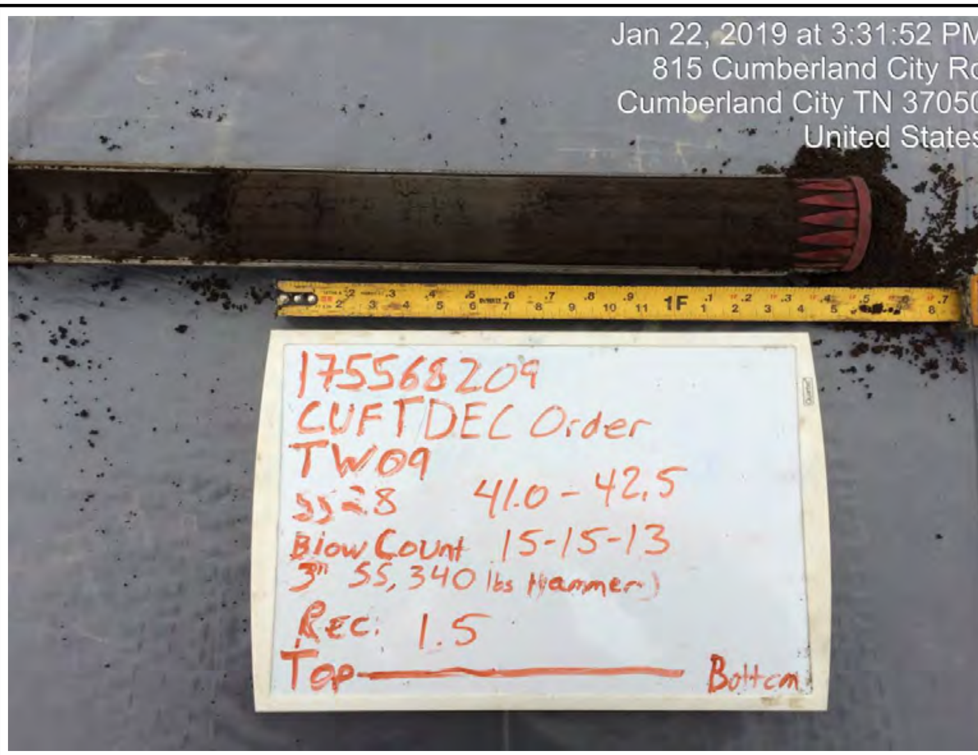
Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (38.0-39.5 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 197 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (39.5-41.0 feet).	
Photograph ID: 198 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (41.0-42.5 feet).	

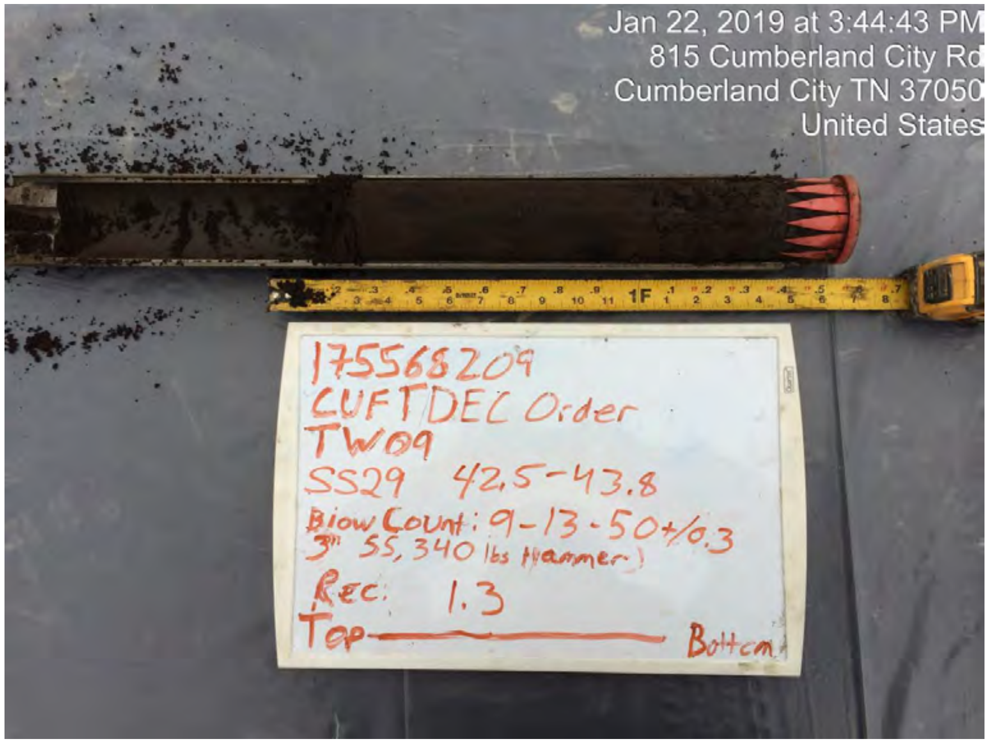
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 199

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (42.5-43.8 feet). Sampler refusal at 43.8 feet.

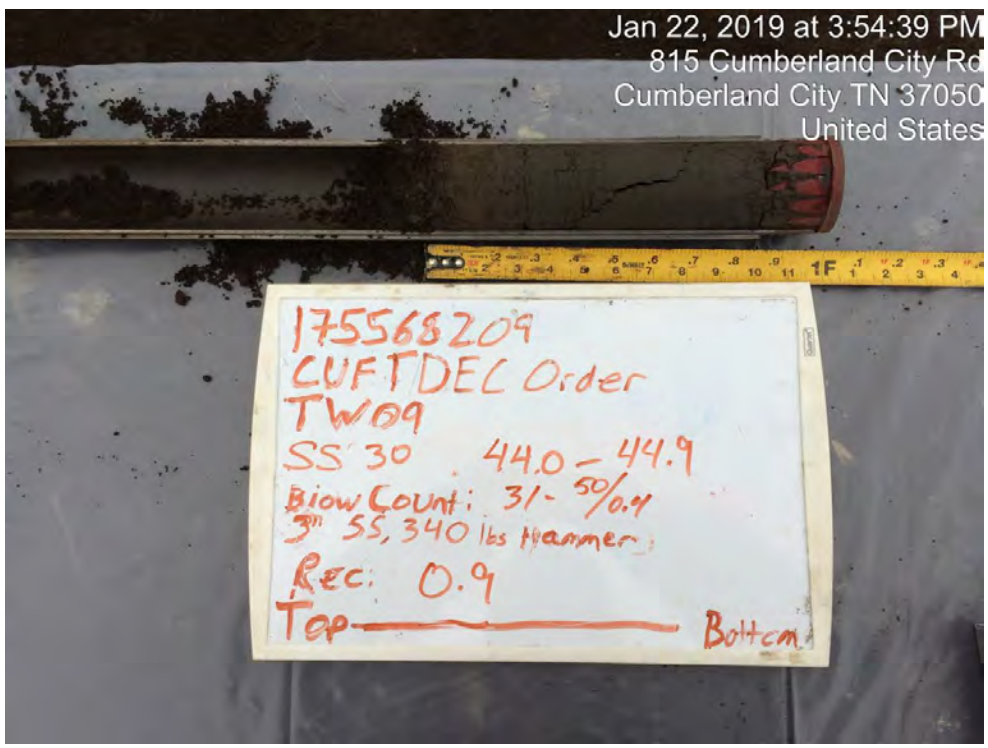


Photograph ID: 200

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (44.0-44.9 feet). Sampler refusal at 44.9 feet.



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Photographic Log

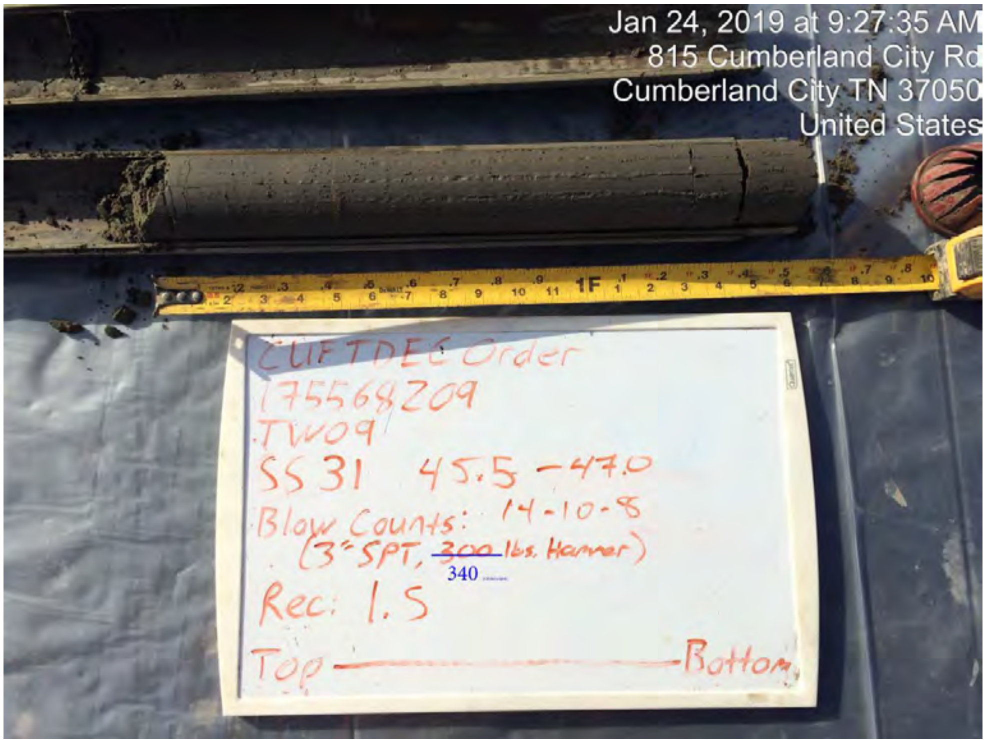
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 201

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (45.5-47.0 feet).

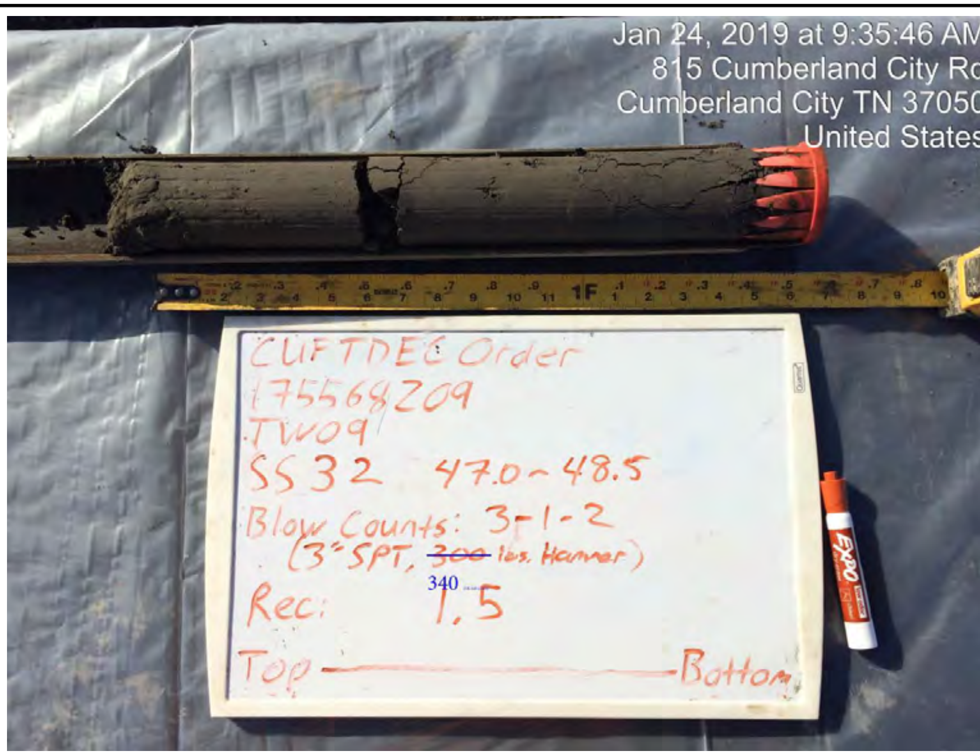


Photograph ID: 202

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (47.0-48.5 feet).



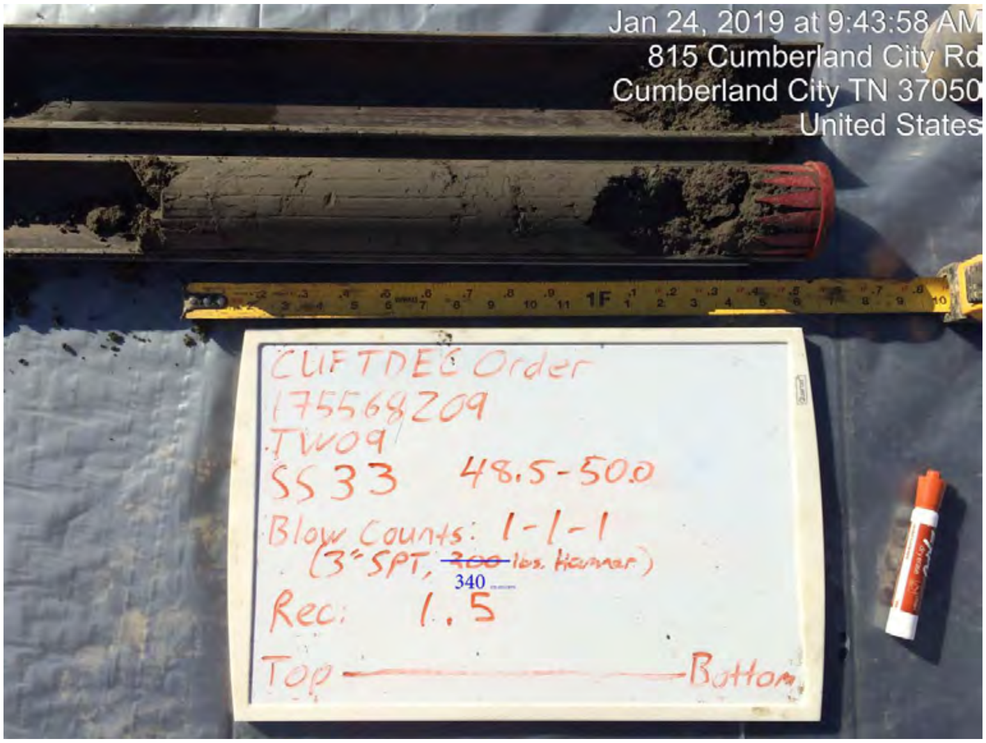
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 203

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (48.5-50.0 feet).

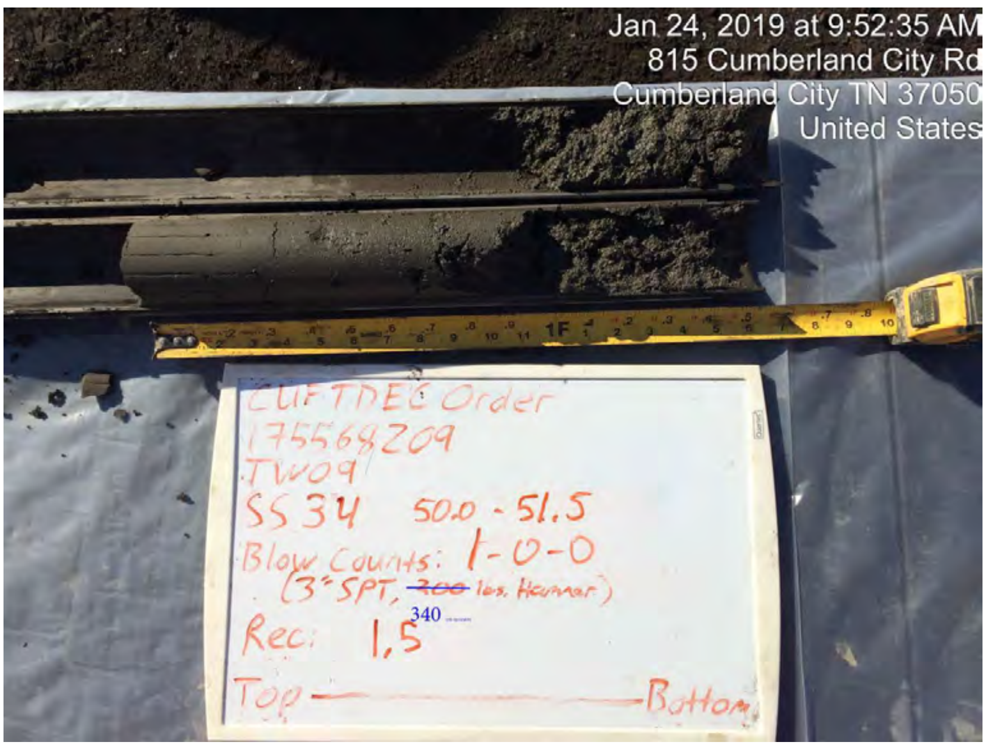


Photograph ID: 204

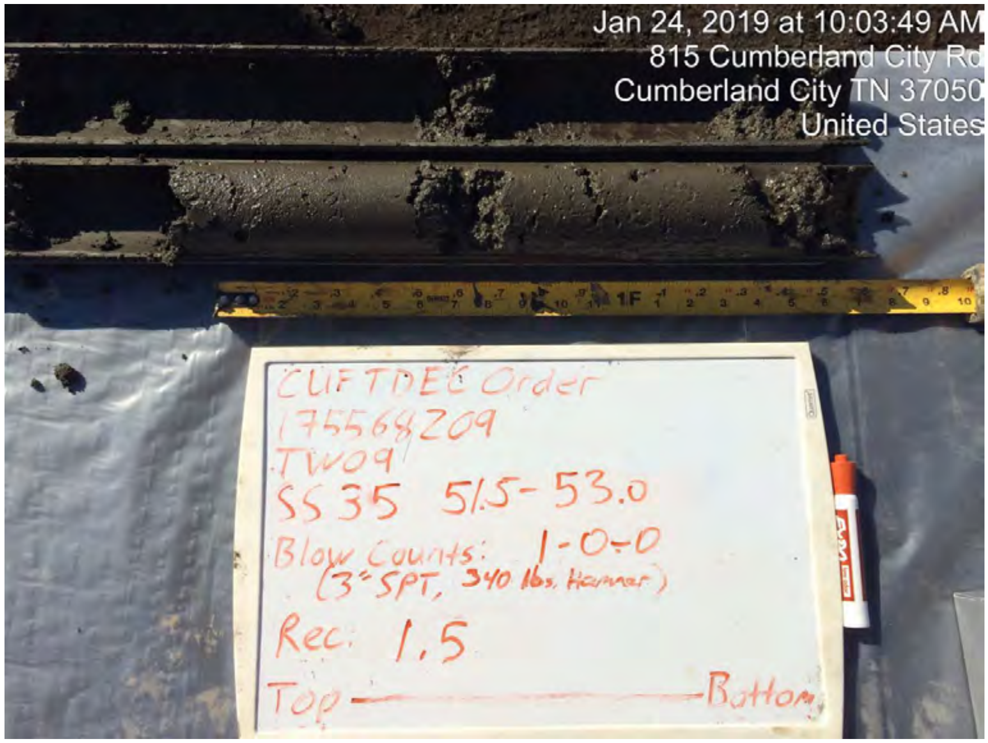
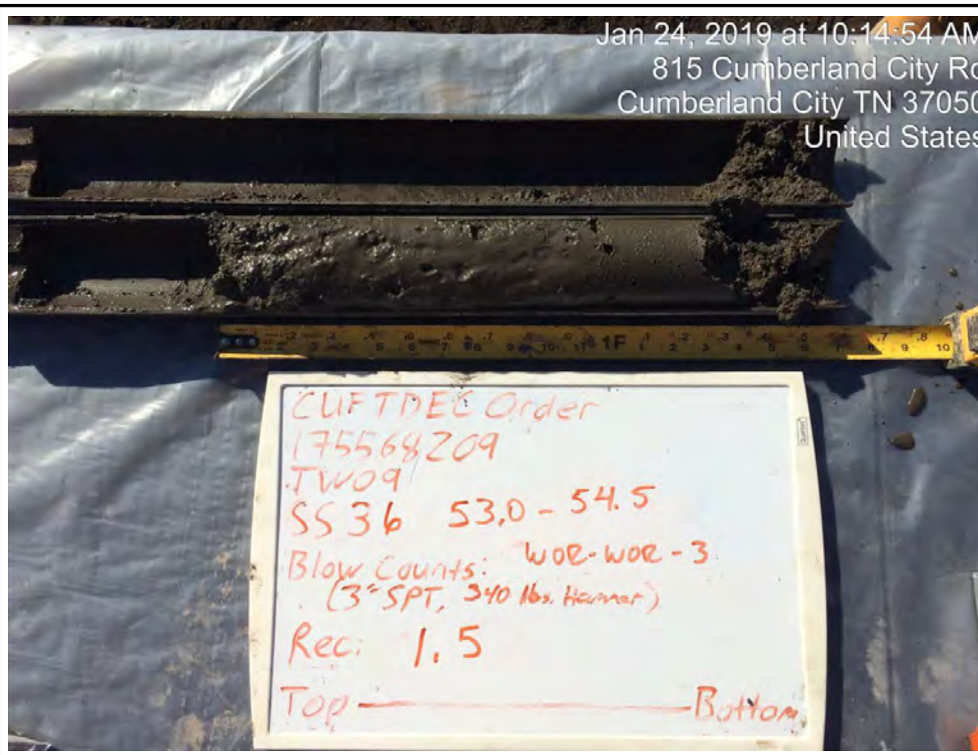
Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (50.0-51.5 feet).
Blowcount on white board should be 1-WH-WH.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 205 **Photo Location:** CUF-TW09 **Photo Date:** 1/24/2019 **Comments:** Interval (51.5-53.0 feet). Blowcount on white board should be 1-WH-WH.	
Photograph ID: 206 **Photo Location:** CUF-TW09 **Photo Date:** 1/24/2019 **Comments:** Interval (53.0-54.5 feet). WOR on white board is the same as WR on the boring log.	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 207

Photo Location: CUF-TW09

Photo Date: 1/24/2019

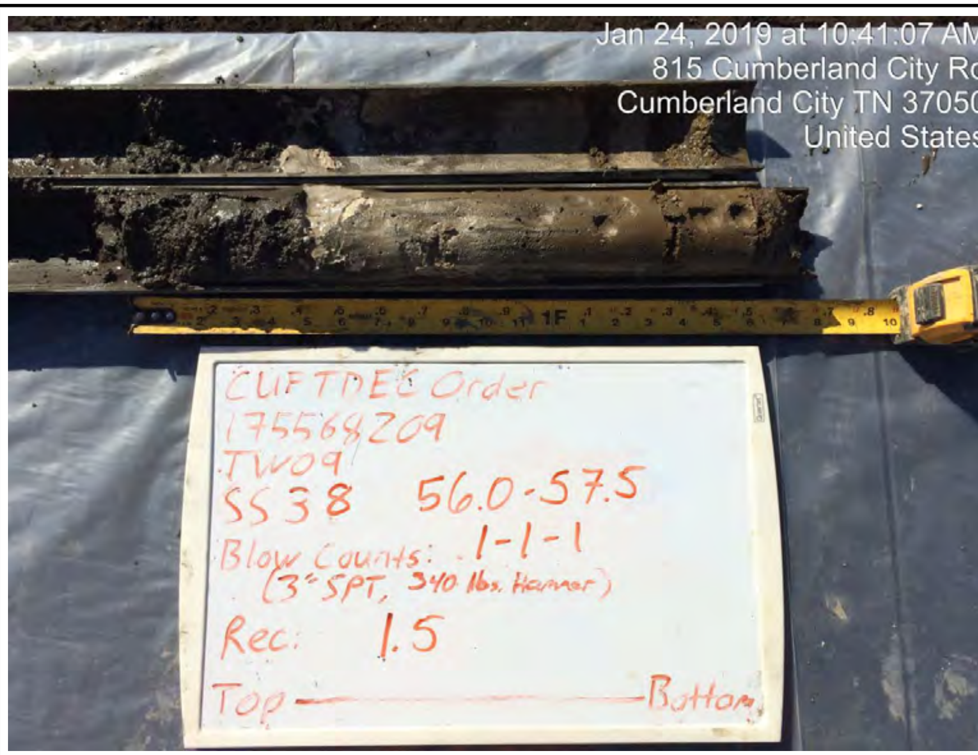
Comments: Interval (54.5-56.0 feet).

Photograph ID: 208

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (56.0-57.5 feet).



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 209

Photo Location: CUF-TW09

Photo Date: 1/24/2019

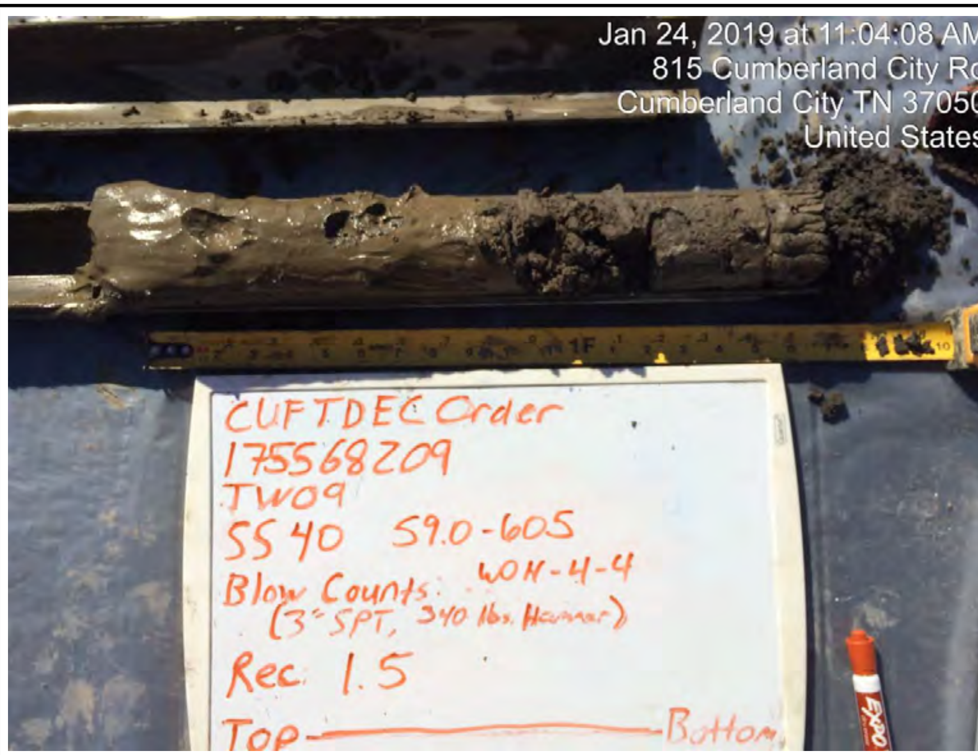
Comments: Interval (57.5-59.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 210

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (59.0-60.5 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 211

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

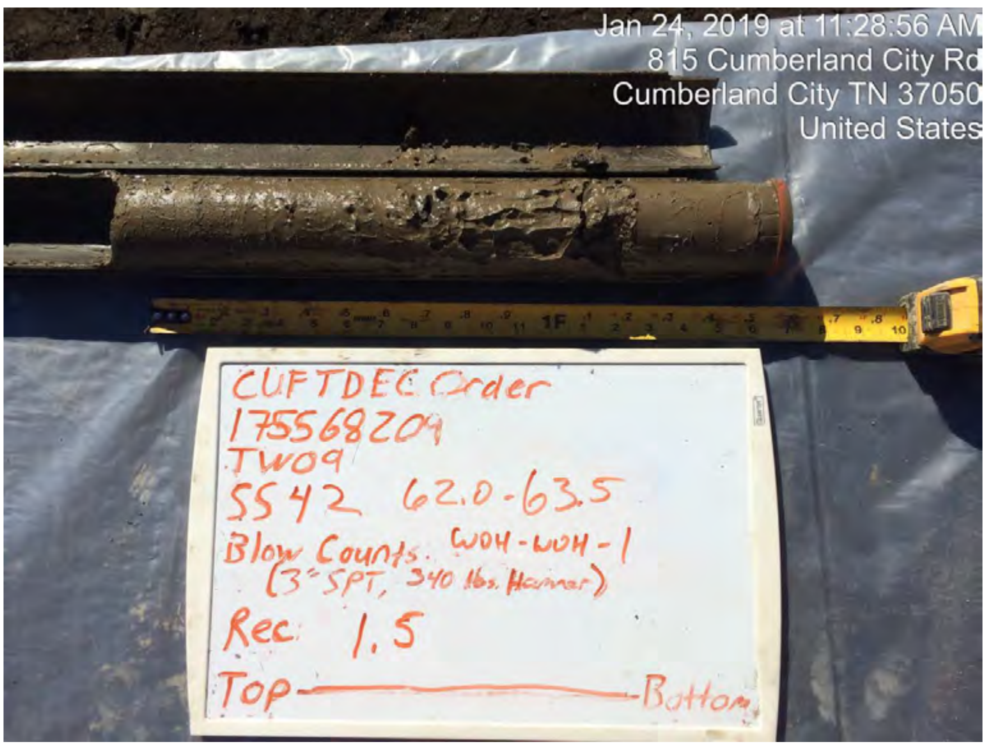
Comments:
Interval (60.5-62.0 feet).

Photograph ID: 212

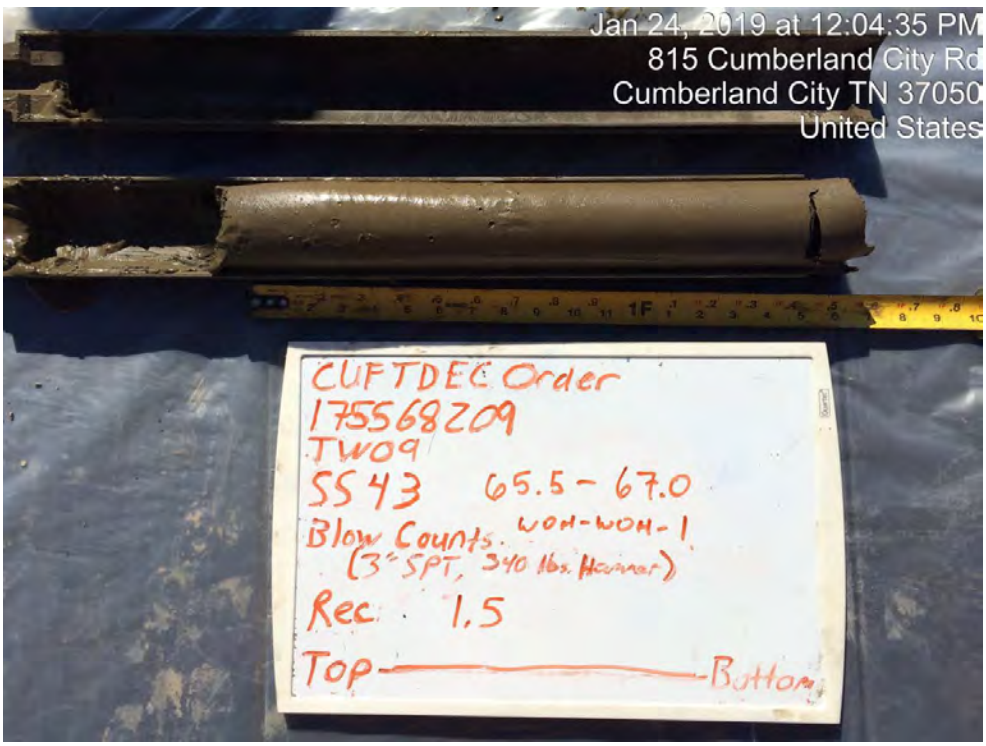
Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (62.0-63.5 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 213 **Photo Location:** CUF-TW09 **Photo Date:** 1/24/2019 **Comments:** Photo of interval (63.5-65.5 feet) unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 214 **Photo Location:** CUF-TW09 **Photo Date:** 1/24/2019 **Comments:** Interval (65.5-67.0 feet). WOH on white board is the same as WH on the boring log.	

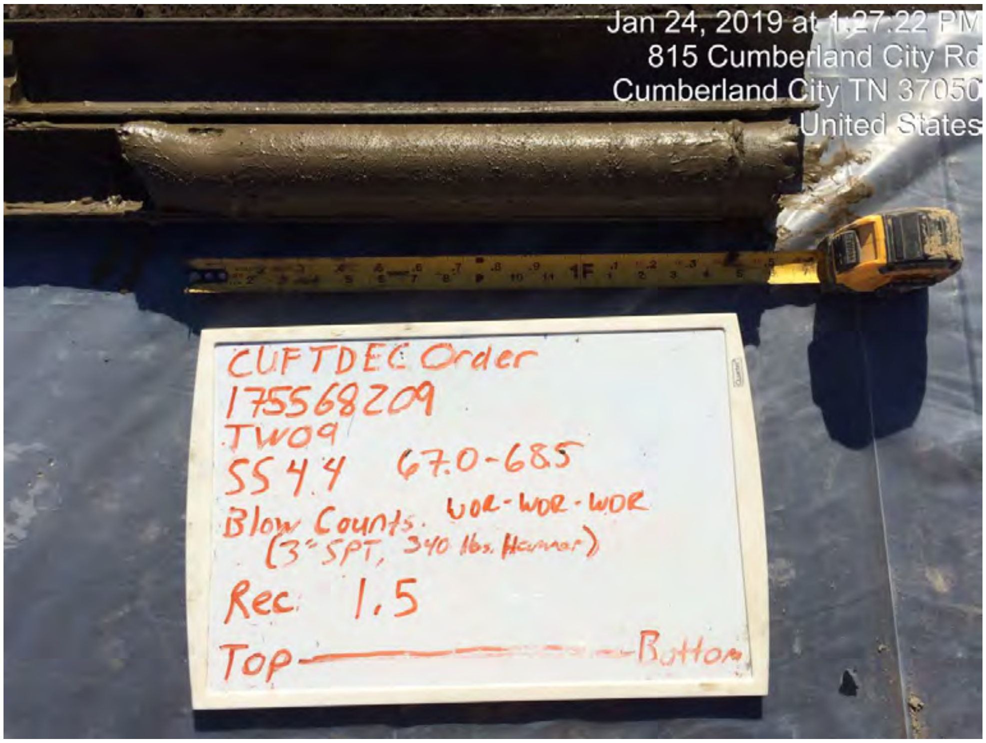
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 215

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (67.0-68.5 feet). WOR on white board is the same as WR on the boring log.

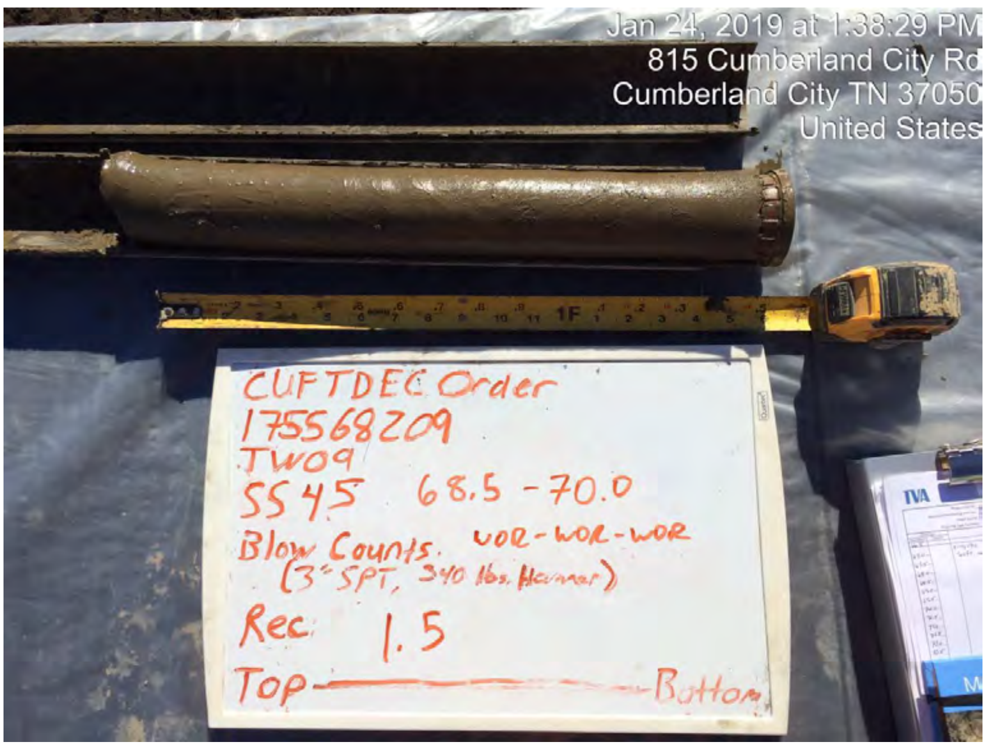


Photograph ID: 216

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (68.5-70.0 feet). WOR on white board is the same as WR on the boring log.



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 217

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Photo of interval (70.0-72.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photograph ID: 218

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (72.0-73.5 feet). WOR on white board is the same as WR on the boring log.

Stantec

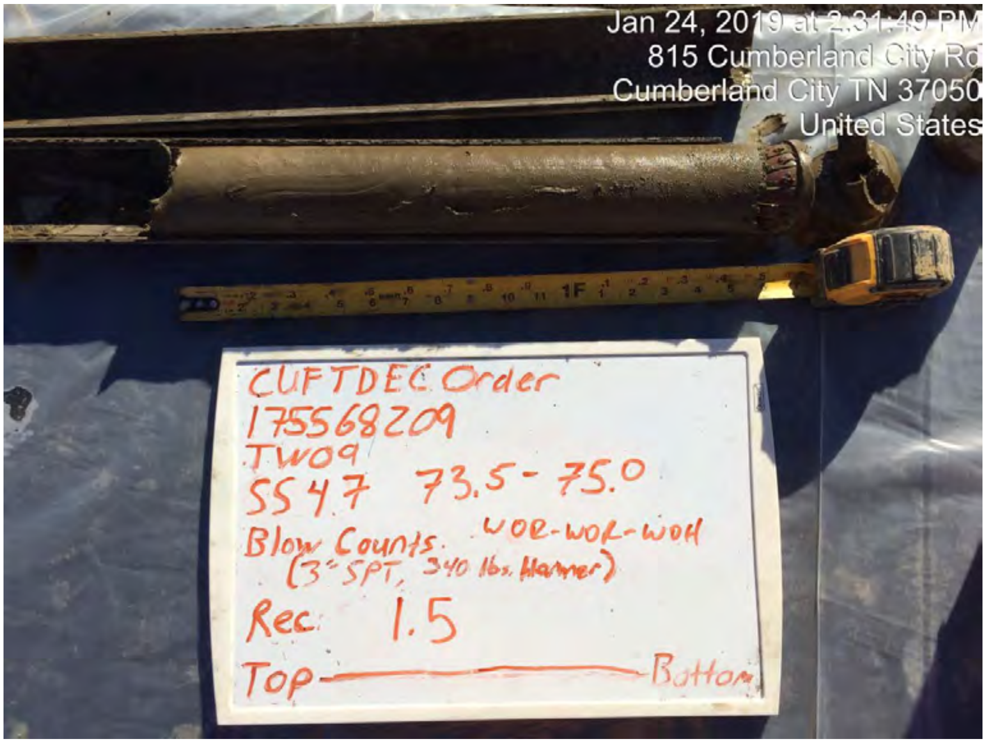
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 219

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (73.5-75.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

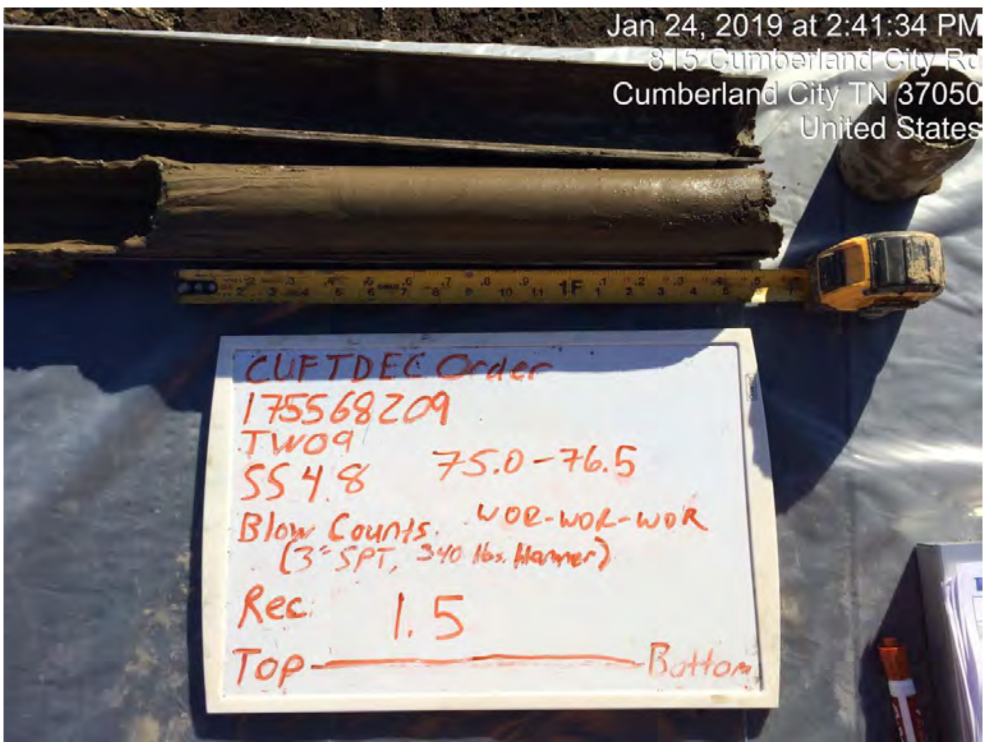


Photograph ID: 220

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (75.0-76.5 feet). WOR on white board is the same as WR on the boring log.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 221

Photo Location: CUF-TW09

Photo Date: 1/24/2019

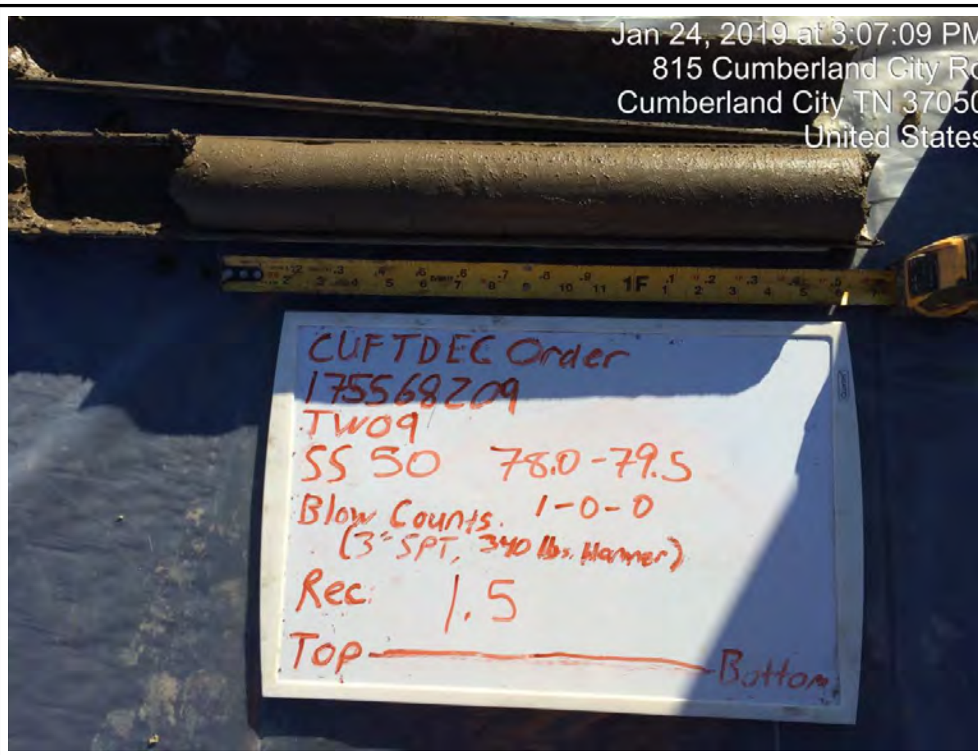
Comments: Interval (76.5-78.0 feet).

Photograph ID: 222

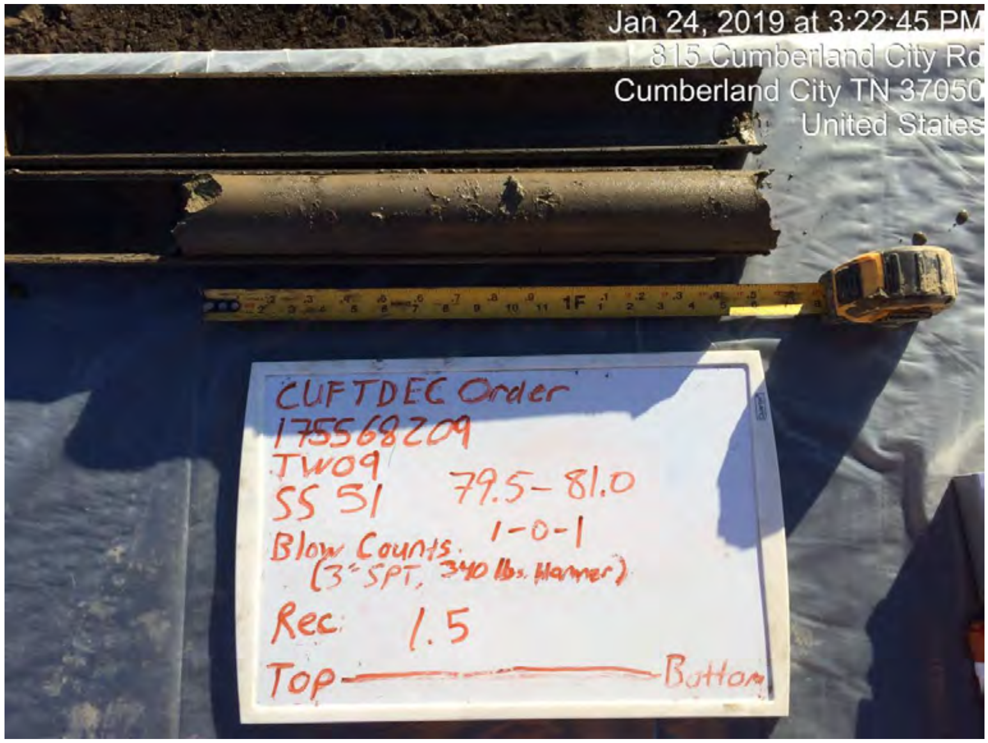
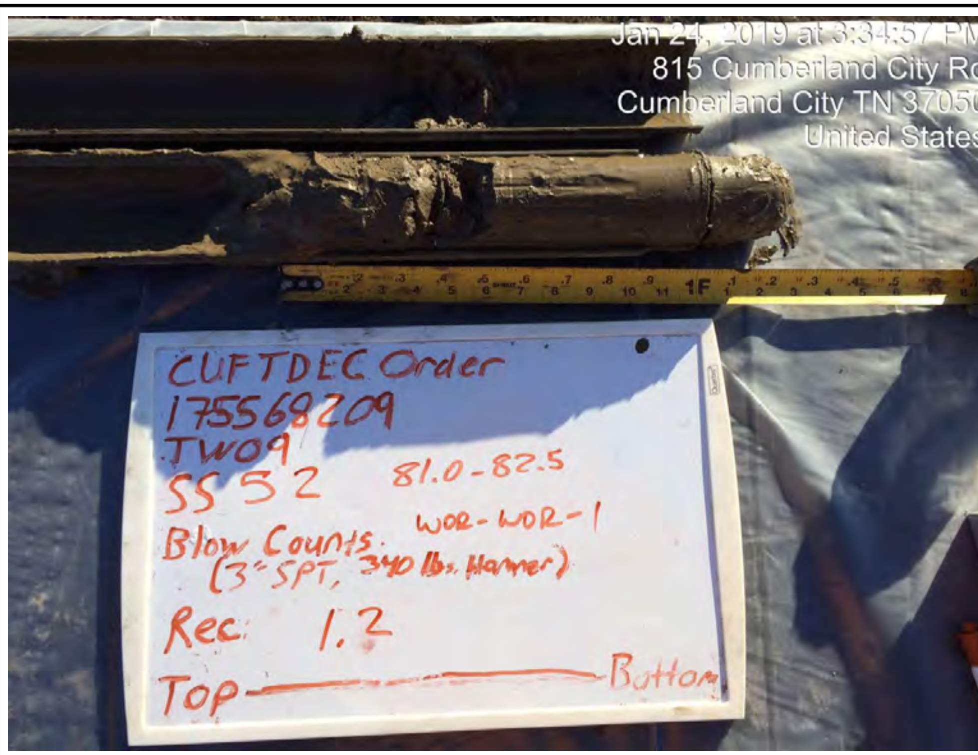
Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (78.0-79.5 feet). Blowcount on white board should be 1-WH-WH.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 223 **Photo Location:** CUF-TW09 **Photo Date:** 1/24/2019 **Comments:** Interval (79.5-81.0 feet). Blowcount on white board should be 1-WH-1.	
Photograph ID: 224 **Photo Location:** CUF-TW09 **Photo Date:** 1/24/2019 **Comments:** Interval (81.0-82.5 feet).	

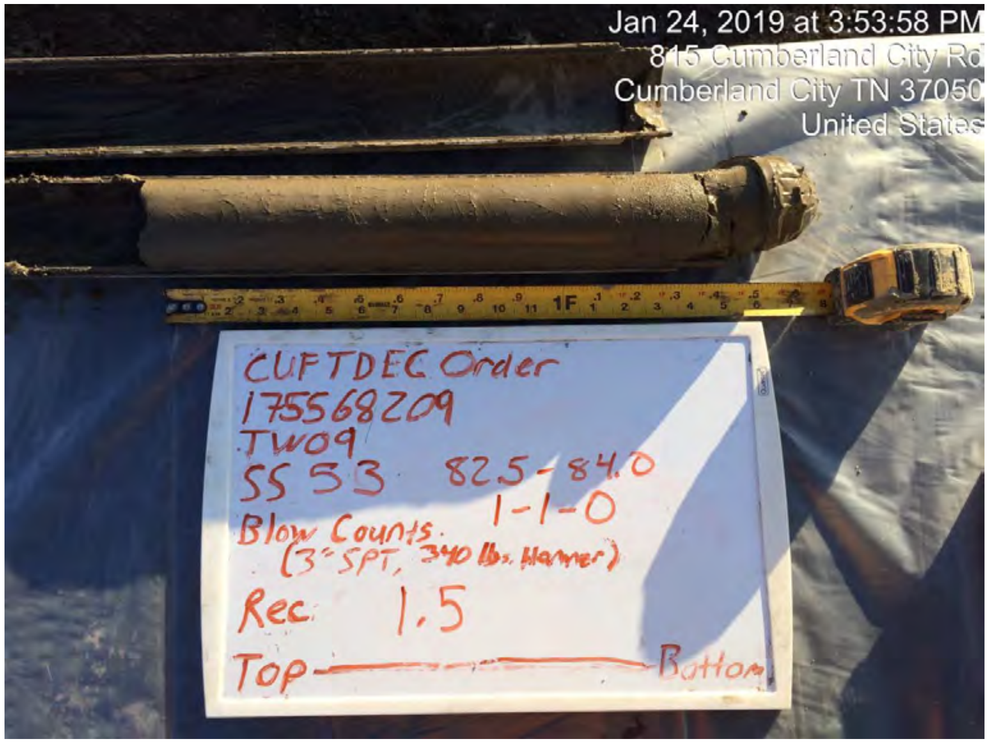
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 225

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (82.5-84.0 feet). Blowcount on white board should be 1-1-WH.

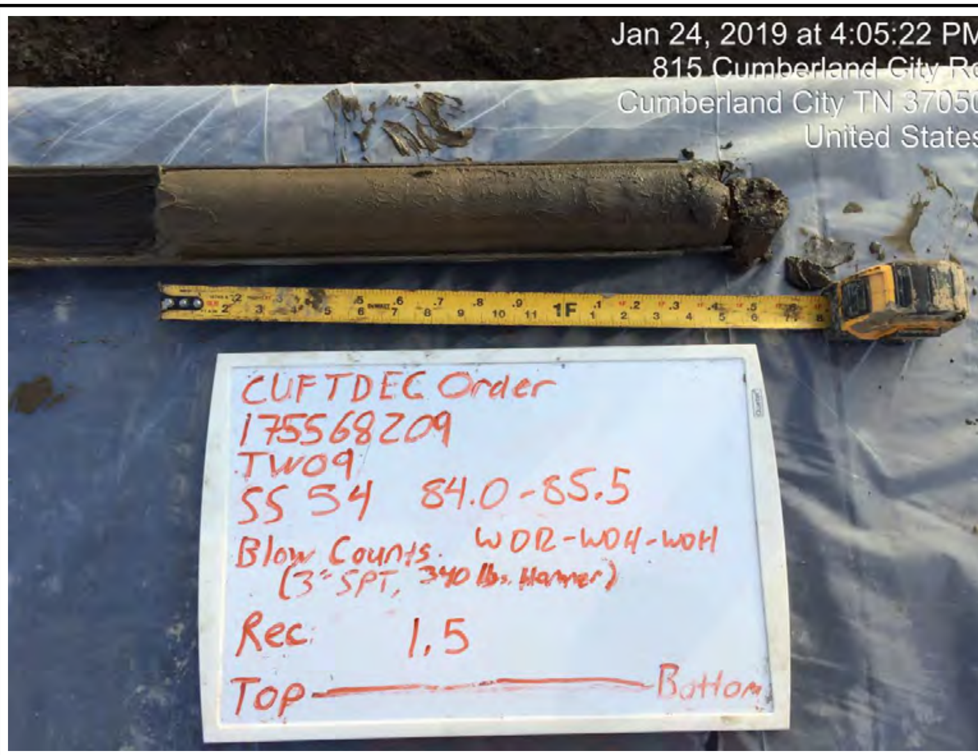


Photograph ID: 226

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (84.0-85.5 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 227

Photo Location:
CUF-TW09

Photo Date:
1/25/2019

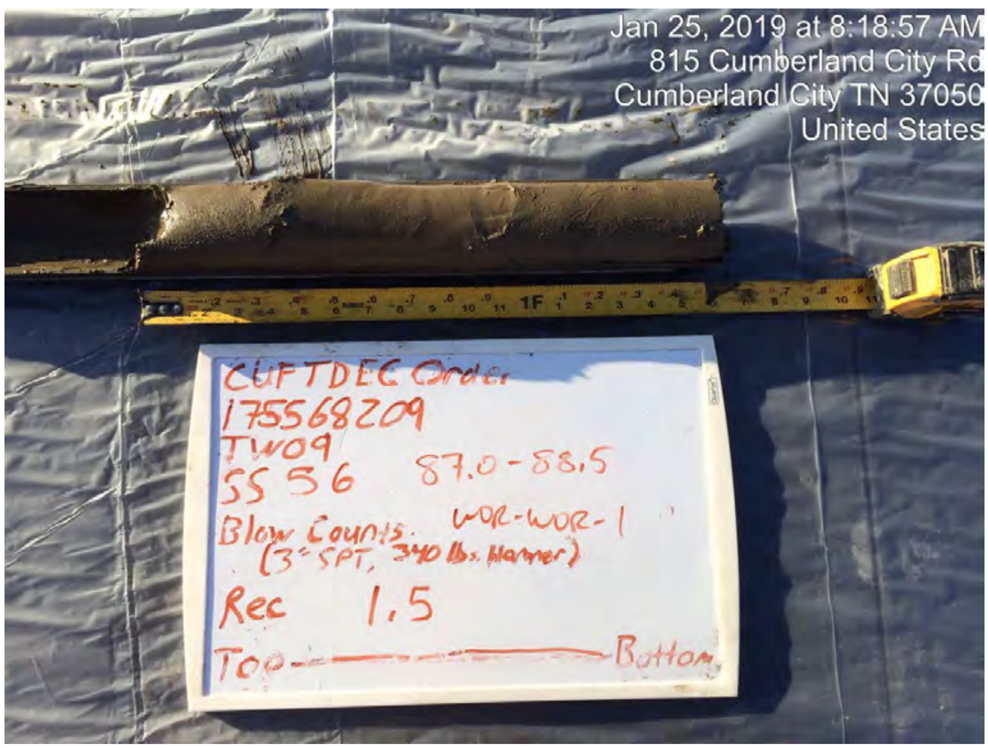
Comments:
Interval (85.5-87.0 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 228

Photo Location:
CUF-TW09

Photo Date:
1/25/2019

Comments:
Interval (87.0-88.5 feet). WOR on white board is the same as WR on the boring log.



Stantec

Photographic Log

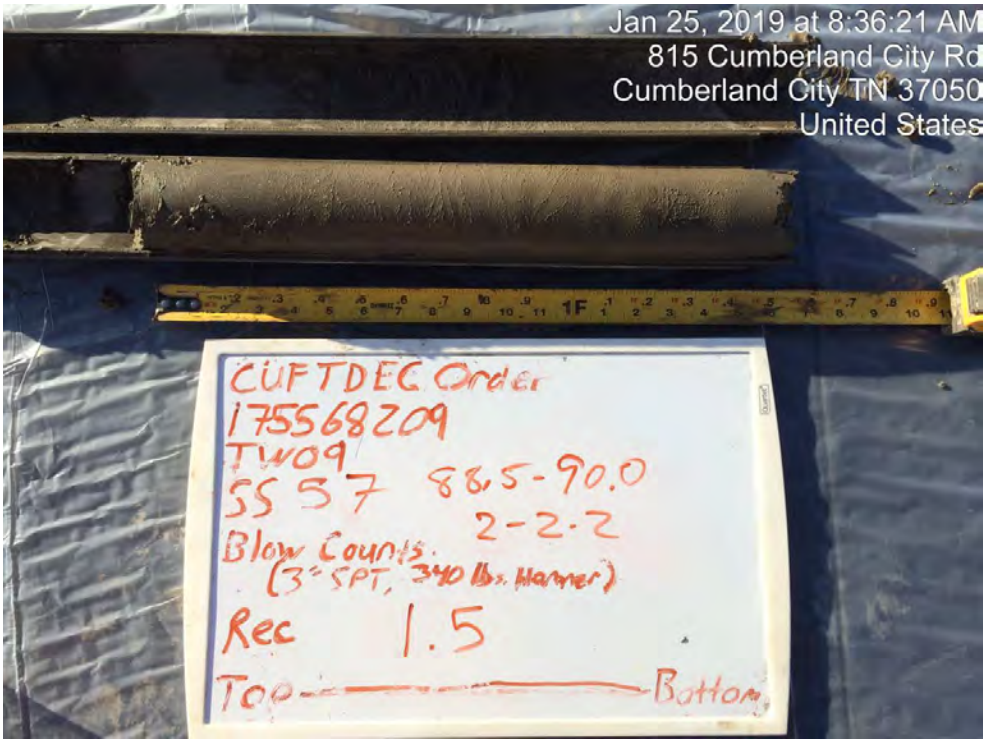
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 229

Photo Location:
CUF-TW09

Photo Date:
1/25/2019

Comments:
Interval (88.5-90.0 feet).

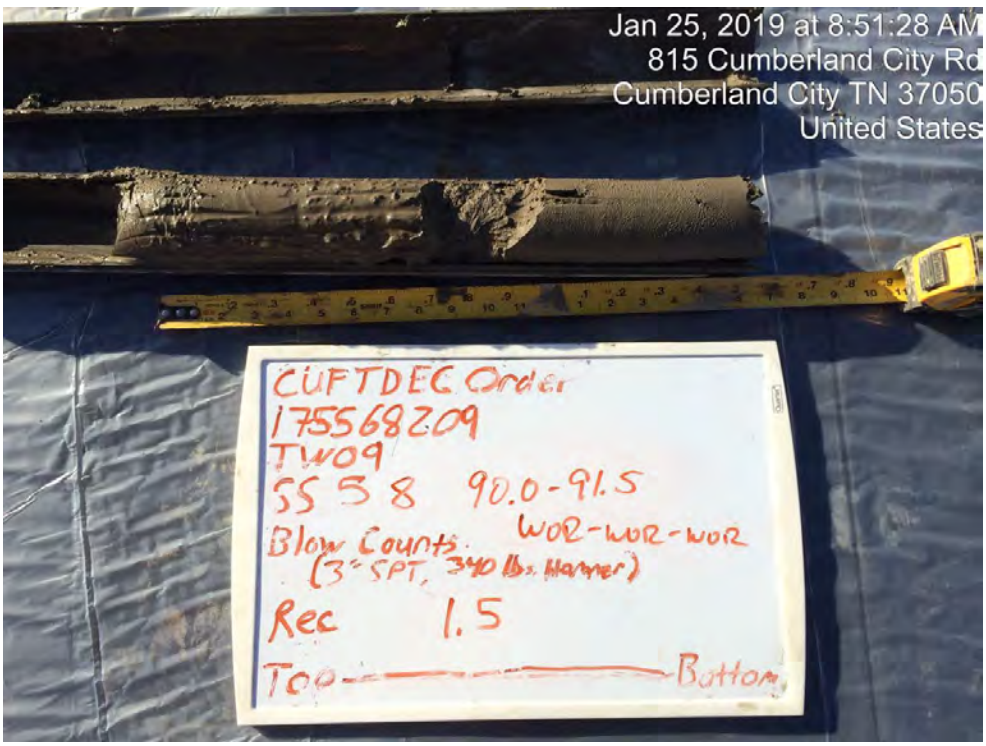


Photograph ID: 230

Photo Location:
CUF-TW09

Photo Date:
1/25/2019

Comments:
Interval (90.0-91.5 feet). WOR on white board is the same as WR on the boring log.



Stantec

Photographic Log

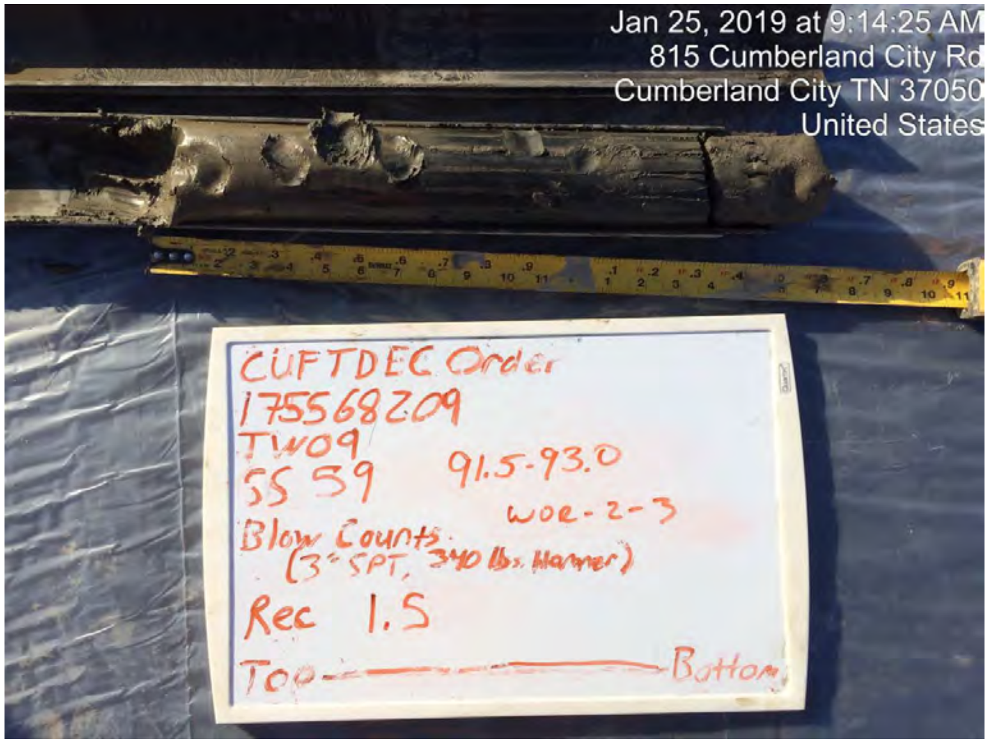
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 231

Photo Location: CUF-TW09

Photo Date: 1/25/2019

Comments: Interval (91.5-93.0 feet). WOR on white board is the same as WR on the boring log.



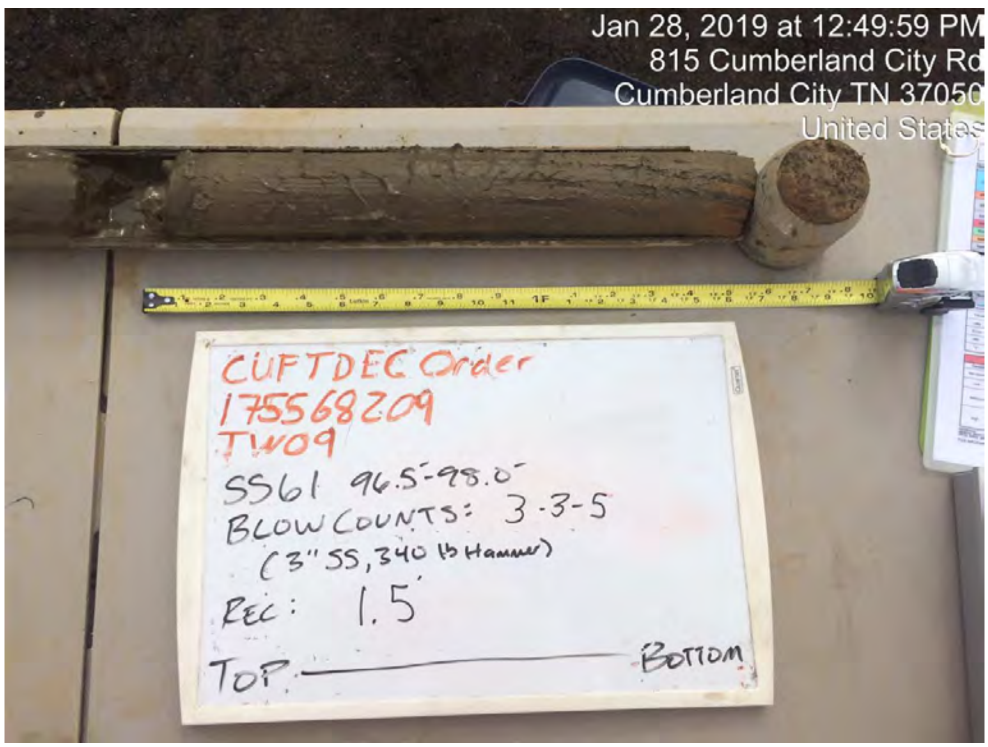
Photograph ID: 232

Photo Location: CUF-TW09

Photo Date: 1/25/2019

Comments: Interval (93.0-94.5 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 233 **Photo Location:** CUF-TW09 **Photo Date:** 1/25/2019 **Comments:** Photo of interval (94.5-96.5 feet) unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 234 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (96.5-98.0 feet).	

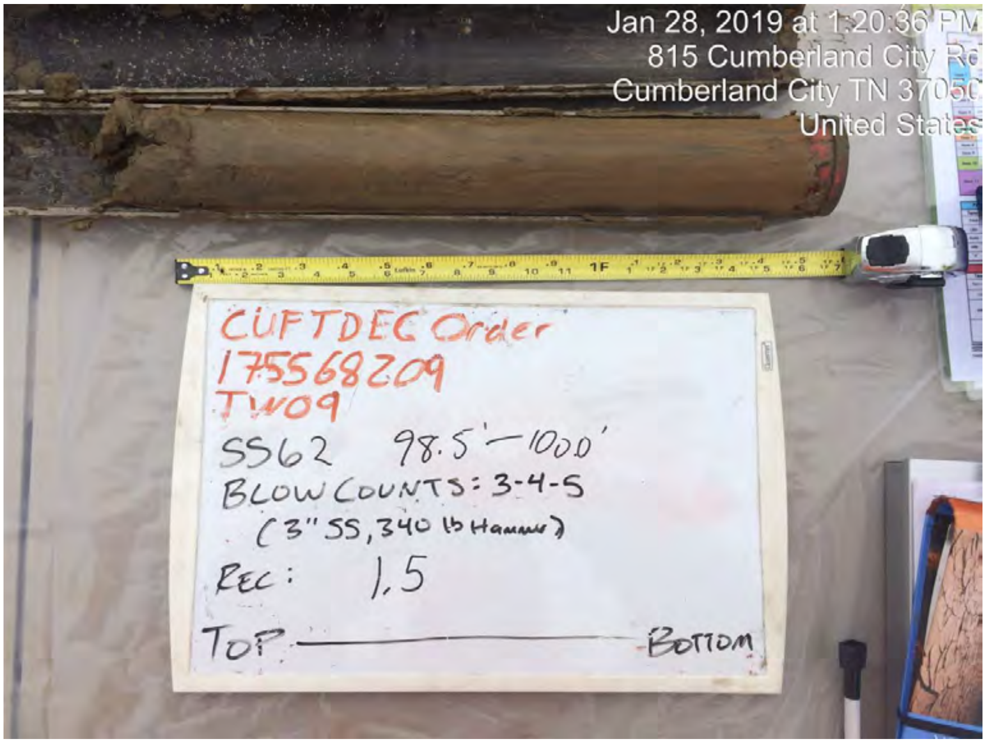
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 235

Photo Location: CUF-TW09

Photo Date: 1/28/2019

Comments: Interval (98.5-100.0 feet).

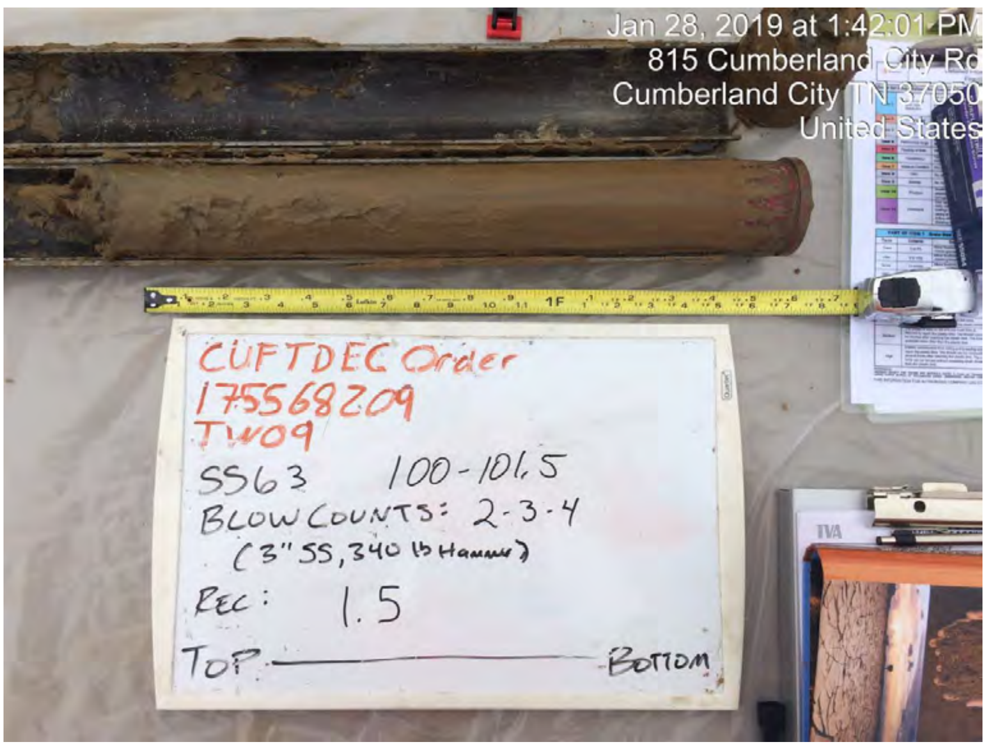


Photograph ID: 236

Photo Location: CUF-TW09

Photo Date: 1/28/2019

Comments: Interval (100.0-101.5 feet). Interval on white board should be 100.0-101.5 feet.



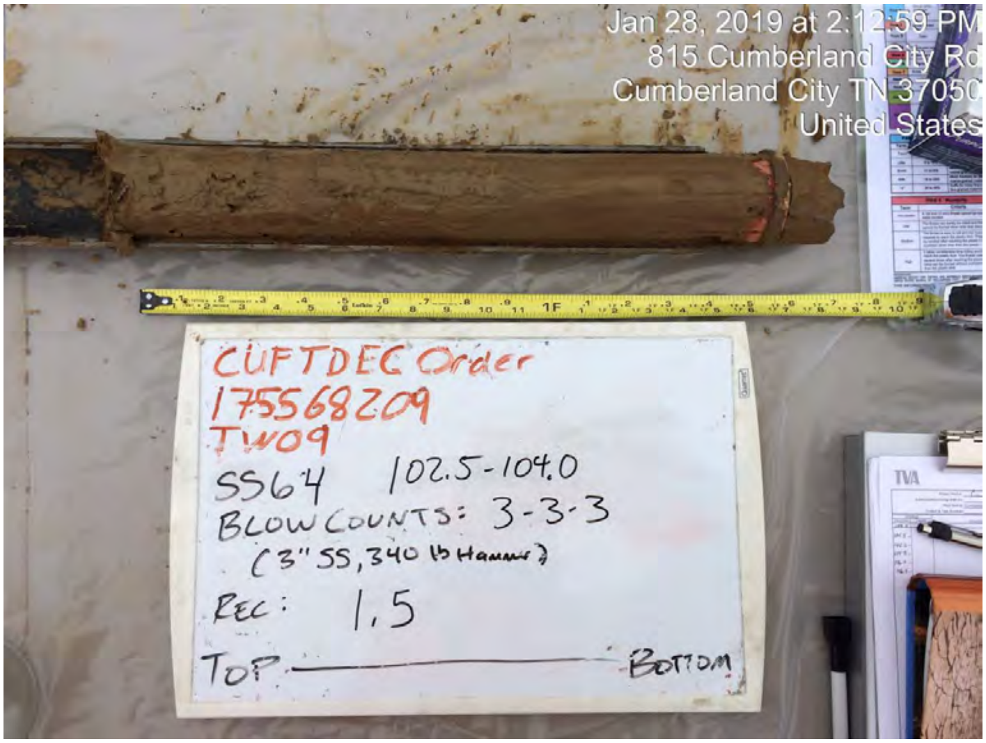
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 237

Photo Location:
CUF-TW09

Photo Date:
1/28/2019

Comments:
Interval (102.5-104.0 feet).



Photograph ID: 238

Photo Location:
CUF-TW09

Photo Date:
1/28/2019

Comments:
Interval (105.0-106.5 feet). Interval on white board should be 105.0-106.5 feet.

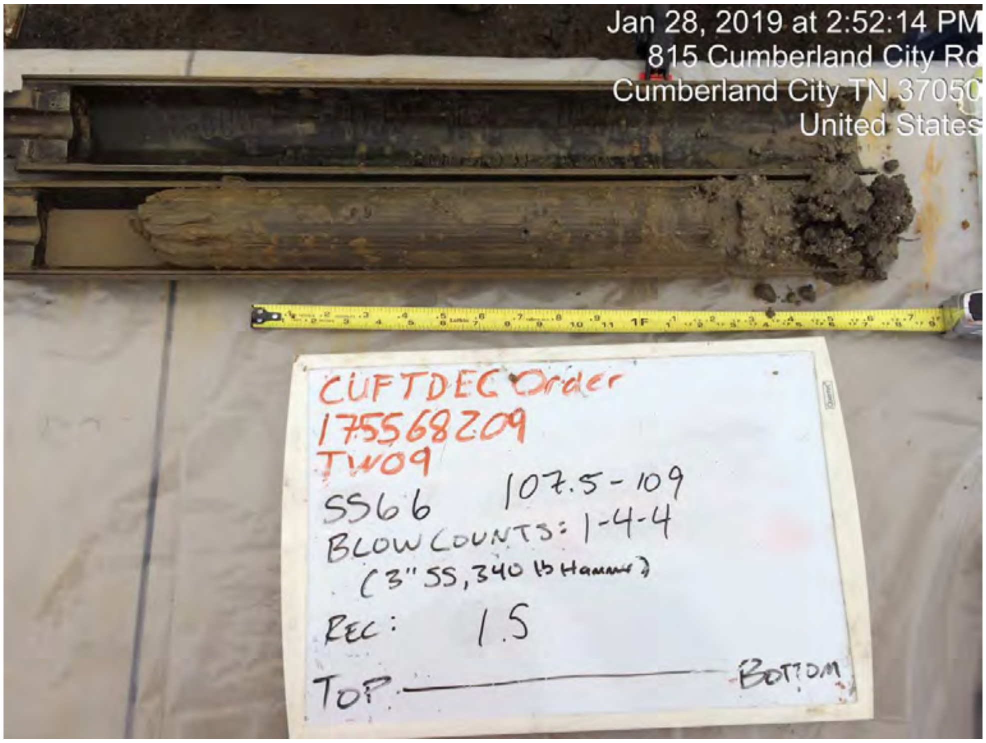
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 239

Photo Location:
CUF-TW09

Photo Date:
1/28/2019

Comments:
Interval (107.5-109.0 feet). Interval on white board should be 107.5-109.0 feet.

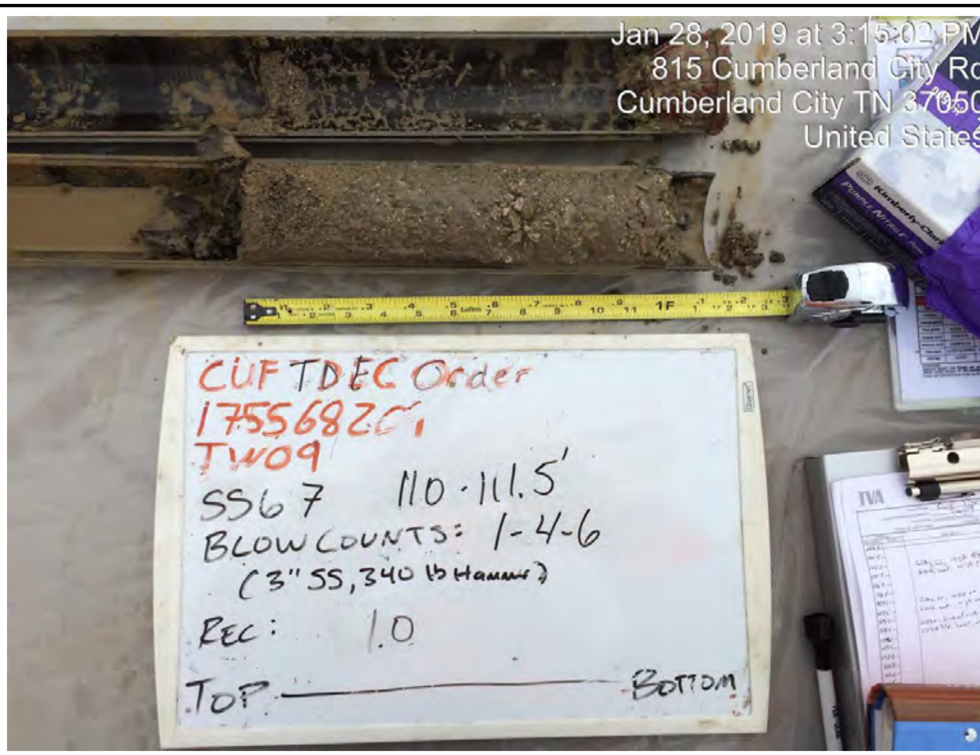


Photograph ID: 240

Photo Location:
CUF-TW09

Photo Date:
1/28/2019

Comments:
Interval (110.0-111.5 feet). Interval on white board should be 110.0-111.5 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 241

Photo Location:
CUF-TW09

Photo Date:
1/28/2019

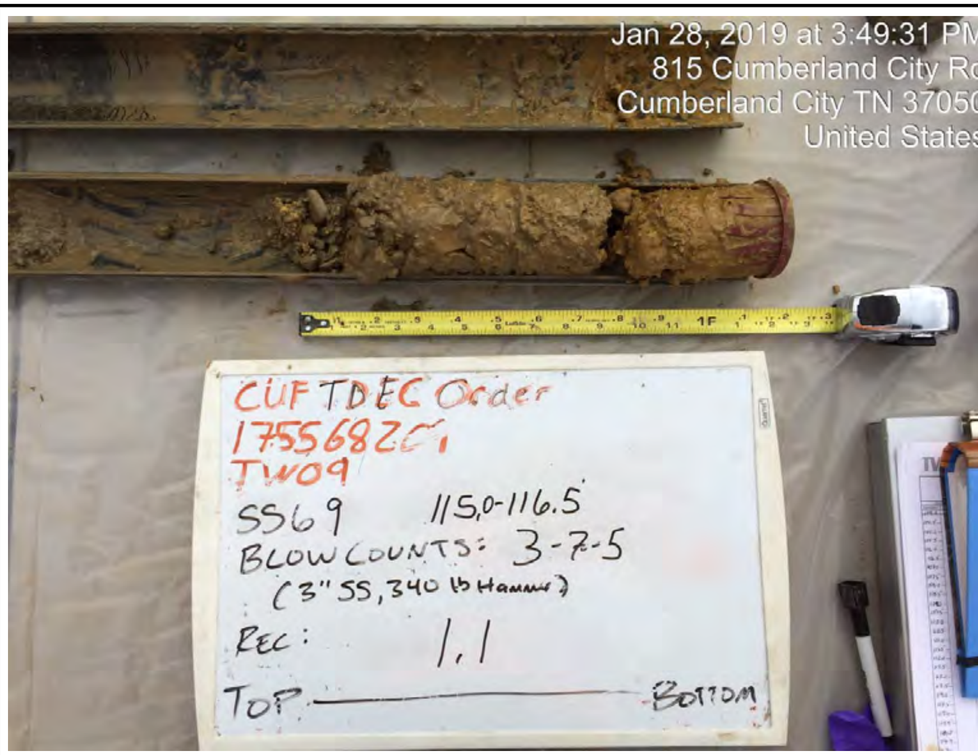
Comments:
Interval (112.5-114.0 feet).

Photograph ID: 242

Photo Location:
CUF-TW09

Photo Date:
1/28/2019

Comments:
Interval (115.0-116.5 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 243

Photo Location: CUF-TW09

Photo Date: 1/28/2019

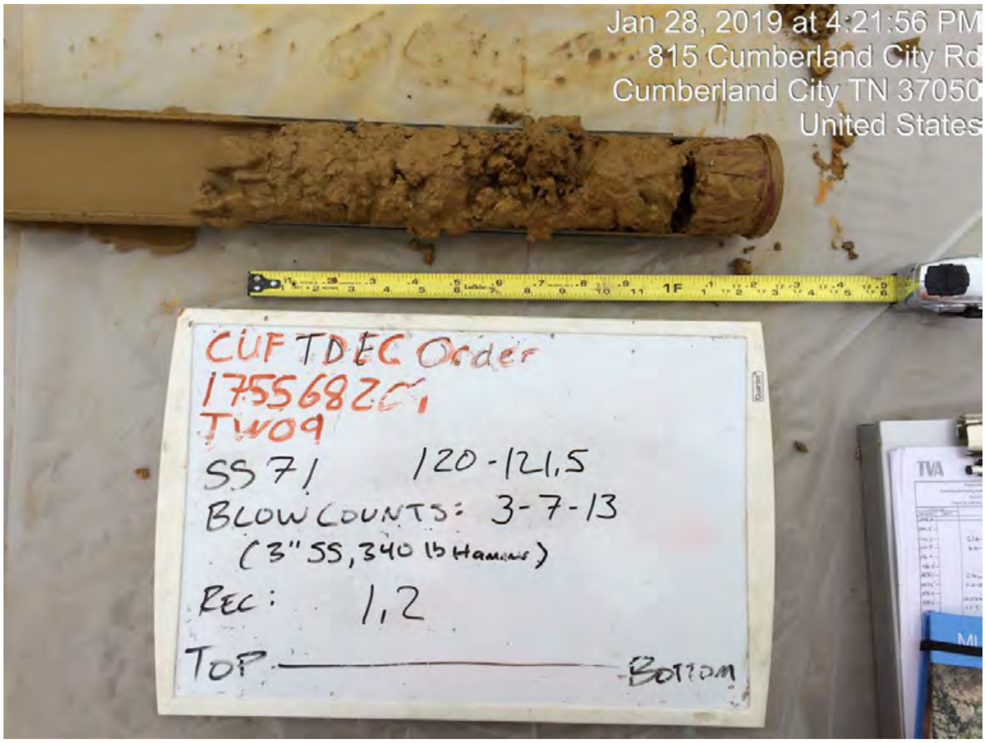
Comments: Interval (117.5-119.0 feet).

Photograph ID: 244

Photo Location: CUF-TW09

Photo Date: 1/28/2019

Comments: Interval (120.0-121.5 feet). Interval on white board should be 120.0-121.5 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 245

Photo Location: CUF-TW09

Photo Date: 1/29/2019

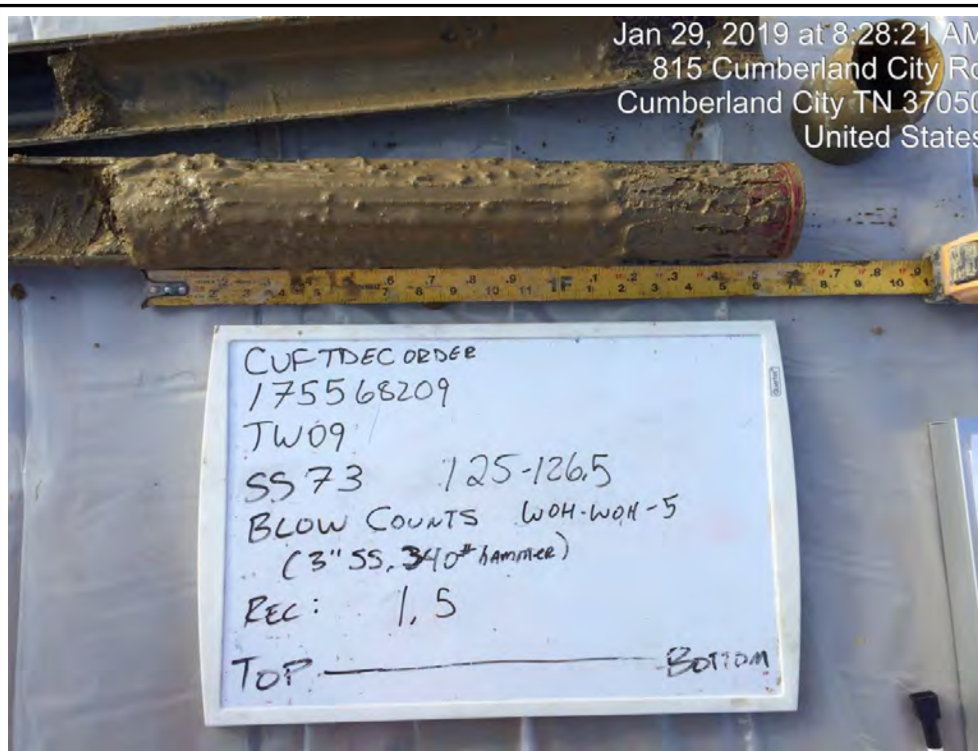
Comments: Interval (122.5-124.0 feet).

Photograph ID: 246

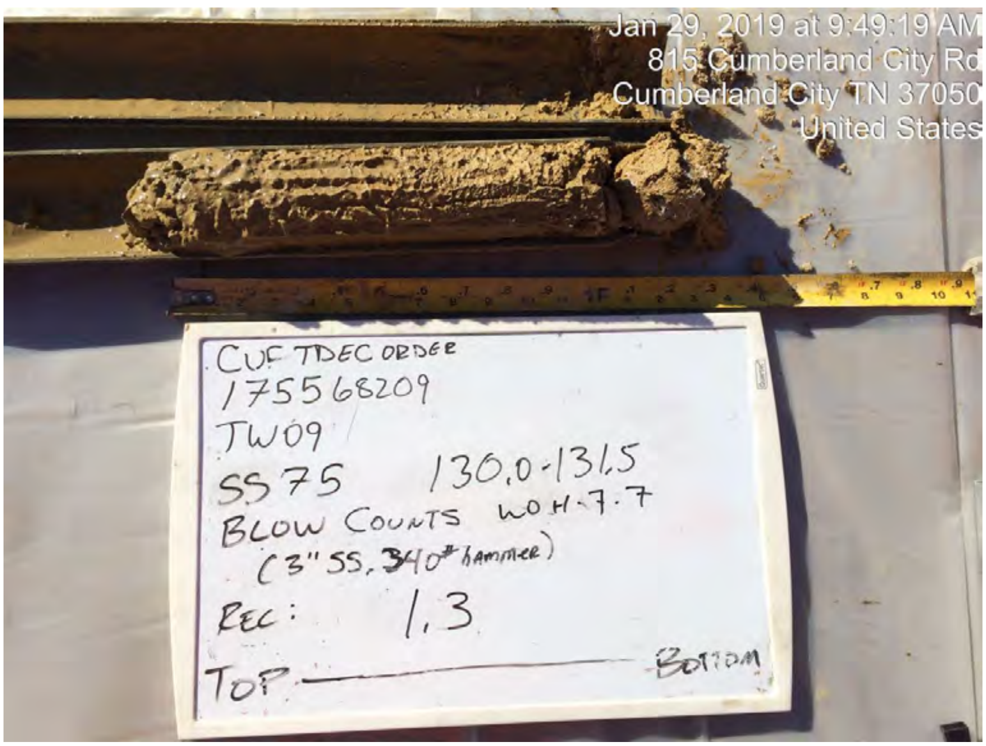
Photo Location: CUF-TW09

Photo Date: 1/29/2019

Comments: Interval (125.0-126.5 feet). Interval on white board should be 125.0-126.5 feet. WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 247 **Photo Location:** CUF-TW09 **Photo Date:** 1/29/2019 **Comments:** Interval (127.5-129.0 feet). Blowcount on white board should be 2-2-WH.	
Photograph ID: 248 **Photo Location:** CUF-TW09 **Photo Date:** 1/29/2019 **Comments:** Interval (130.0-131.5 feet). WOH on white board is the same as WH on the boring log.	

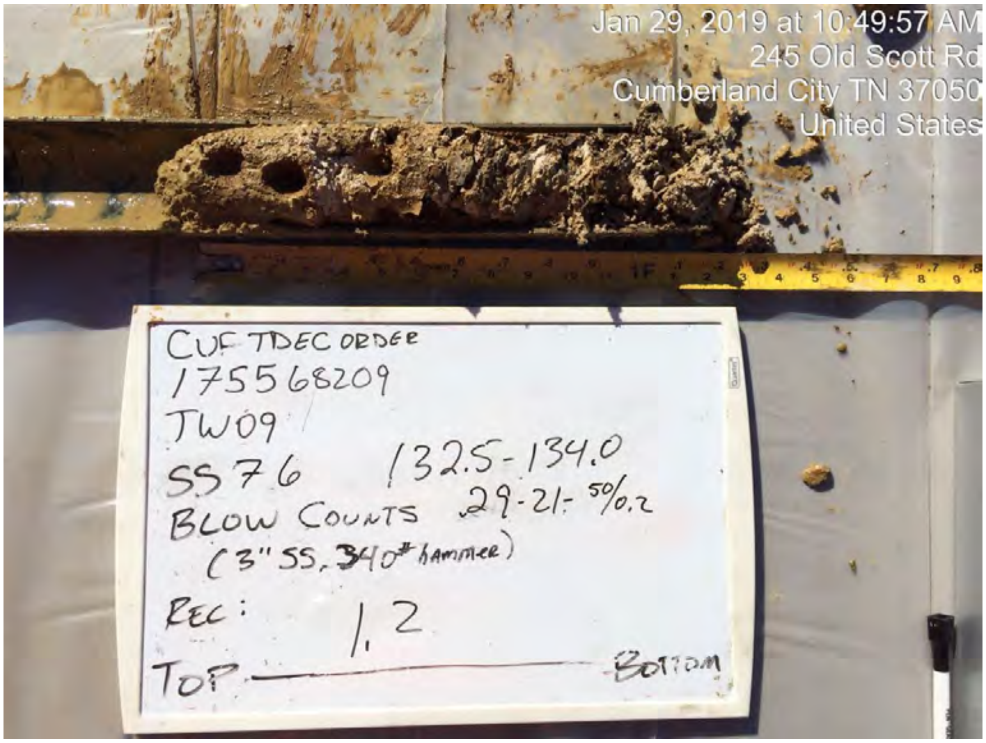
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 249

Photo Location: CUF-TW09

Photo Date: 1/29/2019

Comments: Interval (132.5-133.7 feet). Interval shown on white board should be 132.5 to 133.7 feet.



Photograph ID: 250

Photo Location: CUF-TW09

Photo Date: 2/1/2019

Comments: Interval (137.2-151.7 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

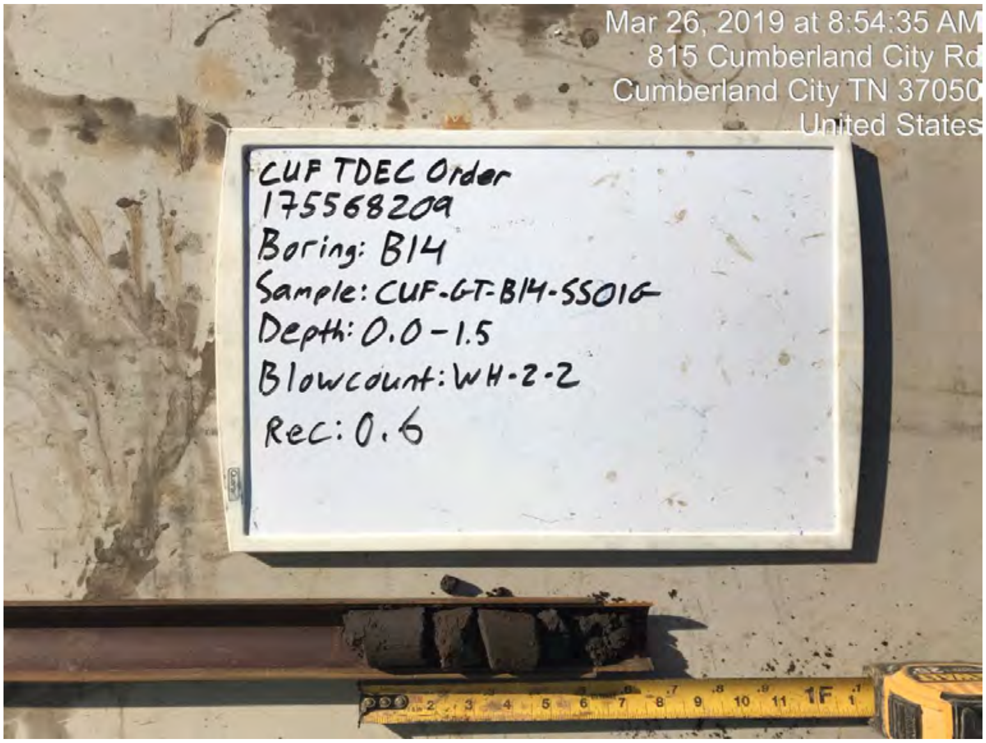
Photograph ID: 251

Photo Location:
CUF-TW09

Photo Date:
2/4/2019

Comments:
Interval (151.7-157.7 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 1 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Interval (0.0-1.5 feet).	
Photograph ID: 2 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Interval (2.5-4.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 3

Photo Location: CUF-B14

Photo Date: 3/26/2019

Comments: Interval (5.0-6.5 feet).

Photograph ID: 4

Photo Location: CUF-B14

Photo Date: 3/26/2019

Comments: Interval (7.5-8.1 feet). Interval shown on white board should be 7.5-8.1 feet. Sampler refusal at 8.1 feet.

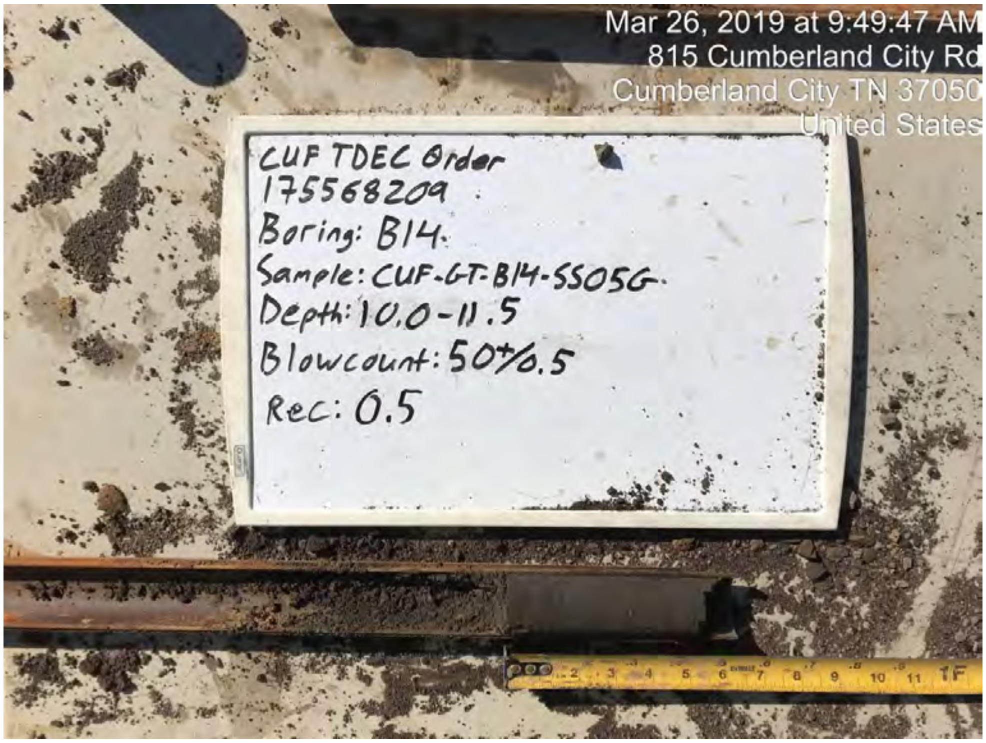
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 5

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (10.0-10.5 feet). Interval shown on white board should be 10.0-10.5 feet. Sampler refusal at 10.5 feet.

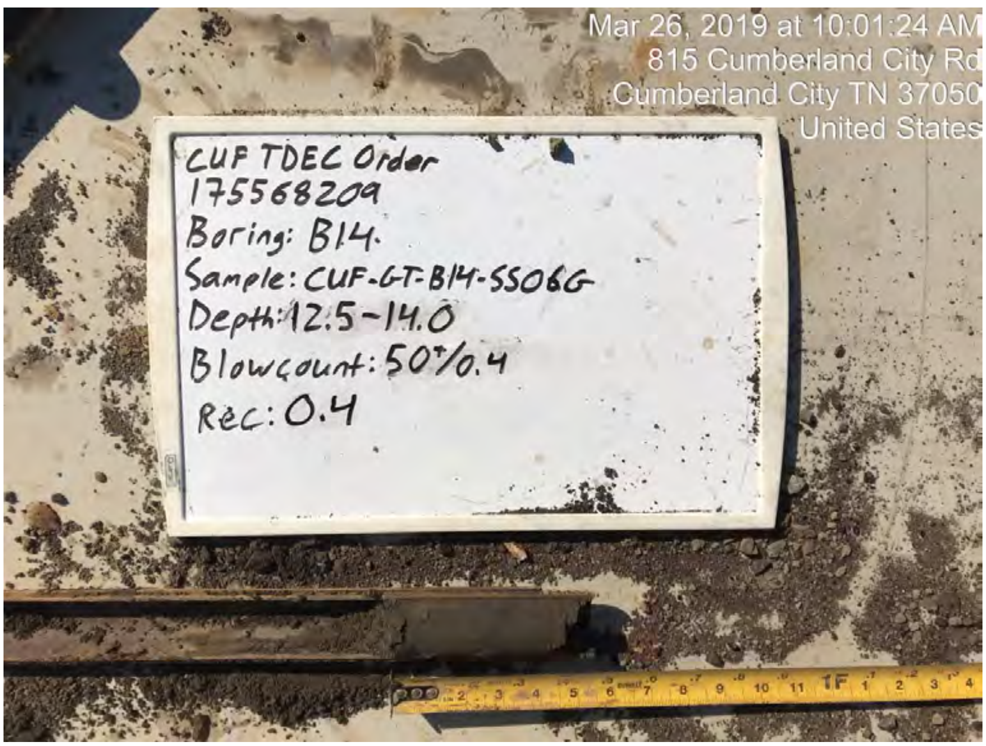


Photograph ID: 6

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (12.5-12.9 feet). Interval shown on white board should be 12.5-12.9 feet. Sampler refusal at 12.9 feet.



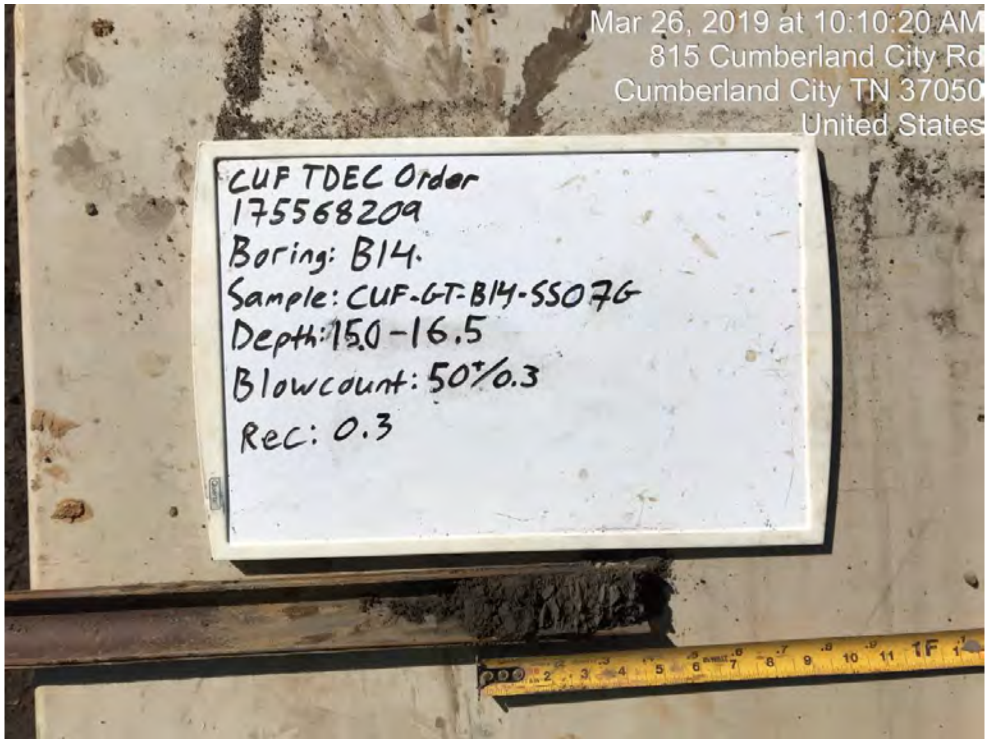
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 7

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (15.0-15.3 feet). Interval shown on white board should be 15.0-15.3 feet. Sampler refusal at 15.3 feet.

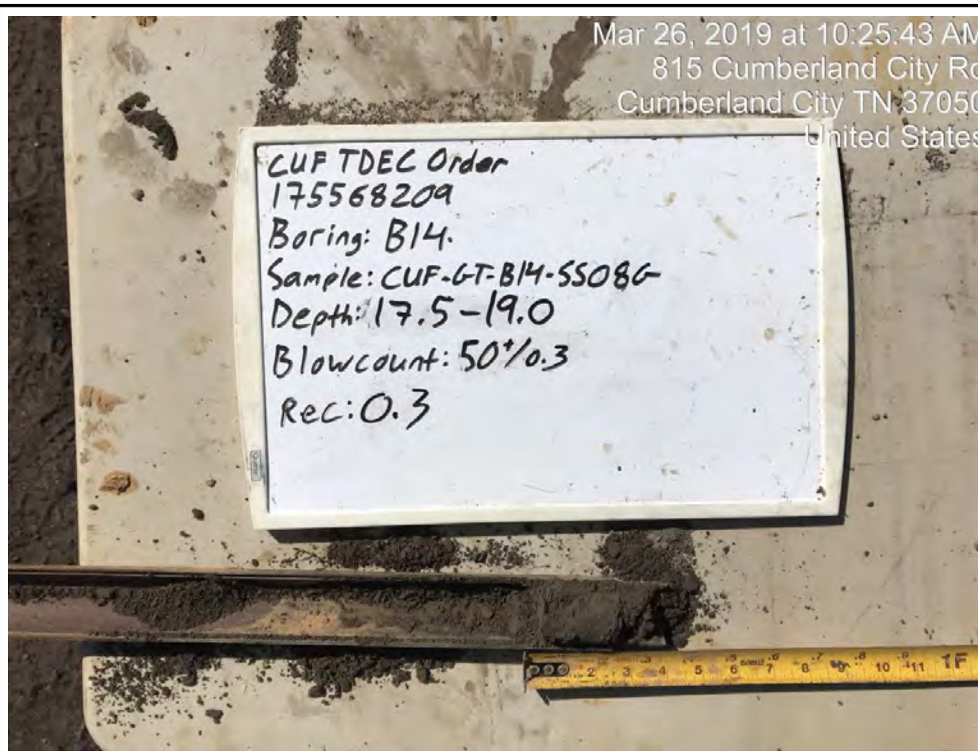


Photograph ID: 8

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (17.5-17.8 feet). Interval shown on white board should be 17.5-17.8 feet. Sampler refusal at 17.8 feet.



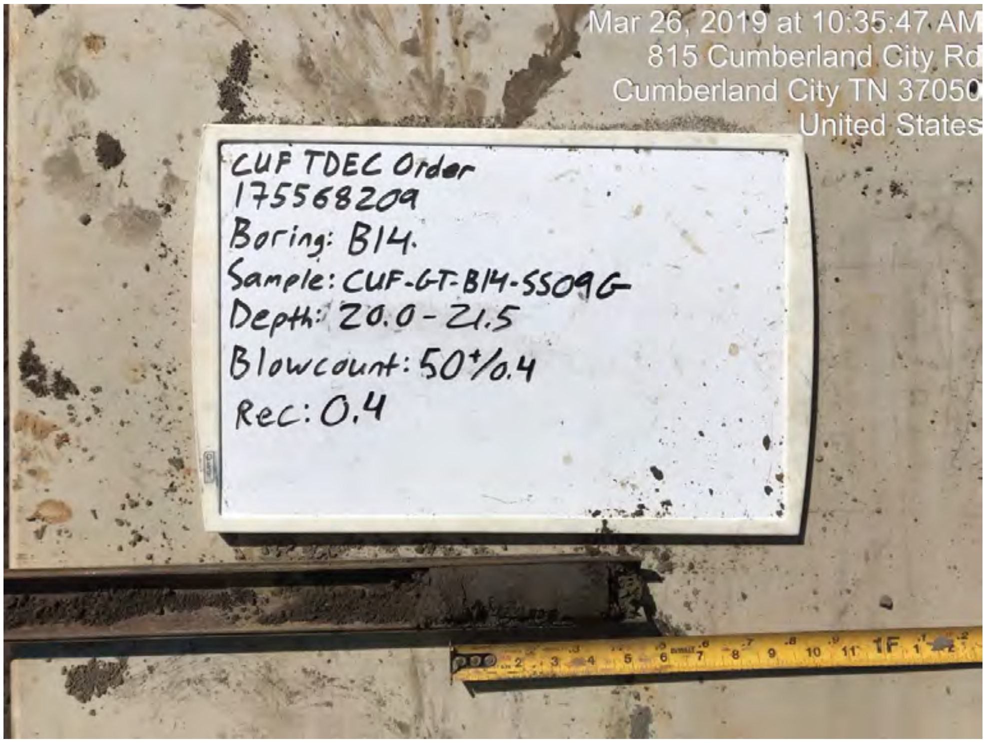
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 9

Photo Location: CUF-B14

Photo Date: 3/26/2019

Comments: Interval (20.0-20.4 feet). Interval shown on white board should be 20.0-20.4 feet. Sampler refusal at 20.4 feet.

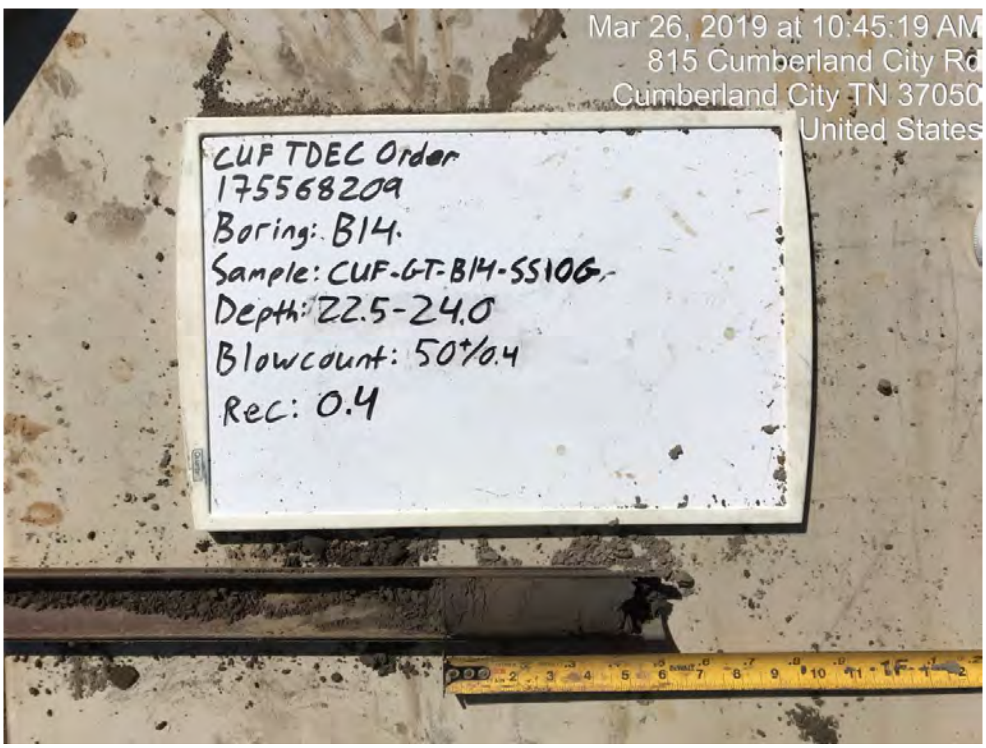


Photograph ID: 10

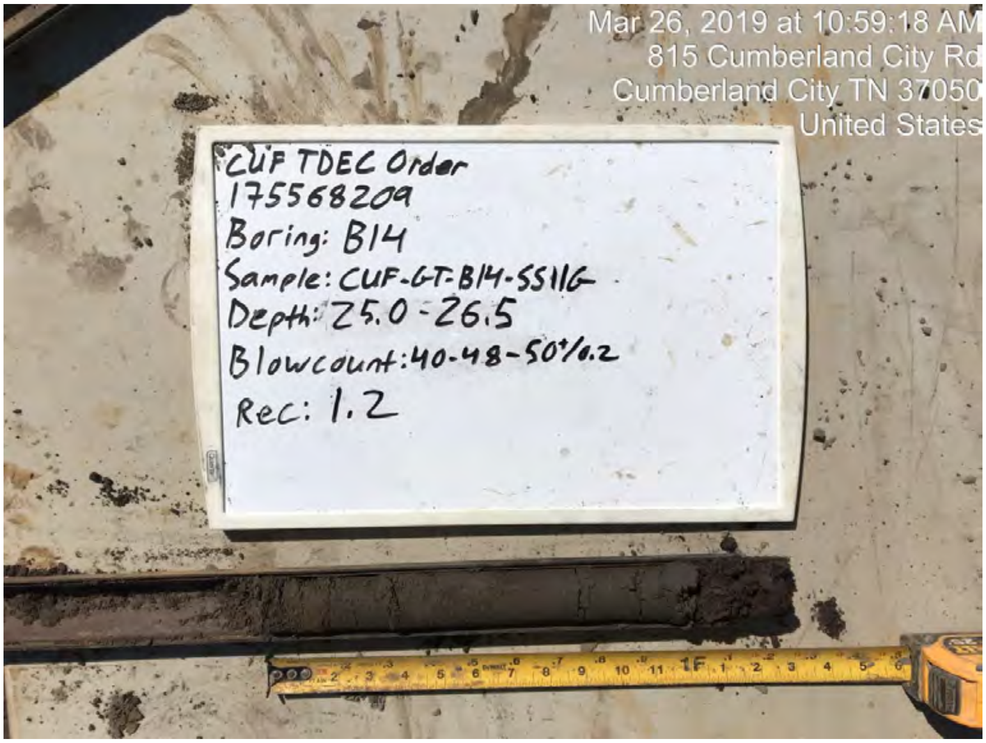
Photo Location: CUF-B14

Photo Date: 3/26/2019

Comments: Interval (22.5-22.9 feet). Interval shown on white board should be 22.5-22.9 feet. Sampler refusal at 22.9 feet.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 11 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Interval (25.0-26.2 feet). Interval shown on white board should be 25.0-26.2 feet. Sampler refusal at 26.2 feet.	
Photograph ID: 12 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Interval (27.5-27.8 feet). Interval shown on white board should be 27.5-27.8 feet. Sampler refusal at 27.8 feet.	

Stantec

Photographic Log

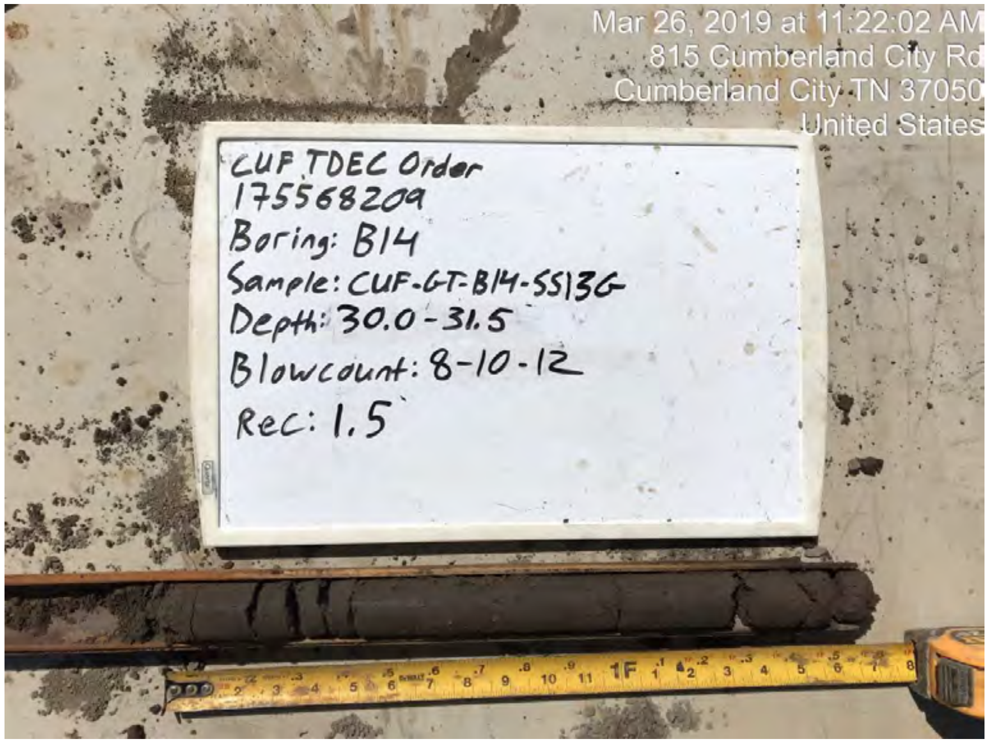
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 13

Photo Location: CUF-B14

Photo Date: 3/26/2019

Comments: Interval (30.0-31.5 feet).

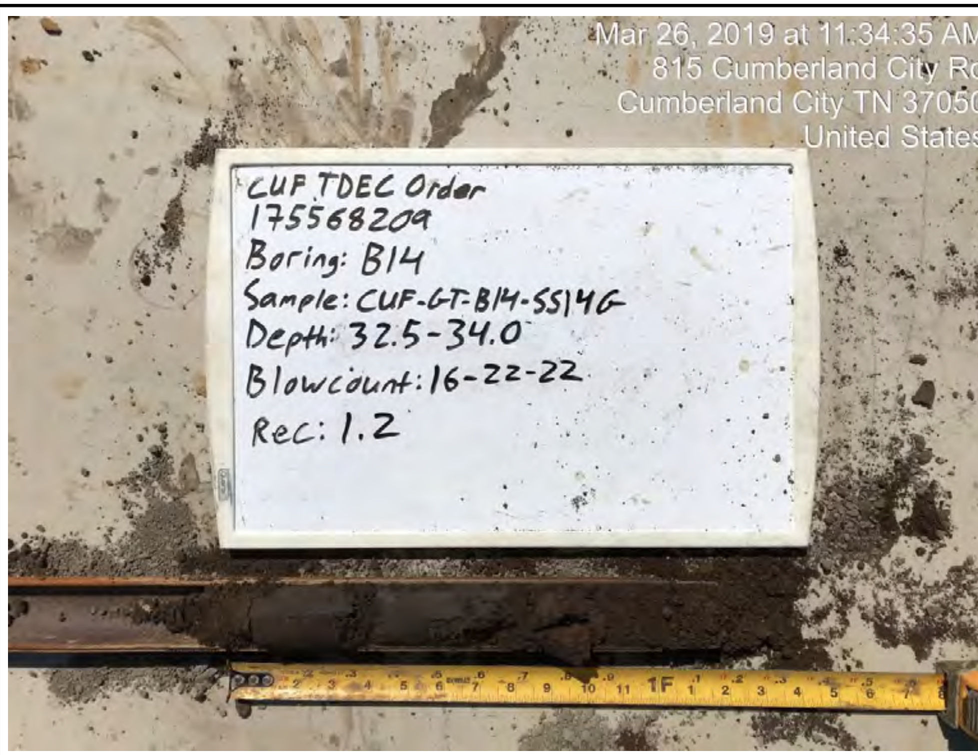


Photograph ID: 14

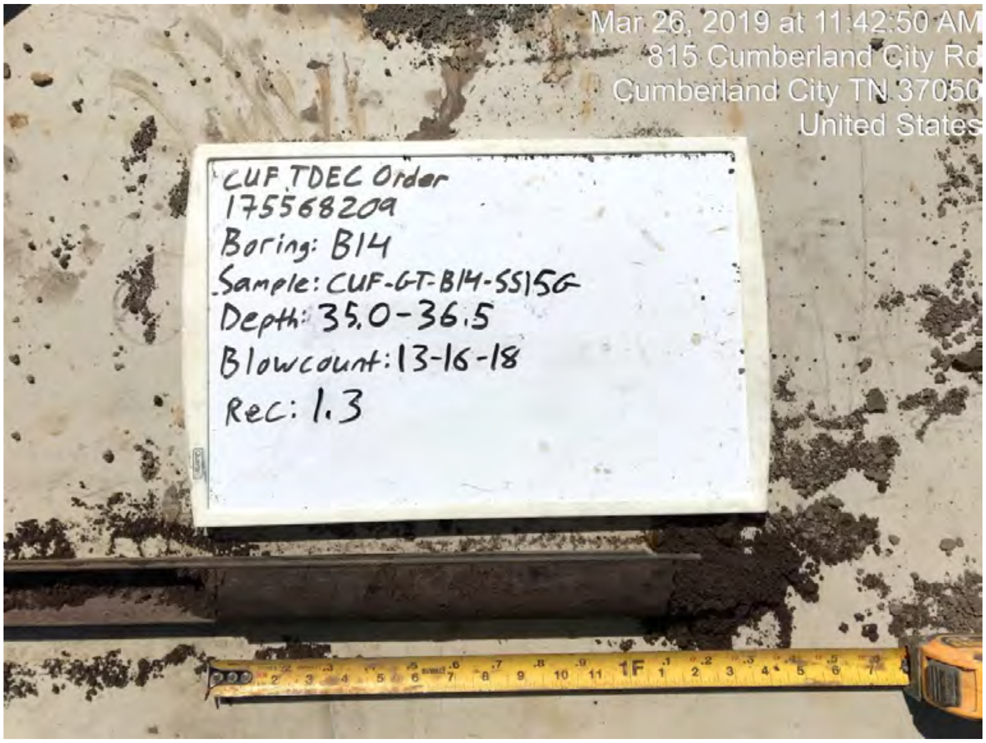
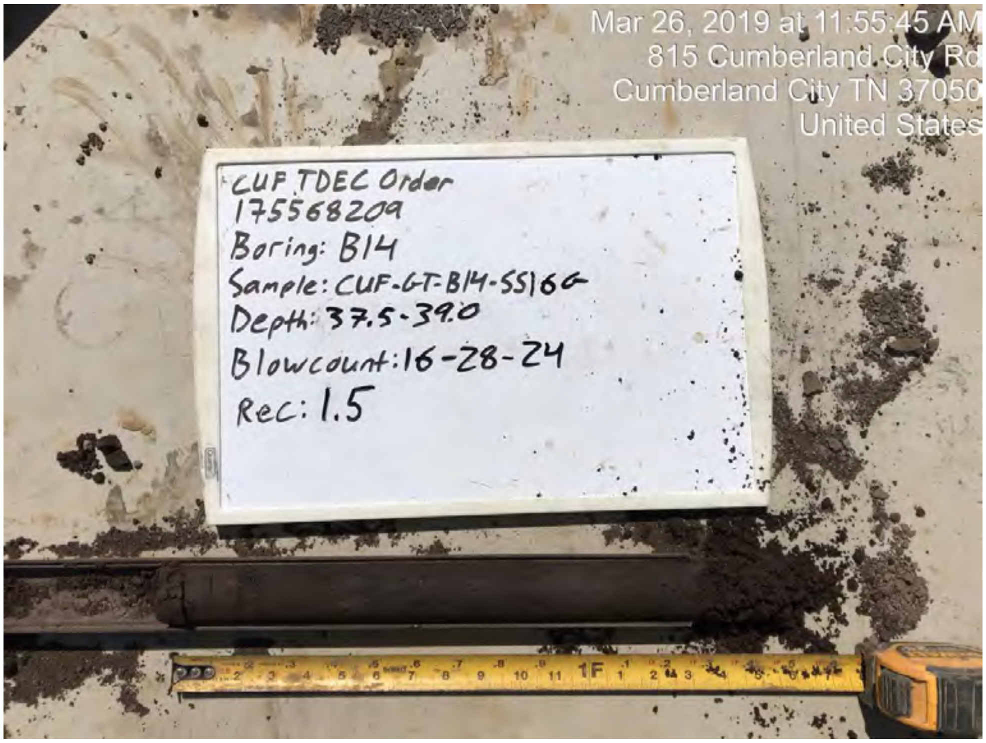
Photo Location: CUF-B14

Photo Date: 3/26/2019

Comments: Interval (32.5-34.0 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 15 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Interval (35.0-36.5 feet).	
Photograph ID: 16 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Interval (37.5-39.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 17

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Photo of interval (40.0-40.3 feet) unavailable because sample collected with shelby tube. Sampler refusal at 40.3 feet.

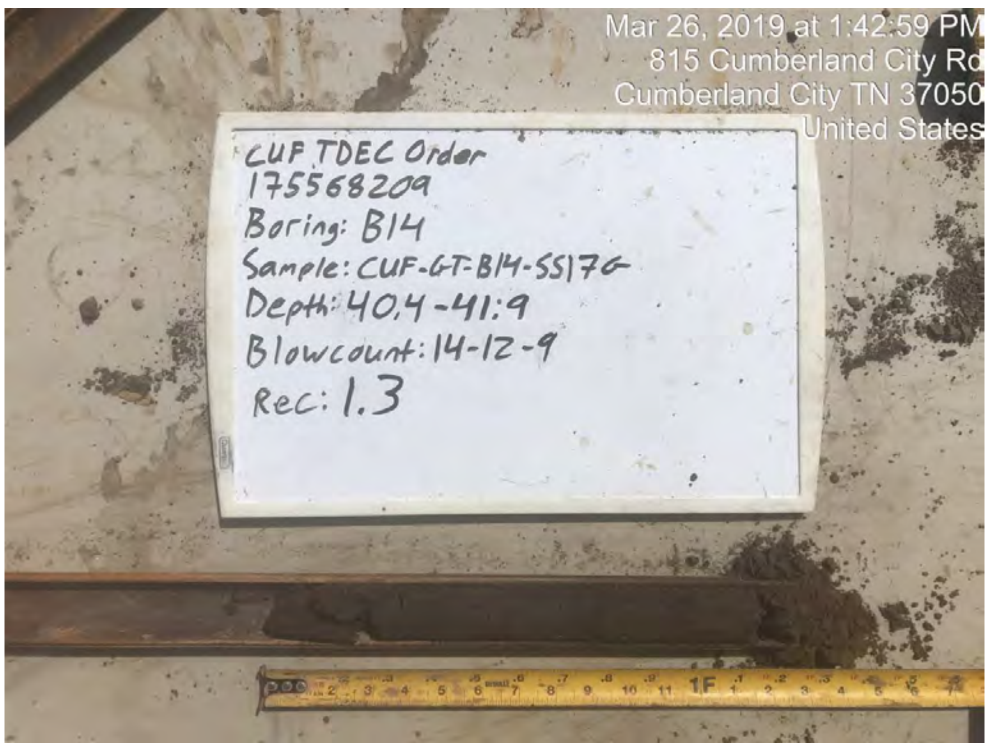
No Photo Applicable

Photograph ID: 18

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (40.4-41.9 feet).



Stantec **Photographic Log**

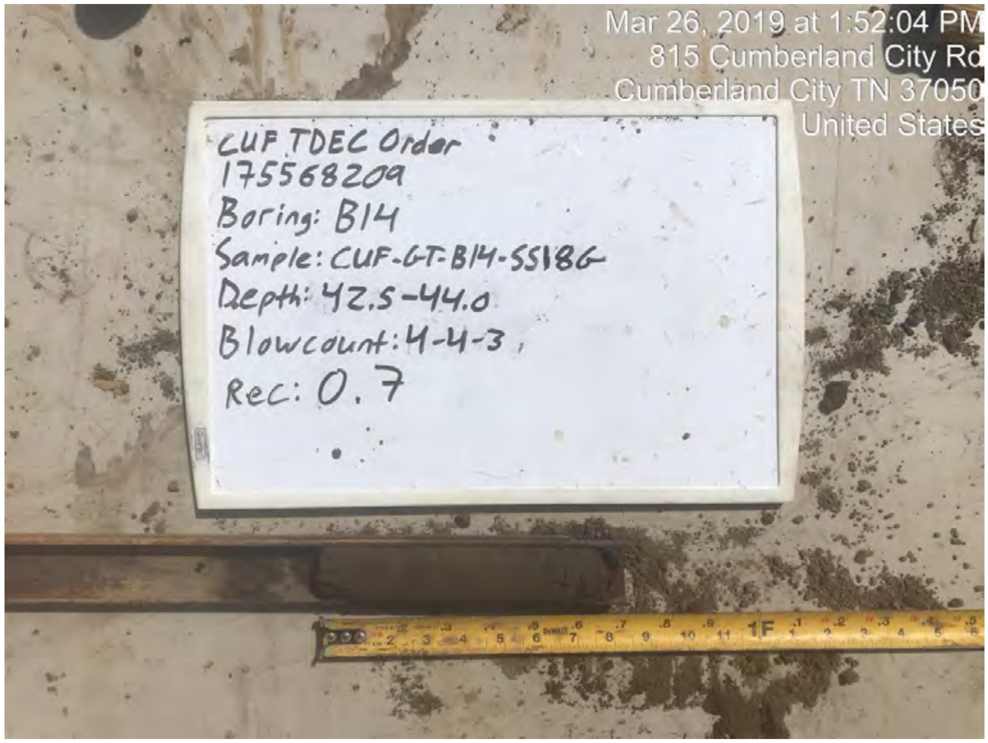
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 19

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (42.5-44.0 feet).



Photograph ID: 20

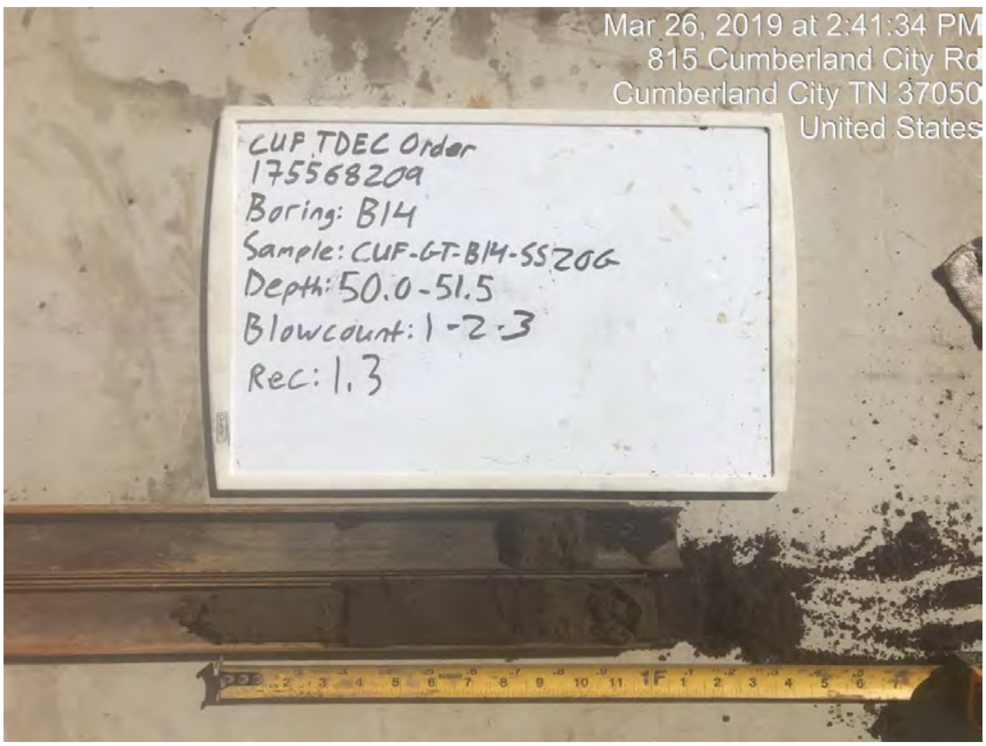
Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Photo of interval (45.0-47.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 21 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Photo of interval (47.5-49.0 feet) unavailable.	No Photo Applicable
Photograph ID: 22 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Interval (50.0-51.5 feet).	

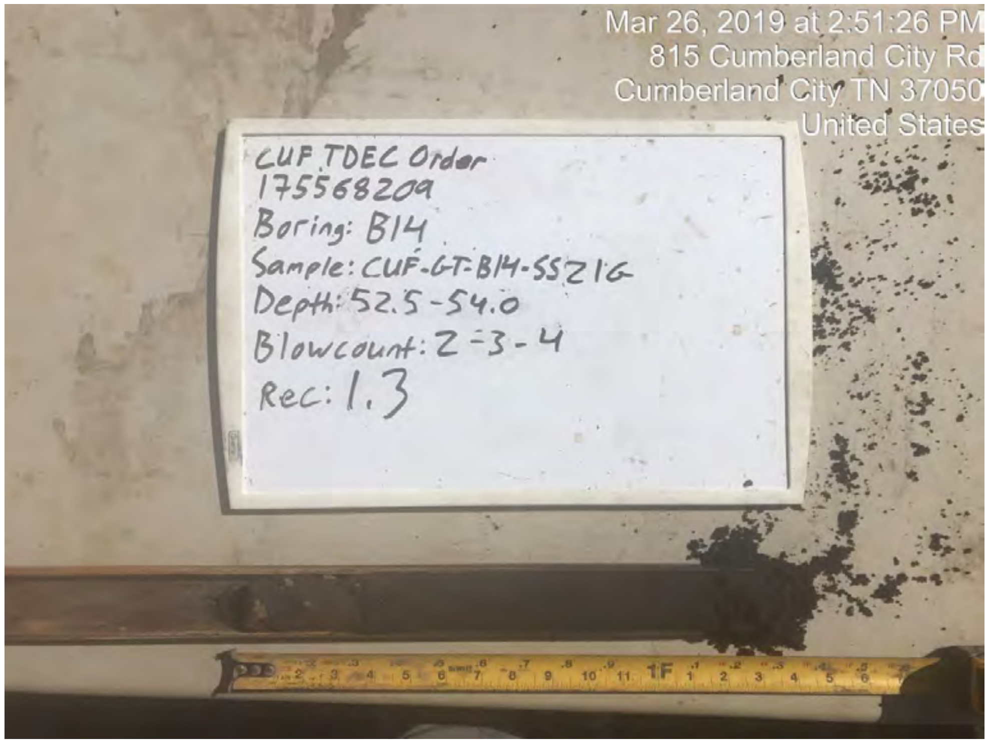
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 23

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (52.5-54.0 feet).

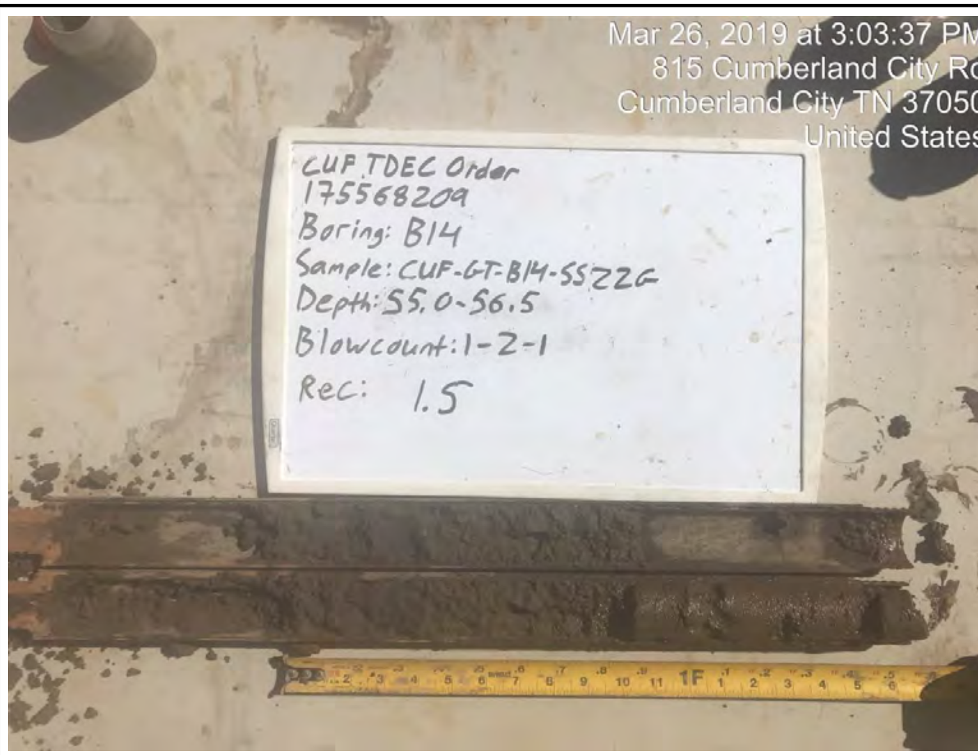


Photograph ID: 24

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (55.0-56.5 feet).



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 25

Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Interval (57.5-59.0 feet).

Photograph ID: 26

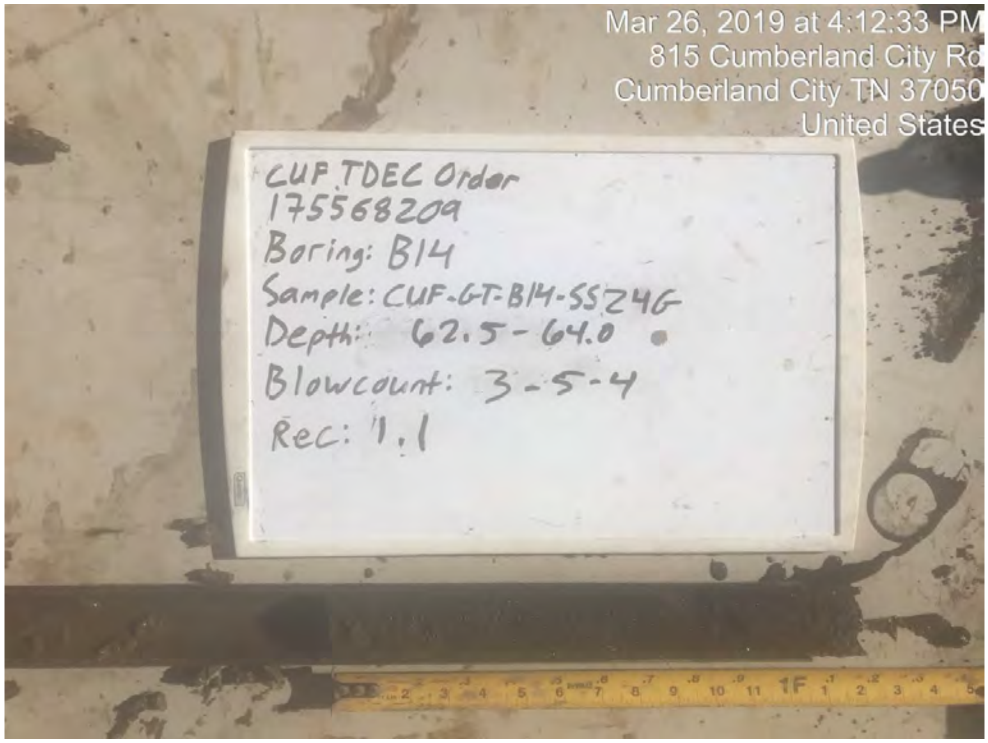
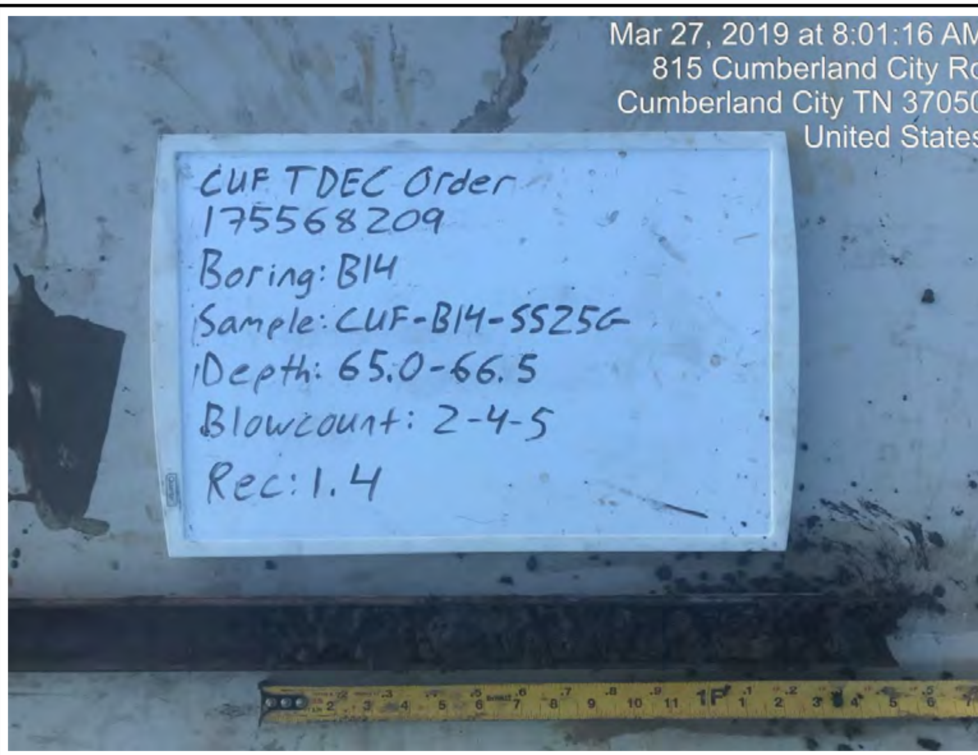
Photo Location:
CUF-B14

Photo Date:
3/26/2019

Comments:
Photo of interval (60.0-62.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 27 **Photo Location:** CUF-B14 **Photo Date:** 3/26/2019 **Comments:** Interval (62.5-64.0 feet).	
Photograph ID: 28 **Photo Location:** CUF-B14 **Photo Date:** 3/27/2019 **Comments:** Interval (65.0-66.5 feet).	

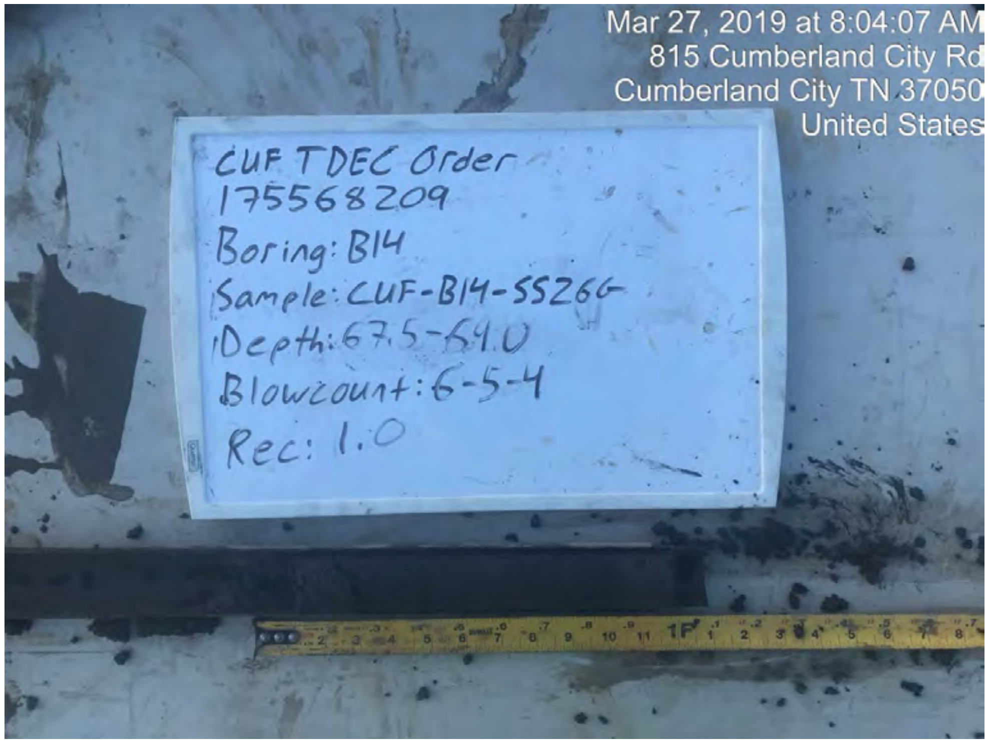
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 29

Photo Location:
CUF-B14

Photo Date:
3/27/2019

Comments:
Interval (67.5-69.0 feet).

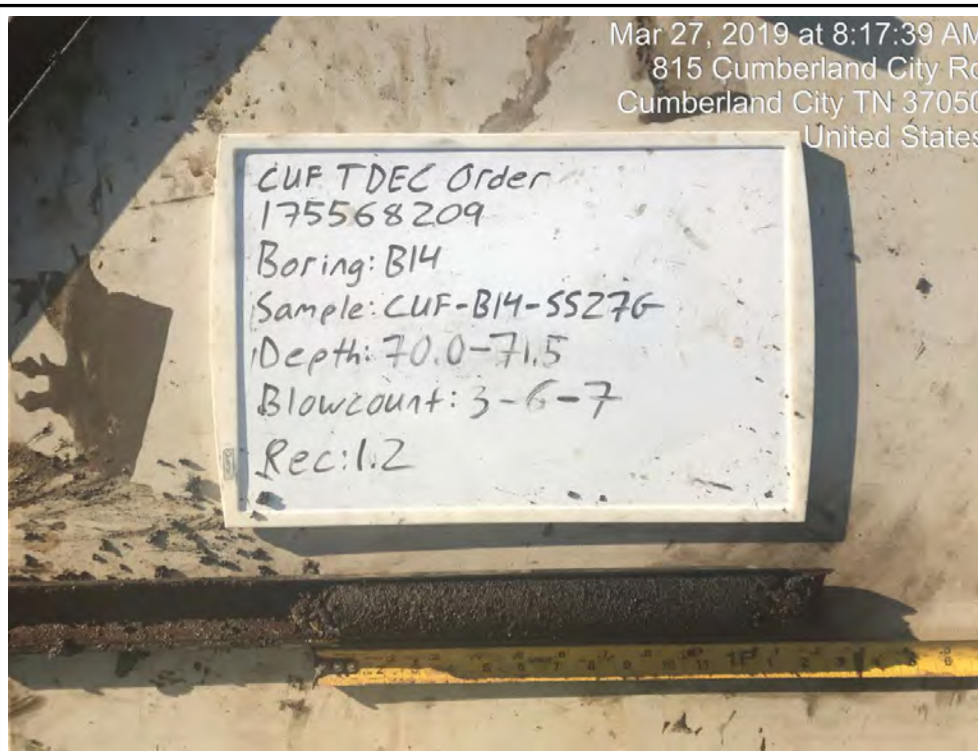


Photograph ID: 30

Photo Location:
CUF-B14

Photo Date:
3/27/2019

Comments:
Interval (70.0-71.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 31

Photo Location:
CUF-B14

Photo Date:
3/27/2019

Comments:
Interval (72.5-74.0 feet).

Photograph ID: 32

Photo Location:
CUF-B14

Photo Date:
3/27/2019

Comments:
Interval (75.0-76.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 33

Photo Location:
CUF-B14

Photo Date:
3/27/2019

Comments:
Interval (77.5-79.0 feet).

Photograph ID: 34

Photo Location:
CUF-B14

Photo Date:
3/27/2019

Comments:
Photo of interval (80.0-81.4 feet) unavailable because sample collected with shelby tube. Sampler refusal at 81.4 feet.

No Photo Applicable

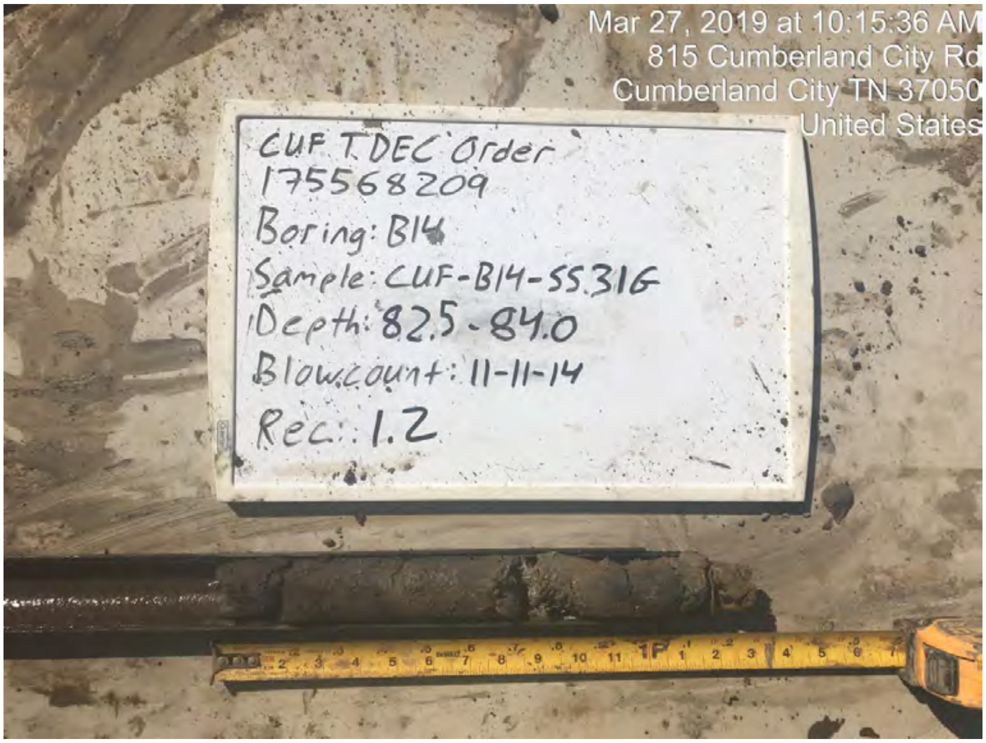
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 35

Photo Location: CUF-B14

Photo Date: 3/27/2019

Comments: Interval (82.5-84.0 feet).

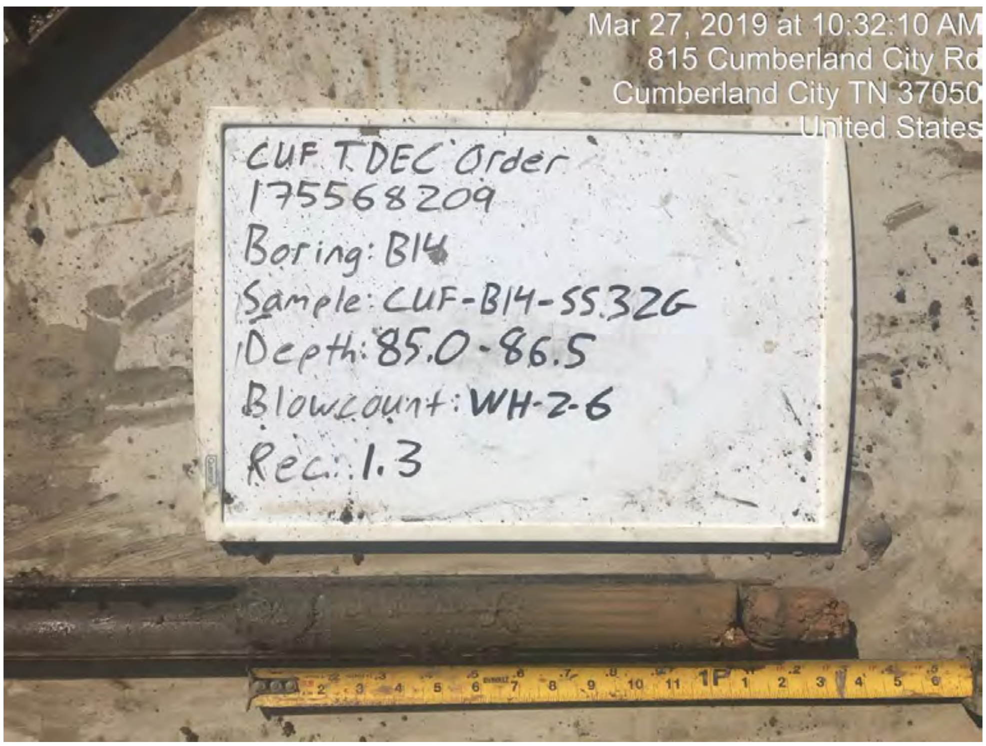


Photograph ID: 36

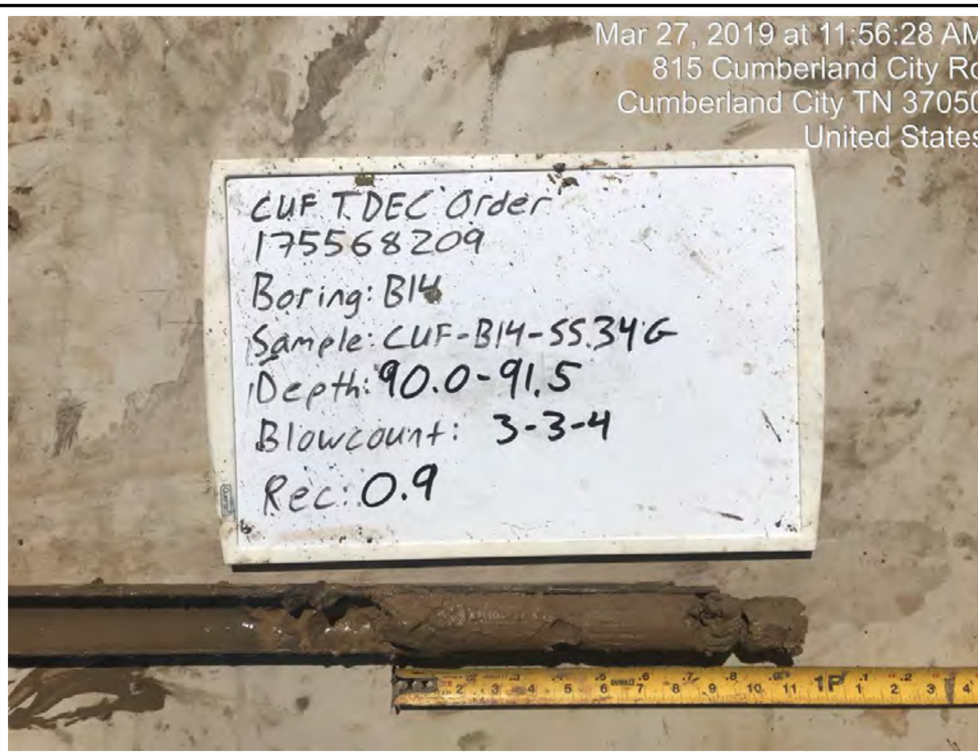
Photo Location: CUF-B14

Photo Date: 3/27/2019

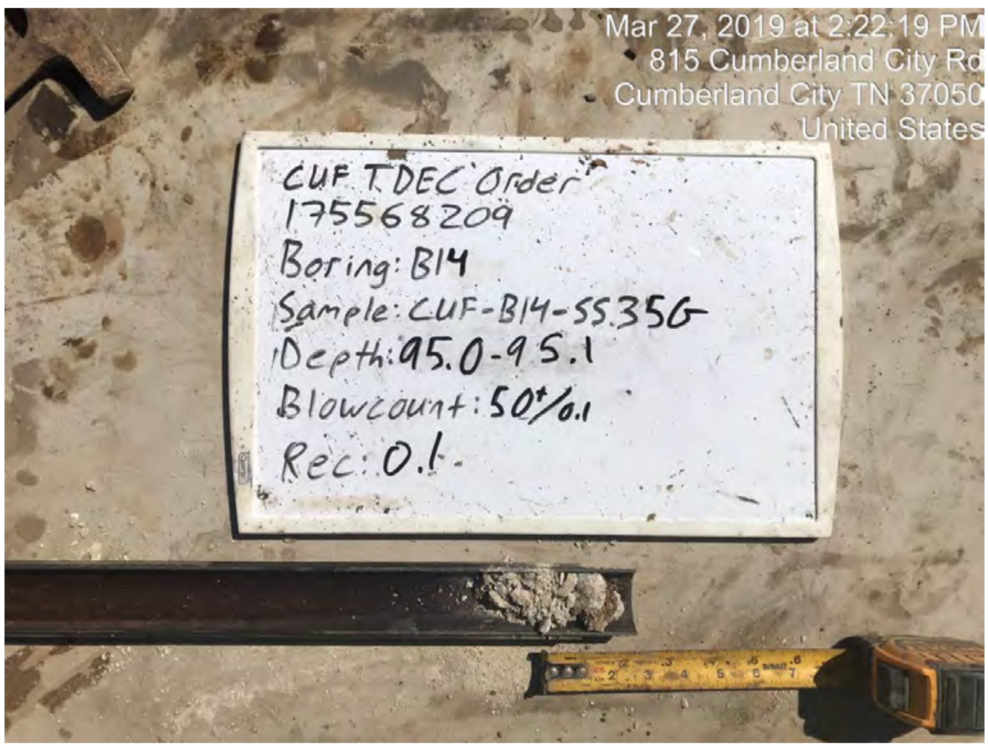
Comments: Interval (85.0-86.5 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 37 **Photo Location:** CUF-B14 **Photo Date:** 3/27/2019 **Comments:** Interval (87.5-89.0 feet).	
Photograph ID: 38 **Photo Location:** CUF-B14 **Photo Date:** 3/27/2019 **Comments:** Interval (90.0-91.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 39 **Photo Location:** CUF-B14 **Photo Date:** 3/27/2019 **Comments:** Photo of interval (92.5-94.1 feet) unavailable because sample collected with shelby tube. Sampler refusal at 94.1 feet.	No Photo Applicable
Photograph ID: 40 **Photo Location:** CUF-B14 **Photo Date:** 3/27/2019 **Comments:** Interval (95.0-95.1 feet). Sampler refusal at 95.1 feet.	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 41

Photo Location:
CUF-B14

Photo Date:
3/27/2019

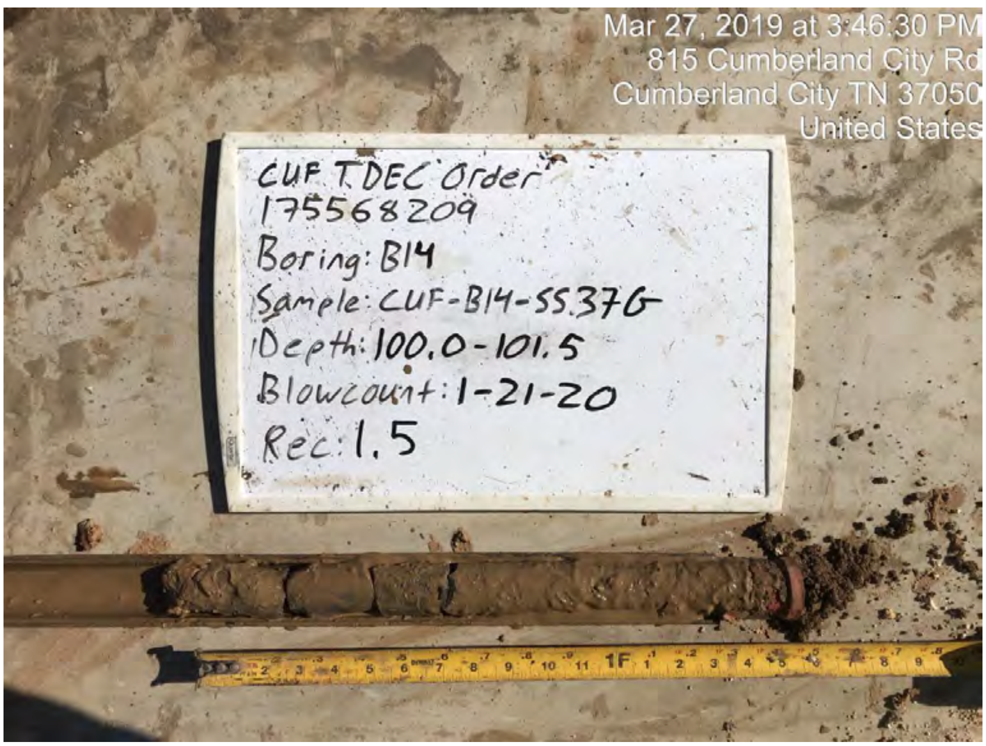
Comments:
Interval (97.5-99.0 feet). Sample identifier on white board should be SS36.

Photograph ID: 42

Photo Location:
CUF-B14

Photo Date:
3/27/2019

Comments:
Interval (100.0-101.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 43

Photo Location: CUF-B14

Photo Date: 3/27/2019

Comments: Interval (102.5-104.0 feet).

Photograph ID: 44

Photo Location: CUF-B14

Photo Date: 3/27/2019

Comments: Interval (105.0-106.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 45

Photo Location:
CUF-B14

Photo Date:
4/10/2019

Comments:
Interval (107.5-109.0 feet).

Photograph ID: 46

Photo Location:
CUF-B14

Photo Date:
4/10/2019

Comments:
Interval (100.0-111.5 feet).

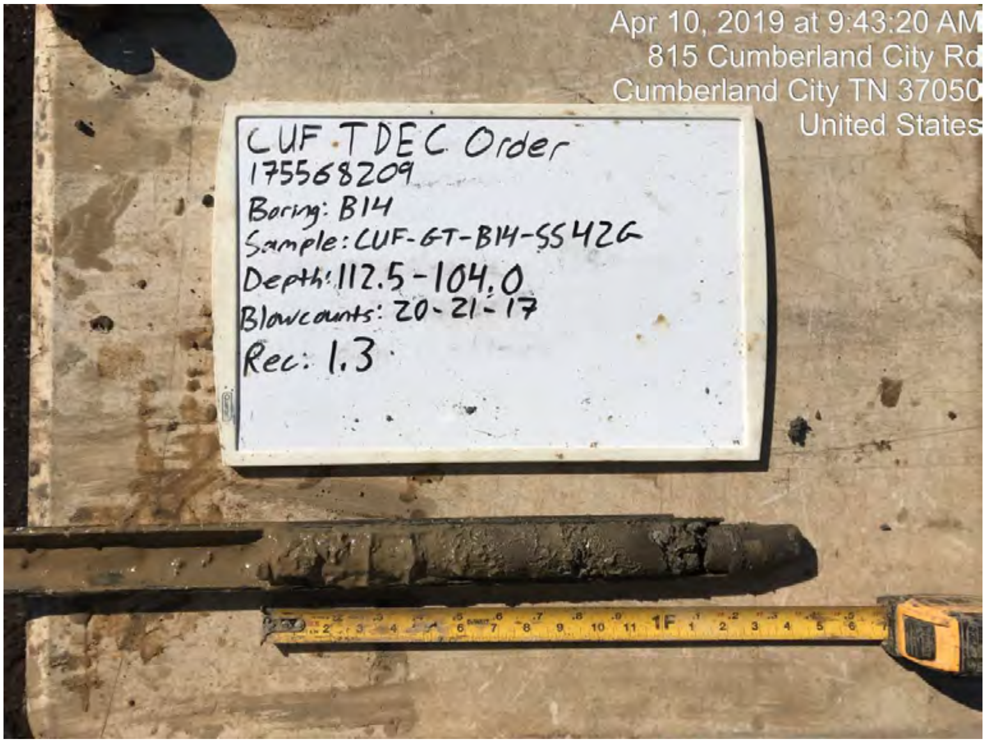
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 47

Photo Location:
CUF-B14

Photo Date:
4/10/2019

Comments:
Interval (112.5-114.0 feet). Depth range on white board should be 112.5-114.0.

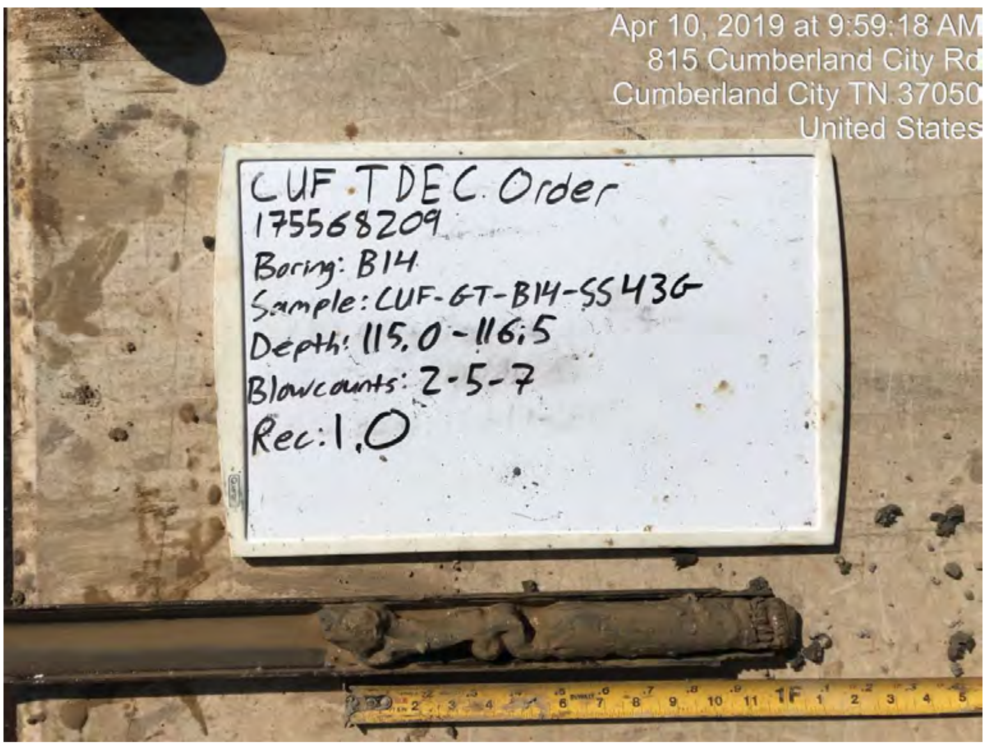


Photograph ID: 48

Photo Location:
CUF-B14

Photo Date:
4/10/2019

Comments:
Interval (115.0-116.5 feet).



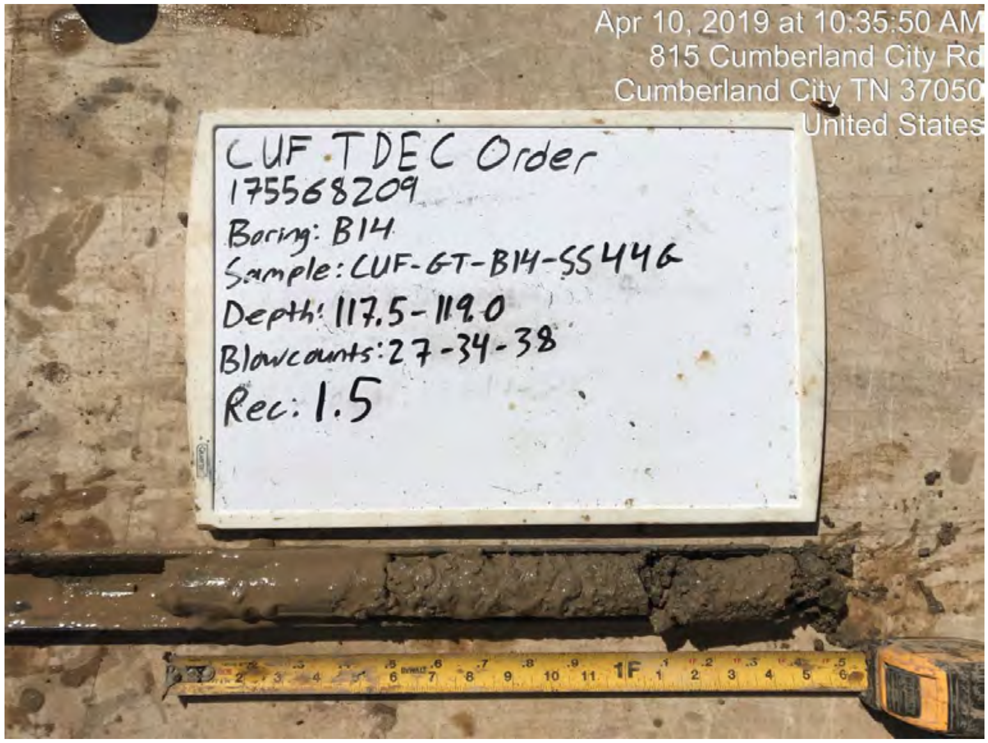
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 49

Photo Location:
CUF-B14

Photo Date:
4/10/2019

Comments:
Interval (117.5-119.0 feet).

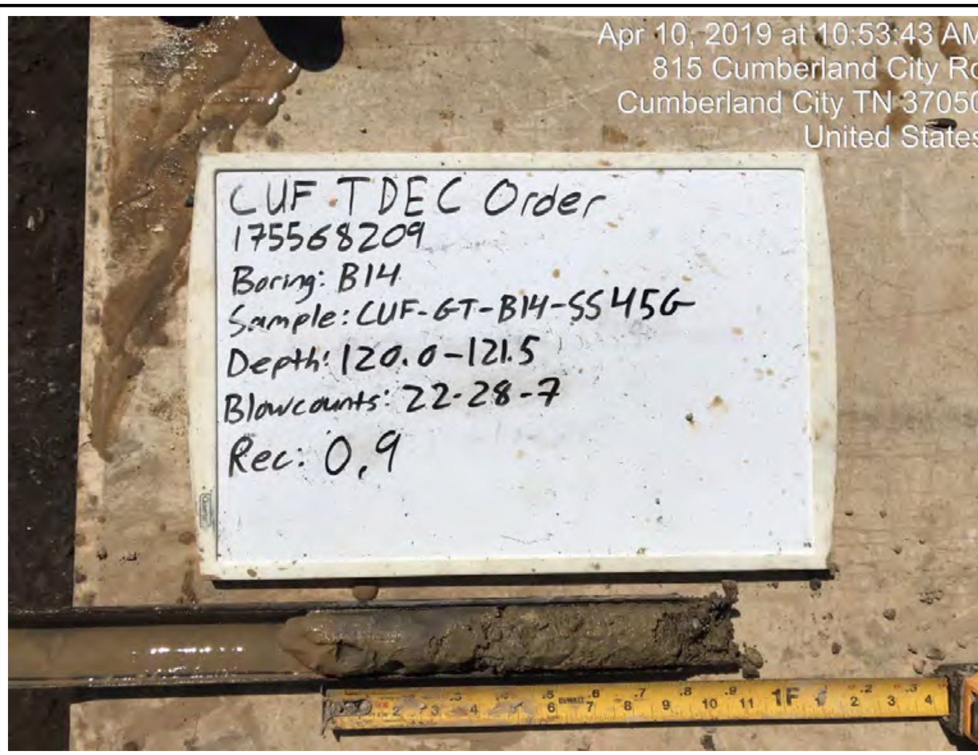


Photograph ID: 50

Photo Location:
CUF-B14

Photo Date:
4/10/2019

Comments:
Interval (120.0-121.5 feet).



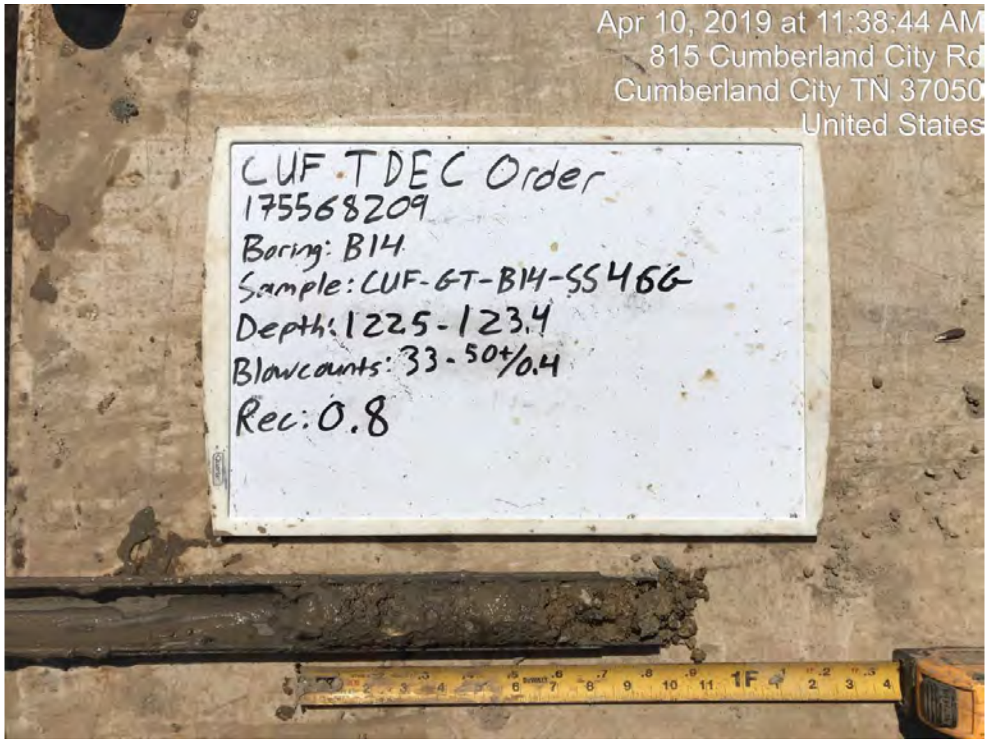
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 51

Photo Location:
CUF-B14

Photo Date:
4/10/2019

Comments:
Interval (122.5-123.4 feet).



Photograph ID: 52

Photo Location:
CUF-B14

Photo Date:
4/12/2019

Comments:
Interval (125.0-138.6 feet). Metadata date reflects the date the photo was taken, not the date the core was drilled.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 53

Photo Location:
CUF-B14

Photo Date:
4/12/2019

Comments:
Interval (138.6-145.1 feet).

Photograph ID: 54

Photo Location:
CUF-B15

Photo Date:
4/25/2019

Comments:
Interval (0.0-1.5 feet).

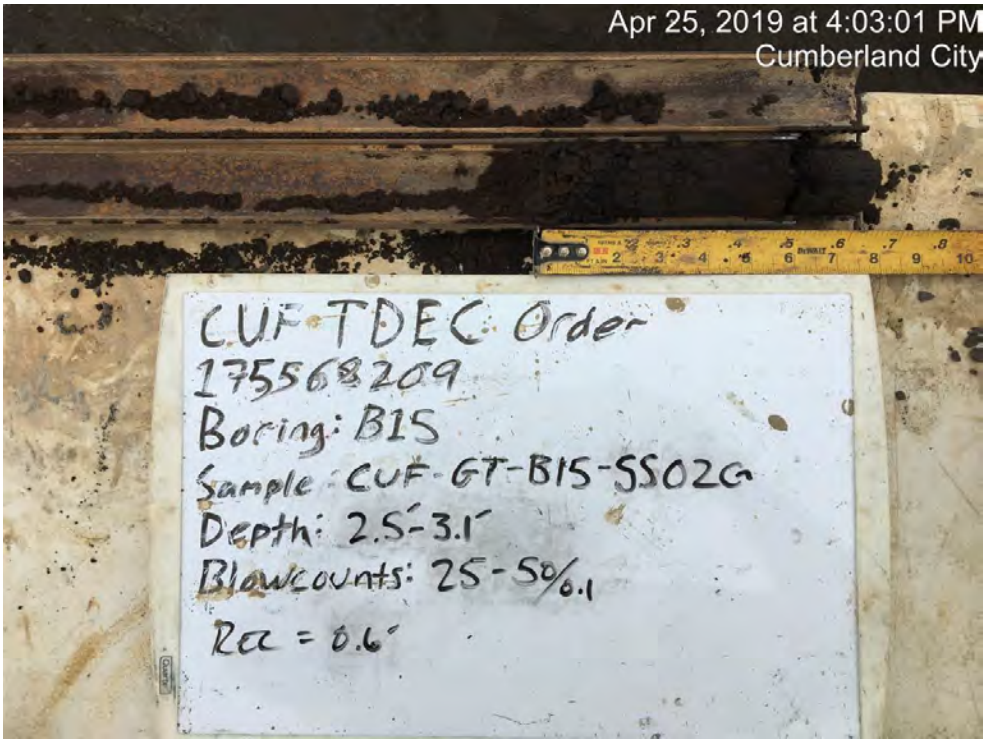
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 55

Photo Location:
CUF-B15

Photo Date:
4/25/2019

Comments:
Interval (2.5-3.1 feet). Sampler refusal at 3.1 feet.



Photograph ID: 56

Photo Location:
CUF-B15

Photo Date:
4/25/2019

Comments:
Interval (5.0-5.8 feet). Sampler refusal at 5.8 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 57

Photo Location:
CUF-B15

Photo Date:
4/25/2019

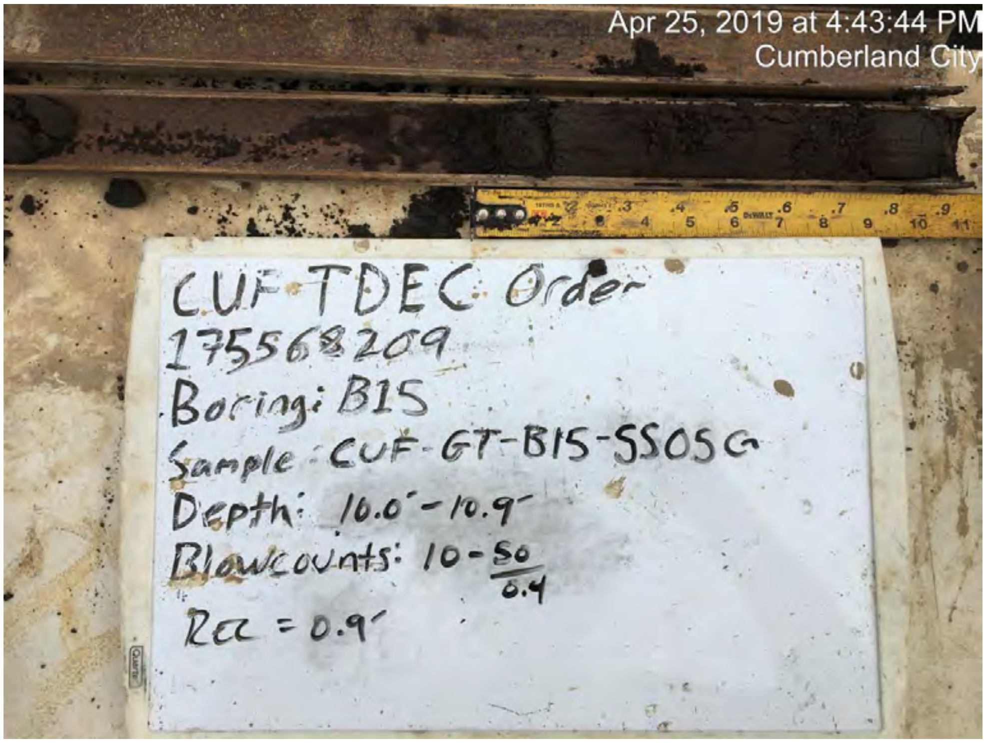
Comments:
Interval (7.5-8.2 feet). Sampler refusal at 8.2 feet.

Photograph ID: 58

Photo Location:
CUF-B15

Photo Date:
4/25/2019

Comments:
Interval (10.0-10.9 feet). Sampler refusal at 10.9 feet.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 59

Photo Location:
CUF-B15

Photo Date:
4/26/2019

Comments:
Interval (12.5-14.0 feet).

Photograph ID: 60

Photo Location:
CUF-B15

Photo Date:
4/26/2019

Comments:
Photo of interval (15.0-15.8 feet) unavailable because sample collected with shelby tube. Sampler refusal at 15.8 feet.

No Photo Applicable

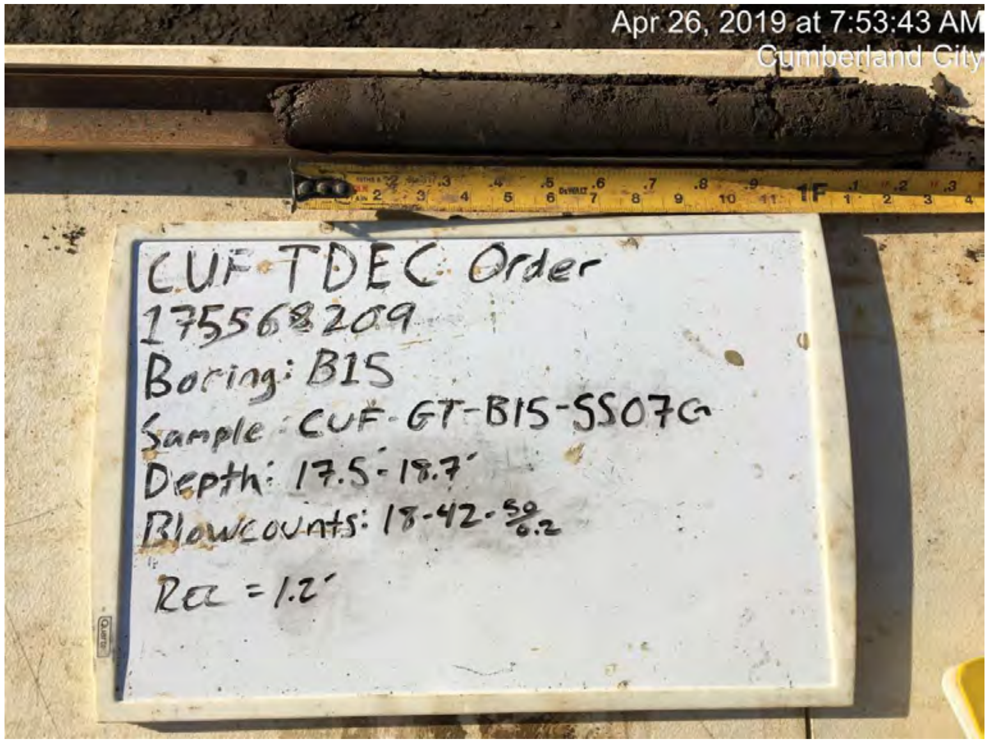
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 61

Photo Location: CUF-B15

Photo Date: 4/26/2019

Comments: Interval (17.5-18.7 feet). Sampler refusal at 18.7 feet.



Photograph ID: 62

Photo Location: CUF-B15

Photo Date: 4/26/2019

Comments: Interval (20.0-21.5 feet).

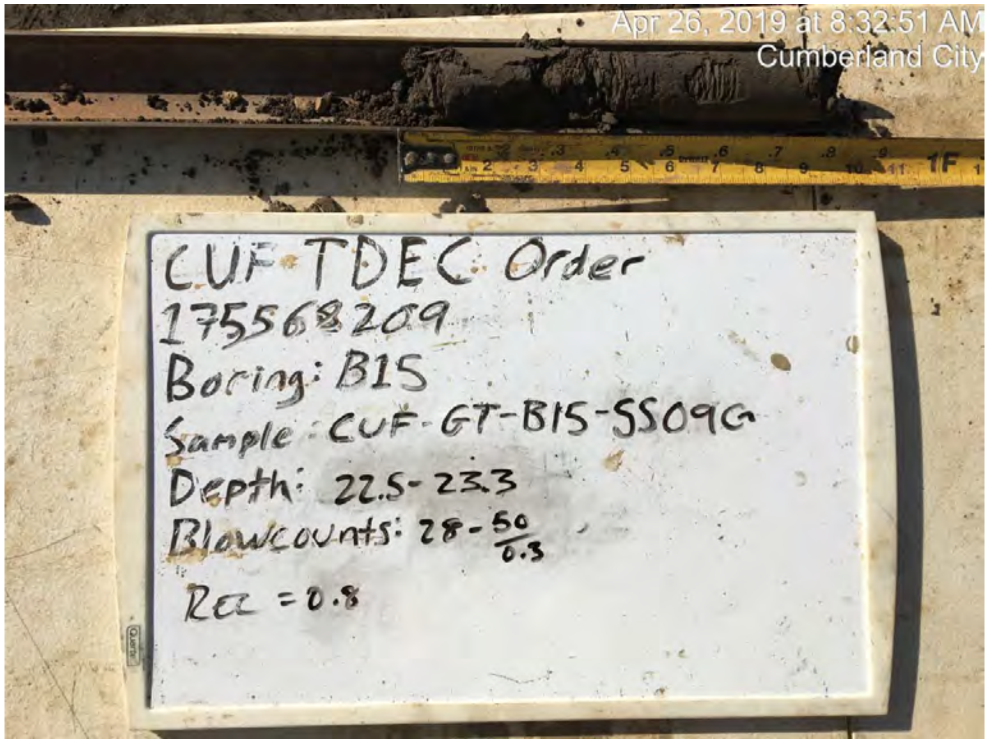
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 63

Photo Location: CUF-B15

Photo Date: 4/26/2019

Comments: Interval (22.5-23.3 feet). Sampler refusal at 23.3 feet.

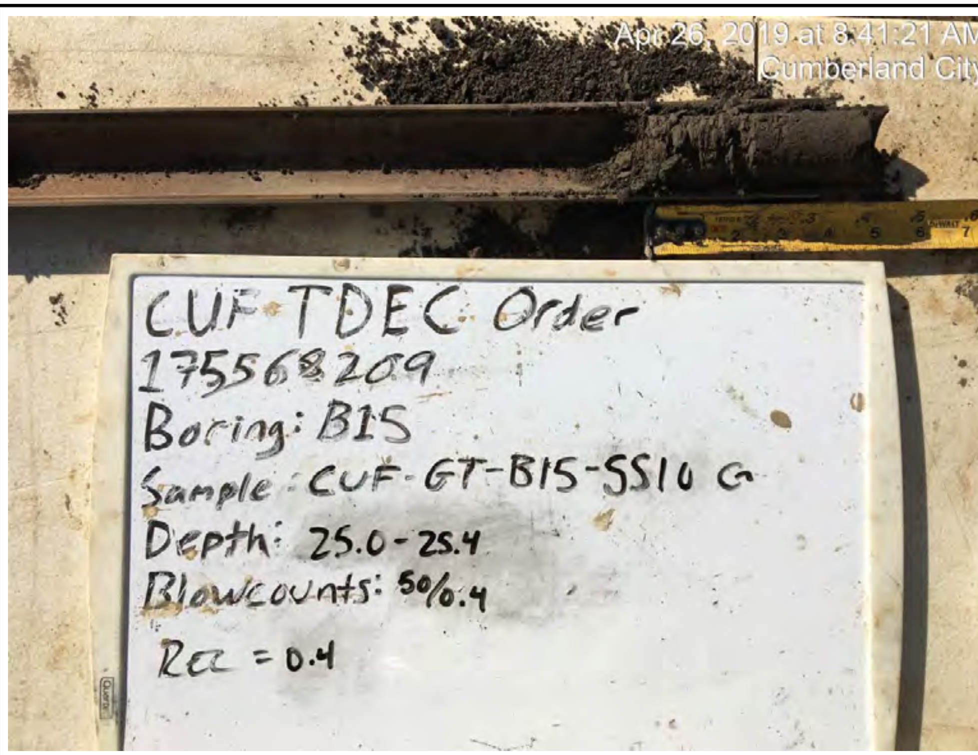


Photograph ID: 64

Photo Location: CUF-B15

Photo Date: 4/26/2019

Comments: Interval (25.0-25.4 feet). Sampler refusal at 25.4 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 65

Photo Location:
CUF-B15

Photo Date:
4/26/2019

Comments:
Interval (27.5-28.3 feet). Sampler refusal at 28.3 feet.

Photograph ID: 66

Photo Location:
CUF-B15

Photo Date:
4/26/2019

Comments:
Interval (30.0-30.4 feet). Sampler refusal at 30.4 feet.

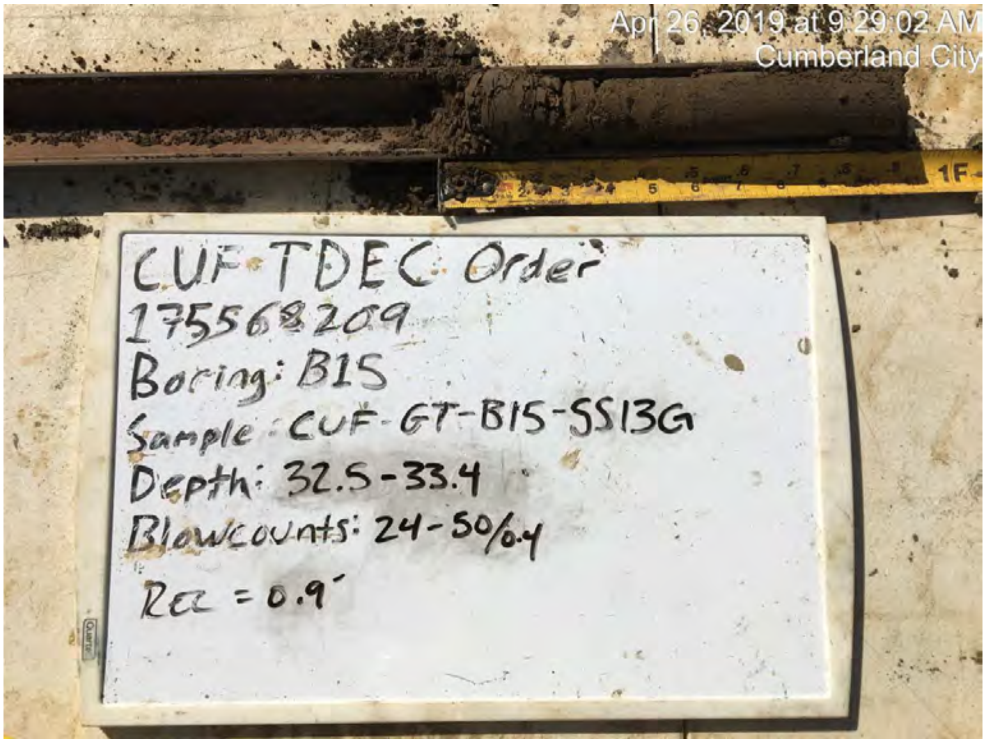
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 67

Photo Location: CUF-B15

Photo Date: 4/26/2019

Comments: Interval (32.5-33.4 feet). Sampler refusal at 33.4 feet.

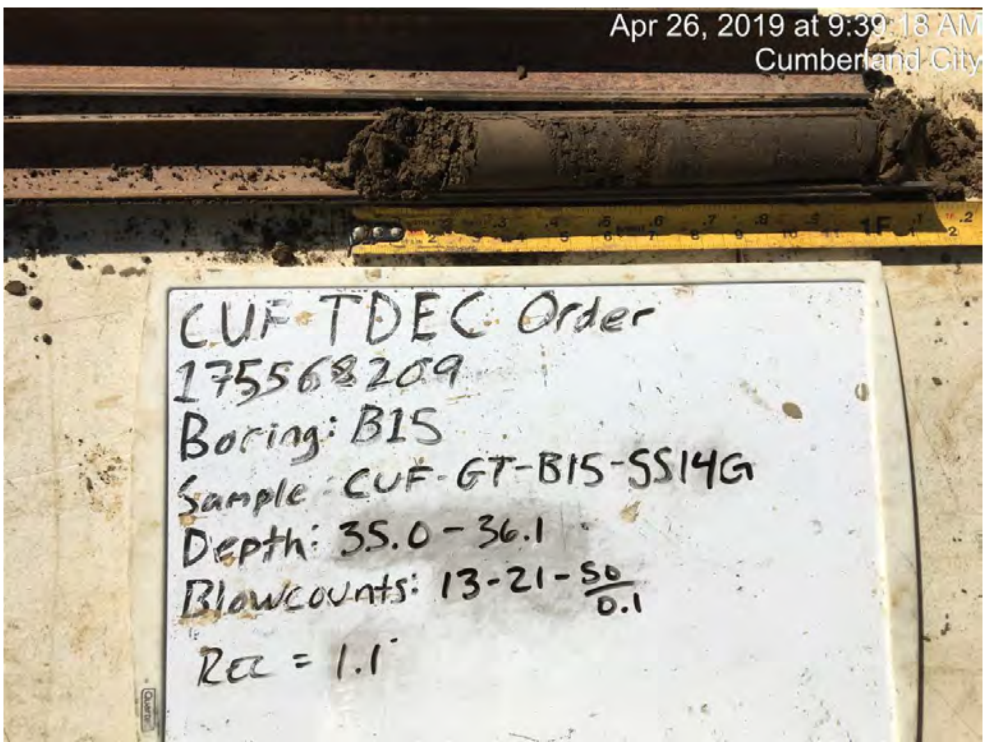


Photograph ID: 68

Photo Location: CUF-B15

Photo Date: 4/26/2019

Comments: Interval (35.0-36.1 feet). Sampler refusal at 36.1 feet.



Stantec

Photographic Log

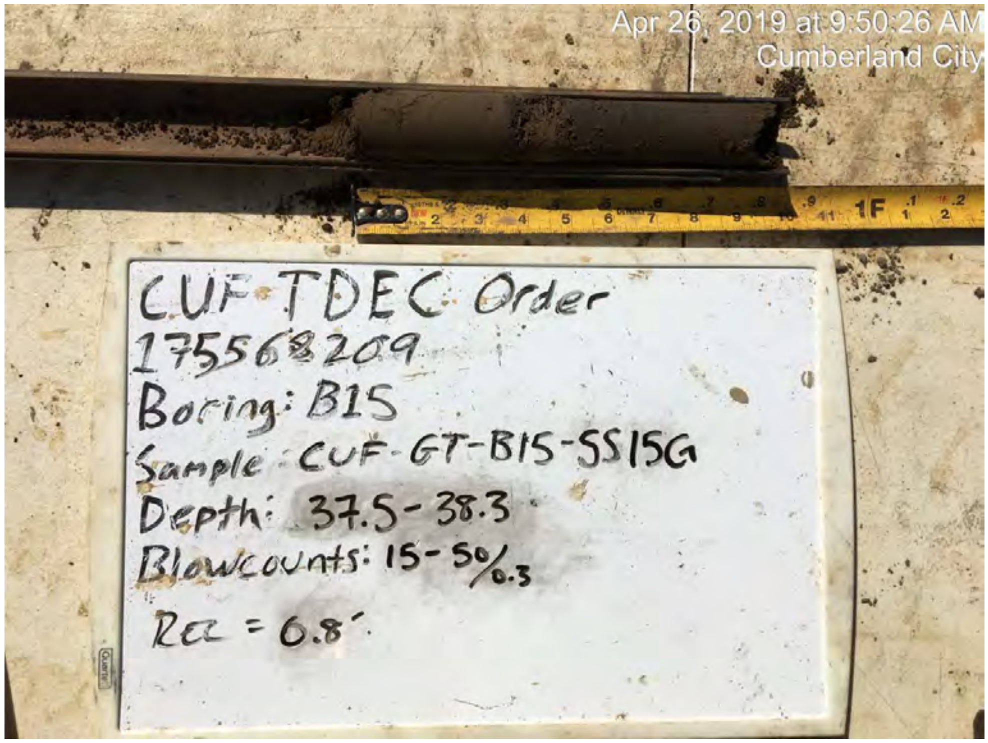
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 69

Photo Location:
CUF-B15

Photo Date:
4/26/2019

Comments:
Interval (37.5-38.3 feet). Sampler refusal at 38.3 feet.



Photograph ID: 70

Photo Location:
CUF-B15

Photo Date:
4/26/2019

Comments:
Interval (40.0-41.2 feet). Sampler refusal at 41.2 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 71

Photo Location:
CUF-B15

Photo Date:
4/29/2019

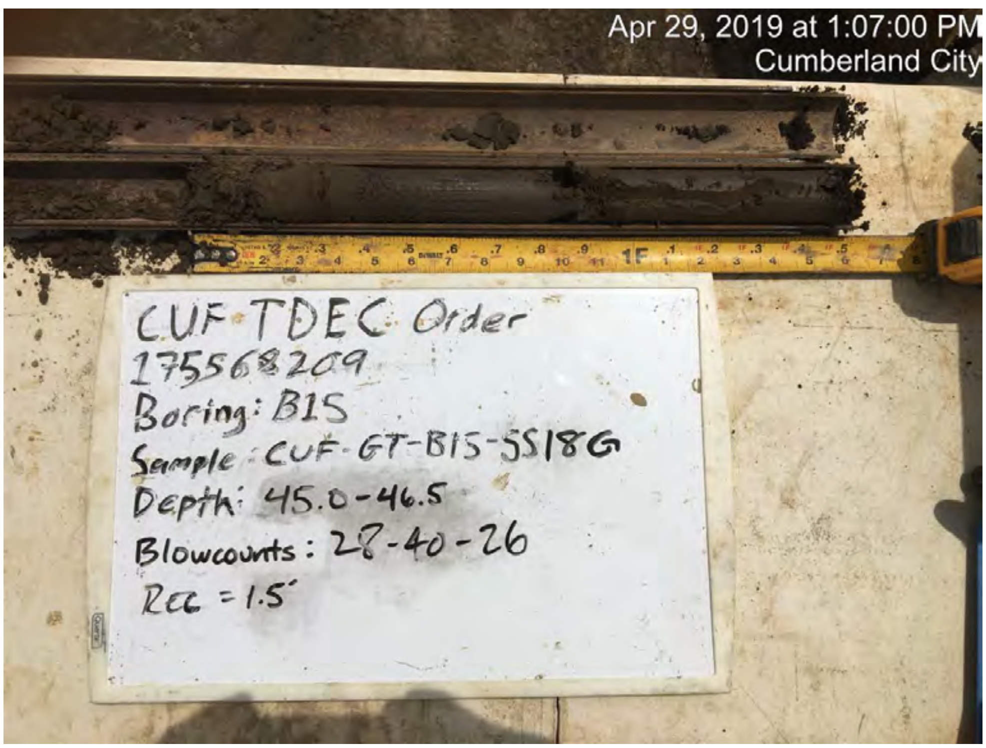
Comments:
Interval (42.5-43.3 feet). Sampler refusal at 43.3 feet.

Photograph ID: 72

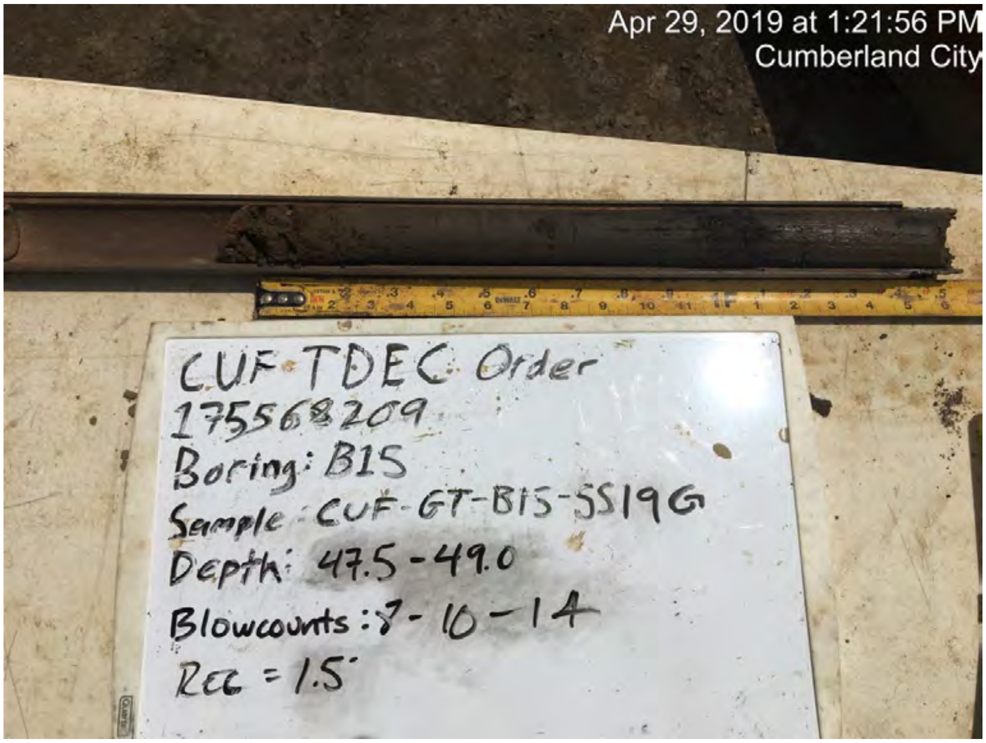
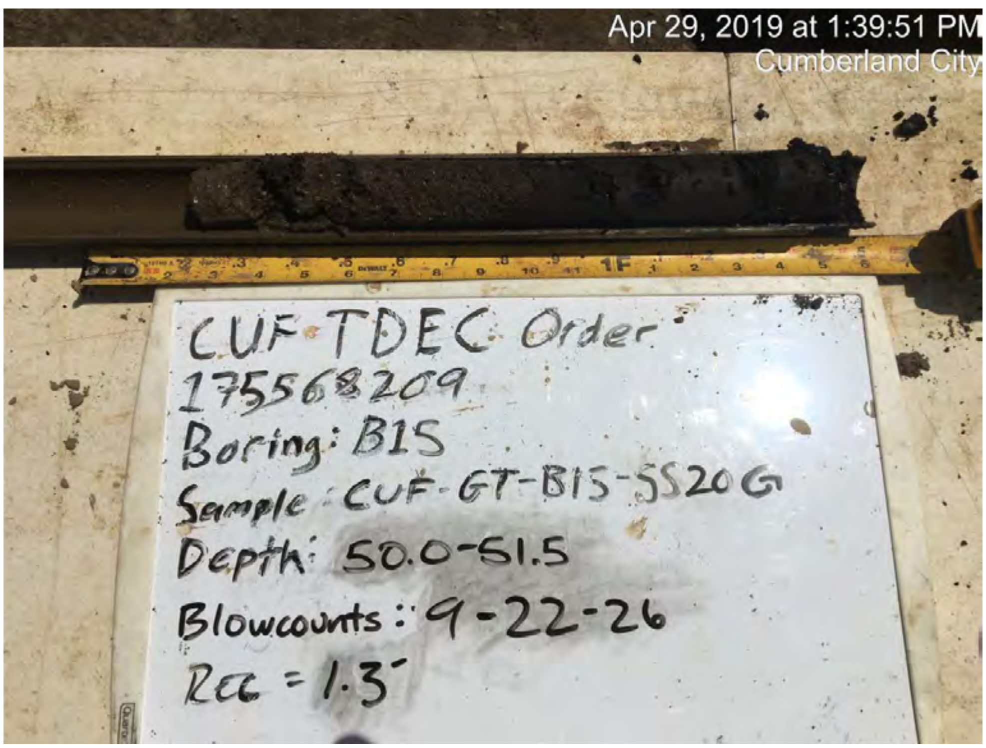
Photo Location:
CUF-B15

Photo Date:
4/29/2019

Comments:
Interval (45.0-46.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 73 **Photo Location:** CUF-B15 **Photo Date:** 4/29/2019 **Comments:** Interval (47.5-49.0 feet).	
Photograph ID: 74 **Photo Location:** CUF-B15 **Photo Date:** 4/29/2019 **Comments:** Interval (50.0-51.5 feet).	

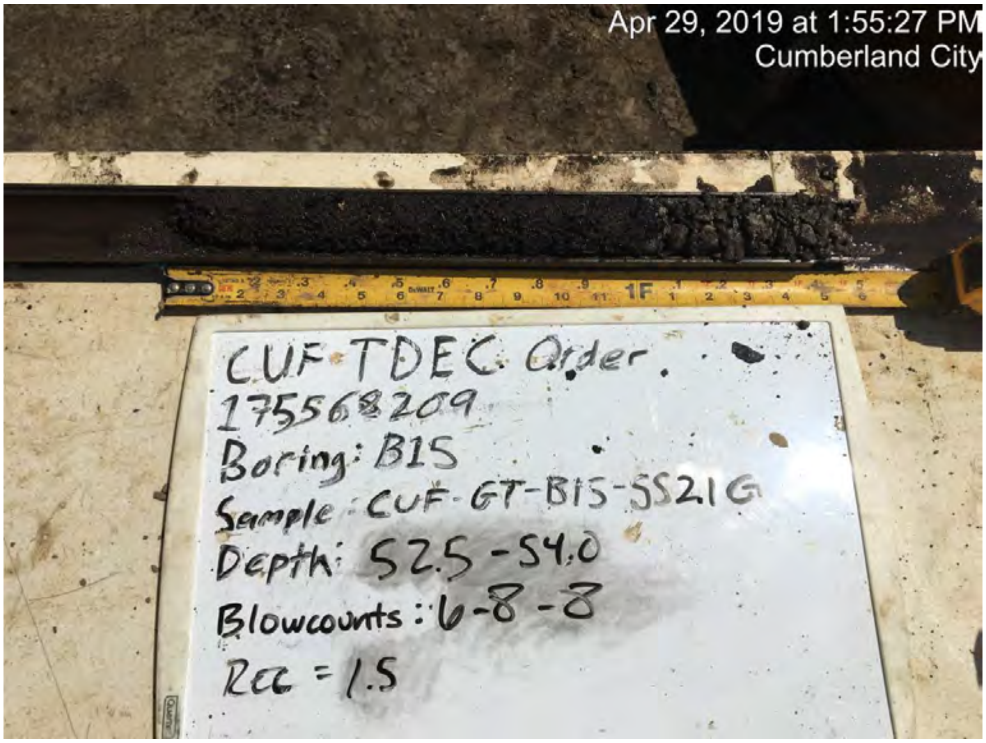
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 75

Photo Location:
CUF-B15

Photo Date:
4/29/2019

Comments:
Interval (52.5-54.0 feet).

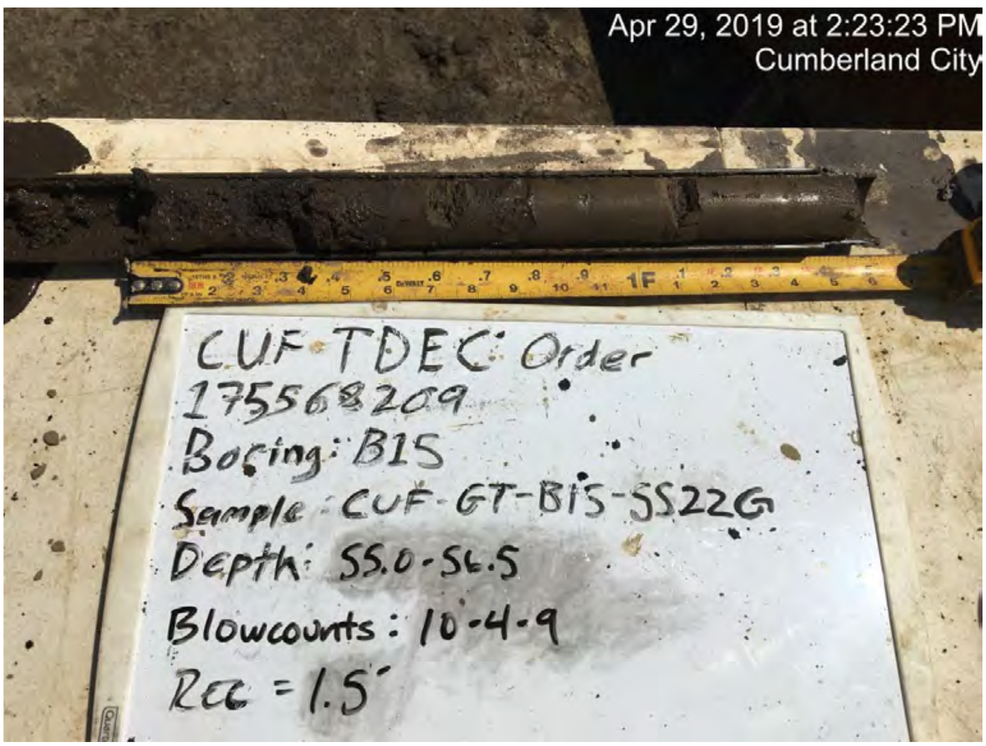


Photograph ID: 76

Photo Location:
CUF-B15

Photo Date:
4/29/2019

Comments:
Interval (55.0-56.5 feet).



Stantec

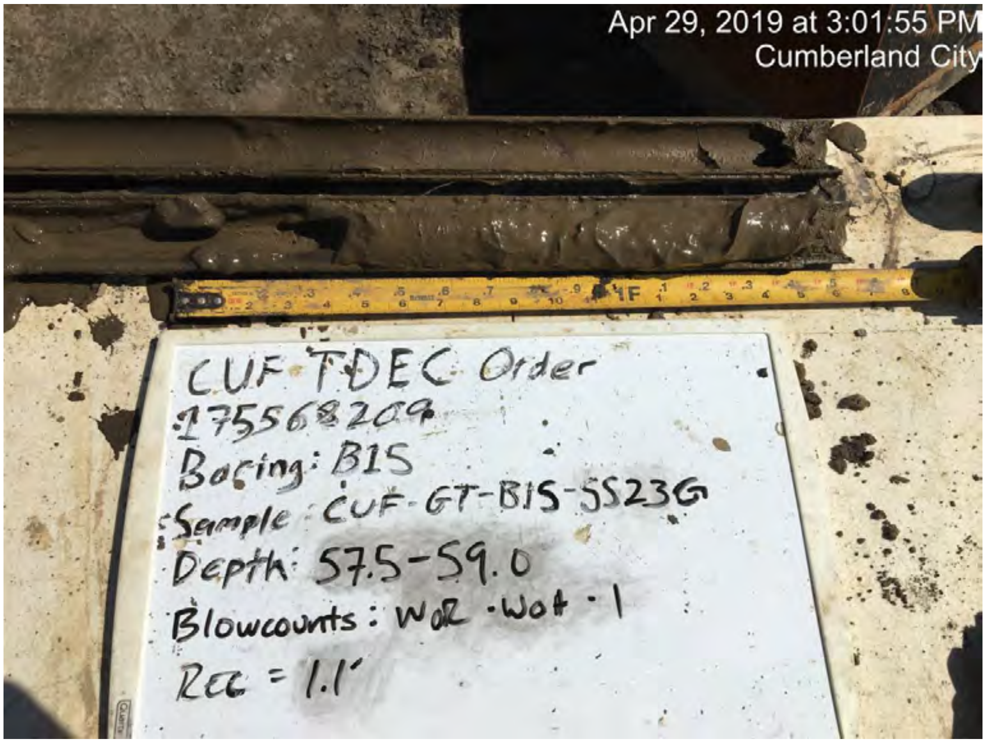
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 77

Photo Location:
CUF-B15

Photo Date:
4/29/2019

Comments:
Interval (57.5-59.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

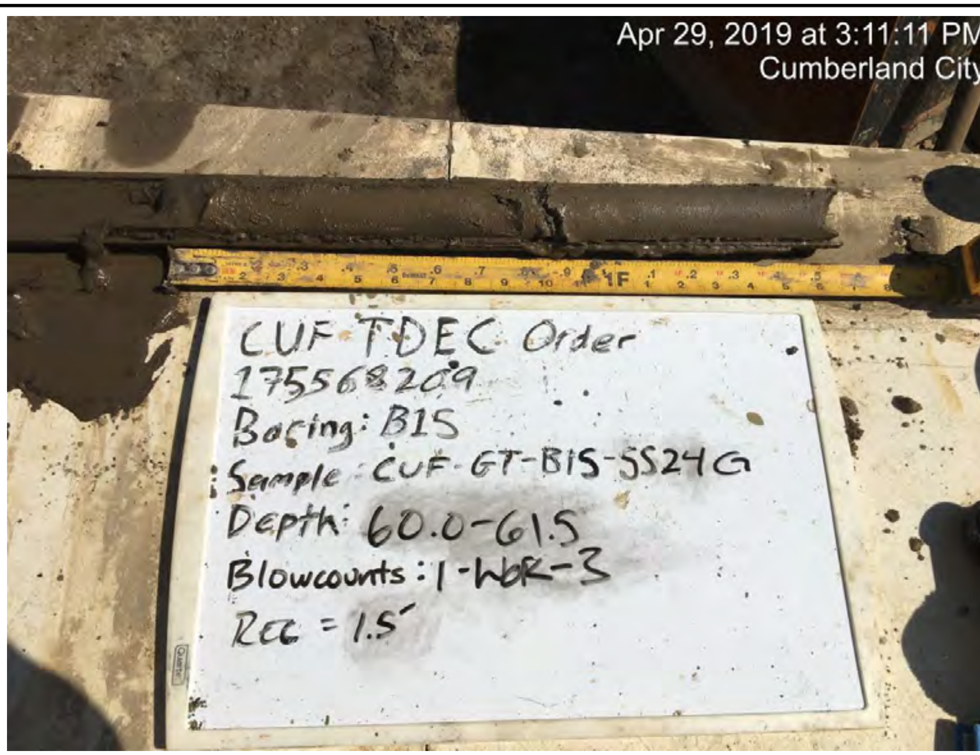


Photograph ID: 78

Photo Location:
CUF-B15

Photo Date:
4/29/2019

Comments:
Interval (60.0-61.5 feet). WOR on white board is the same as WR on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 79

Photo Location:
CUF-B15

Photo Date:
4/29/2019

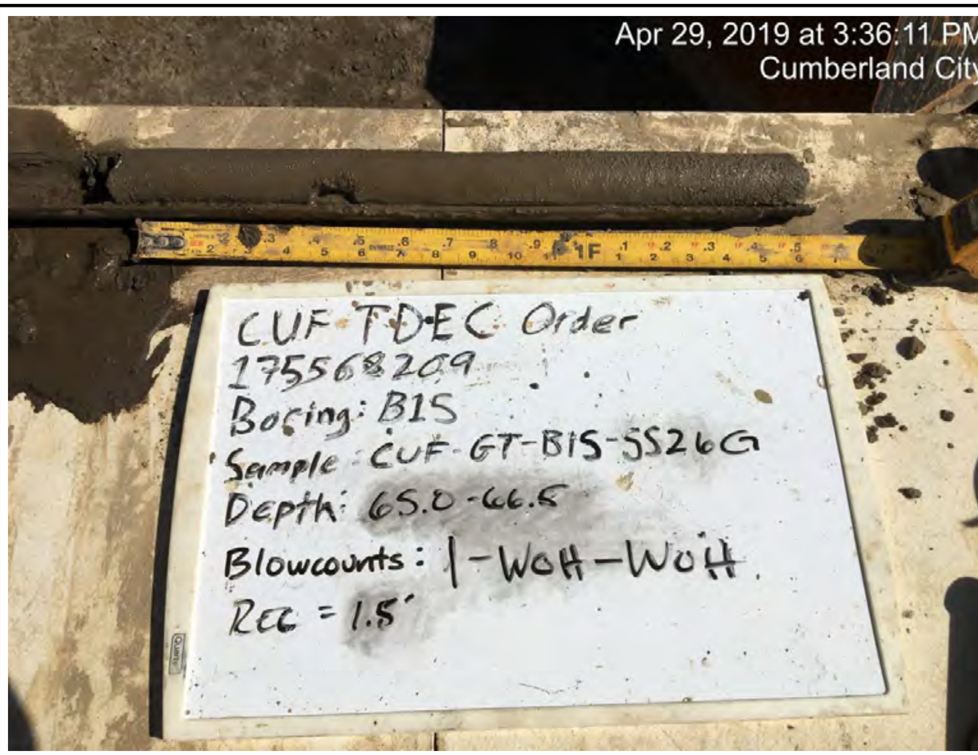
Comments:
Interval (62.5-64.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 80

Photo Location:
CUF-B15

Photo Date:
4/29/2019

Comments:
Interval (65.0-66.5 feet). WOH on white board is the same as WH on the boring log.



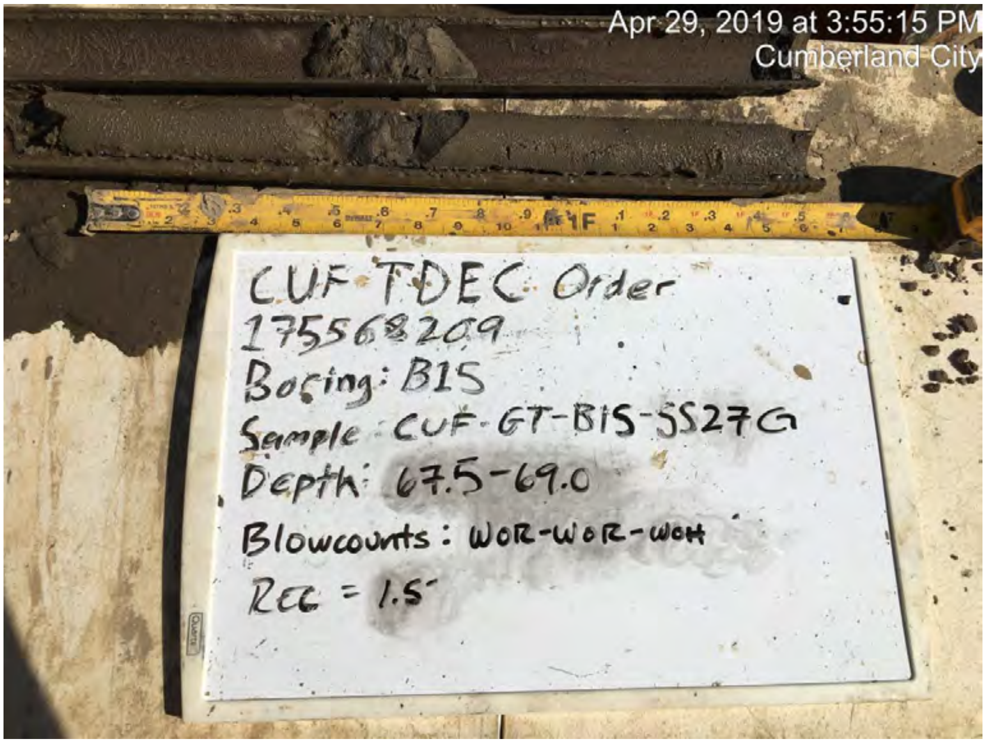
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 81

Photo Location:
CUF-B15

Photo Date:
4/29/2019

Comments:
Interval (67.5-69.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

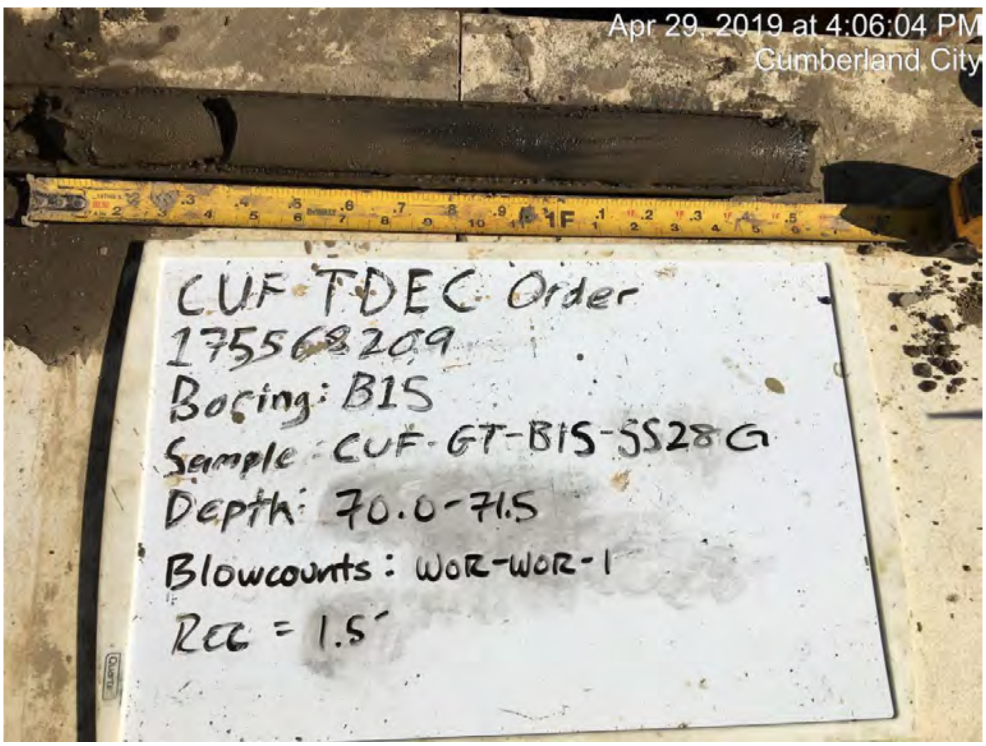


Photograph ID: 82

Photo Location:
CUF-B15

Photo Date:
4/29/2019

Comments:
Interval (70.0-71.5 feet). WOR on white board is the same as WR on the boring log.



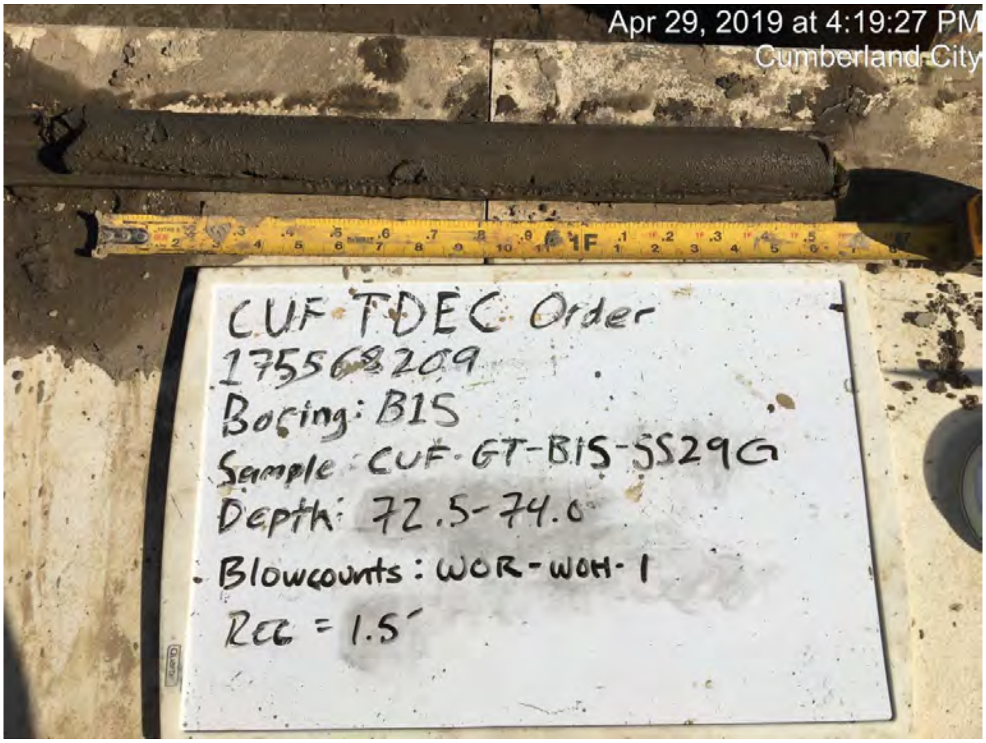
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 83

Photo Location: CUF-B15

Photo Date: 4/29/2019

Comments: Interval (72.5-74.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.



Photograph ID: 84

Photo Location: CUF-B15

Photo Date: 4/29/2019

Comments: Interval (75.0-76.5 feet). WOR on white board is the same as WR on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 85

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Photo of interval (77.0-78.2 feet) unavailable because sample collected with shelby tube. Sampler refusal at 78.2 feet.

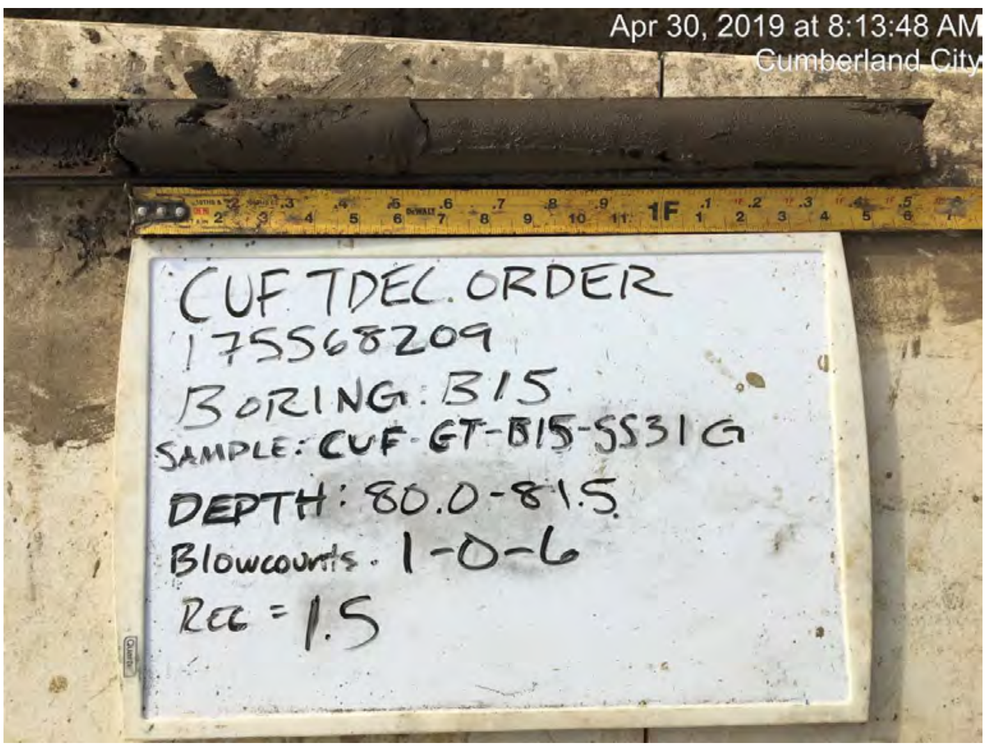
No Photo Applicable

Photograph ID: 86

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Interval (80.0-81.5 feet). Blowcount shown on white board should be 1-WH-6.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 87

Photo Location:
CUF-B15

Photo Date:
4/30/2019

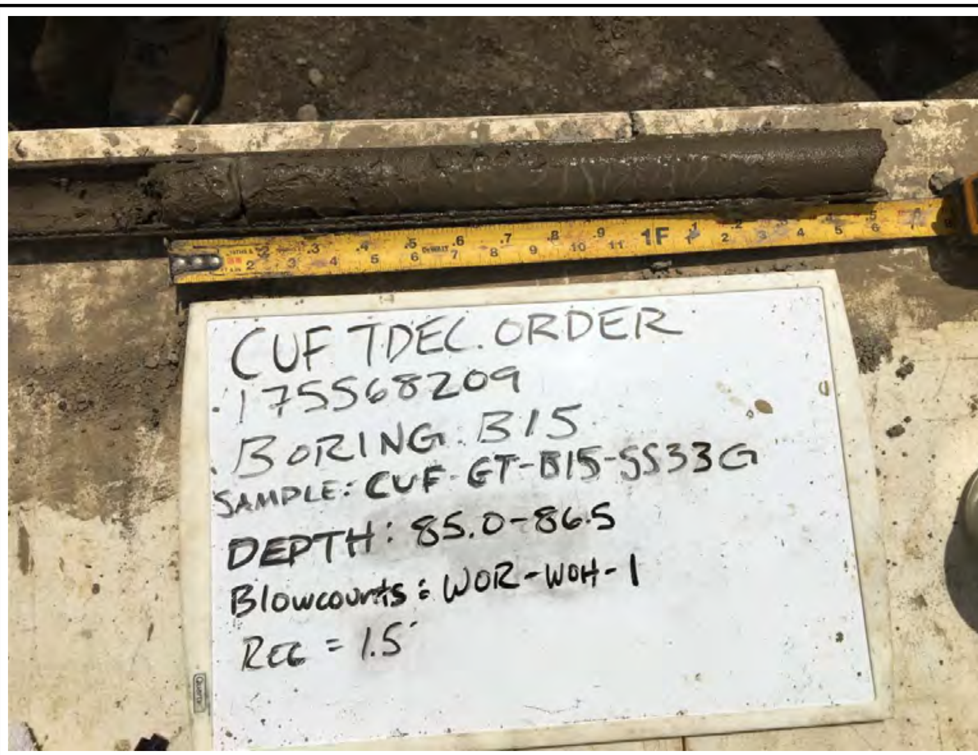
Comments:
Interval (82.5-84.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 88

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Interval (85.0-86.5 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.



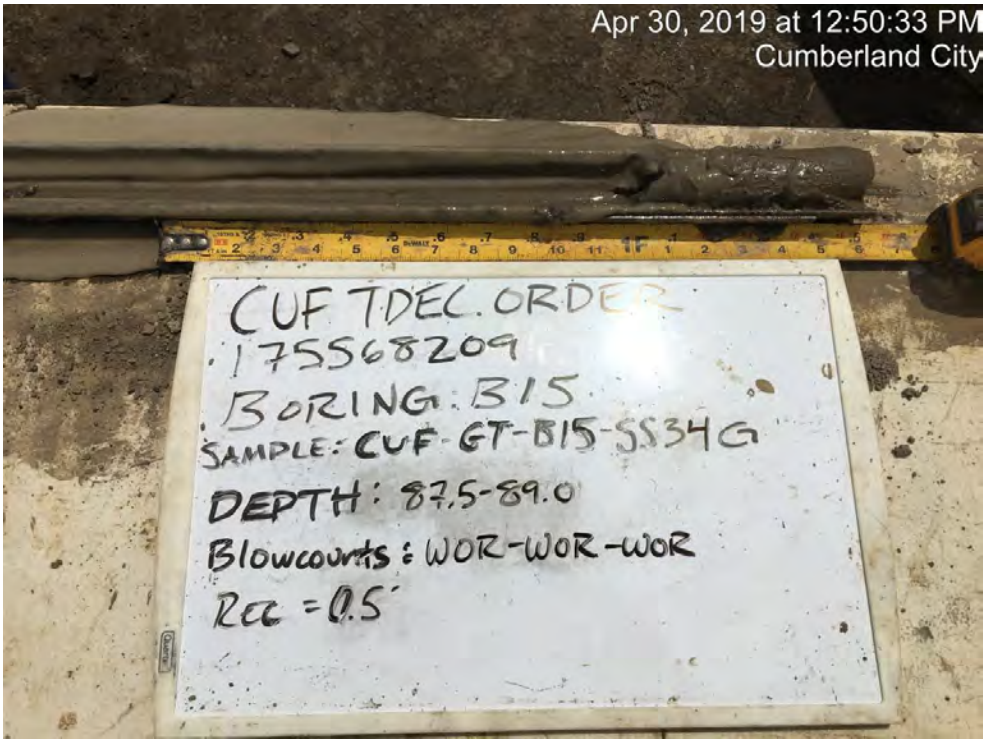
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 89

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Interval (87.5-89.0 feet). WOR on white board is the same as WR on the boring log.

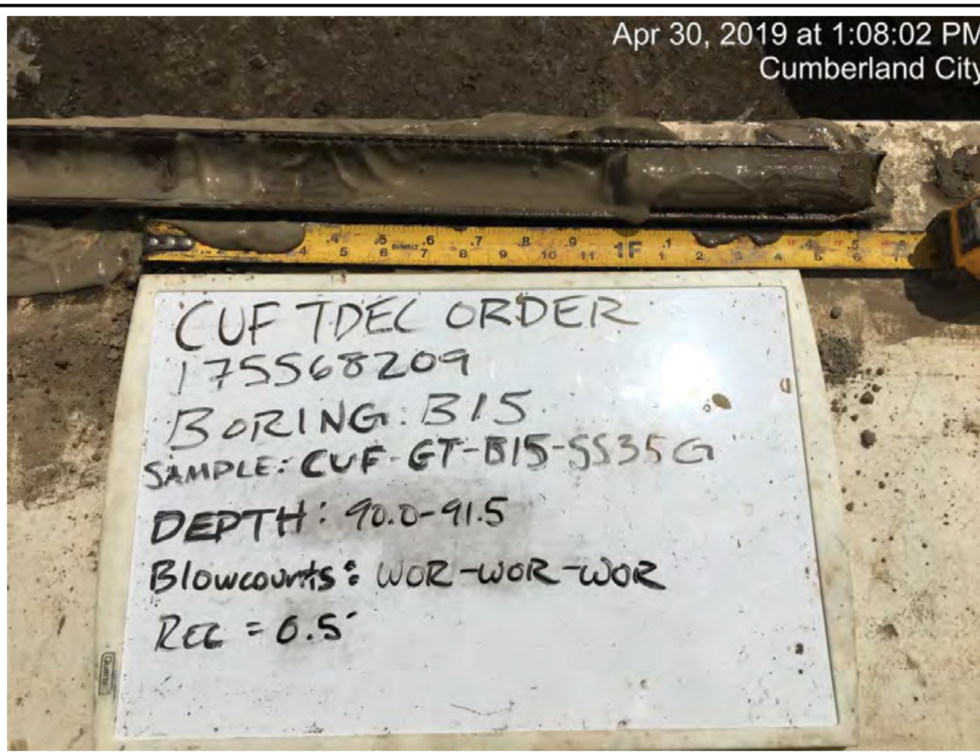


Photograph ID: 90

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Interval (90.0-91.5 feet). WOR on white board is the same as WR on the boring log.



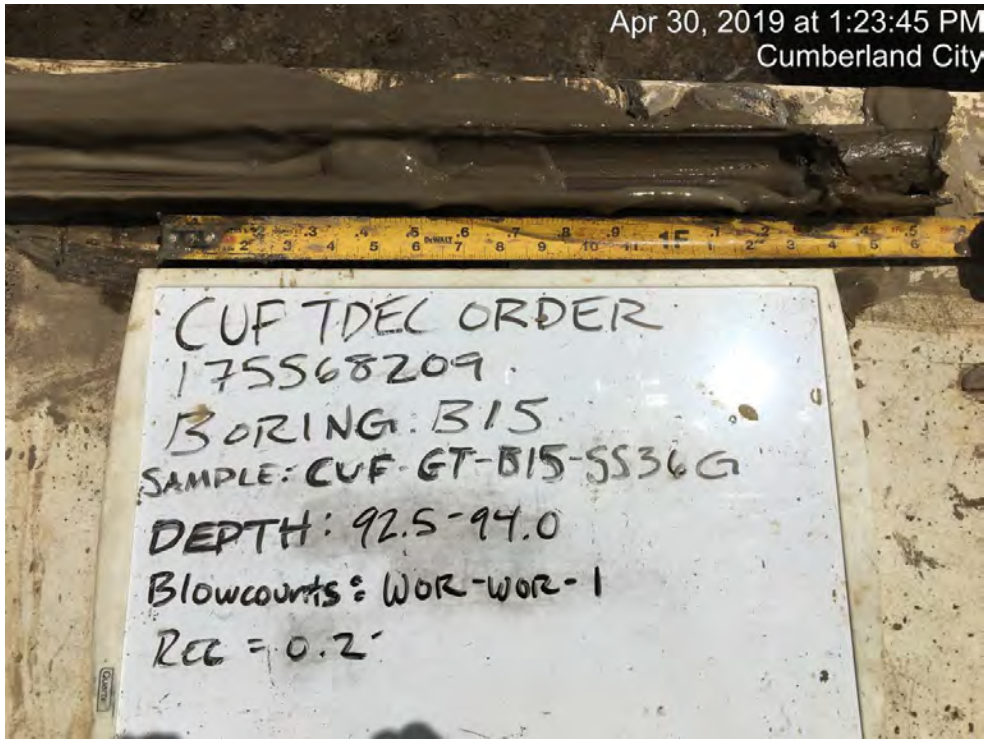
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 91

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Interval (92.5-94.0 feet). WOR on white board is the same as WR on the boring log.

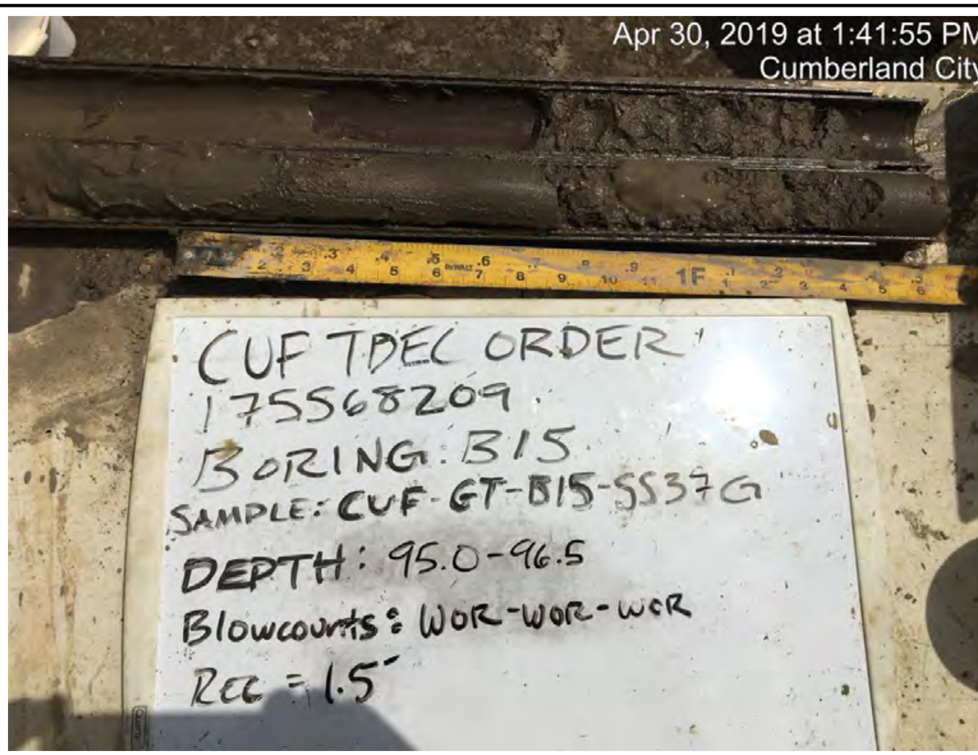


Photograph ID: 92

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Interval (95.0-96.5 feet). WOR on white board is the same as WR on the boring log.



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Photographic Log

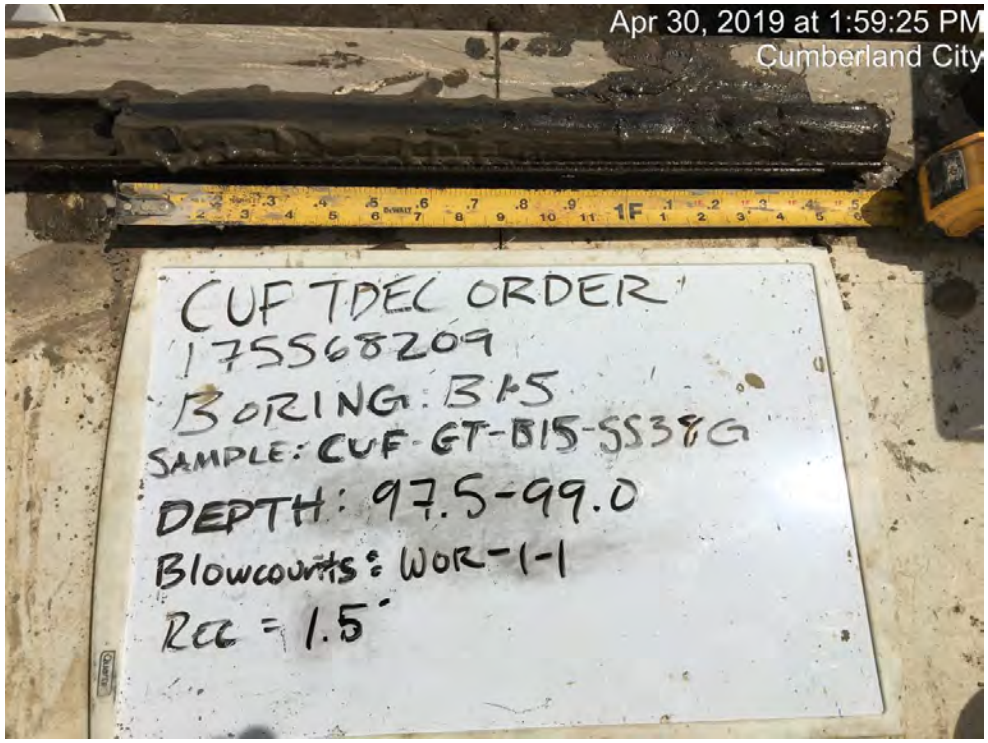
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 93

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Interval (97.5-99.0 feet). WOR on white board is the same as WR on the boring log.



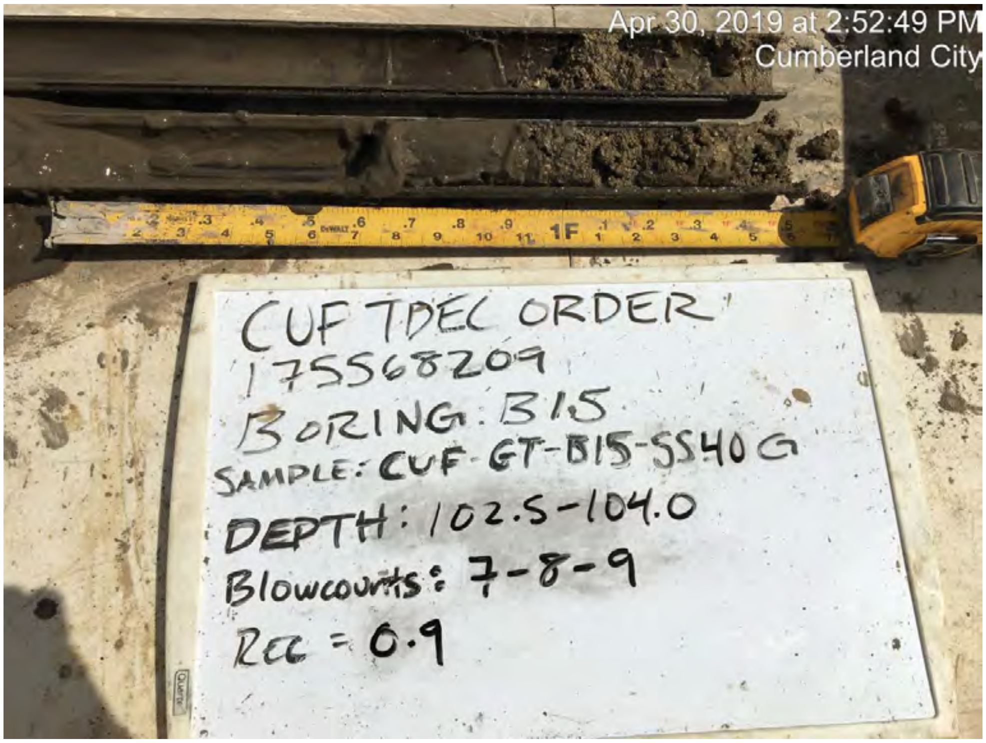
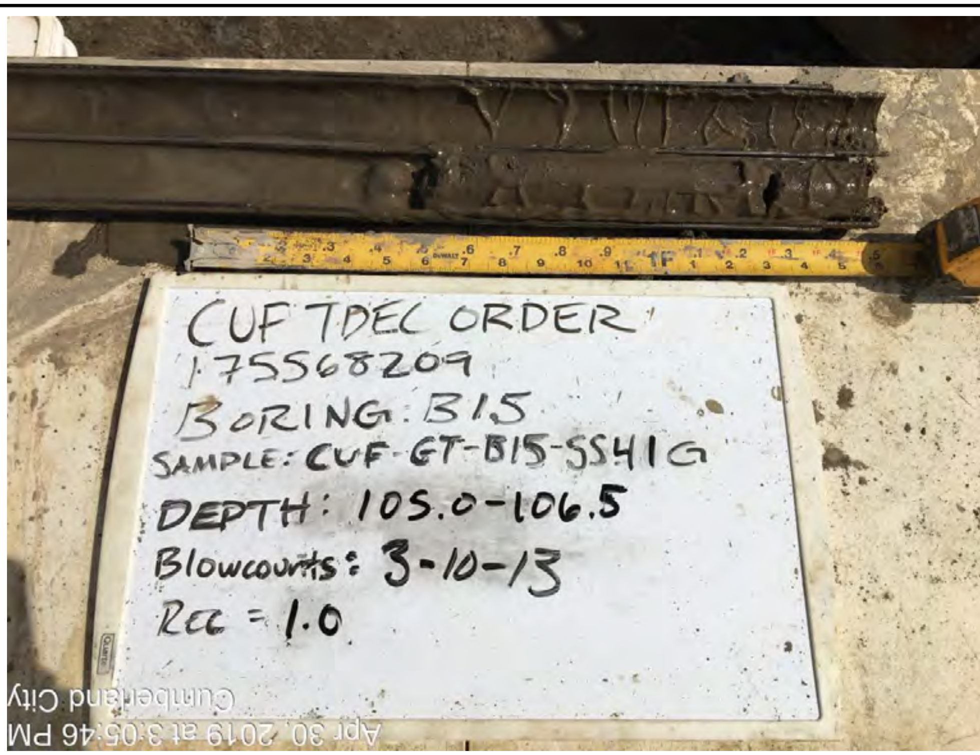
Photograph ID: 94

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Interval (100.0-101.5 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 95 **Photo Location:** CUF-B15 **Photo Date:** 4/30/2019 **Comments:** Interval (102.5-104.0 feet).	
Photograph ID: 96 **Photo Location:** CUF-B15 **Photo Date:** 4/30/2019 **Comments:** Interval (105.0-106.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 97

Photo Location:
CUF-B15

Photo Date:
4/30/2019

Comments:
Photo of interval (107.5-109.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photograph ID: 98

Photo Location:
CUF-B15

Photo Date:
5/1/2019

Comments:
Interval (110.0-111.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 99

Photo Location: CUF-B15

Photo Date: 5/1/2019

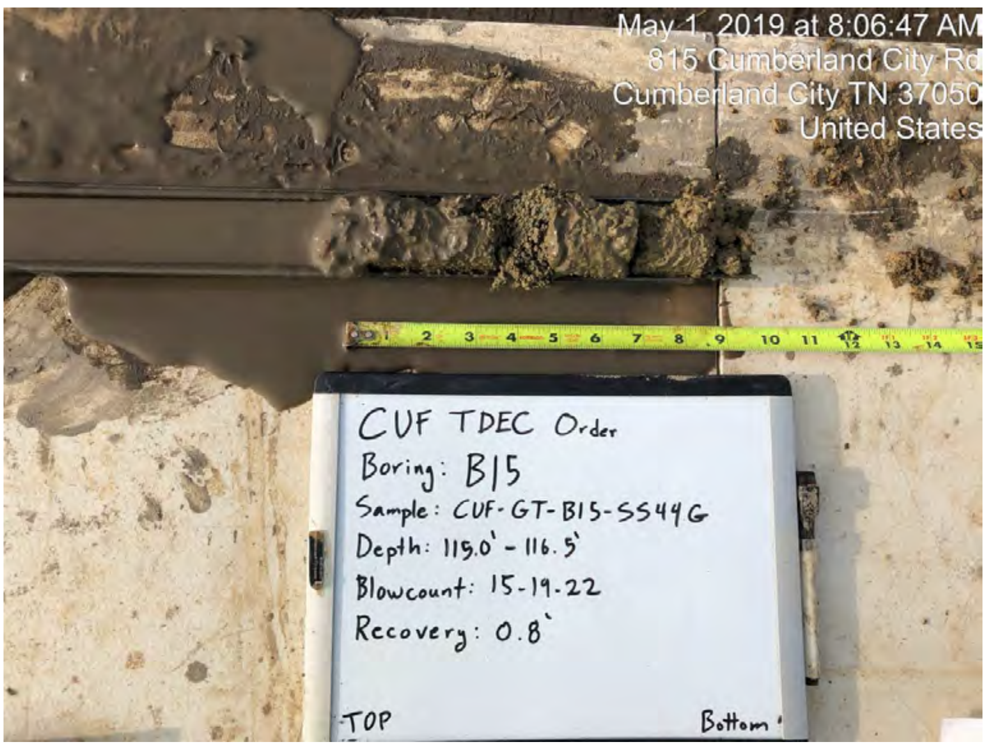
Comments: Interval (112.5-114.0 feet).

Photograph ID: 100

Photo Location: CUF-B15

Photo Date: 5/1/2019

Comments: Interval (115.0-116.5 feet).



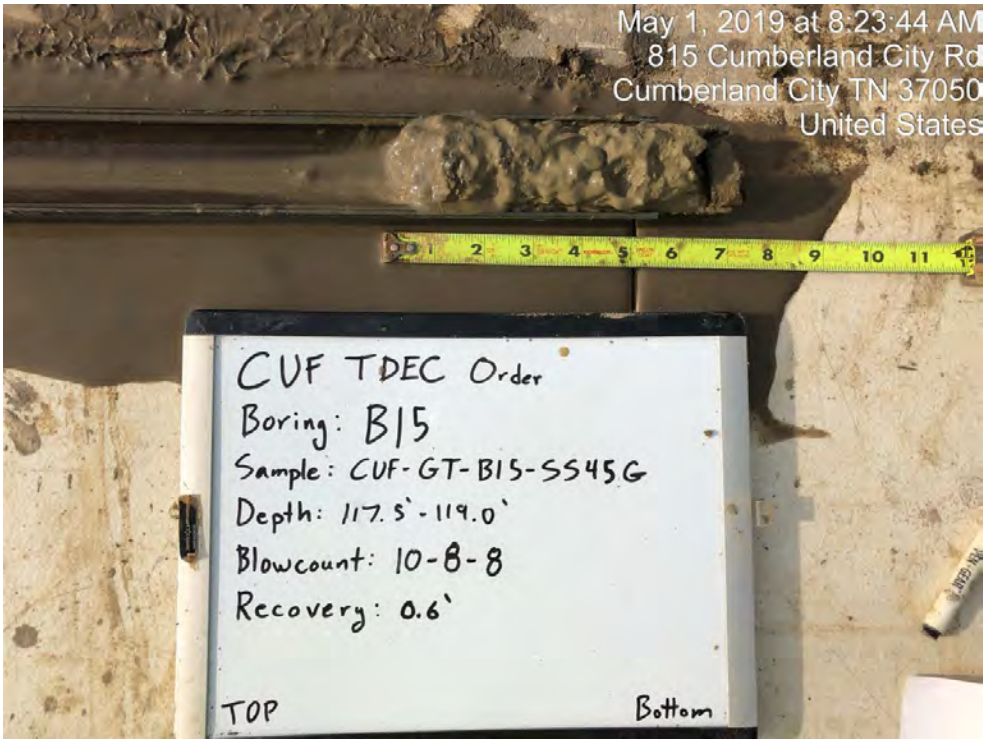
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 101

Photo Location: CUF-B15

Photo Date: 5/1/2019

Comments: Interval (117.5-119.0 feet).

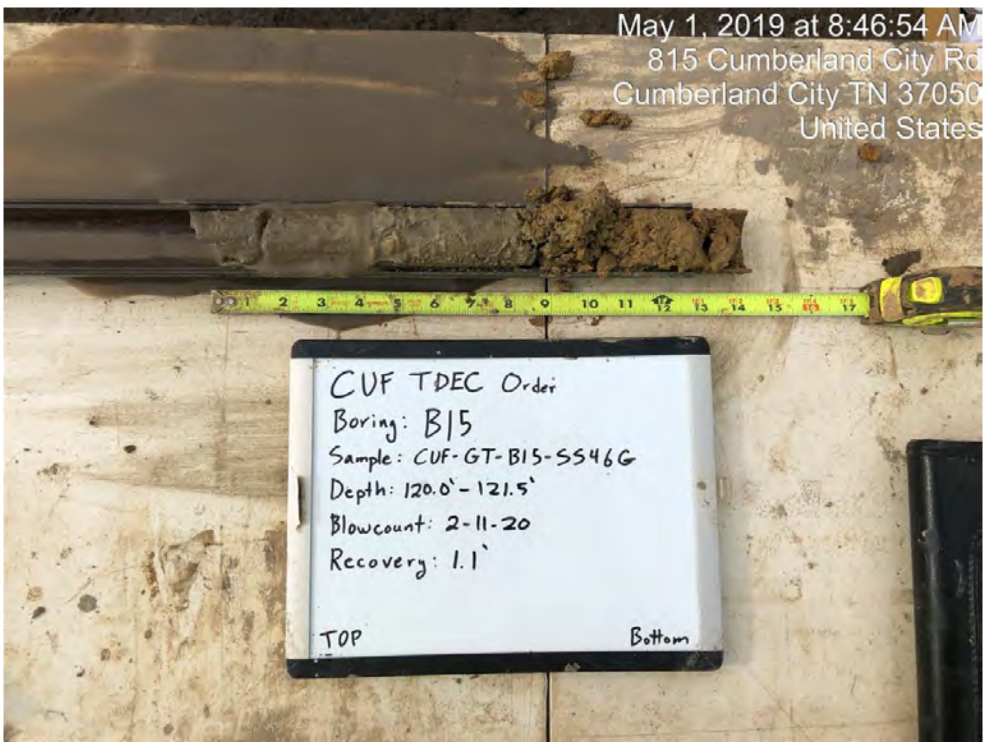


Photograph ID: 102

Photo Location: CUF-B15

Photo Date: 5/1/2019

Comments: Interval (120.0-121.5 feet).



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 103

Photo Location:
CUF-B15

Photo Date:
5/1/2019

Comments:
Interval (122.5-123.7 feet).

Photograph ID: 104

Photo Location:
CUF-B15

Photo Date:
5/3/2019

Comments:
Interval (125.5-157.9 feet).

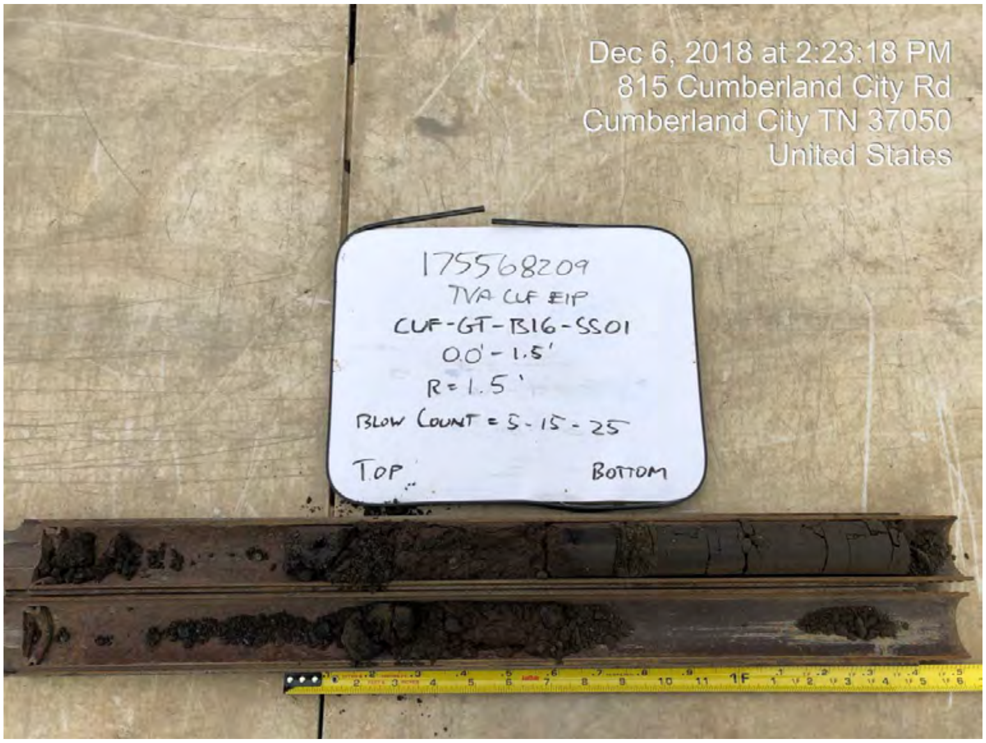
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 105

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (0.0-1.5 feet).

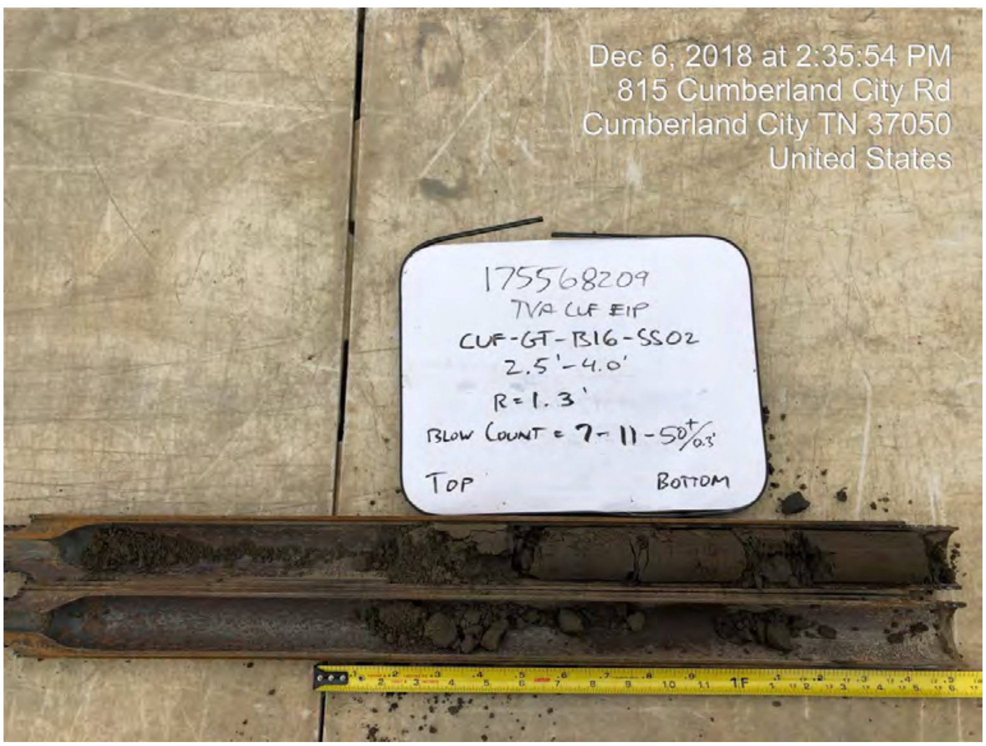


Photograph ID: 106

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (2.5-3.8 feet). Interval shown on white board should be 2.5-3.8 feet. Sampler refusal at 3.8 feet.



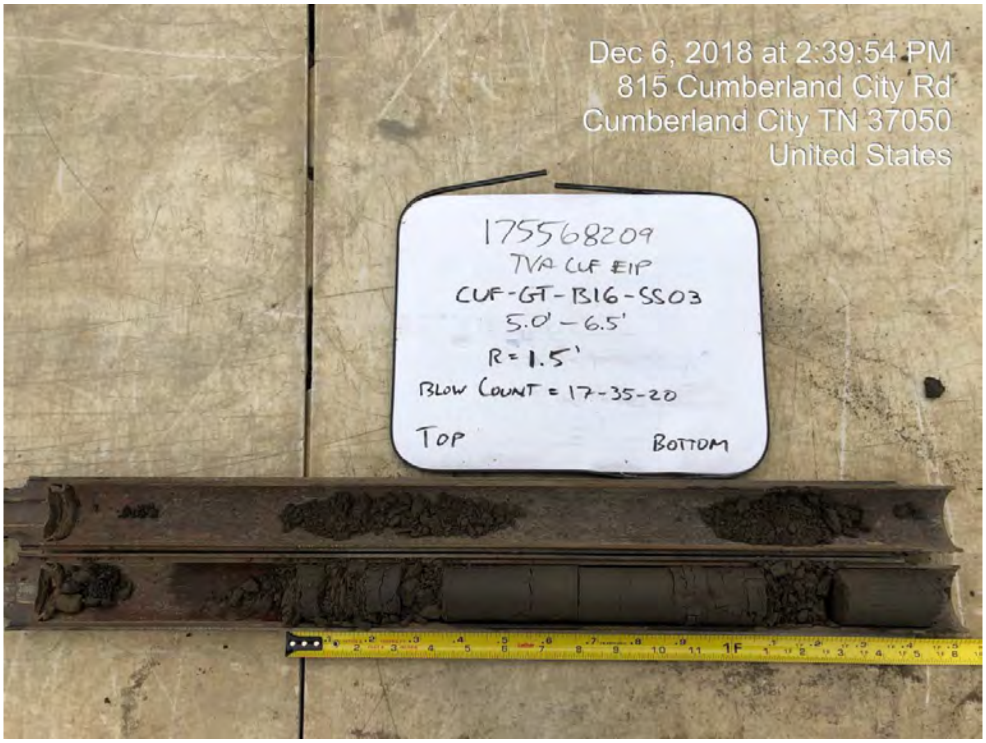
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 107

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (5.0-6.5 feet).

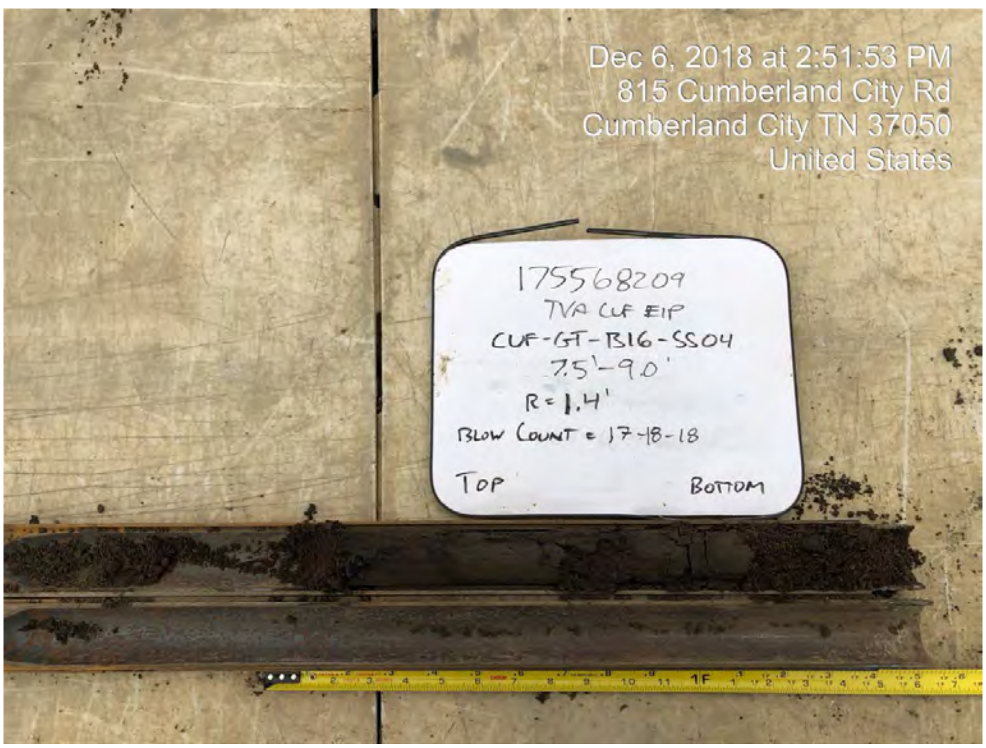


Photograph ID: 108

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (7.5-9.0 feet).



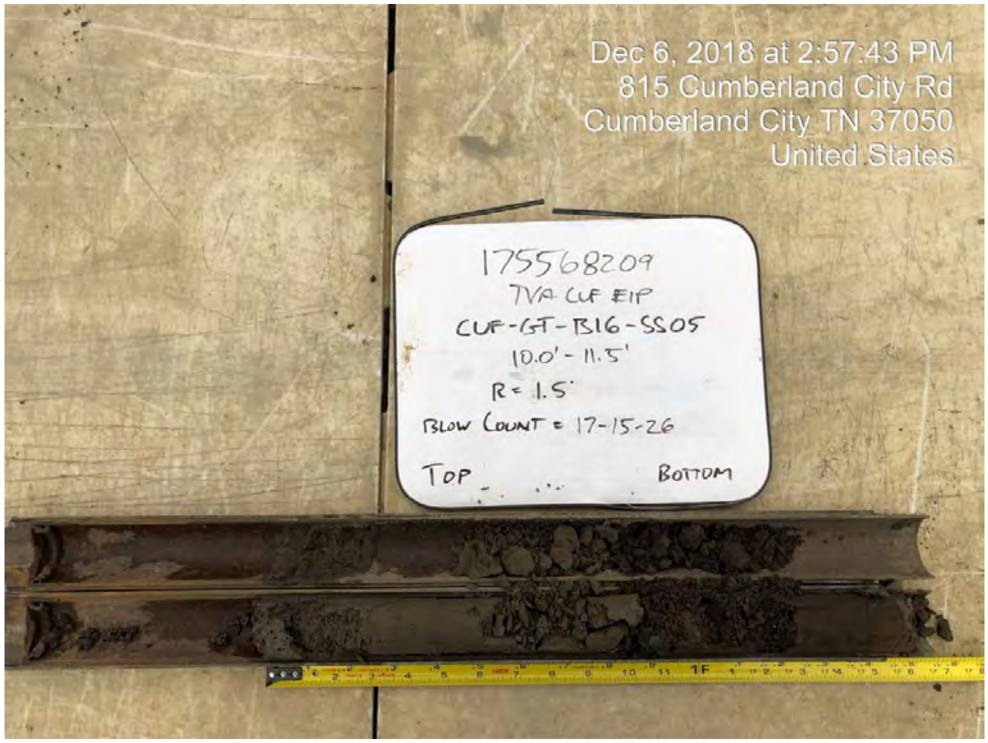
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 109

Photo Location: CUF-B16

Photo Date: 12/6/2018

Comments: Interval (10.0-11.5 feet).



Photograph ID: 110

Photo Location: CUF-B16

Photo Date: 12/6/2018

Comments: Interval (12.5-14.0 feet).

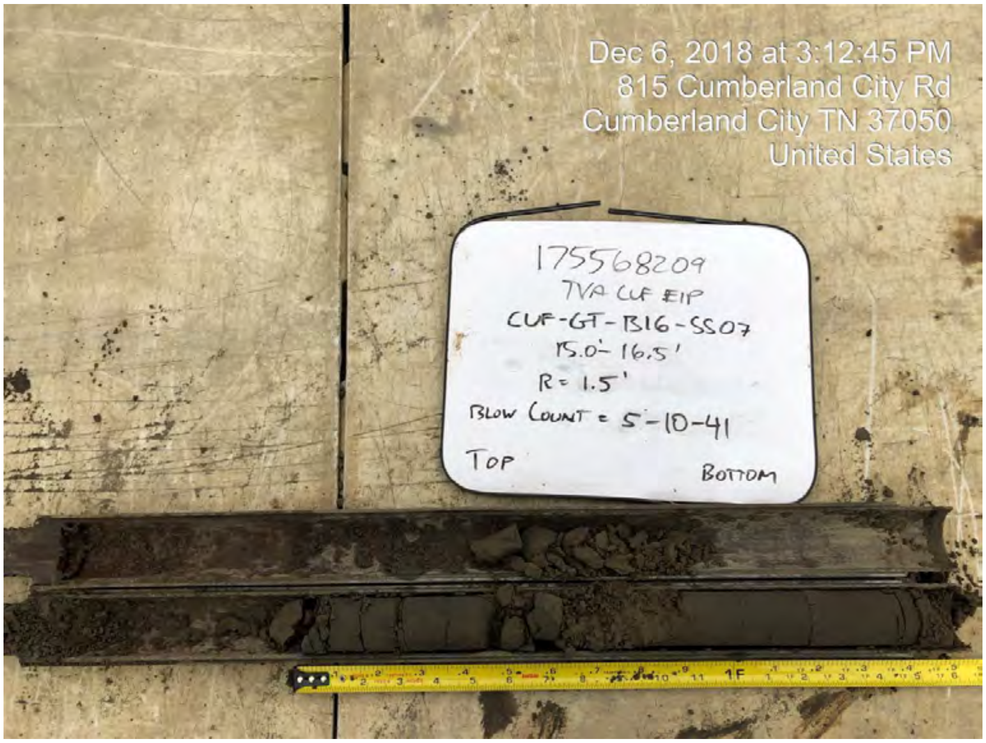
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 111

Photo Location: CUF-B16

Photo Date: 12/6/2018

Comments: Interval (15.0-16.5 feet).



Photograph ID: 112

Photo Location: CUF-B16

Photo Date: 12/6/2018

Comments: Interval (17.5-18.0 feet). Interval shown on white board should be 17.5-18.0 feet. Sampler refusal at 18.0 feet.

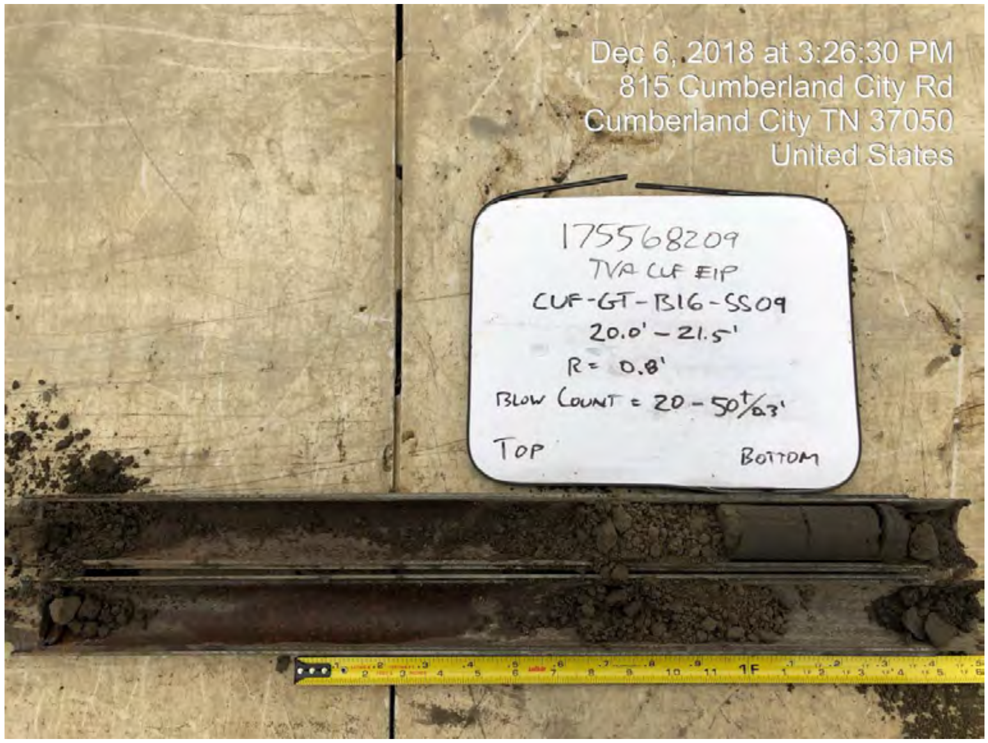
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 113

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (20.0-20.8 feet). Interval shown on white board should be 20.0-20.8 feet. Sampler refusal at 20.8 feet.

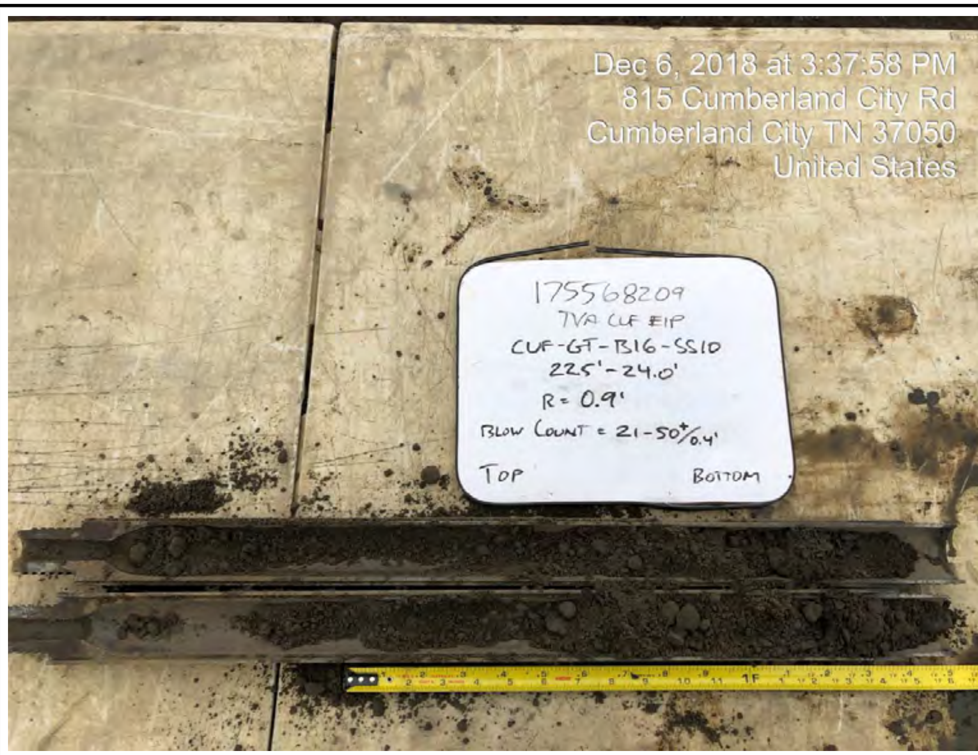


Photograph ID: 114

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (22.5-23.4 feet). Interval shown on white board should be 22.5-23.4 feet. Sampler refusal at 23.4 feet.



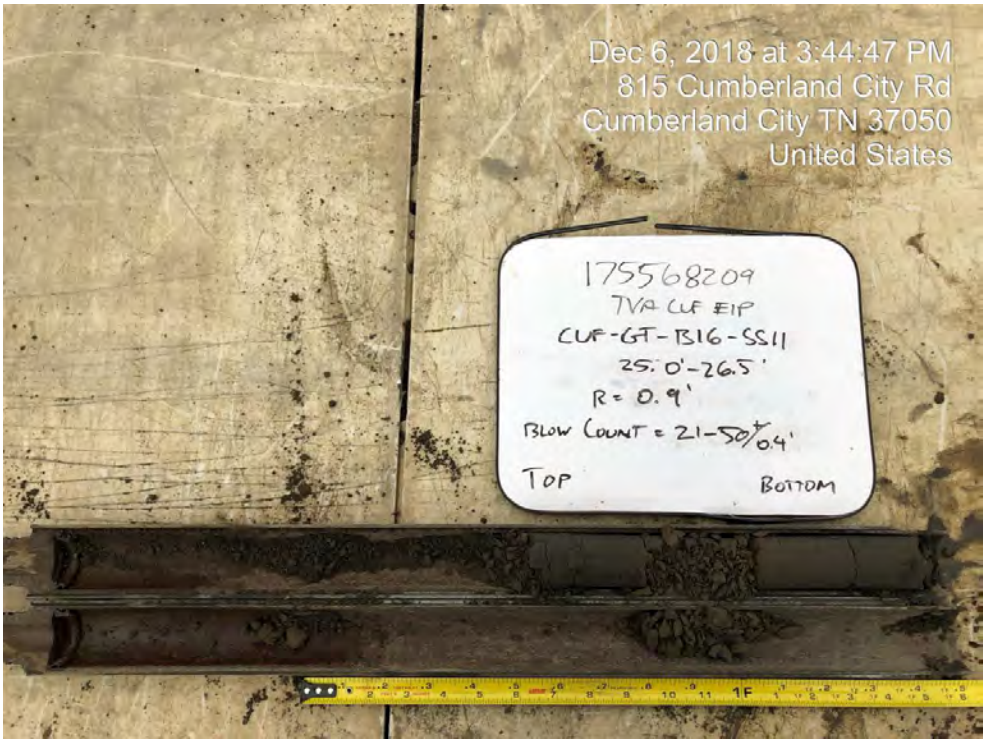
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 115

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (25.0-25.9 feet). Interval shown on white board should be 25.0-25.9 feet. Sampler refusal at 25.9 feet.



Photograph ID: 116

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (27.5-28.2 feet). Interval shown on white board should be 27.5-28.2 feet. Sampler refusal at 28.2 feet.

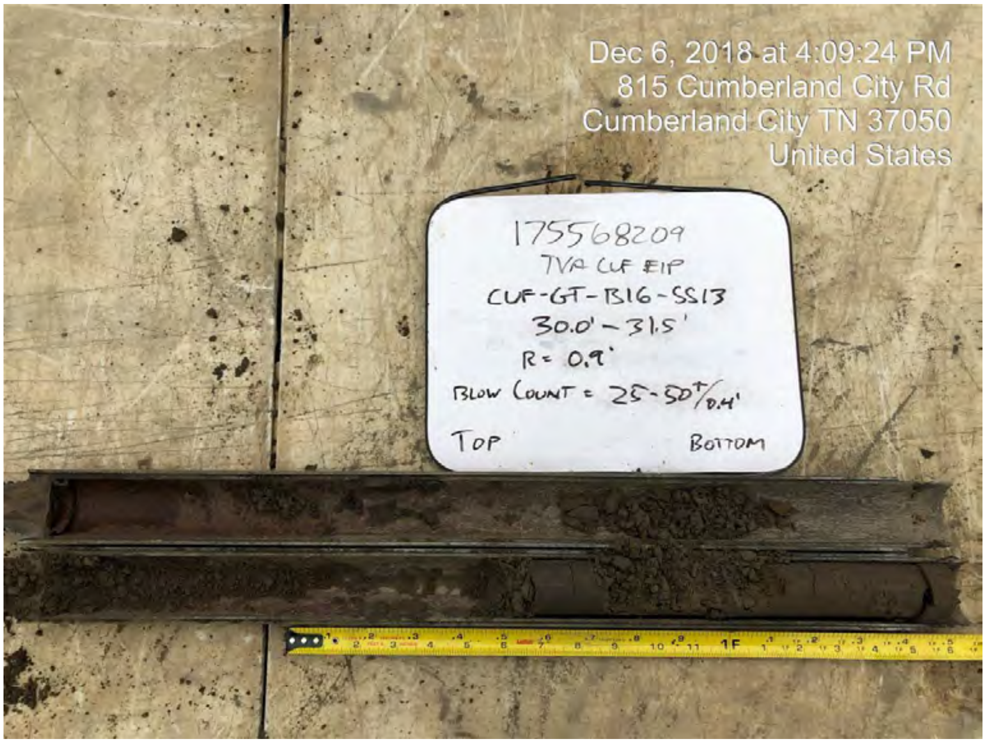
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 117

Photo Location:
CUF-B16

Photo Date:
12/6/2018

Comments:
Interval (30.0-30.9 feet). Interval shown on white board should be 30.0-30.9 feet. Sampler refusal at 30.9 feet.

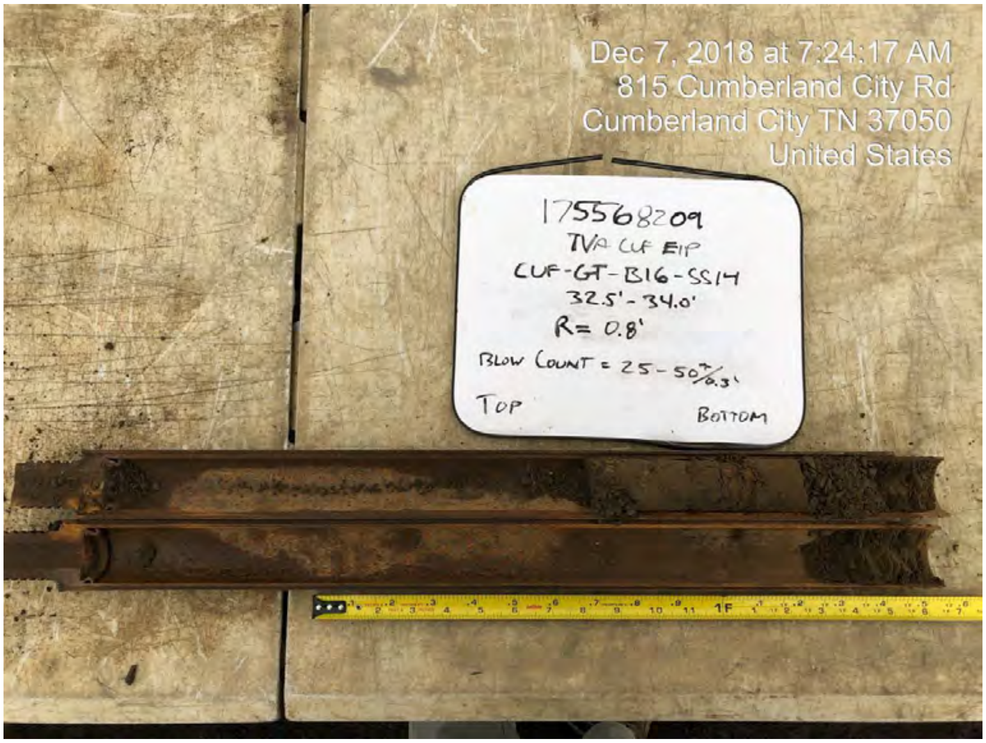


Photograph ID: 118

Photo Location:
CUF-B16

Photo Date:
12/7/2018

Comments:
Interval (32.5-33.3 feet). Interval shown on white board should be 32.5-33.3 feet. Sampler refusal at 33.3 feet.



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 119

Photo Location:
CUF-B16

Photo Date:
12/7/2018

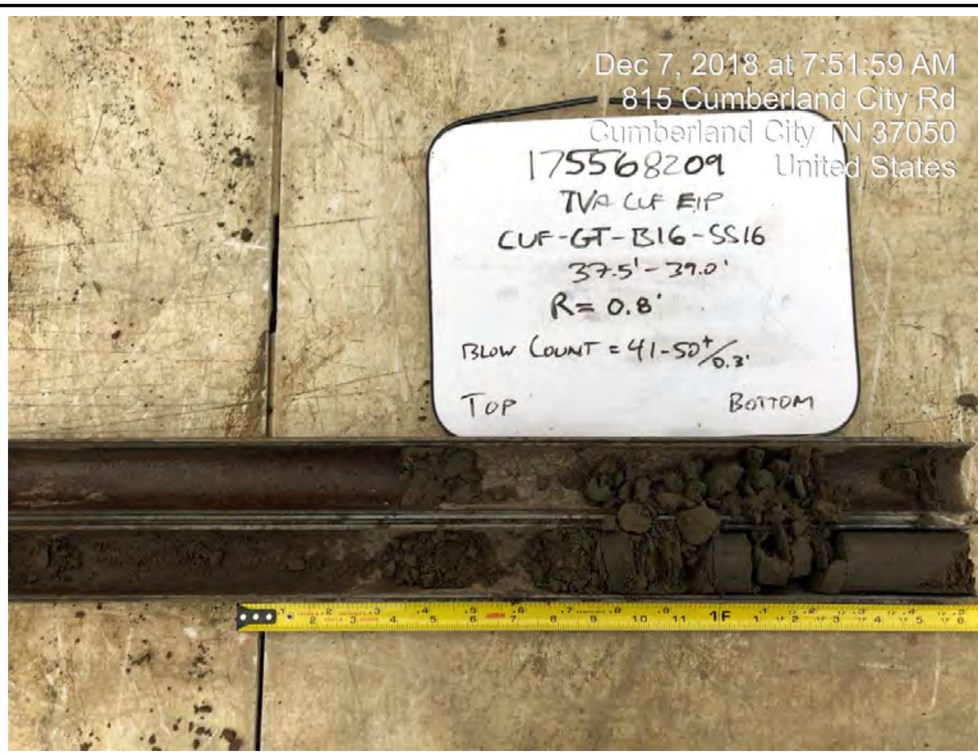
Comments:
Interval (35.0-35.7 feet). Interval shown on white board should be 35.0-35.7 feet. Sampler refusal at 35.7 feet.

Photograph ID: 120

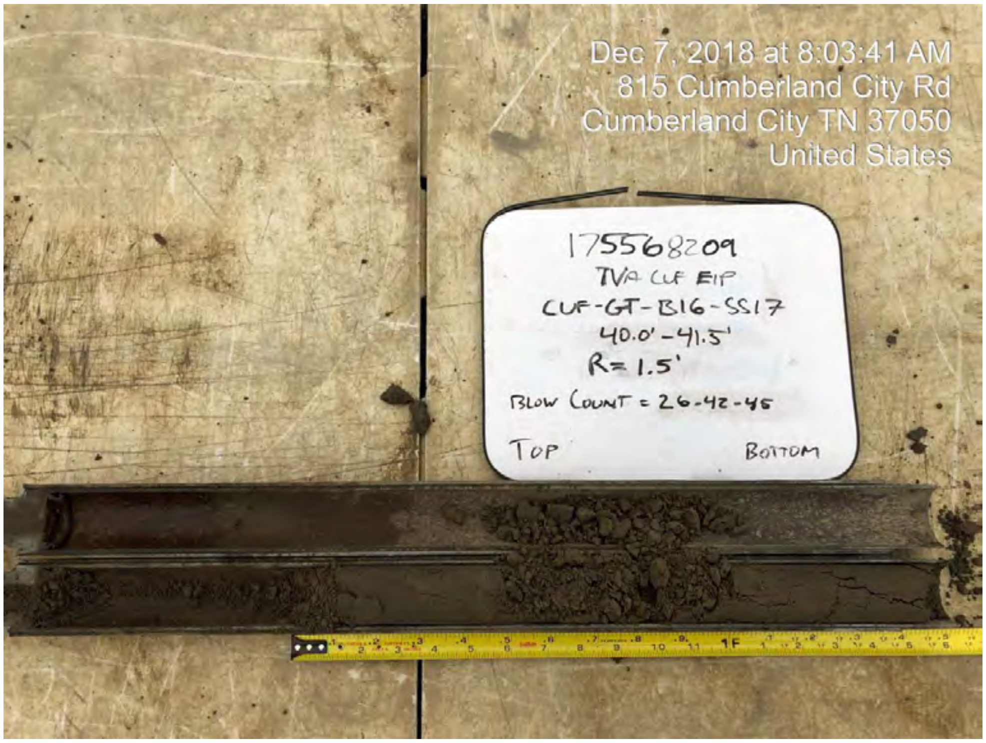
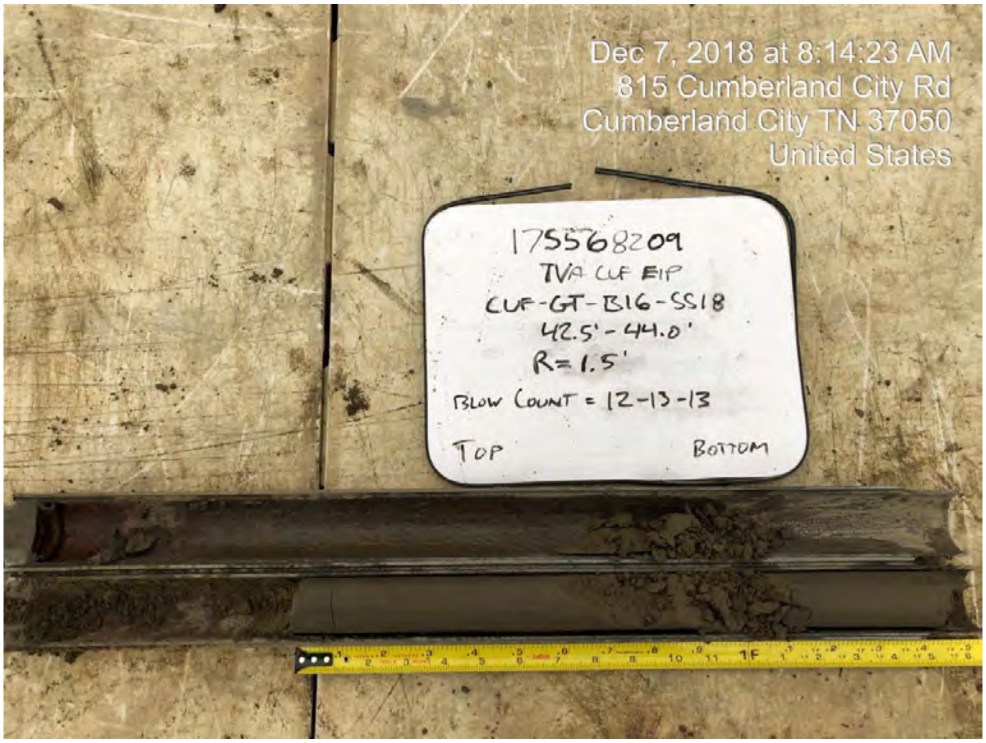
Photo Location:
CUF-B16

Photo Date:
12/7/2018

Comments:
Interval (37.5-38.3 feet). Interval shown on white board should be 37.5-38.3 feet. Sampler refusal at 38.3 feet.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 121 **Photo Location:** CUF-B16 **Photo Date:** 12/7/2018 **Comments:** Interval (40.0-41.5 feet).	
Photograph ID: 122 **Photo Location:** CUF-B16 **Photo Date:** 12/7/2018 **Comments:** Interval (42.5-44.0 feet).	

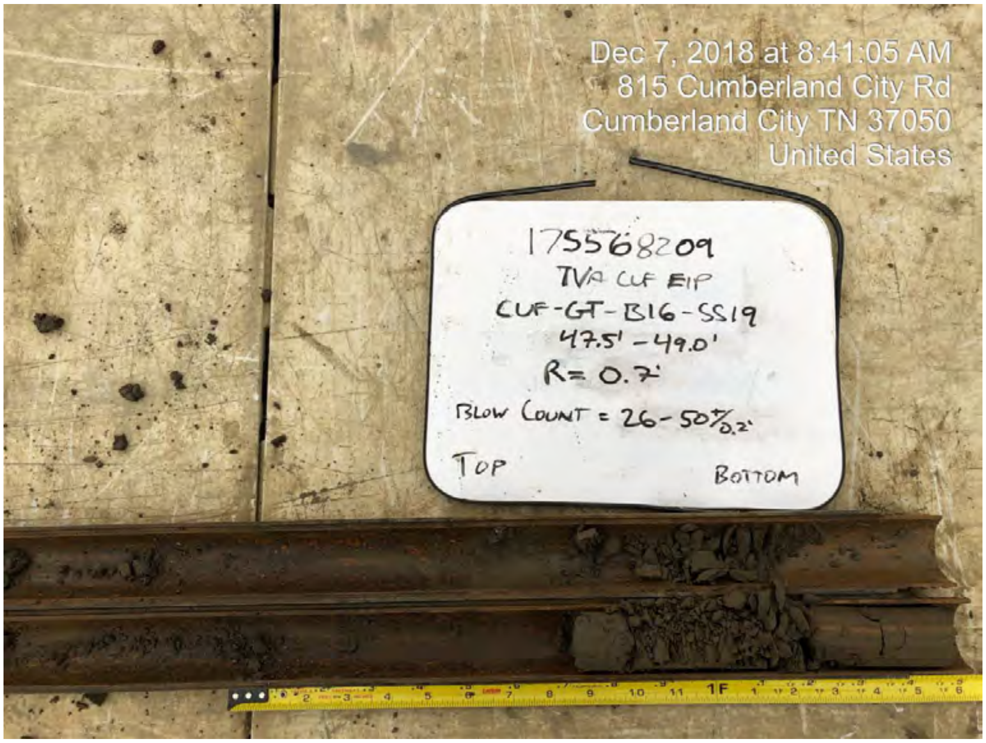
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 123

Photo Location:
CUF-B16

Photo Date:
12/7/2018

Comments:
Interval (47.5-48.2 feet). Interval shown on white board should be 47.5-48.2 feet. Sampler refusal at 48.2 feet.

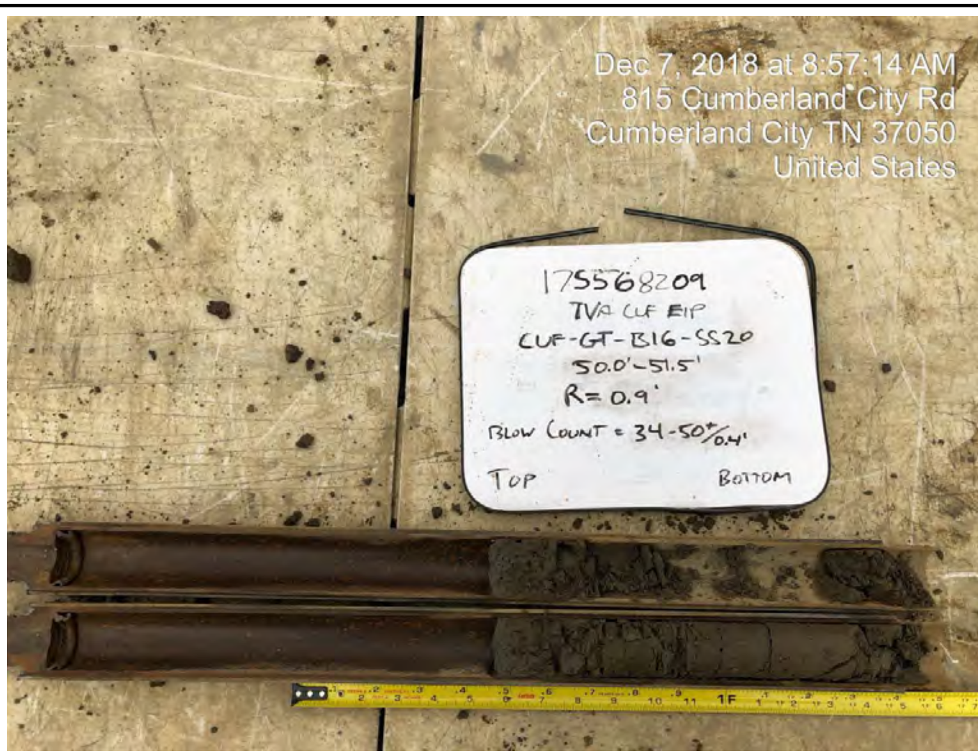


Photograph ID: 124

Photo Location:
CUF-B16

Photo Date:
12/7/2018

Comments:
Interval (50.0-50.9 feet). Interval shown on white board should be 50.0-50.9 feet. Sampler refusal at 50.9 feet.



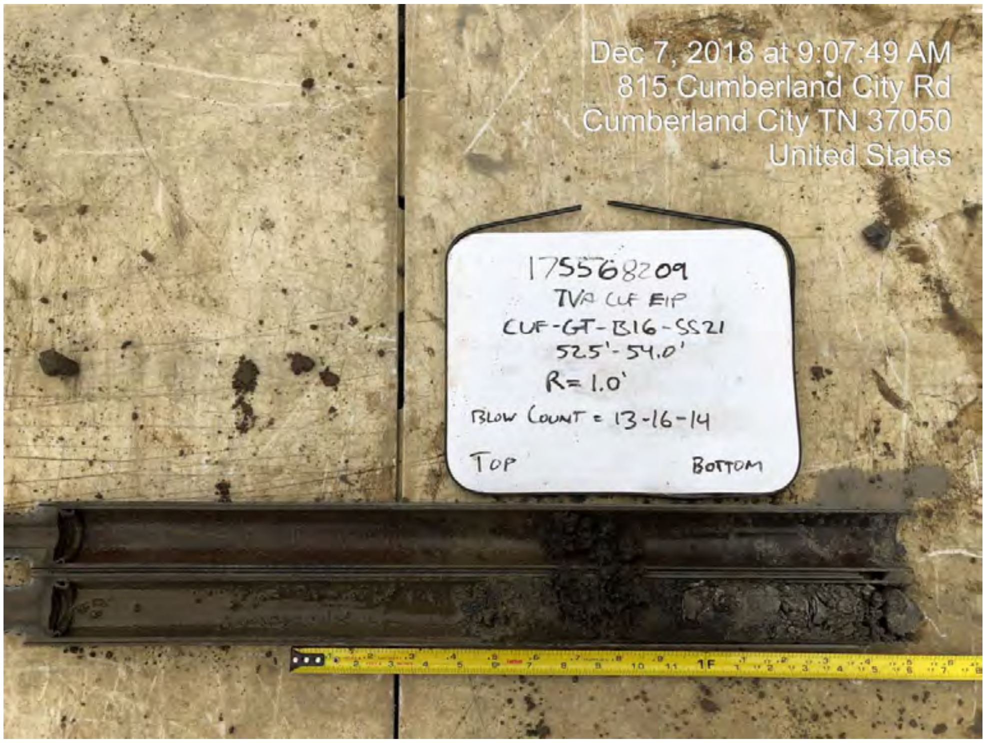
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 125

Photo Location:
CUF-B16

Photo Date:
12/7/2018

Comments:
Interval (52.5-54.0 feet).

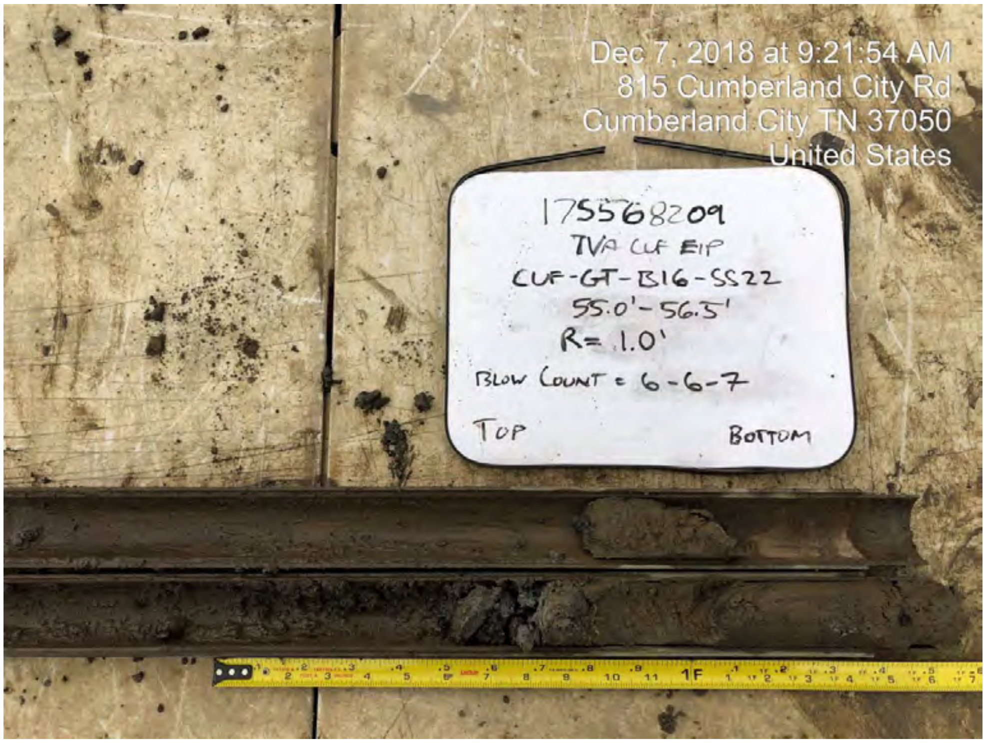


Photograph ID: 126

Photo Location:
CUF-B16

Photo Date:
12/7/2018

Comments:
Interval (55.0-56.5 feet).



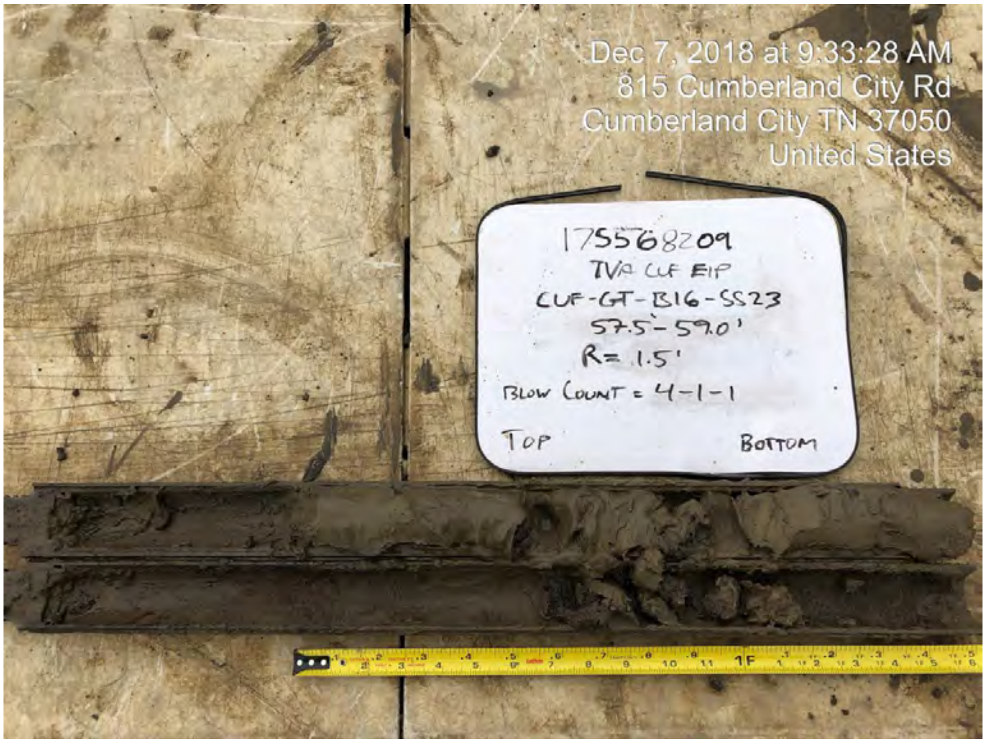
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 127

Photo Location:
CUF-B16

Photo Date:
12/7/2018

Comments:
Interval (57.5-59.0 feet).



Photograph ID: 128

Photo Location:
CUF-B16

Photo Date:
12/7/2018

Comments:
Photo of interval (60.0-62.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 129

Photo Location: CUF-B16

Photo Date: 12/7/2018

Comments: Interval (62.5-64.0 feet).

Photograph ID: 130

Photo Location: CUF-B16

Photo Date: 12/10/2018

Comments: Interval (65.0-66.5 feet). Interval shown on white board should be 65.0-66.5 feet.

Stantec **Photographic Log**

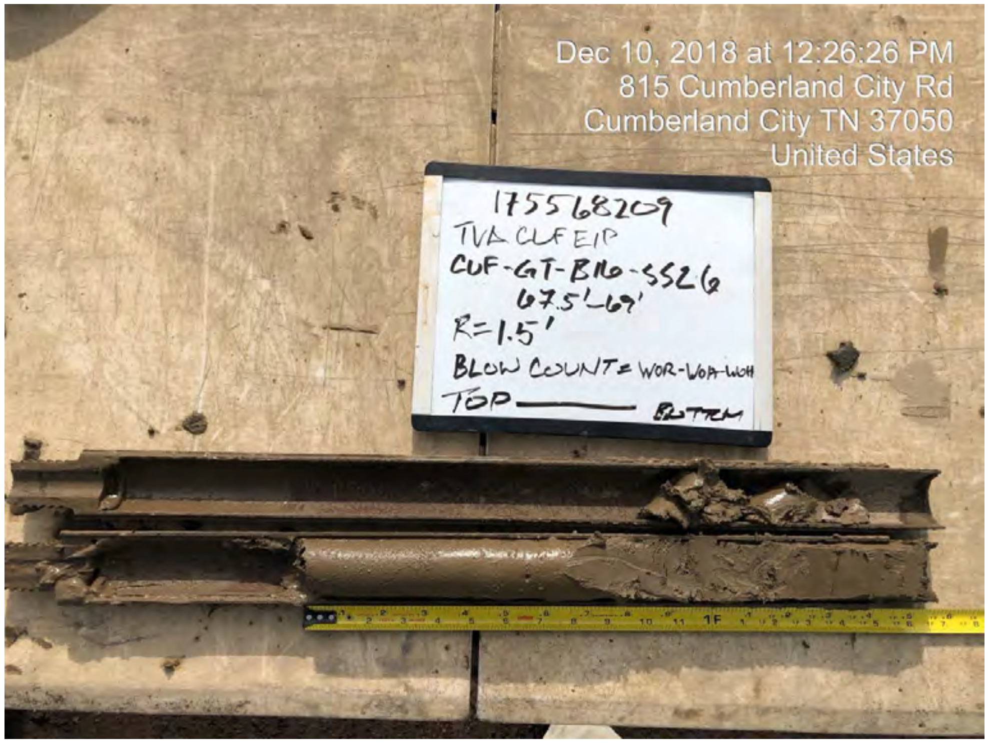
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 131

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (67.5-69.0 feet). Interval shown on white board should be 67.5-69.0 feet. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

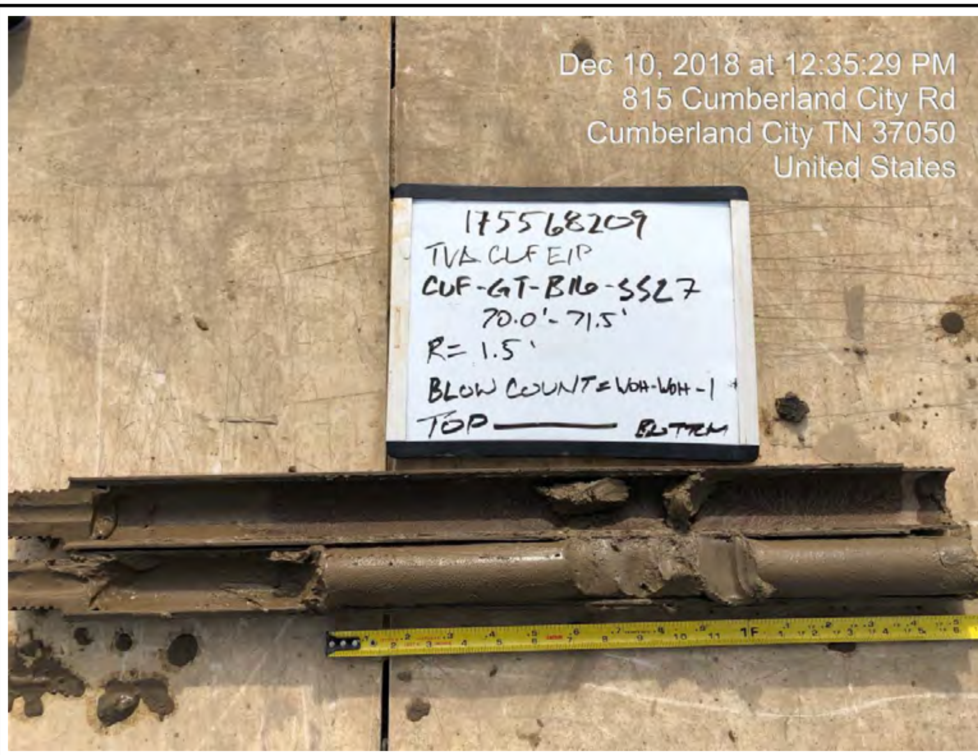


Photograph ID: 132

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (70.0-71.5 feet). WOH on white board is the same as WH on the boring log.



Stantec

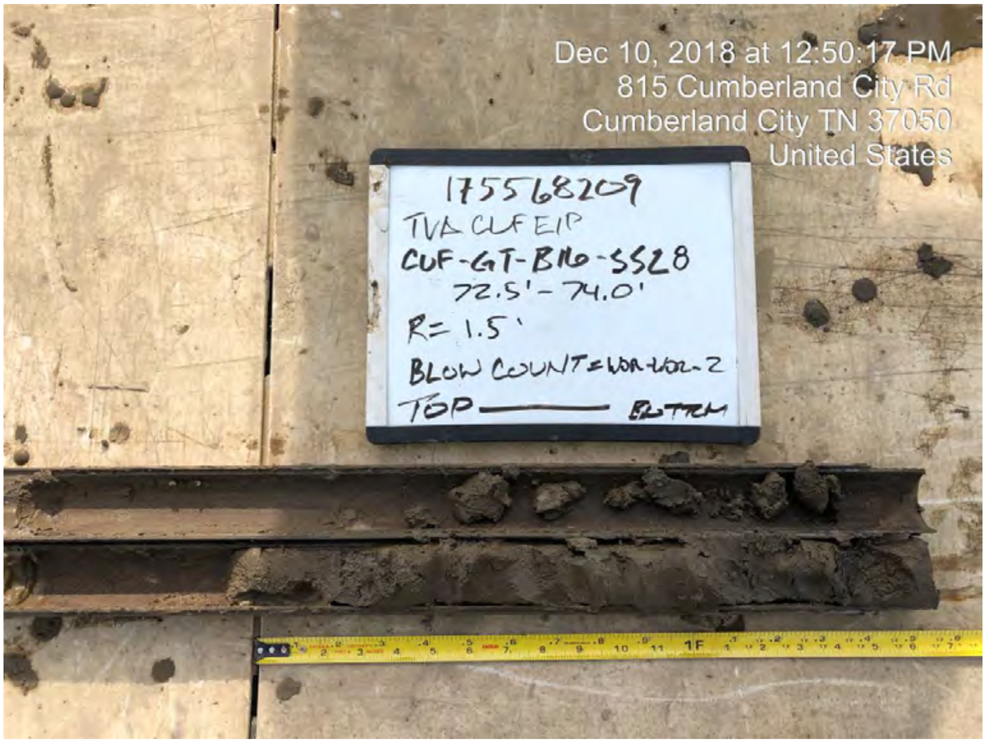
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 133

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (72.5-74.0 feet). WOR on white board is the same as WR on the boring log.



Photograph ID: 134

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (75.0-76.5 feet).

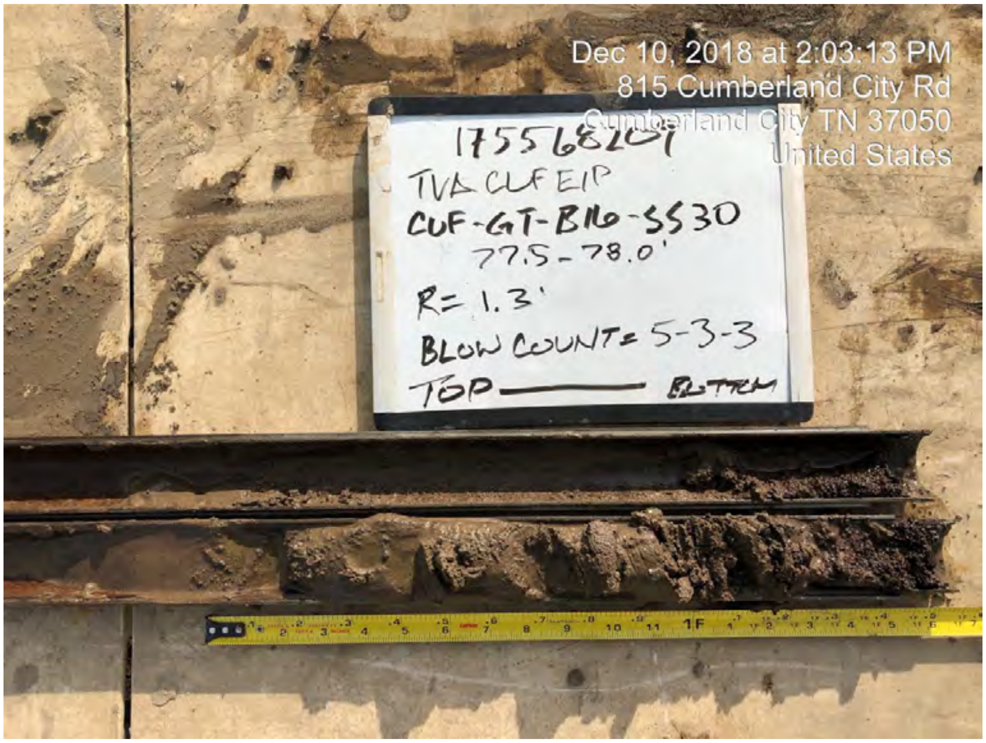
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 135

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (77.5-79.0 feet). Interval shown on white board should be 77.5-79.0 feet.



Photograph ID: 136

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (80.0-81.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 137

Photo Location:
CUF-B16

Photo Date:
12/10/2018

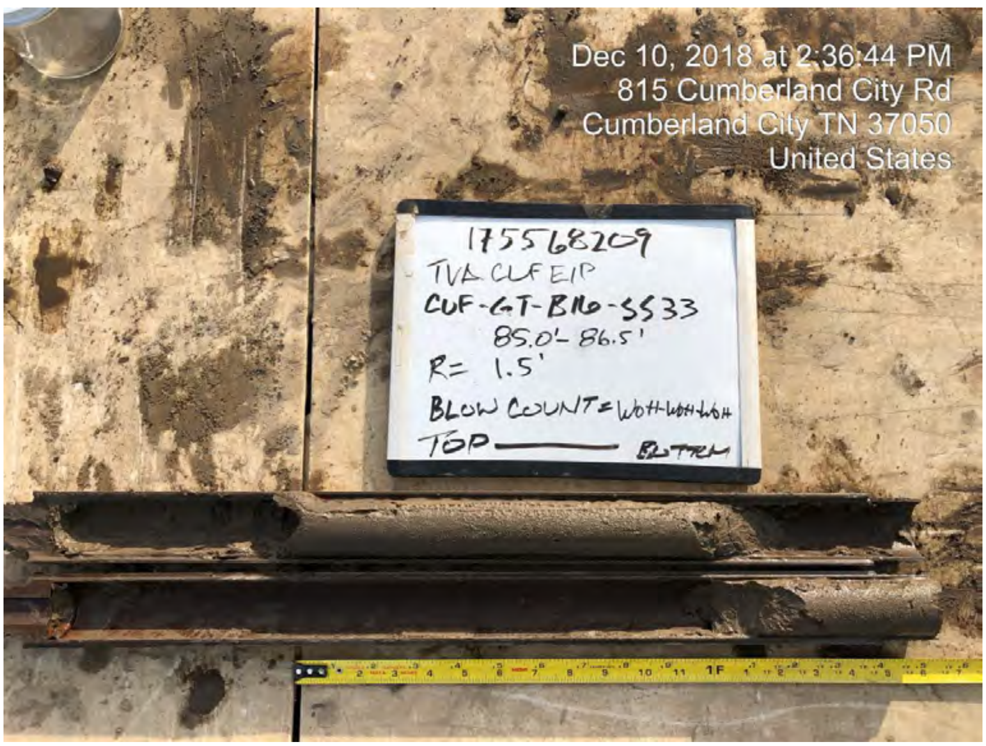
Comments:
Interval (82.5-84.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 138

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (85.0-86.5 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 139

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (87.5-89.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 140

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (90.0-91.5 feet). WOH on white board is the same as WH on the boring log.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 141

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (92.5-94.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 142

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (95.0-96.5 feet). WOH on white board is the same as WH on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 143

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Interval (97.5-99.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 144

Photo Location:
CUF-B16

Photo Date:
12/10/2018

Comments:
Photo of interval (99.0-101.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 145

Photo Location:
CUF-B16

Photo Date:
12/11/2018

Comments:
Interval (101.0-102.5 feet).

Photograph ID: 146

Photo Location:
CUF-B16

Photo Date:
12/11/2018

Comments:
Interval (102.5-104.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 147

Photo Location:
CUF-B16

Photo Date:
12/11/2018

Comments:
Interval (105.0-106.5 feet).

Photograph ID: 148

Photo Location:
CUF-B16

Photo Date:
12/11/2018

Comments:
Photo of interval (107.5-109.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 149

Photo Location:
CUF-B16

Photo Date:
12/11/2018

Comments:
Photo of interval (110.0-110.8 feet) unavailable.

No Photo Applicable

Photograph ID: 150

Photo Location:
CUF-B16

Photo Date:
12/11/2018

Comments:
Interval (112.5-114.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 151

Photo Location: CUF-B16

Photo Date: 12/11/2018

Comments: Interval (115.0-116.5 feet).

Photograph ID: 152

Photo Location: CUF-B16

Photo Date: 12/11/2018

Comments: Interval (117.5-119.0 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 153

Photo Location:
CUF-B16

Photo Date:
12/11/2018

Comments:
Interval (120.0-121.5 feet).

Photograph ID: 154

Photo Location:
CUF-B16

Photo Date:
12/11/2018

Comments:
Interval (122.5-123.9 feet). Interval shown on white board should be 122.5-123.9 feet.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 155

Photo Location:
CUF-B16

Photo Date:
12/13/2018

Comments:
Interval (124.5-140.9 feet). Metadata date reflects the date the photo was taken, not the date the core was drilled.

Photograph ID: 156

Photo Location:
CUF-B16

Photo Date:
4/12/2019

Comments:
Interval (140.9-144.5 feet). Metadata date reflects the date the photo was taken, not the date the core was drilled.

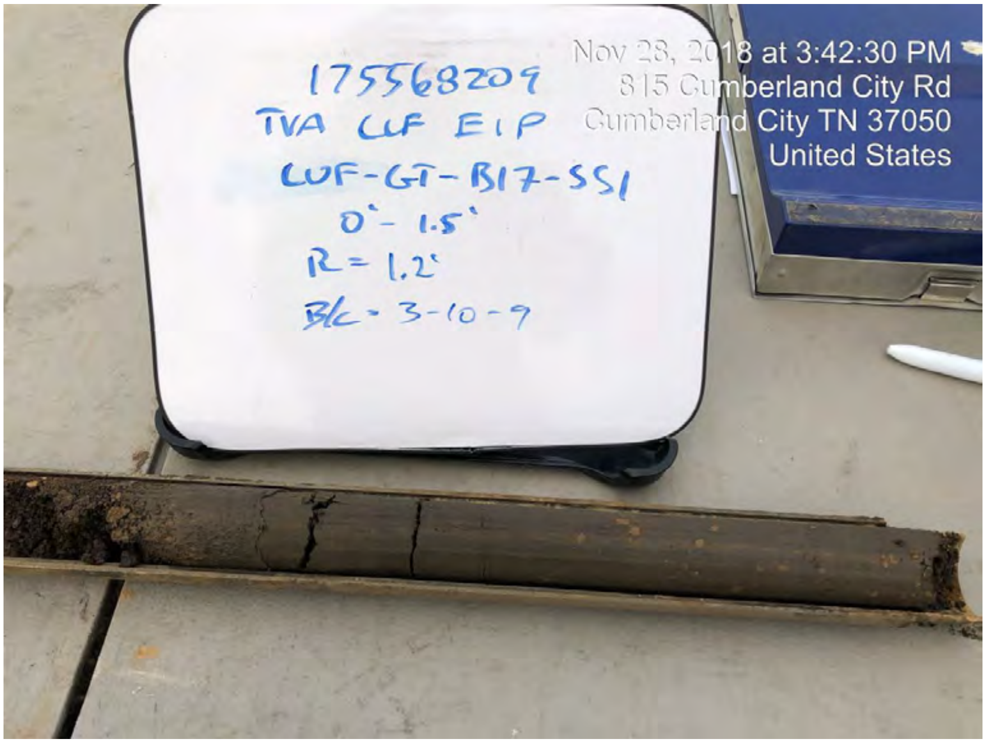
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 157

Photo Location:
CUF-B17

Photo Date:
11/28/2018

Comments:
Interval (0.0-1.5 feet). Sample identifier on white board should be SS01. Interval shown on white board should be 0.0-1.5 feet.

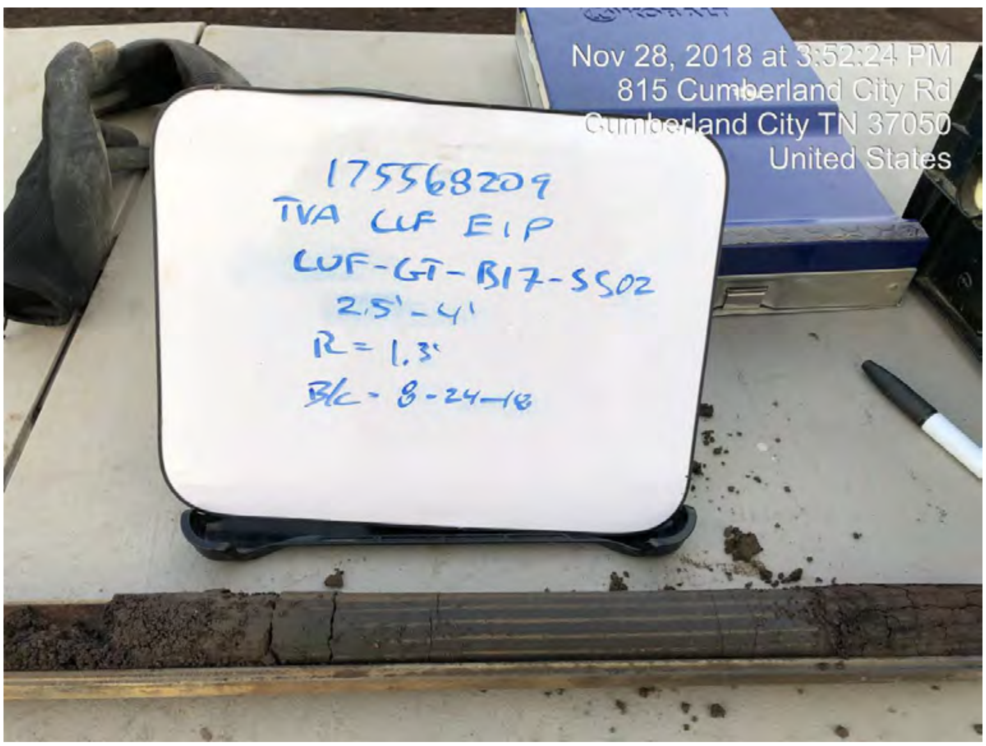


Photograph ID: 158

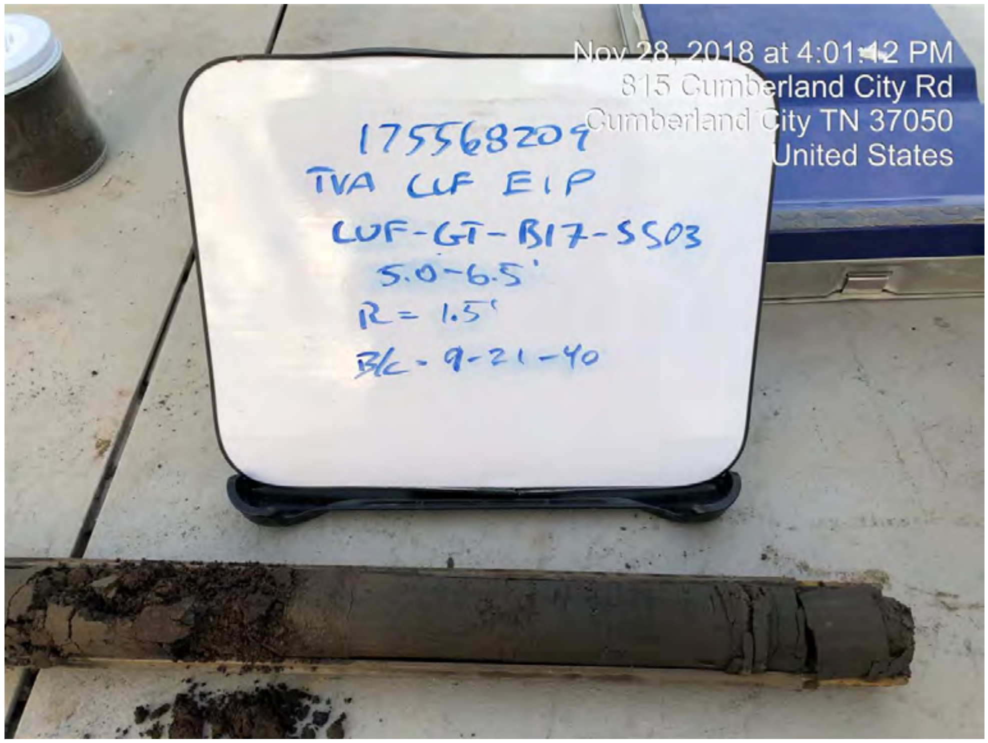
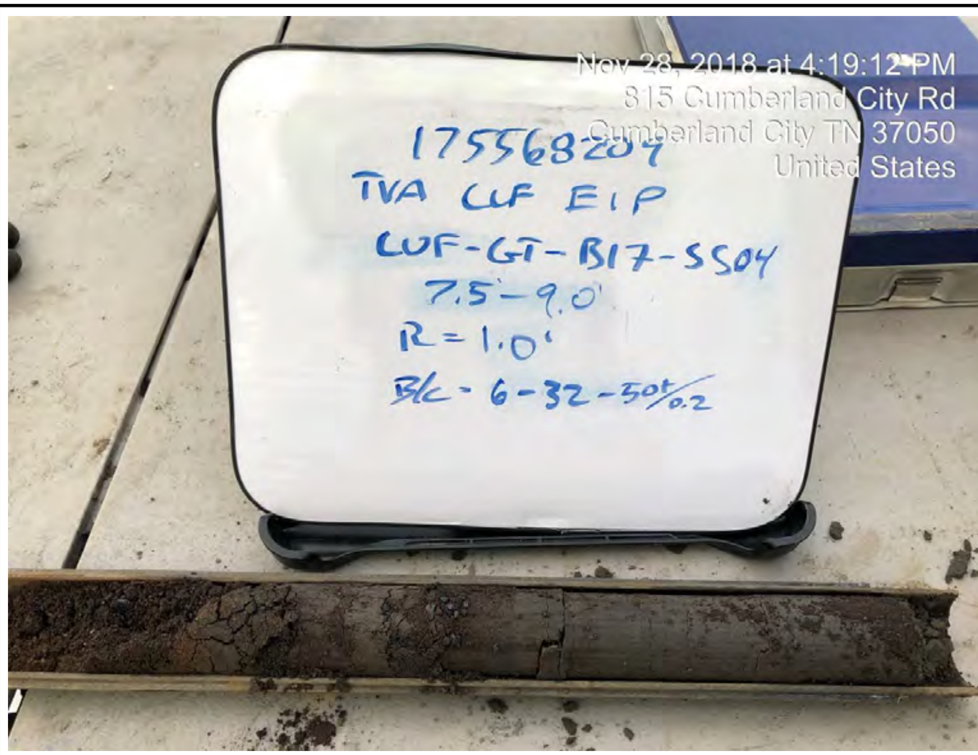
Photo Location:
CUF-B17

Photo Date:
11/28/2018

Comments:
Interval (2.5-4.0 feet). Interval shown on white board should be 2.5-4.0 feet.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 159 **Photo Location:** CUF-B17 **Photo Date:** 11/28/2018 **Comments:** Interval (5.0-6.5 feet).	
Photograph ID: 160 **Photo Location:** CUF-B17 **Photo Date:** 11/28/2018 **Comments:** Interval (7.5-8.7 feet). Interval shown on white board should be 7.5-8.7 feet. Sampler refusal at 8.7 feet.	

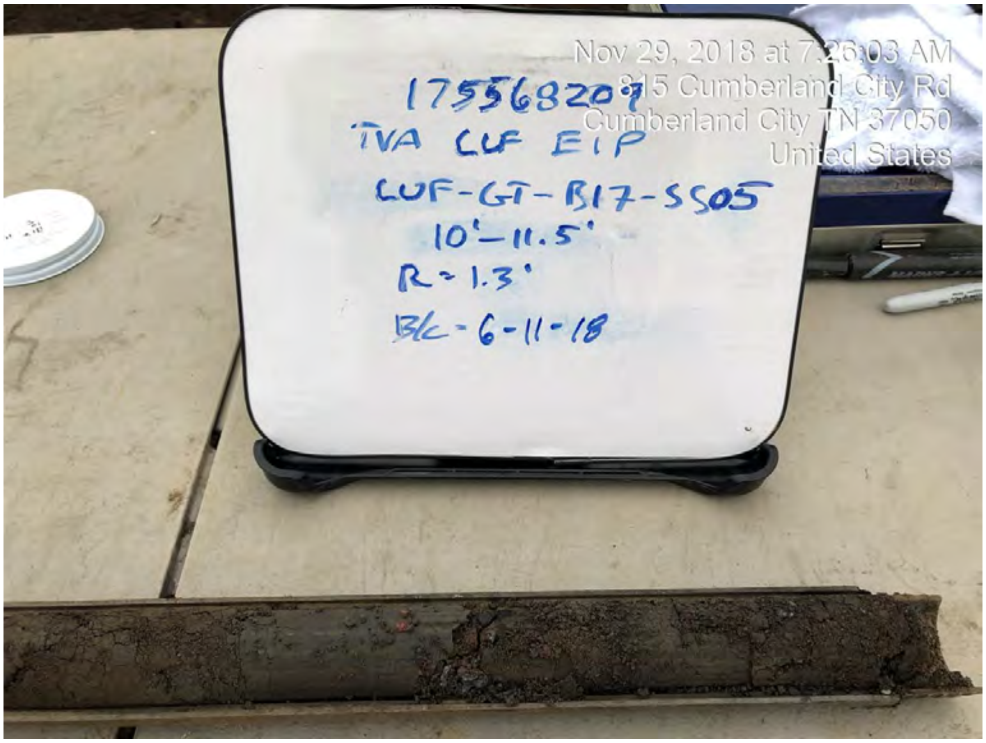
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 161

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (10.0-11.5 feet). Interval shown on white board should be 10.0-11.5 feet.



Photograph ID: 162

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (12.5-14.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 163

Photo Location: CUF-B17

Photo Date: 11/29/2018

Comments: Photo of interval (15.0-17.0 feet) unavailable because sample collected with shelby tube.

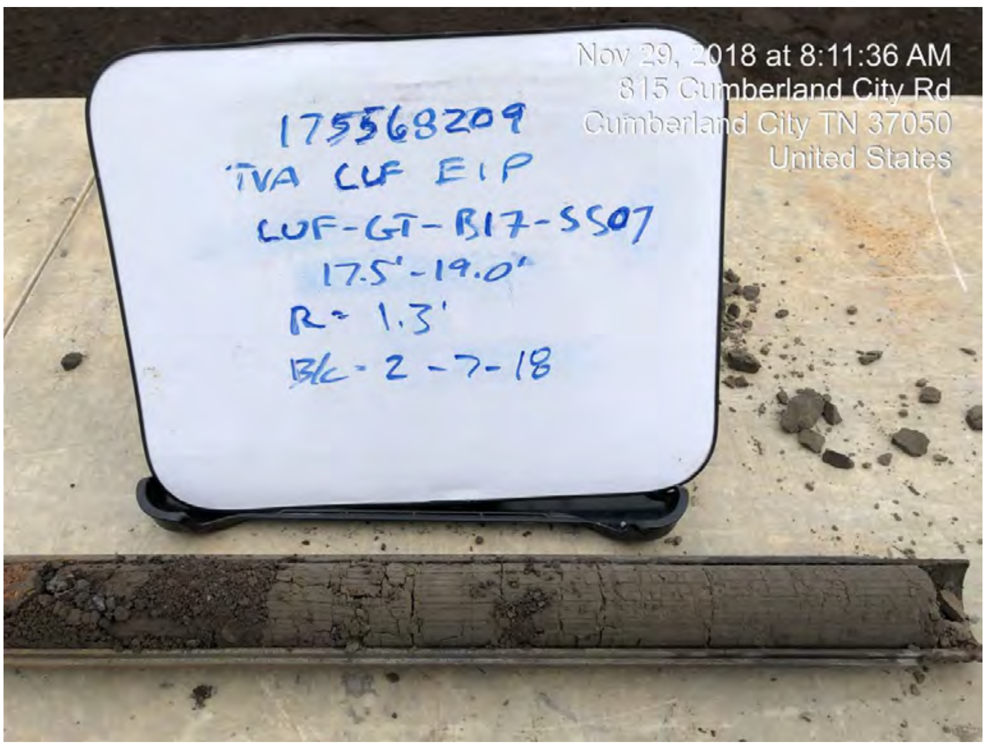
No Photo Applicable

Photograph ID: 164

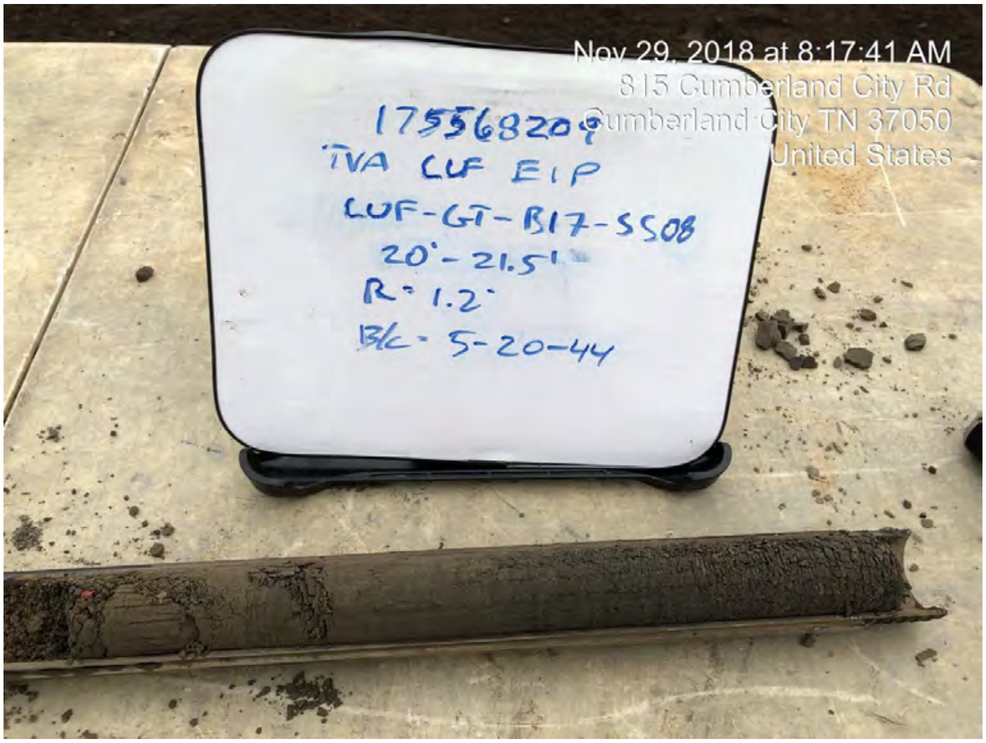
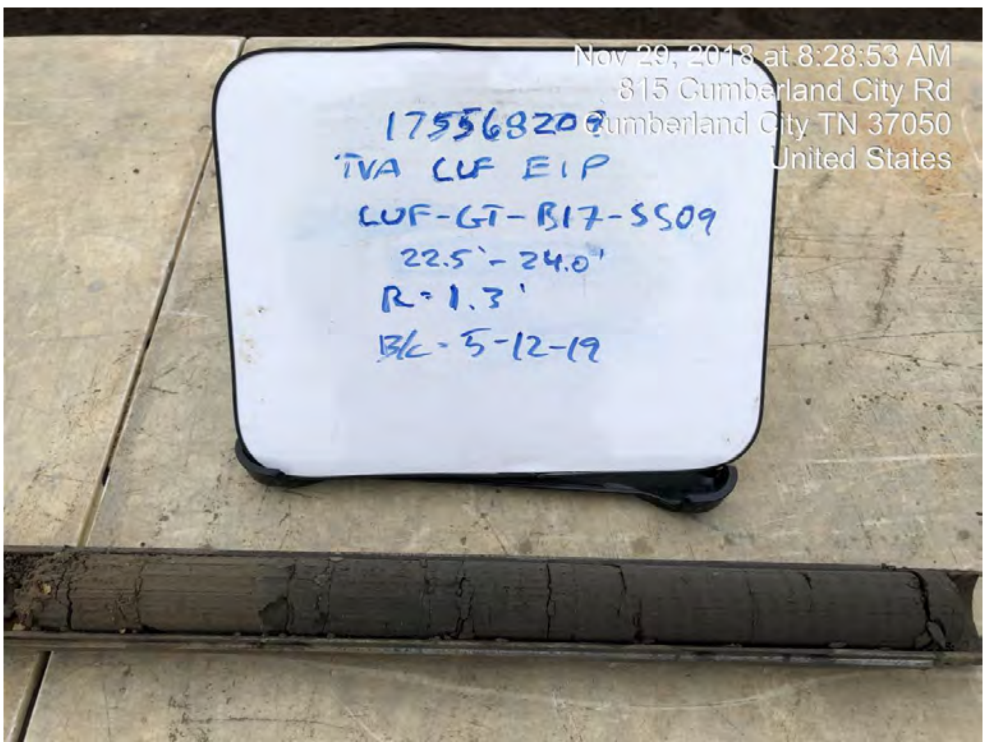
Photo Location: CUF-B17

Photo Date: 11/29/2018

Comments: Interval (17.5-19.0 feet).



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 165 **Photo Location:** CUF-B17 **Photo Date:** 11/29/2018 **Comments:** Interval (20.0-21.5 feet). Interval shown on white board should be 20.0-21.5 feet.	
Photograph ID: 166 **Photo Location:** CUF-B17 **Photo Date:** 11/29/2018 **Comments:** Interval (22.5-24.0 feet).	

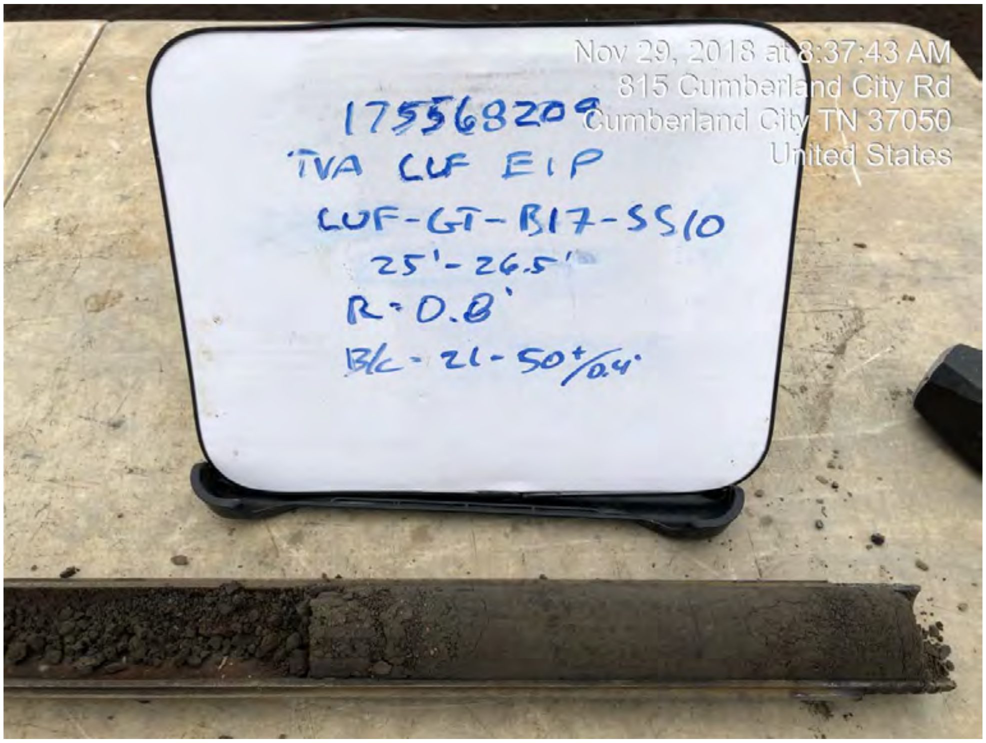
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 167

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (25.0-25.9 feet). Interval shown on white board should be 25.0-25.9 feet. Sampler refusal at 25.9 feet.

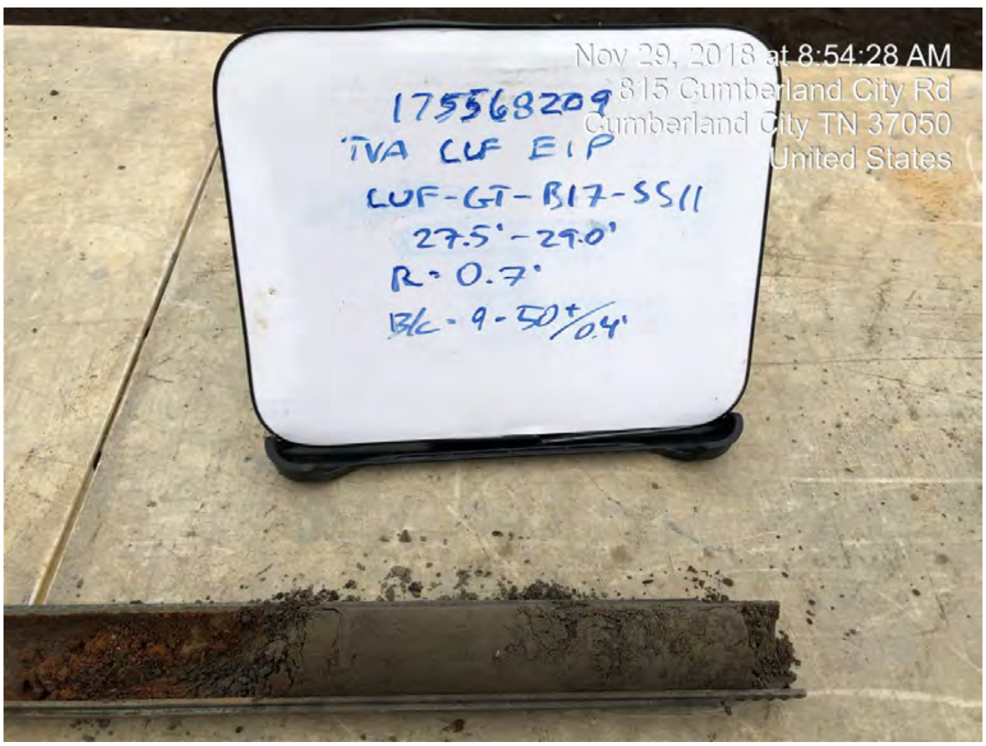


Photograph ID: 168

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (27.5-28.4 feet). Interval shown on white board should be 27.5-28.4 feet. Sampler refusal at 28.4 feet.



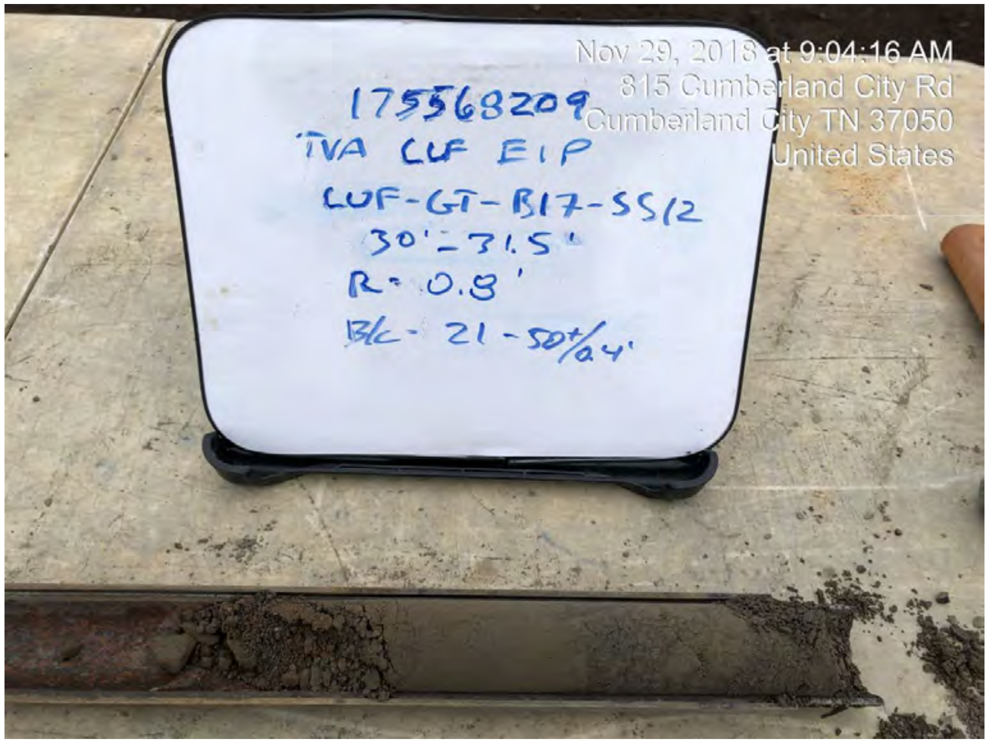
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 169

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (30.0-30.9 feet). Interval shown on white board should be 30.0-30.9 feet. Sampler refusal at 30.9 feet.



Photograph ID: 170

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (32.5-33.4 feet). Interval shown on white board should be 32.5-33.4 feet. Sampler refusal at 33.4 feet.

Stantec **Photographic Log**

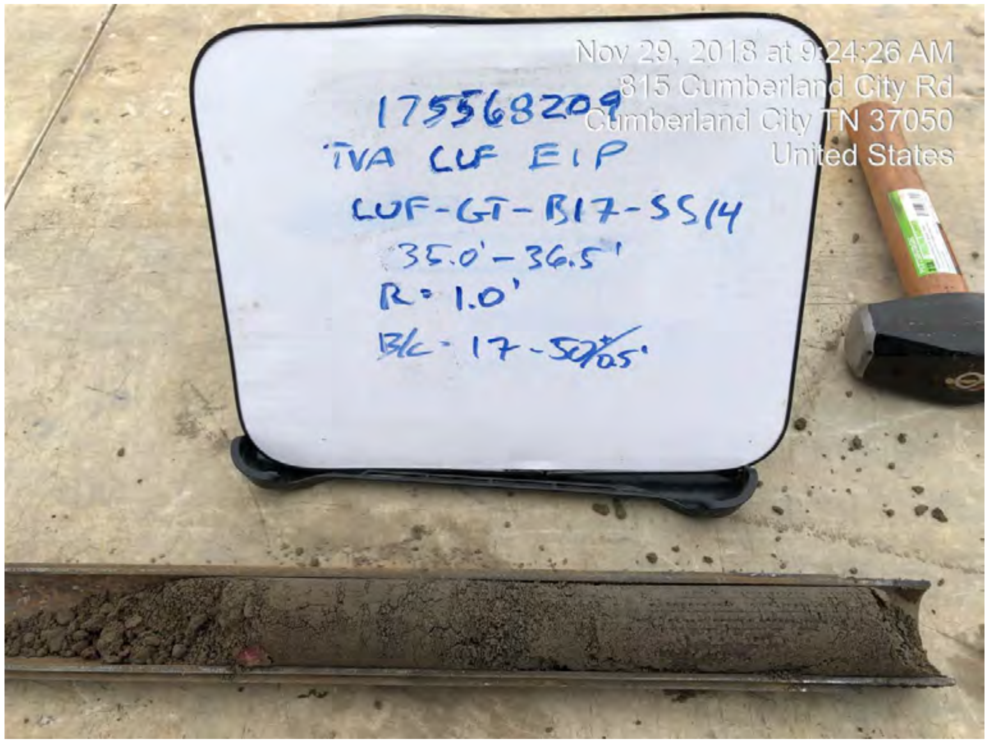
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 171

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (35.0-36.0 feet). Interval shown on white board should be 35.0-36.0 feet. Blow count shown on white board should be 17-50. Sampler refusal at 36.0 feet.

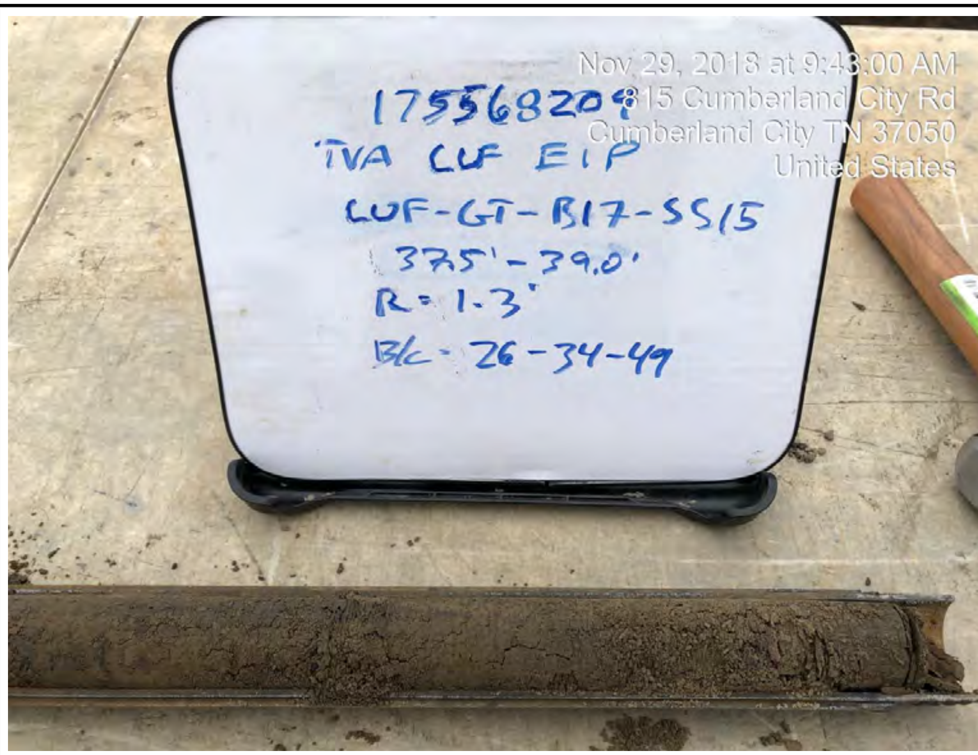


Photograph ID: 172

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (37.5-39.0 feet).



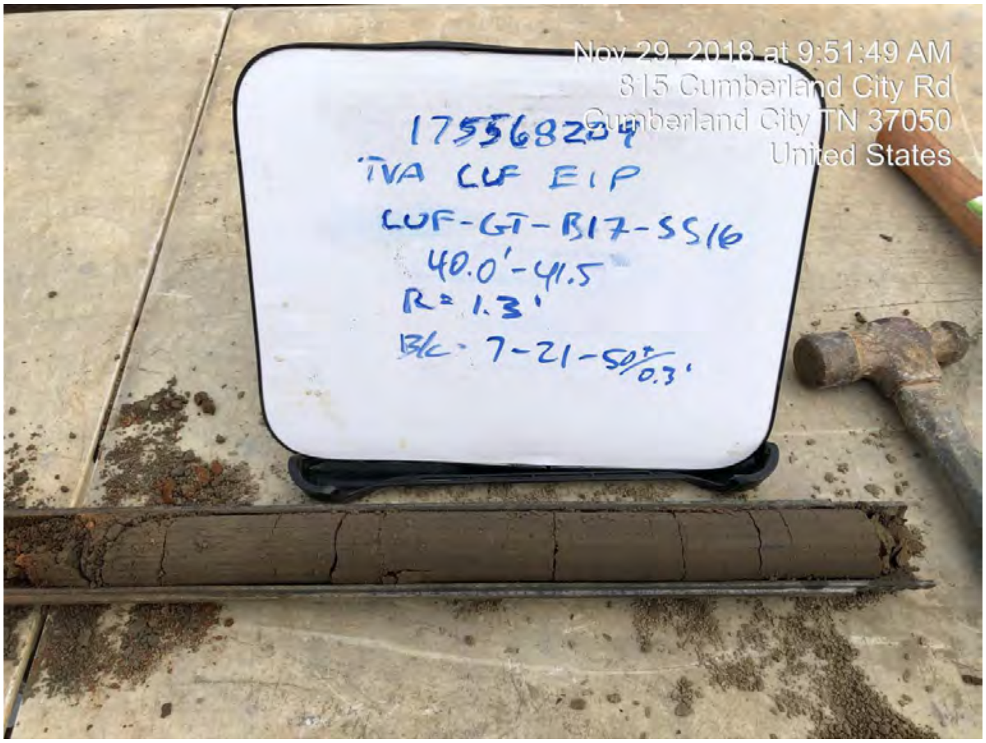
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 173

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (40.0-41.3 feet). Interval shown on white board should be 40.0-41.3 feet. Sampler refusal at 41.3 feet.



Photograph ID: 174

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (42.5-43.9 feet). Interval shown on white board should be 42.5-43.9 feet. Recovery on white board should be 1.4 feet. Sampler refusal at 43.9 feet.

Stantec

Photographic Log

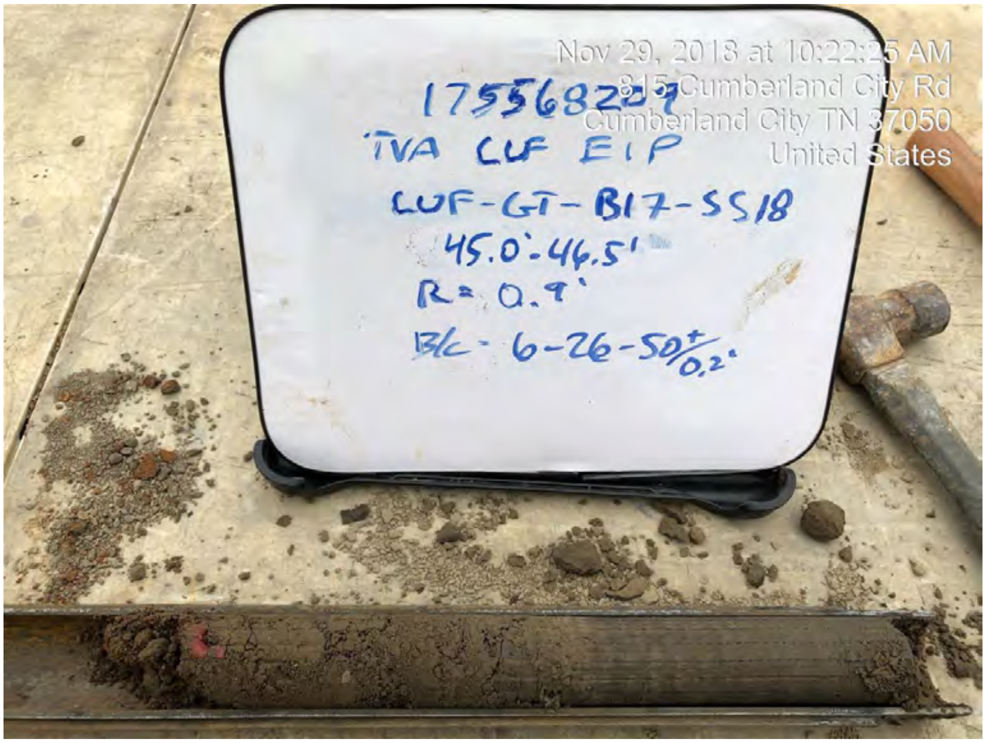
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 175

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (45.0-46.2 feet). Interval shown on white board should be 45.0-46.2 feet. Sampler refusal at 46.2 feet.

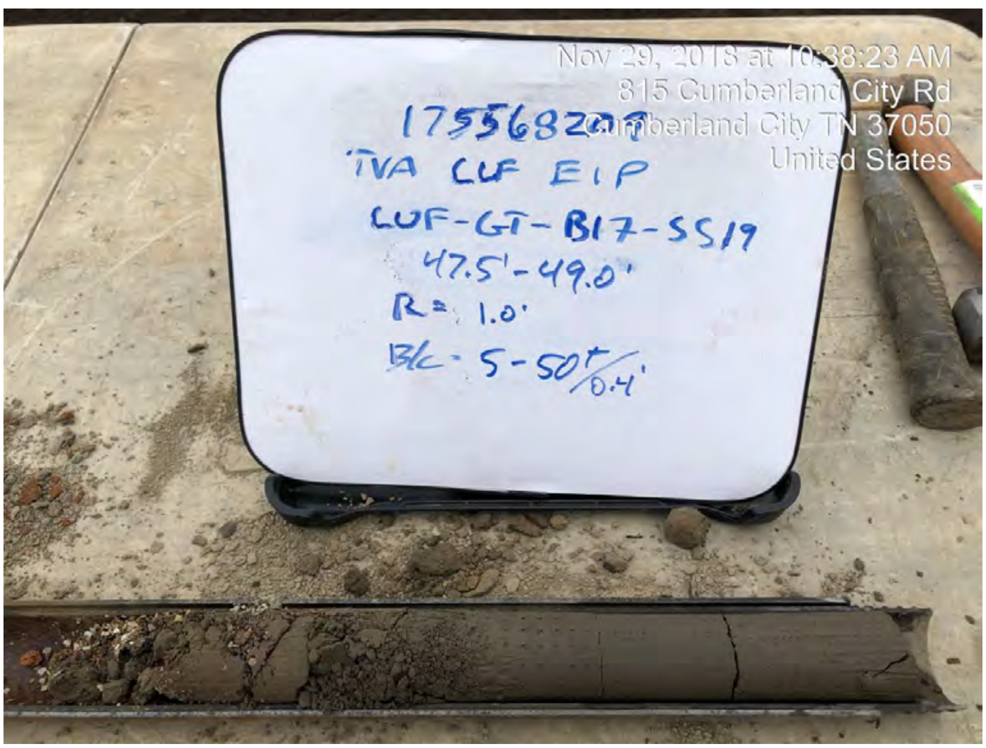


Photograph ID: 176

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (47.5-48.4 feet). Interval shown on white board should be 47.5-48.4 feet. Sampler refusal at 48.4 feet.



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Photographic Log

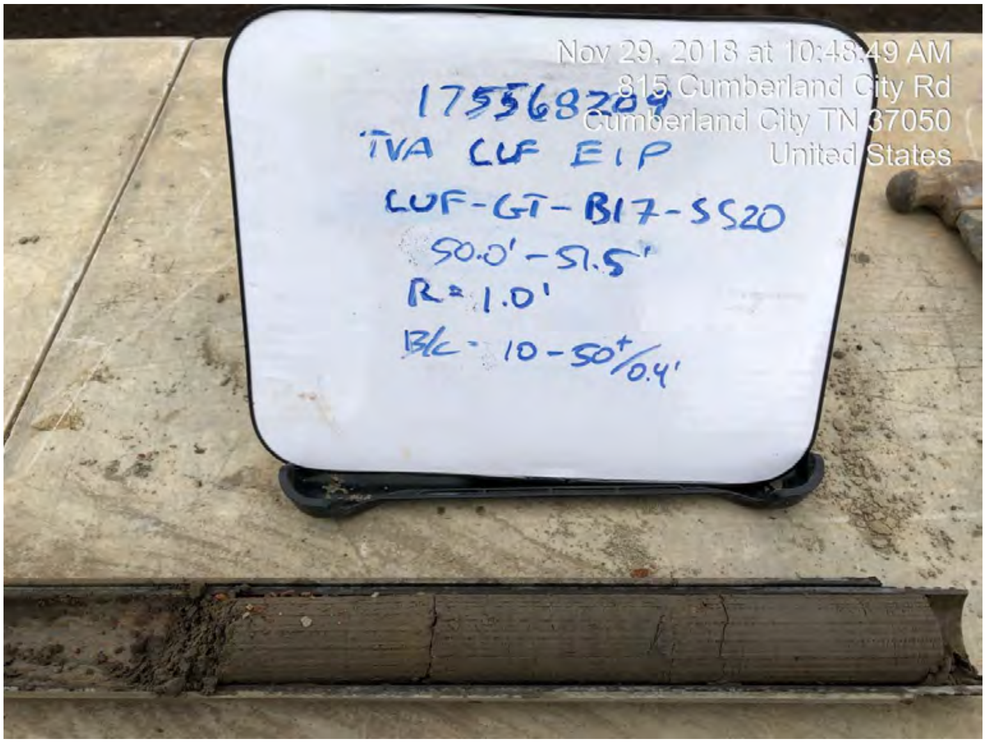
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 177

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (50.0-50.9 feet). Interval shown on white board should be 50.0-50.9 feet. Sampler refusal at 50.9 feet.

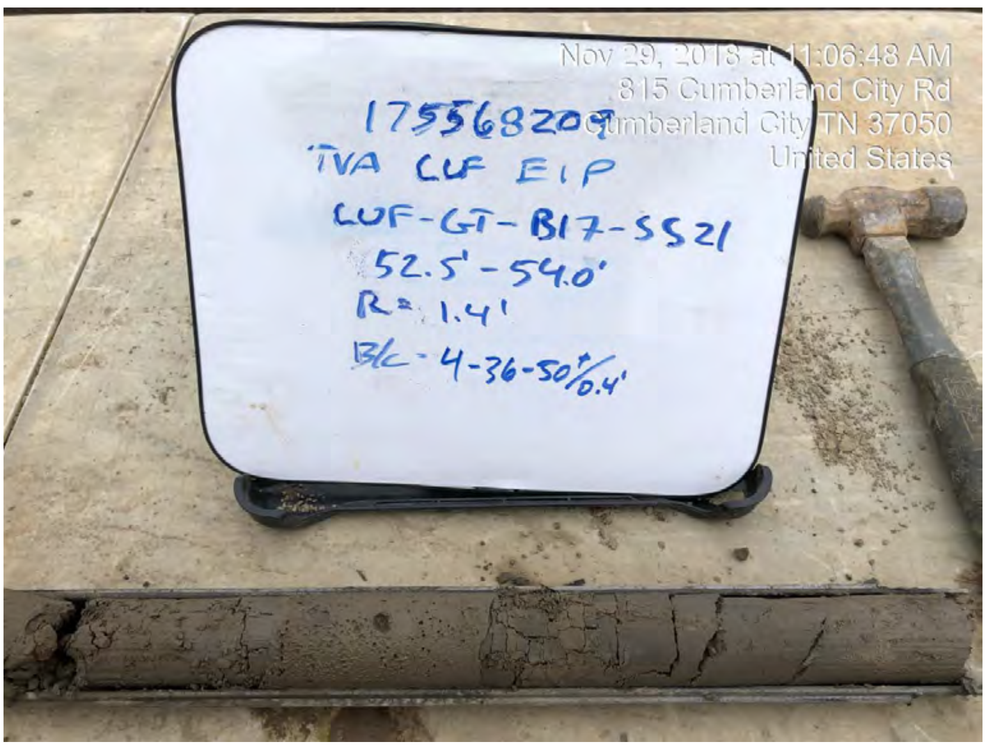


Photograph ID: 178

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (52.5-53.9 feet). Interval shown on white board should be 52.5-53.9 feet. Sampler refusal at 53.9 feet.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 179

Photo Location: CUF-B17

Photo Date: 11/29/2018

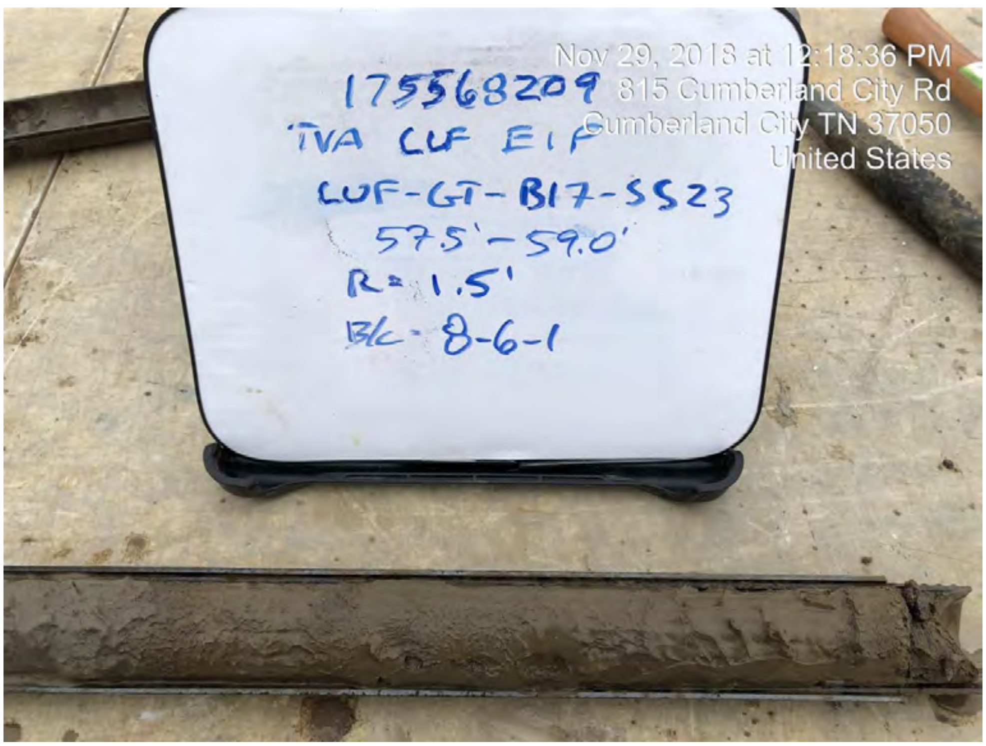
Comments: Interval (55.0-56.5 feet).

Photograph ID: 180

Photo Location: CUF-B17

Photo Date: 11/29/2018

Comments: Interval (57.5-59.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 181

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Photo of interval (60.0-62.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photograph ID: 182

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (62.5-64.0 feet).

Stantec

Photographic Log

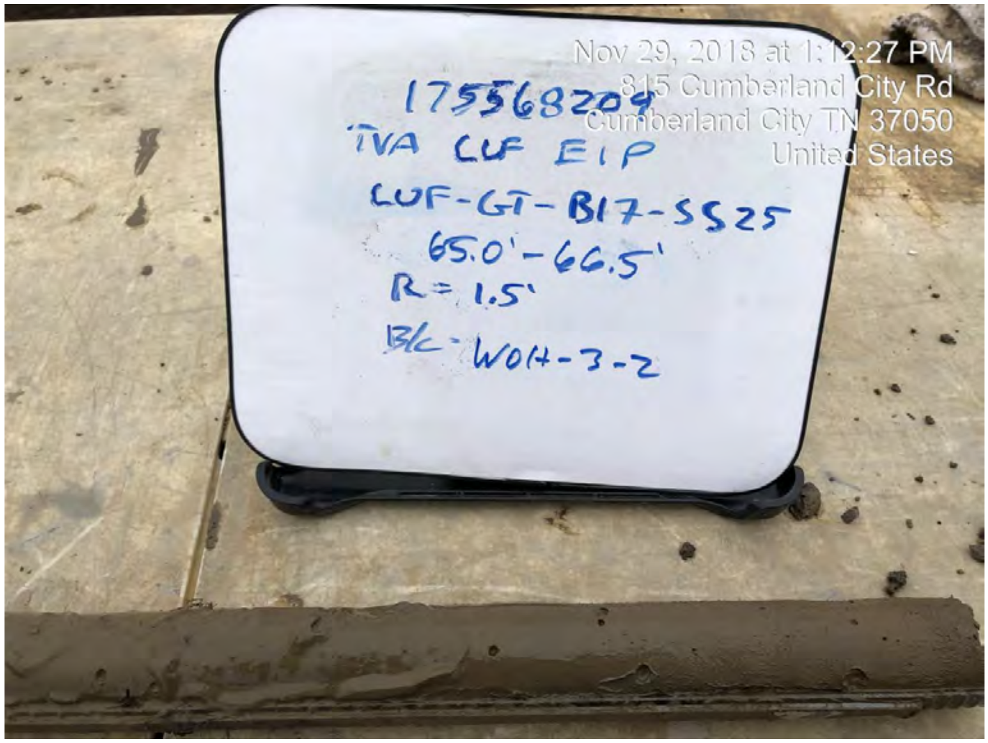
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 183

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (65.0-66.5 feet). WOH on white board is the same as WH on the boring log.

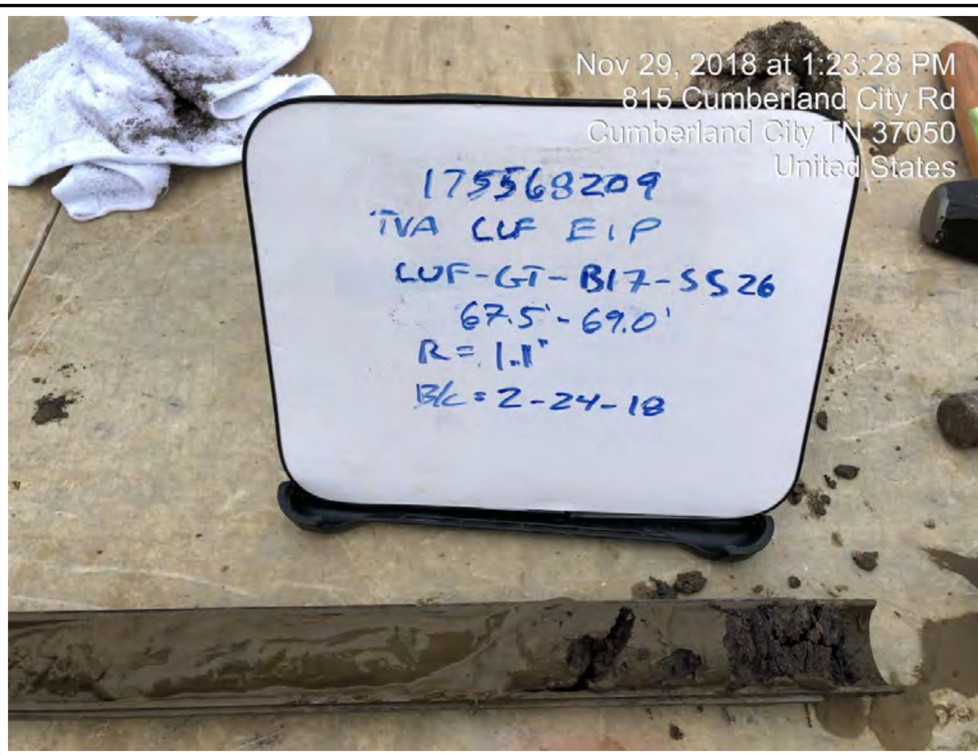


Photograph ID: 184

Photo Location:
CUF-B17

Photo Date:
11/29/2018

Comments:
Interval (67.5-69.0 feet).



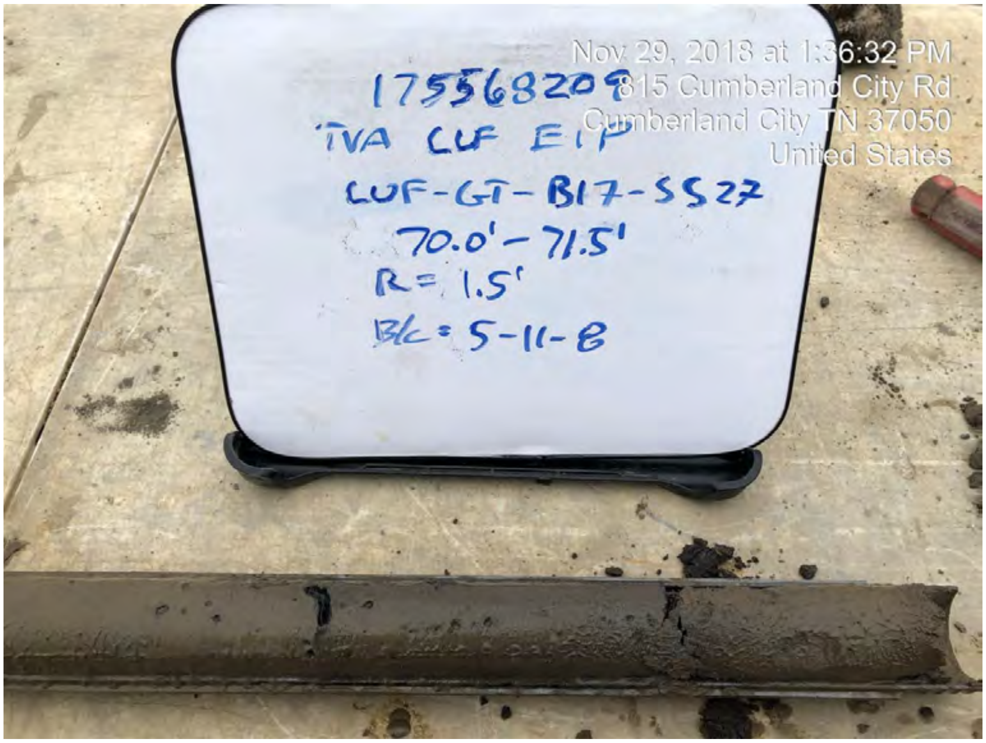
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 185

Photo Location: CUF-B17

Photo Date: 11/29/2018

Comments: Interval (70.0-71.5 feet).

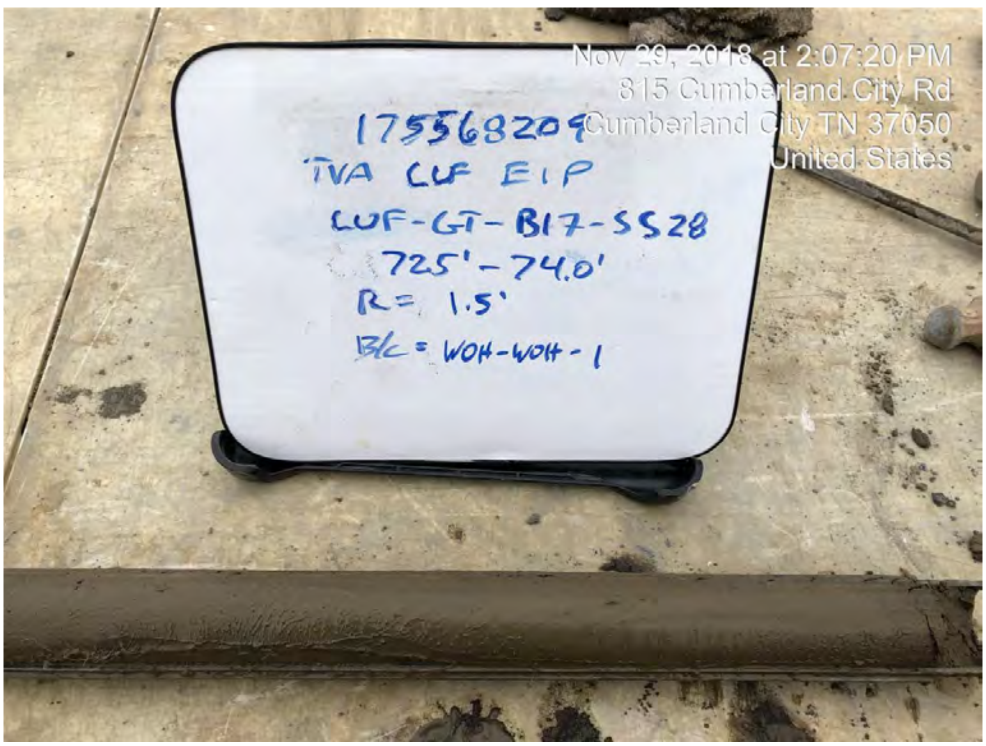


Photograph ID: 186

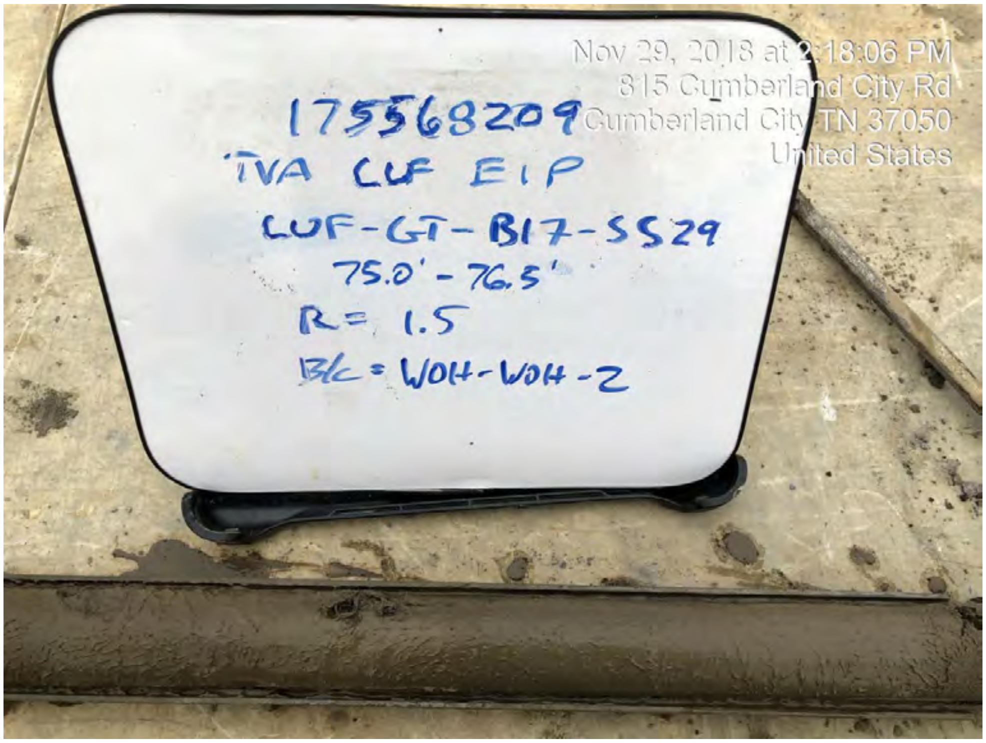
Photo Location: CUF-B17

Photo Date: 11/29/2018

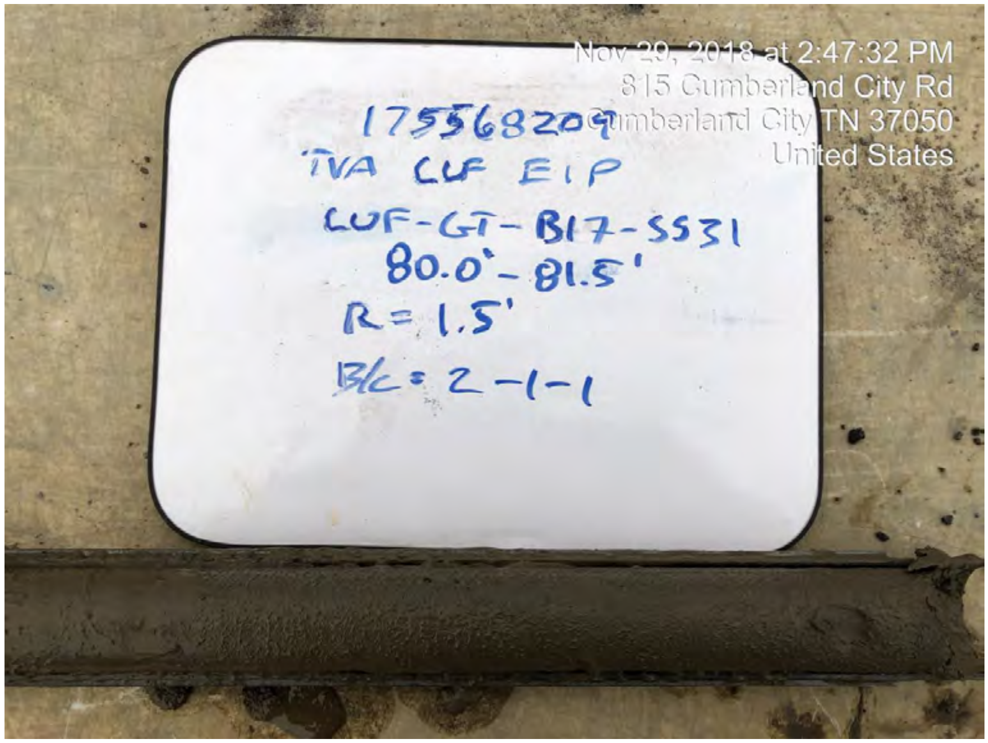
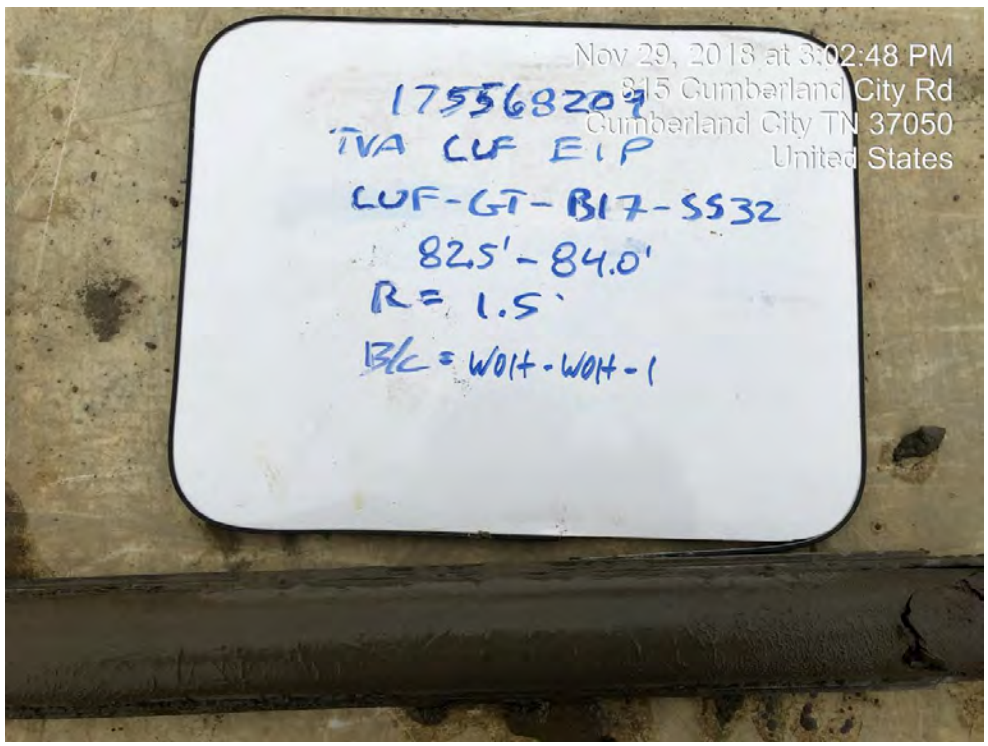
Comments: Interval (72.5-74.0 feet). WOH on white board is the same as WH on the boring log.



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 187 **Photo Location:** CUF-B17 **Photo Date:** 11/29/2018 **Comments:** Interval (75.0-76.5 feet). WOH on white board is the same as WH on the boring log.	
Photograph ID: 188 **Photo Location:** CUF-B17 **Photo Date:** 11/29/2018 **Comments:** Interval (77.5-79.0 feet).	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 189 **Photo Location:** CUF-B17 **Photo Date:** 11/29/2018 **Comments:** Interval (80.0-81.5 feet).	
Photograph ID: 190 **Photo Location:** CUF-B17 **Photo Date:** 11/29/2018 **Comments:** Interval (82.5-84.0 feet). WOH on white board is the same as WH on the boring log.	

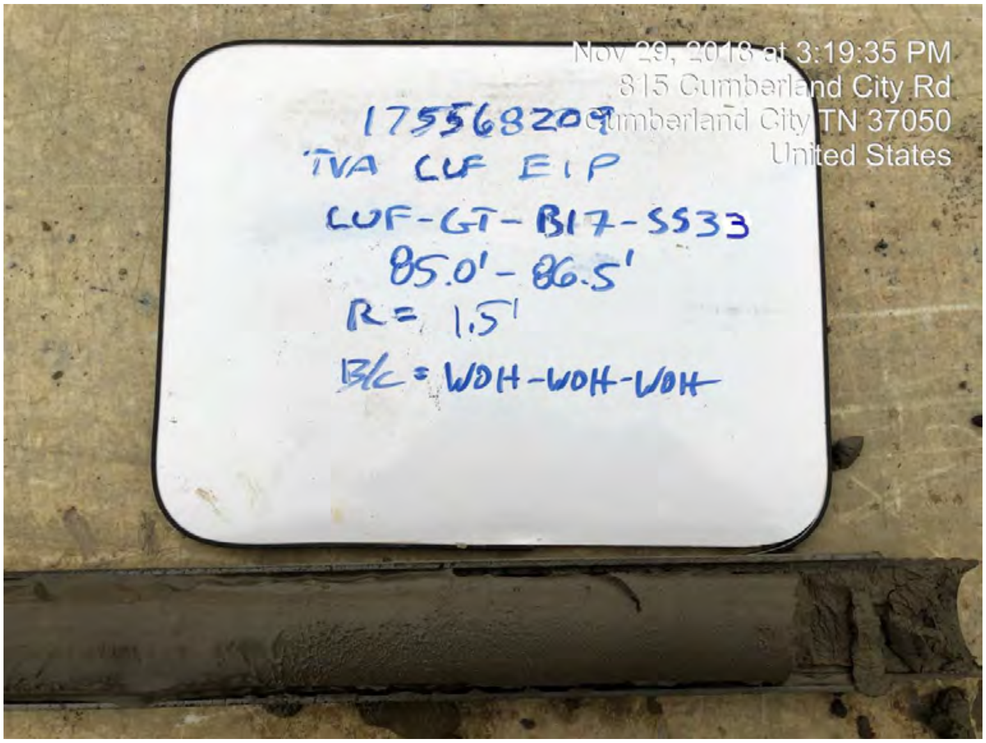
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 191

Photo Location: CUF-B17

Photo Date: 11/29/2018

Comments: Interval (85.0-86.5 feet). WOH on white board is the same as WH on the boring log.

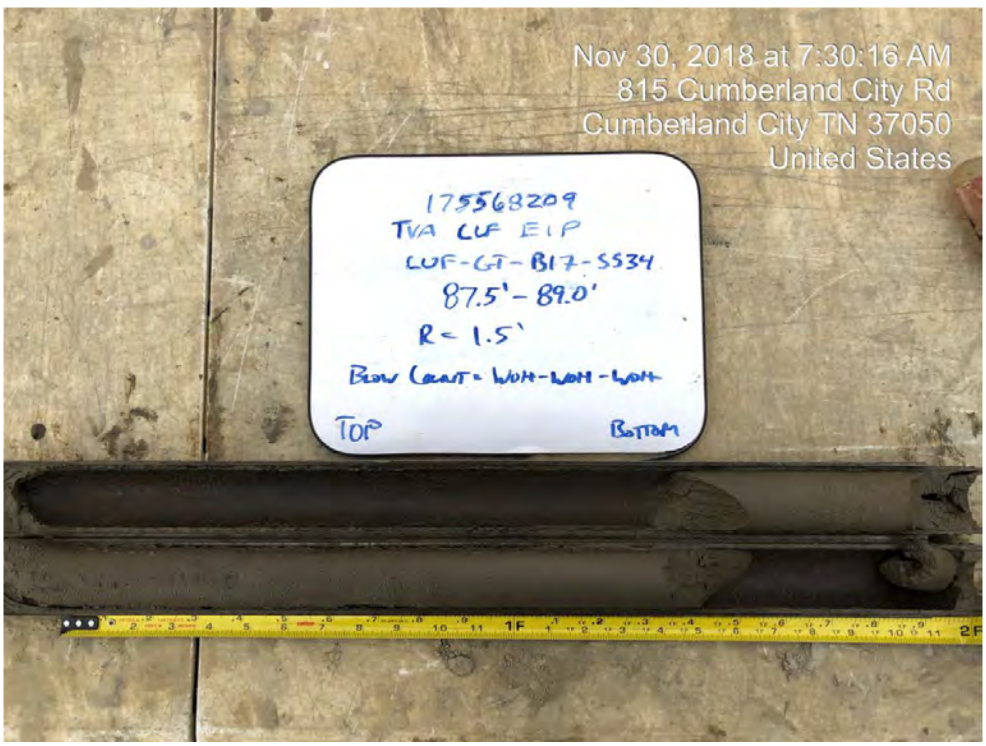


Photograph ID: 192

Photo Location: CUF-B17

Photo Date: 11/30/2018

Comments: Interval (87.5-89.0 feet). WOH on white board is the same as WH on the boring log.



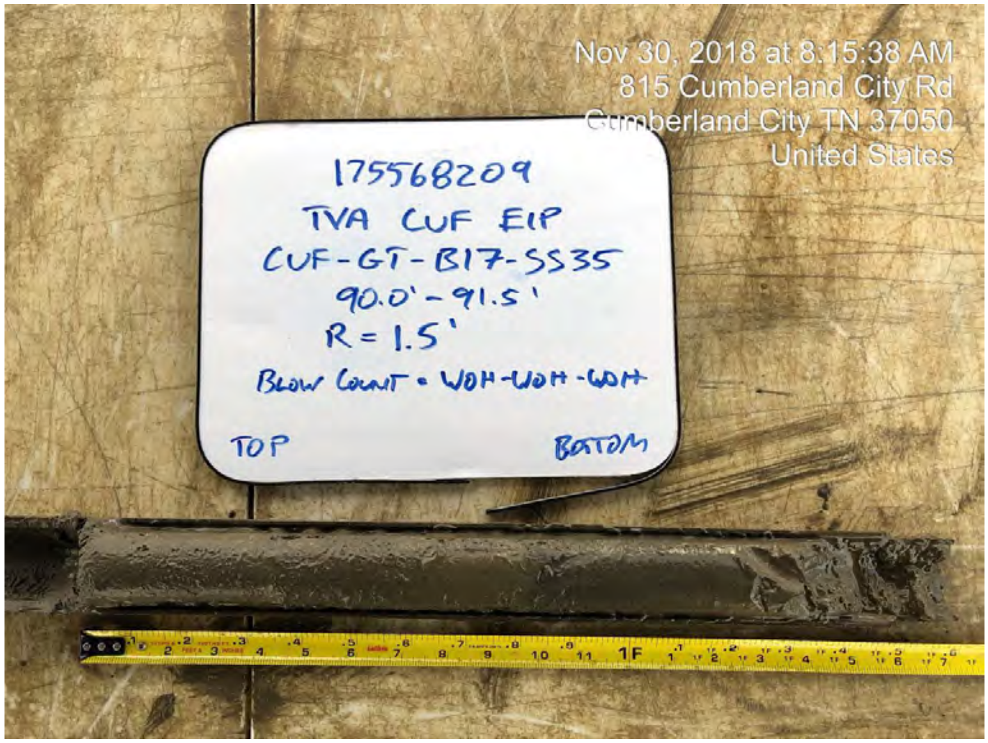
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 193

Photo Location: CUF-B17

Photo Date: 11/30/2018

Comments: Interval (90.0-91.5 feet). WOH on white board is the same as WH on the boring log.

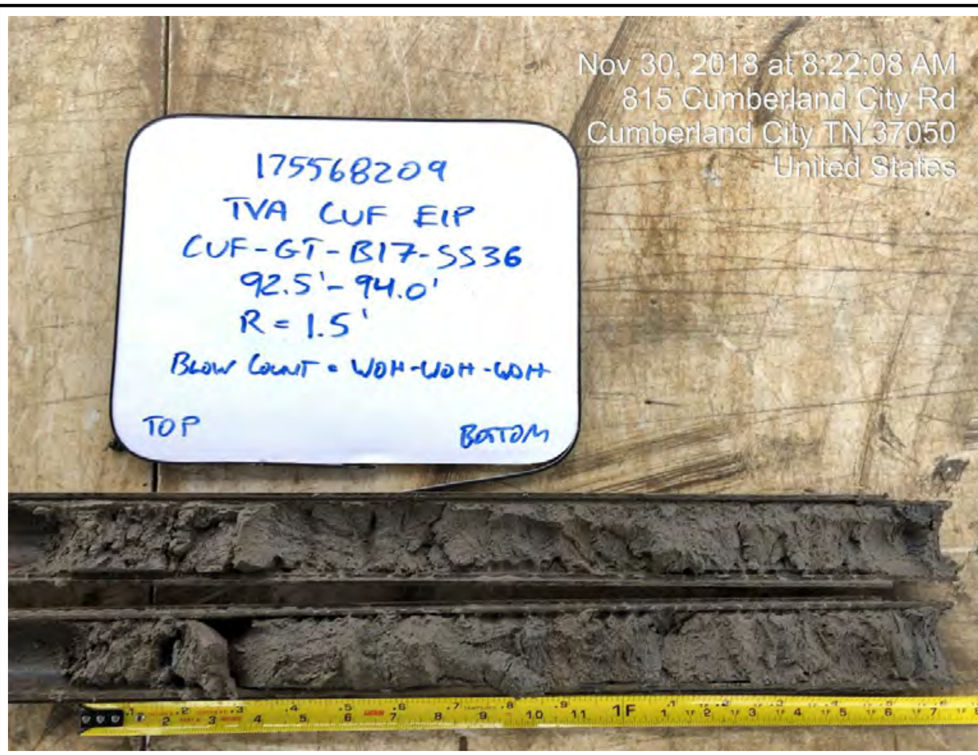


Photograph ID: 194

Photo Location: CUF-B17

Photo Date: 11/30/2018

Comments: Interval (92.5-94.0 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 195

Photo Location: CUF-B17

Photo Date: 11/30/2018

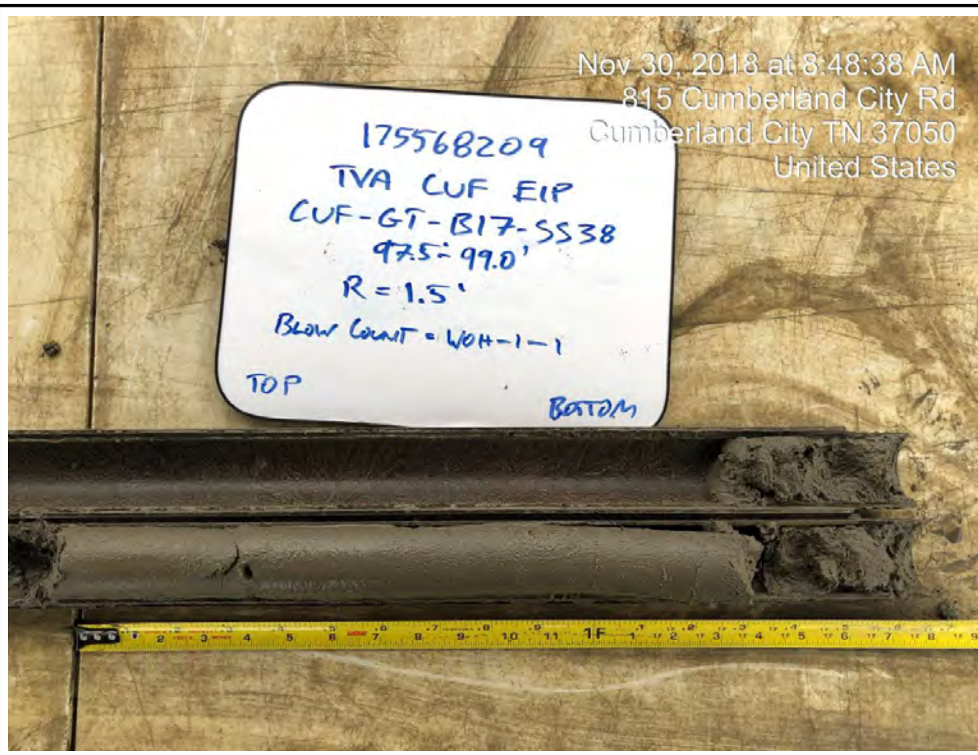
Comments: Interval (95.0-96.5 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 196

Photo Location: CUF-B17

Photo Date: 11/30/2018

Comments: Interval (97.5-99.0 feet). WOH on white board is the same as WH on the boring log.



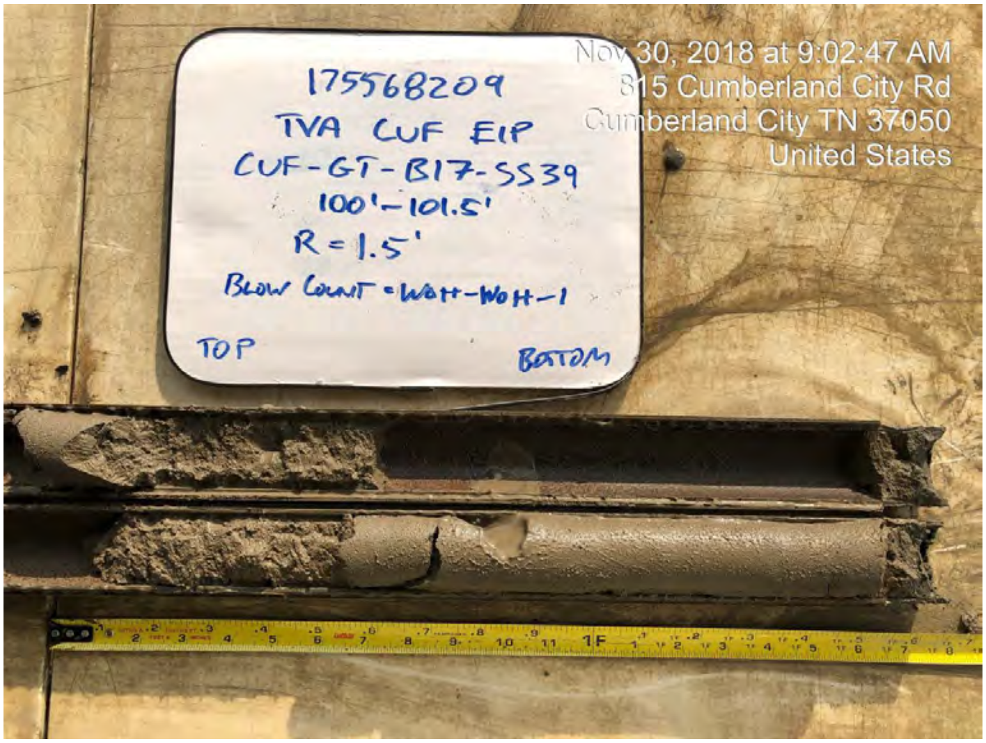
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 197

Photo Location: CUF-B17

Photo Date: 11/30/2018

Comments: Interval (100.0-101.5 feet). WOH on white board is the same as WH on the boring log.

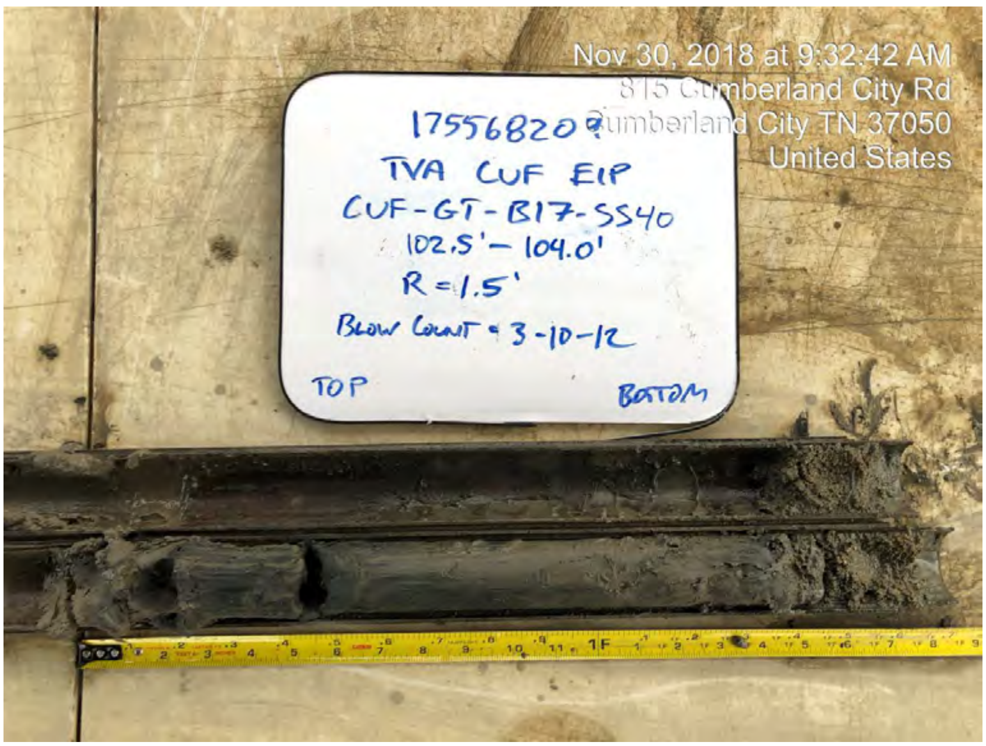


Photograph ID: 198

Photo Location: CUF-B17

Photo Date: 11/30/2018

Comments: Interval (102.5-104.0 feet).



Stantec

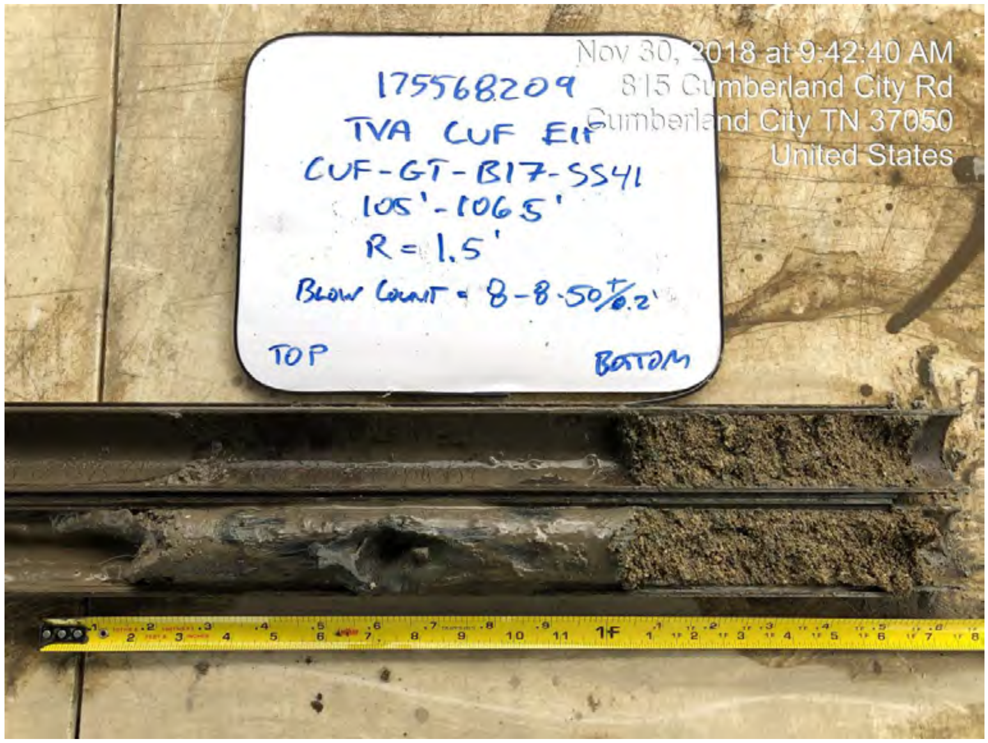
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 199

Photo Location:
CUF-B17

Photo Date:
11/30/2018

Comments:
Interval (105.0-106.5 feet). Interval shown on white board should be 105.0-106.5 feet. Blowcount shown on white board should be 8-8-50.



Photograph ID: 200

Photo Location:
CUF-B17

Photo Date:
11/30/2018

Comments:
Interval (107.5-107.7 feet). Interval shown on white board should be 107.5-107.7 feet.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 201

Photo Location:
CUF-B17

Photo Date:
12/6/2018

Comments:
Interval (108.5-125.4 feet).

Photograph ID: 202

Photo Location:
CUF-B17

Photo Date:
12/6/2018

Comments:
Interval (125.4-128.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 203

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Photo of interval (0.0-1.5 feet) unavailable.

No Photo Applicable

Photograph ID: 204

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (2.5-4.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 205

Photo Location:
CUF-B23

Photo Date:
11/5/2020

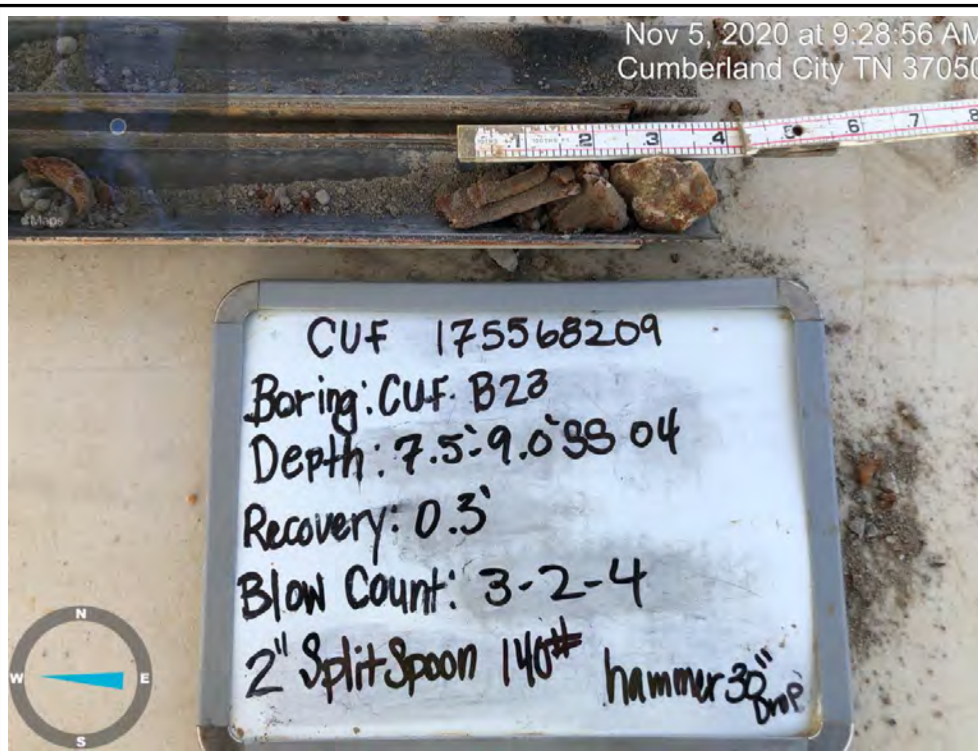
Comments:
Interval (5.0-6.5 feet)

Photograph ID: 206

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (7.5-9.0 feet)



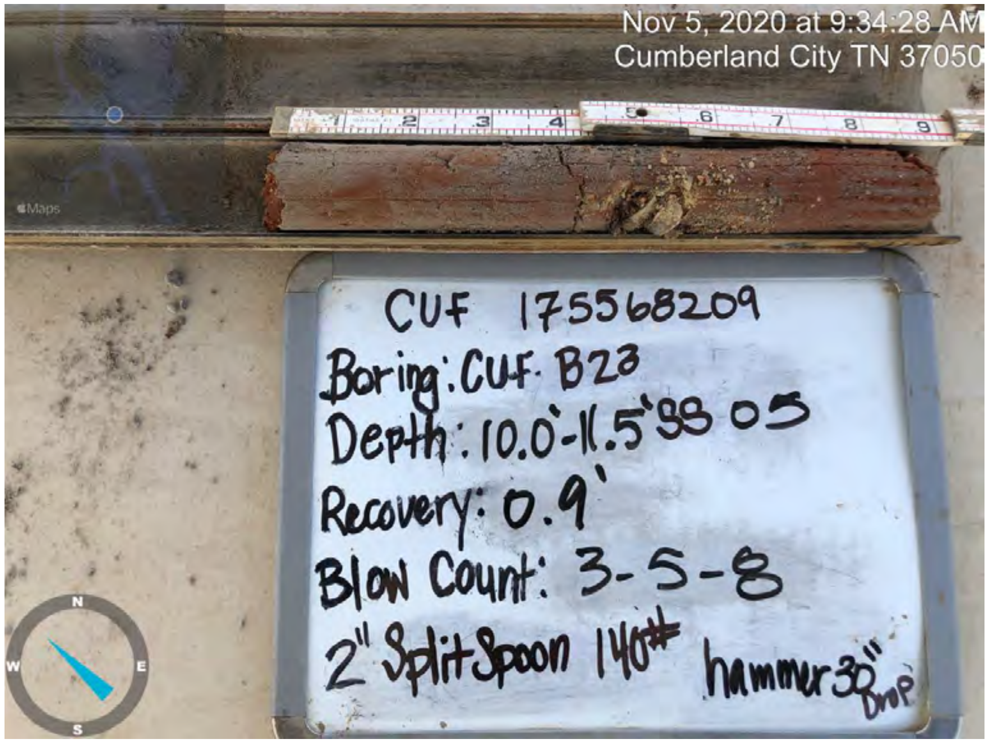
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 207

Photo Location: CUF-B23

Photo Date: 11/5/2020

Comments: Interval (10.0-11.5 feet)

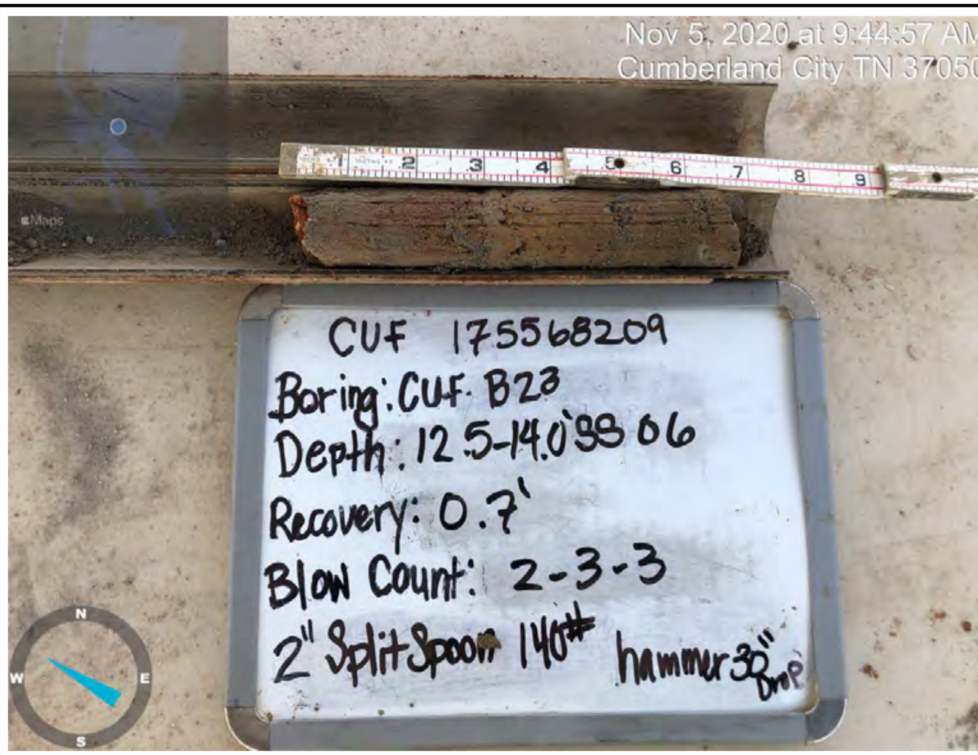


Photograph ID: 208

Photo Location: CUF-B23

Photo Date: 11/5/2020

Comments: Interval (12.5-14.0 feet)



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 209

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (15.0-16.5 feet)

Photograph ID: 210

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (16.5-18.0 feet)

Stantec

Photographic Log

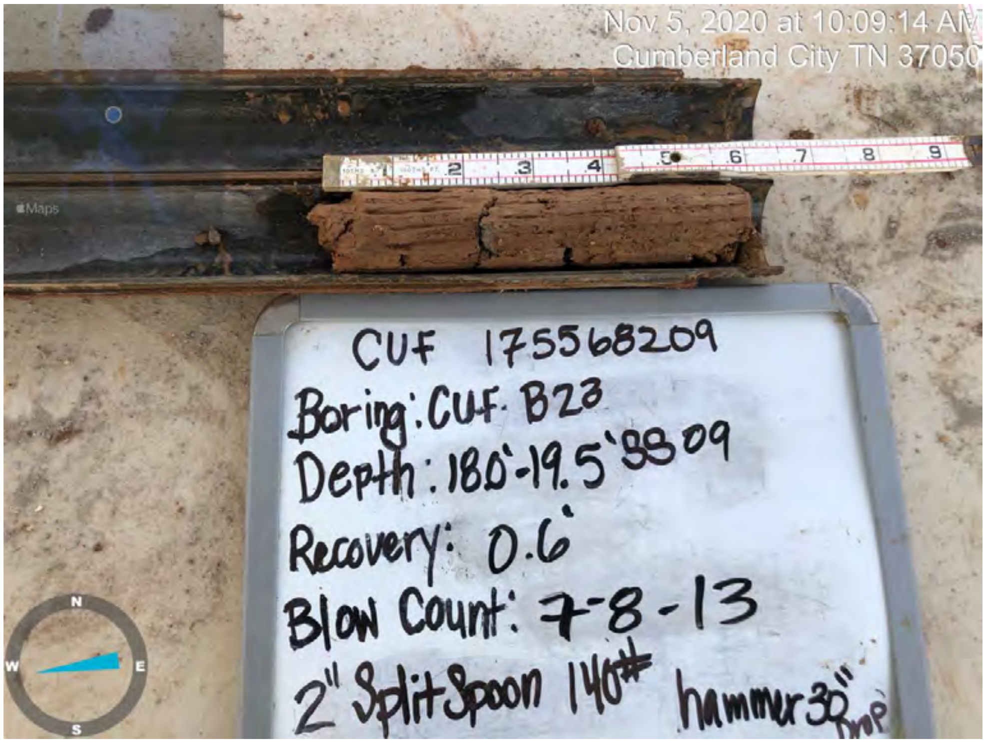
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 211

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (18.0-19.5 feet)



Photograph ID: 212

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (19.5-21.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 213

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (21.0-22.5 feet)

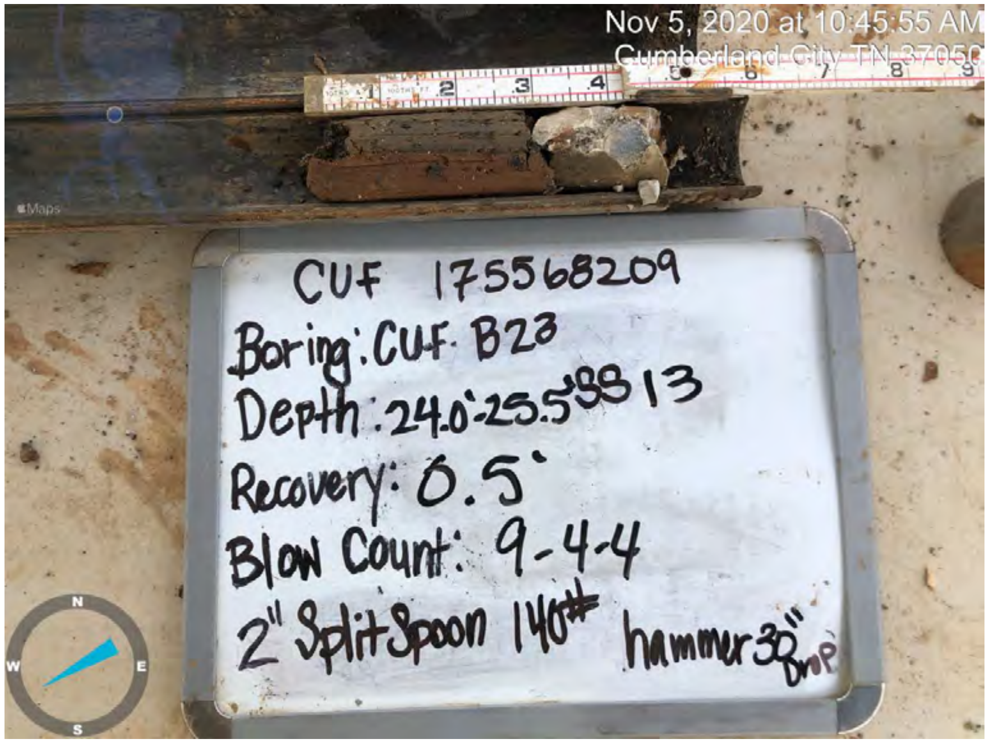
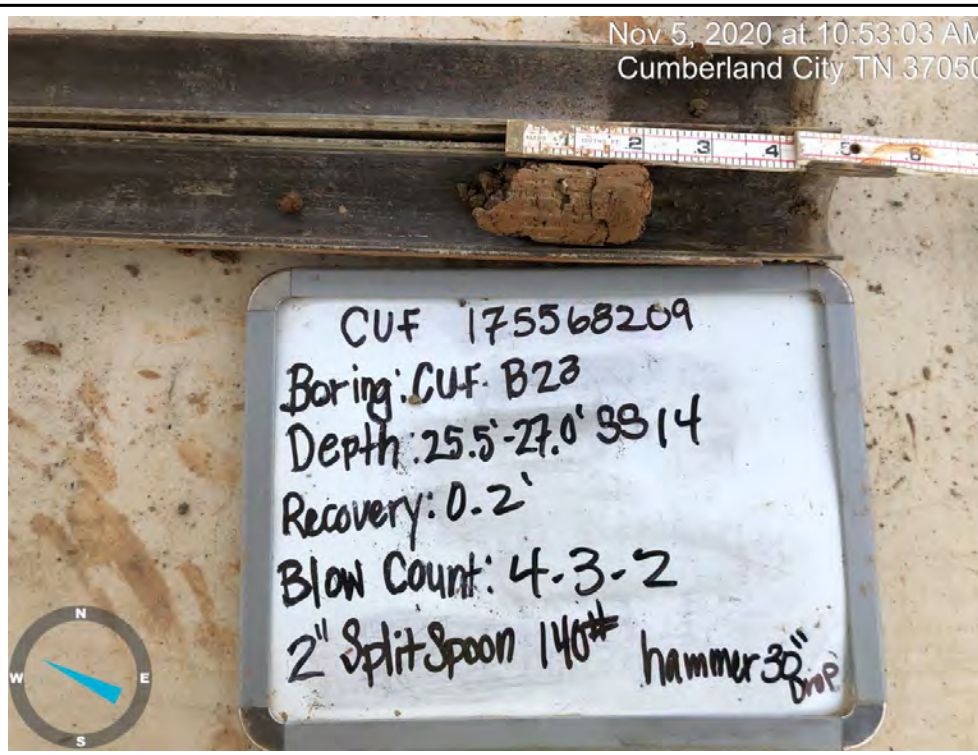
Photograph ID: 214

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (22.5-24.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 215 **Photo Location:** CUF-B23 **Photo Date:** 11/5/2020 **Comments:** Interval (24.0-25.5 feet)	
Photograph ID: 216 **Photo Location:** CUF-B23 **Photo Date:** 11/5/2020 **Comments:** Interval (25.5-27.0 feet)	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 217

Photo Location:
CUF-B23

Photo Date:
11/5/2020

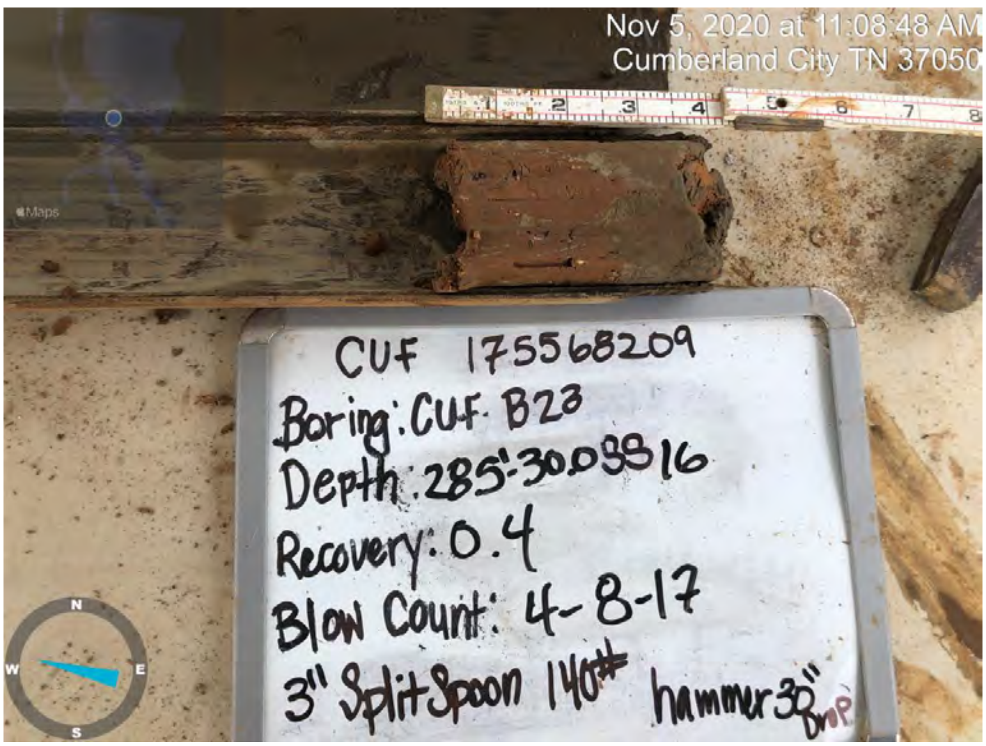
Comments:
Interval (27.0-28.5 feet)

Photograph ID: 218

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (28.5-30.0 feet)



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 219

Photo Location: CUF-B23

Photo Date: 11/5/2020

Comments: Interval (30.0-31.5 feet)

Photograph ID: 220

Photo Location: CUF-B23

Photo Date: 11/5/2020

Comments: Interval (31.5-33.0 feet). Split spoon size on white board should be 2".

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 221

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (33.0-34.5 feet). Split spoon size on white board should be 2". Blow count on white board should be 2-3-2. Recovery on white board should be 0.4'.

Photograph ID: 222

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (34.5-36.0 feet)

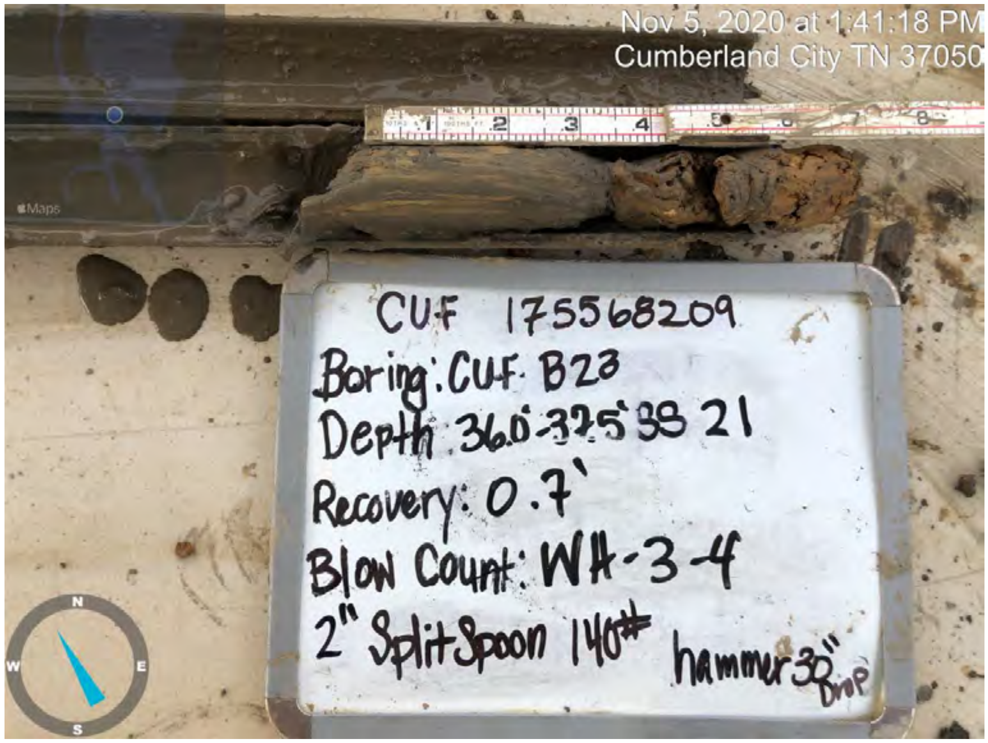
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 223

Photo Location: CUF-B23

Photo Date: 11/5/2020

Comments: Interval (36.0-37.5 feet)



Photograph ID: 224

Photo Location: CUF-B23

Photo Date: 11/5/2020

Comments: Interval (37.5-39.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 225

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (39.0-40.5 feet)

Photograph ID: 226

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (40.5-41.6 feet)

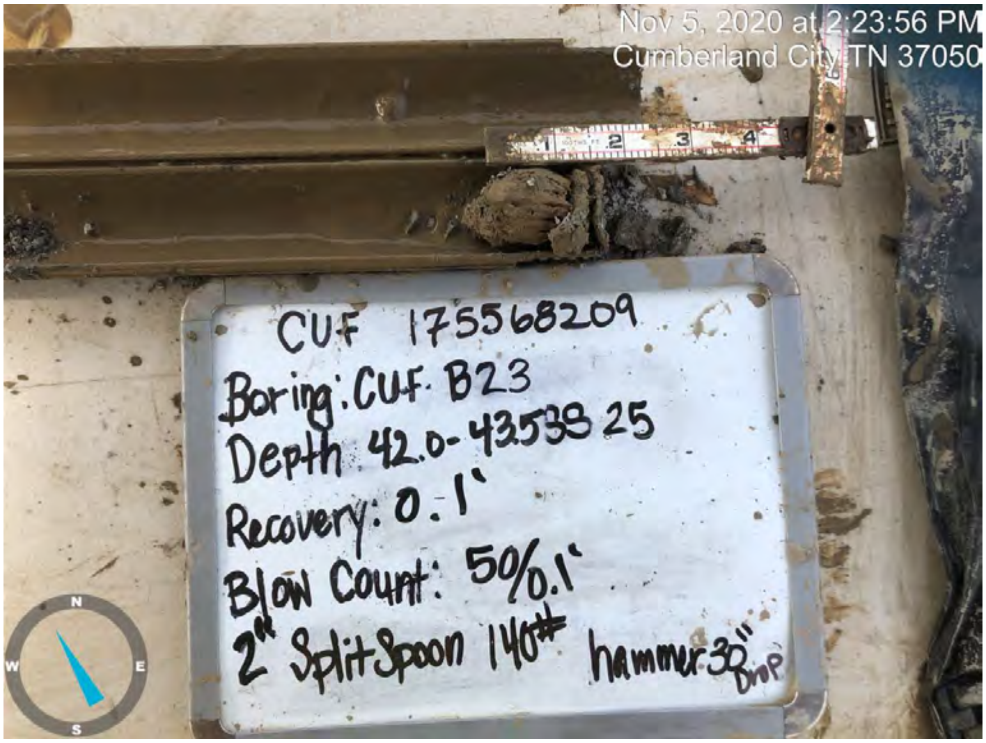
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 227

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (42.0-42.1 feet). Interval on white board should be 42.0-42.1 feet.

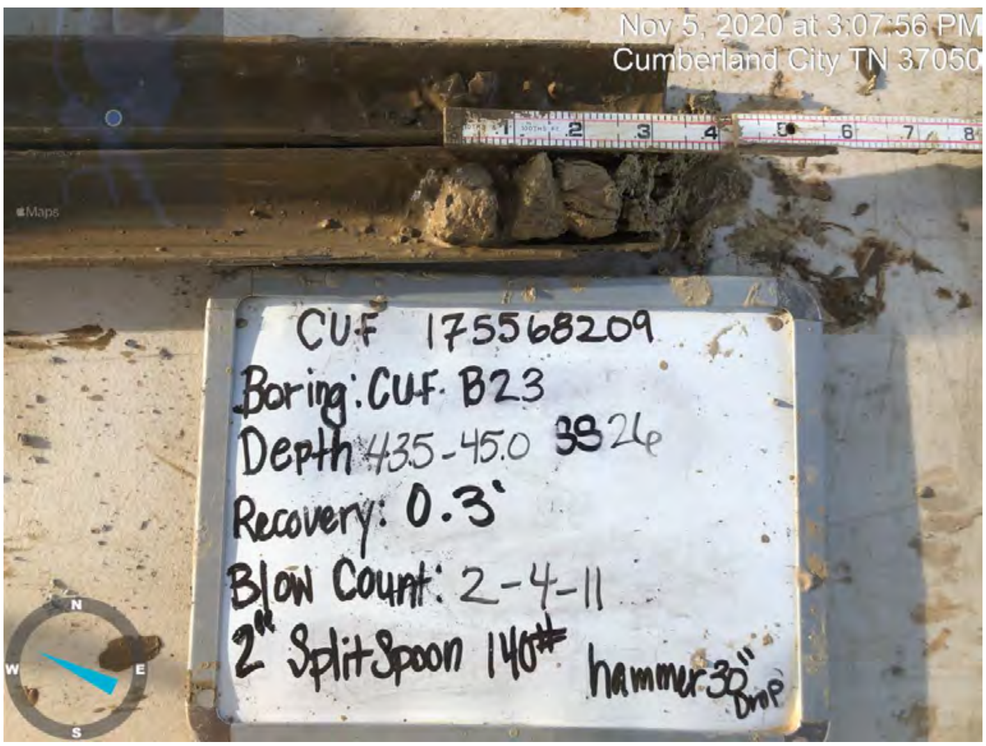


Photograph ID: 228

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (43.5-45.0 feet)



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 229

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Photo of interval (45.0-46.5) unavailable.

No Photo Applicable

Photograph ID: 230

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (46.5-47.9 feet)

Stantec **Photographic Log**

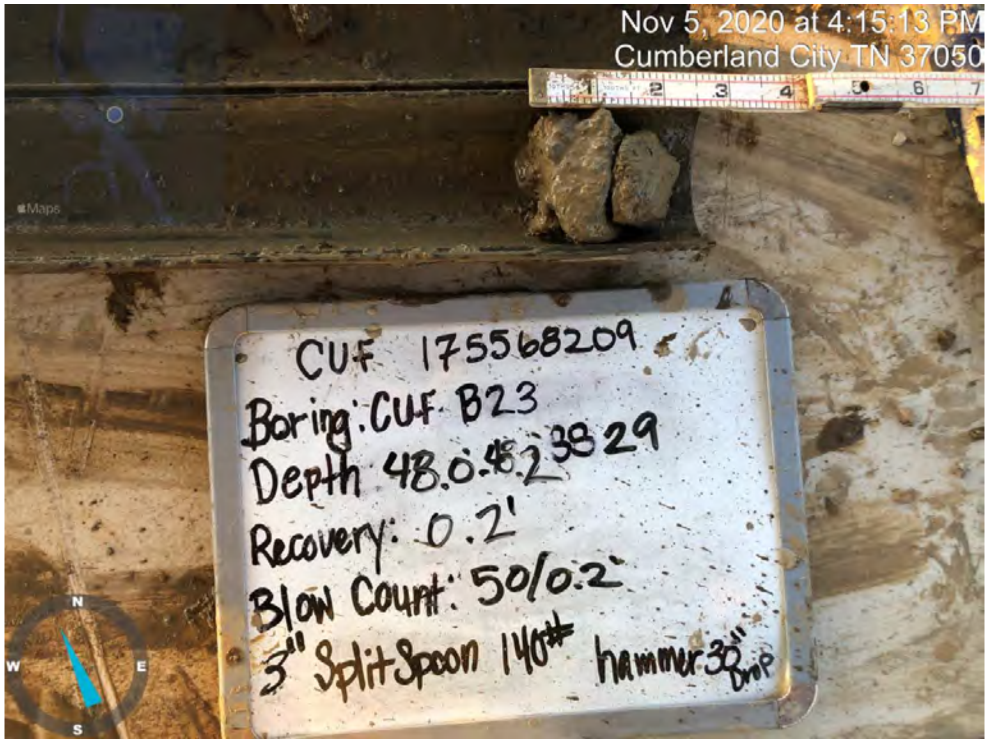
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 231

Photo Location:
CUF-B23

Photo Date:
11/5/2020

Comments:
Interval (48.0-48.2 feet)



Photograph ID: 232

Photo Location:
CUF-B23

Photo Date:
11/6/2020

Comments:
Interval (49.5-51.0 feet)

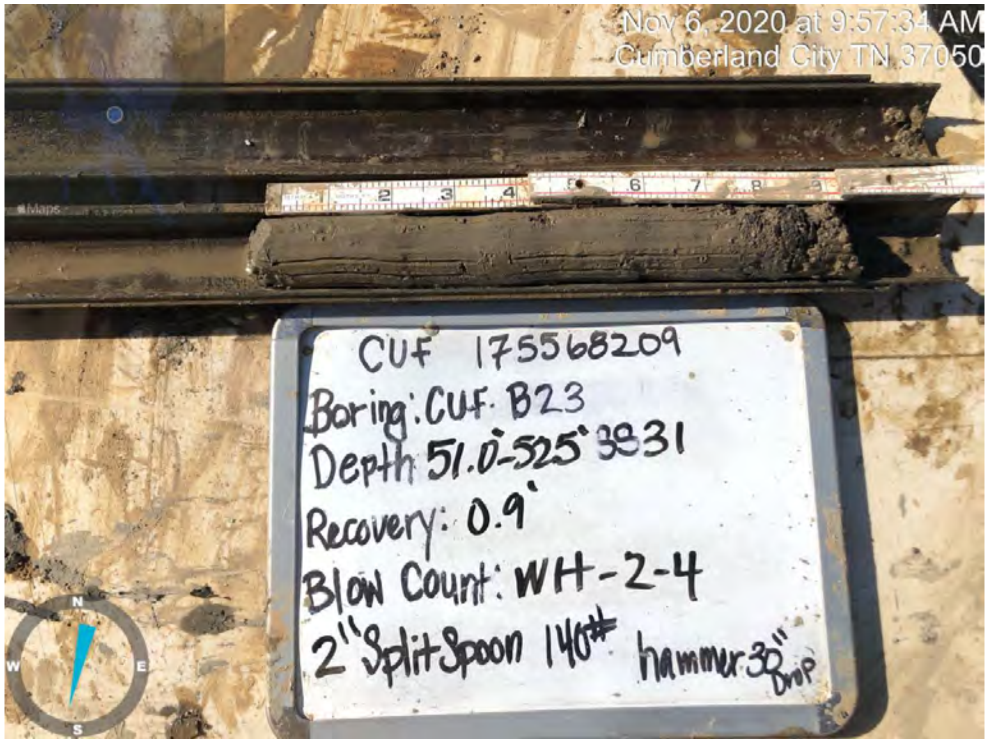
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 233

Photo Location: CUF-B23

Photo Date: 11/6/2020

Comments: Interval (51.0-52.5 feet)



Photograph ID: 234

Photo Location: CUF-B23

Photo Date: 11/6/2020

Comments: Interval (52.5-54.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 235

Photo Location: CUF-B23

Photo Date: 11/9/2020

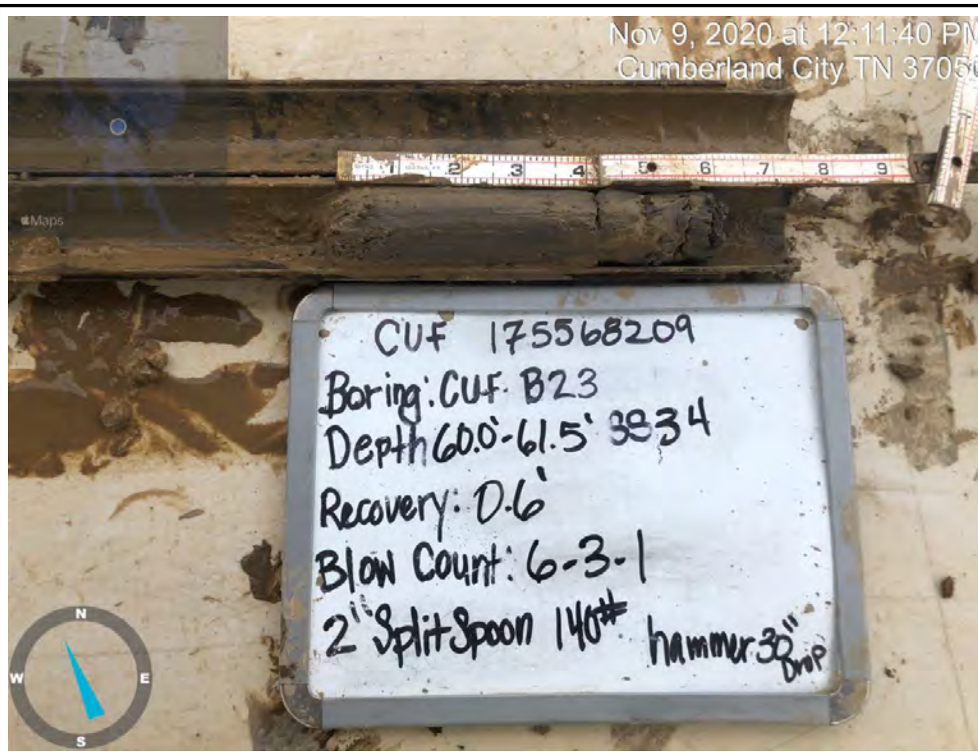
Comments: Interval (54.0-55.5 feet)

Photograph ID: 236

Photo Location: CUF-B23

Photo Date: 11/9/2020

Comments: Interval (60.0-61.5 feet)



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 237

Photo Location:
CUF-B23

Photo Date:
11/9/2020

Comments:
Interval (65.0-66.5 feet)

Photograph ID: 238

Photo Location:
CUF-B23

Photo Date:
11/9/2020

Comments:
Interval (70.0-71.5 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 239

Photo Location:
CUF-B23

Photo Date:
11/9/2020

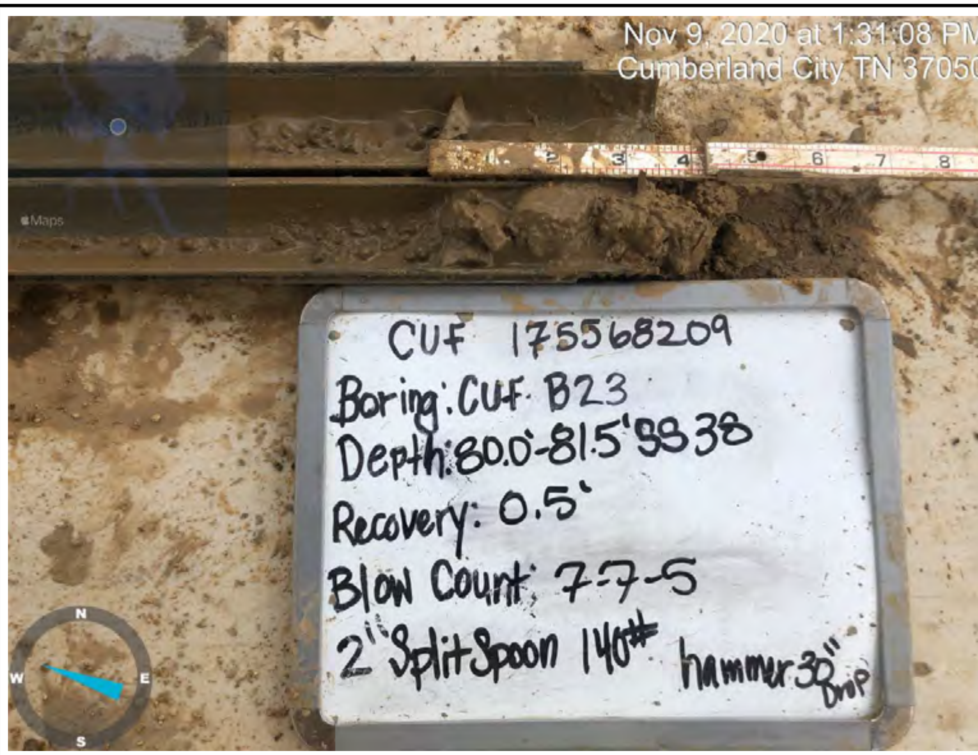
Comments:
Interval (75.0-76.5 feet)

Photograph ID: 240

Photo Location:
CUF-B23

Photo Date:
11/9/2020

Comments:
Interval (80.0-81.5 feet)



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 241

Photo Location: CUF-B23

Photo Date: 11/9/2020

Comments: Interval (85.0-86.5 feet)

Photograph ID: 242

Photo Location: CUF-B23

Photo Date: 11/9/2020

Comments: Interval (90.0-90.9 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 243

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (0.0-1.5 feet)

Photograph ID: 244

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (2.5-4.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 245

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (5.0-6.5 feet)

Photograph ID: 246

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (7.5-9.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 247

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (10.0-11.5 feet)

Photograph ID: 248

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (12.5-14.0 feet). Interval on white board should be 12.5-14.0 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 249

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (15.0-16.5 feet)

Photograph ID: 250

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (17.5-19.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 251

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (20.0-21.5 feet)

Photograph ID: 252

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (21.5-23.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 253 **Photo Location:** CUF-B24 **Photo Date:** 8/25/2020 **Comments:** Interval (23.0-24.5 feet)	
Photograph ID: 254 **Photo Location:** CUF-B24 **Photo Date:** 8/25/2020 **Comments:** Interval (24.5-26.0 feet)	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 255

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (26.0-27.5 feet)

Photograph ID: 256

Photo Location:
CUF-B24

Photo Date:
8/25/2020

Comments:
Interval (27.5-29.0 feet). Sample identifier shown on white board should be SS14.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 257

Photo Location: CUF-B24

Photo Date: 8/25/2020

Comments: Interval (29.0-30.5 feet)

Photograph ID: 258

Photo Location: CUF-B24

Photo Date: 8/25/2020

Comments: Interval (30.5-32.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 259 **Photo Location:** CUF-B24 **Photo Date:** 8/25/2020 **Comments:** Interval (32.0-33.5 feet)	
Photograph ID: 260 **Photo Location:** CUF-B24 **Photo Date:** 8/25/2020 **Comments:** Interval (33.5-35.0 feet)	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 261

Photo Location:
CUF-B24

Photo Date:
8/26/2020

Comments:
Interval (35.0-36.5 feet)

Photograph ID: 262

Photo Location:
CUF-B24

Photo Date:
8/26/2020

Comments:
Interval (36.5-38.0 feet). Interval on white board should be 36.5-38.0 feet.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 263

Photo Location: CUF-B24

Photo Date: 8/26/2020

Comments: Interval (38.0-39.5 feet). Interval on white board should be 38.0-39.5 feet.

Photograph ID: 264

Photo Location: CUF-B24

Photo Date: 8/26/2020

Comments: Interval (39.5-41.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 265

Photo Location:
CUF-B24

Photo Date:
8/26/2020

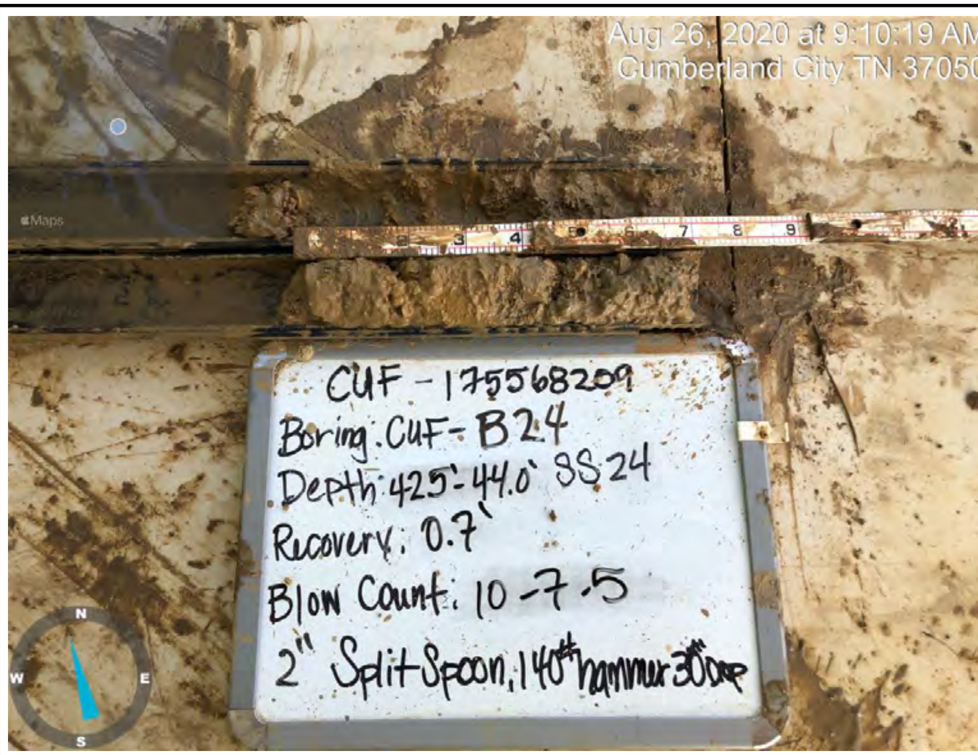
Comments:
Interval (41.0-42.5 feet). Recovery on white board should be 1.0'.

Photograph ID: 266

Photo Location:
CUF-B24

Photo Date:
8/26/2020

Comments:
Interval (42.5-44.0 feet)



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 267

Photo Location: CUF-B24

Photo Date: 8/26/2020

Comments: Interval (44.0-45.5 feet)

Photograph ID: 268

Photo Location: CUF-B24

Photo Date: 8/26/2020

Comments: Interval (45.5-47.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 269

Photo Location: CUF-B24

Photo Date: 8/26/2020

Comments: Interval (47.0-48.5 feet)

Photograph ID: 270

Photo Location: CUF-B24

Photo Date: 8/26/2020

Comments: Interval (48.5-50.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 271

Photo Location:
CUF-B24

Photo Date:
8/26/2020

Comments:
Interval (55.0-56.5 feet)

Photograph ID: 272

Photo Location:
CUF-B24

Photo Date:
8/26/2020

Comments:
Interval (60.0-61.5 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 273

Photo Location:
CUF-B24

Photo Date:
8/26/2020

Comments:
Interval (65.0-66.3 feet)

Photograph ID: 274

Photo Location:
CUF-B24

Photo Date:
8/26/2020

Comments:
Interval (69.0-69.0) no recovery, photo unavailable.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 275

Photo Location: CUF-B25

Photo Date: 8/18/2020

Comments: Interval (0.0-1.5 feet)

Photograph ID: 276

Photo Location: CUF-B25

Photo Date: 8/18/2020

Comments: Interval (2.5-4.0 feet)

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 277

Photo Location:
CUF-B25

Photo Date:
8/18/2020

Comments:
Interval (5.0-6.5 feet)

Photograph ID: 278

Photo Location:
CUF-B25

Photo Date:
8/18/2020

Comments:
Interval (7.5-9.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 279

Photo Location:
CUF-B25

Photo Date:
8/18/2020

Comments:
Interval (10.0-11.5 feet)

Photograph ID: 280

Photo Location:
CUF-B25

Photo Date:
8/18/2020

Comments:
Interval (12.5-14.0 feet)

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 281

Photo Location: CUF-B25

Photo Date: 8/18/2020

Comments: Interval (15.0-16.5 feet)

Photograph ID: 282

Photo Location: CUF-B25

Photo Date: 8/18/2020

Comments: Interval (17.5-19.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 283

Photo Location: CUF-B25

Photo Date: 8/18/2020

Comments: Interval (20.0-21.5 feet)

Photograph ID: 284

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (21.5-22.2 feet). Interval on white board should be 21.5-22.2 feet.

Stantec

Photographic Log

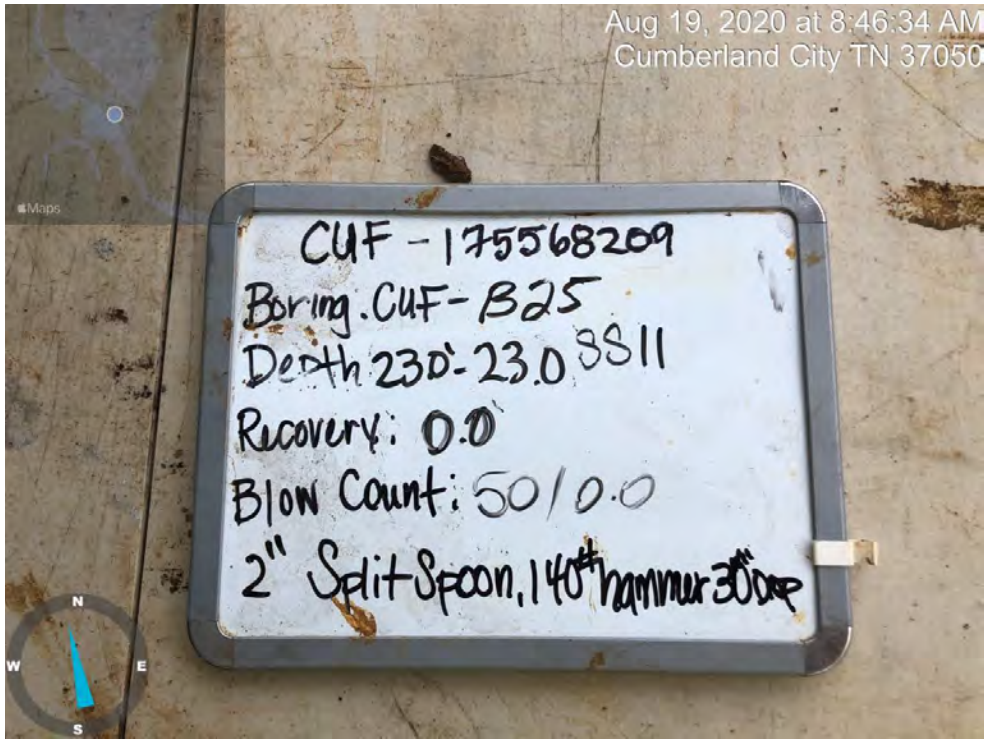
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 285

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (23.0-23.0 feet)



Photograph ID: 286

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (27.5-29.0 feet). Blow counts on white board should be 2-3-6.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 287

Photo Location:
CUF-B25

Photo Date:
8/19/2020

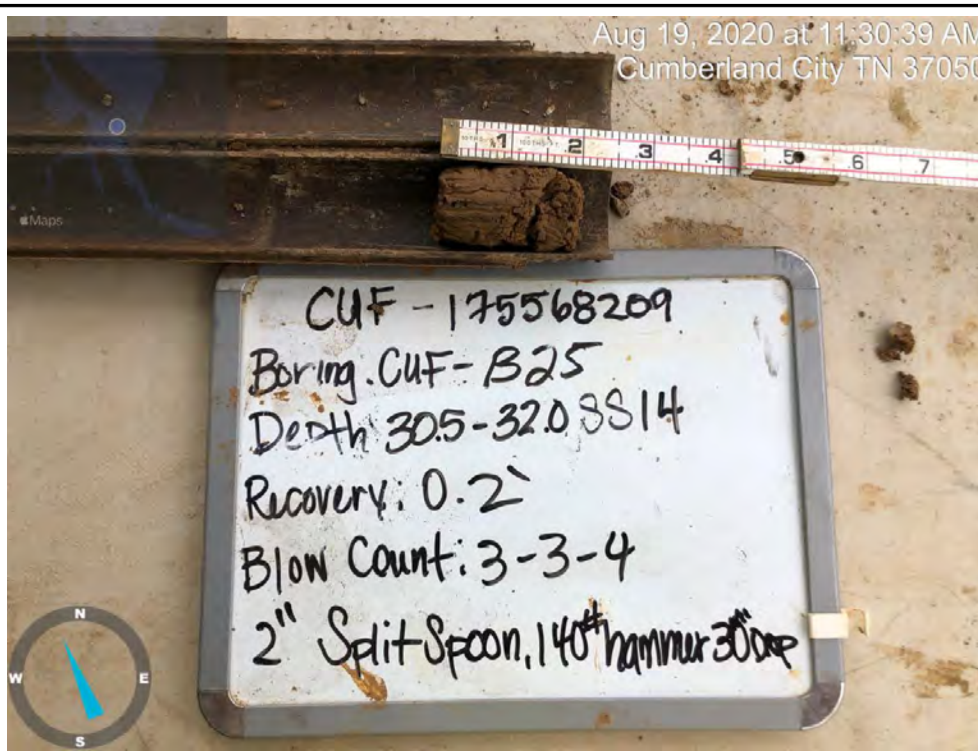
Comments:
Interval (29.0-30.5 feet)

Photograph ID: 288

Photo Location:
CUF-B25

Photo Date:
8/19/2020

Comments:
Interval (30.5-32.0 feet)



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 289

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (32.0-33.5 feet)

Photograph ID: 290

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (33.5-35.0 feet)

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 291

Photo Location:
CUF-B25

Photo Date:
8/19/2020

Comments:
Interval (35.0-36.5 feet)

Photograph ID: 292

Photo Location:
CUF-B25

Photo Date:
8/19/2020

Comments:
Interval (36.5-38.0 feet)

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 293

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (38.0-39.5 feet). Blow count on white board should be WH-4-8.

Photograph ID: 294

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (39.5-41.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 295

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (41.0-42.5 feet)

Photograph ID: 296

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (42.5-44.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 297

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (44.0-45.5 feet)

Photograph ID: 298

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (45.5-47.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 299

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (47.0-48.5 feet)

Photograph ID: 300

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (48.5-50.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 301

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (55.0-56.5 feet)

Photograph ID: 302

Photo Location: CUF-B25

Photo Date: 8/19/2020

Comments: Interval (60.0-61.5 feet)

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 303

Photo Location:
CUF-B25

Photo Date:
8/20/2020

Comments:
Interval (65.0-65.0) no recovery, photo unavailable.

No Photo Applicable

Photograph ID: 304

Photo Location:
CUF-B25

Photo Date:
8/20/2020

Comments:
Interval (70.0-71.5 feet)

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 305

Photo Location:
CUF-B25

Photo Date:
8/20/2020

Comments:
Interval (75.0-76.5 feet)

Photograph ID: 306

Photo Location:
CUF-B25

Photo Date:
8/20/2020

Comments:
Interval (80.0-81.5 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 307

Photo Location:
CUF-B25

Photo Date:
8/20/2020

Comments:
Interval (85.0-85.7 feet)

ATTACHMENT D.1.3

Photographic Log of Stilling Pond/Retention Pond Samples

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 1

Photo Location: CUF-B11

Photo Date: 3/20/2019

Comments: Interval (0.0-1.5 feet).

Photograph ID: 2

Photo Location: CUF-B11

Photo Date: 3/20/2019

Comments: Interval (2.5-4.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 3 **Photo Location:** CUF-B11 **Photo Date:** 3/20/2019 **Comments:** Interval (5.0-6.5 feet).	
Photograph ID: 4 **Photo Location:** CUF-B11 **Photo Date:** 3/20/2019 **Comments:** Interval (7.5-9.0 feet).	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 5

Photo Location: CUF-B11

Photo Date: 3/20/2019

Comments: Interval (10.0-11.5 feet).

Photograph ID: 6

Photo Location: CUF-B11

Photo Date: 3/20/2019

Comments: Interval (12.5-14.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 7

Photo Location:
CUF-B11

Photo Date:
3/20/2019

Comments:
Interval (15.0-16.5 feet).

Photograph ID: 8

Photo Location:
CUF-B11

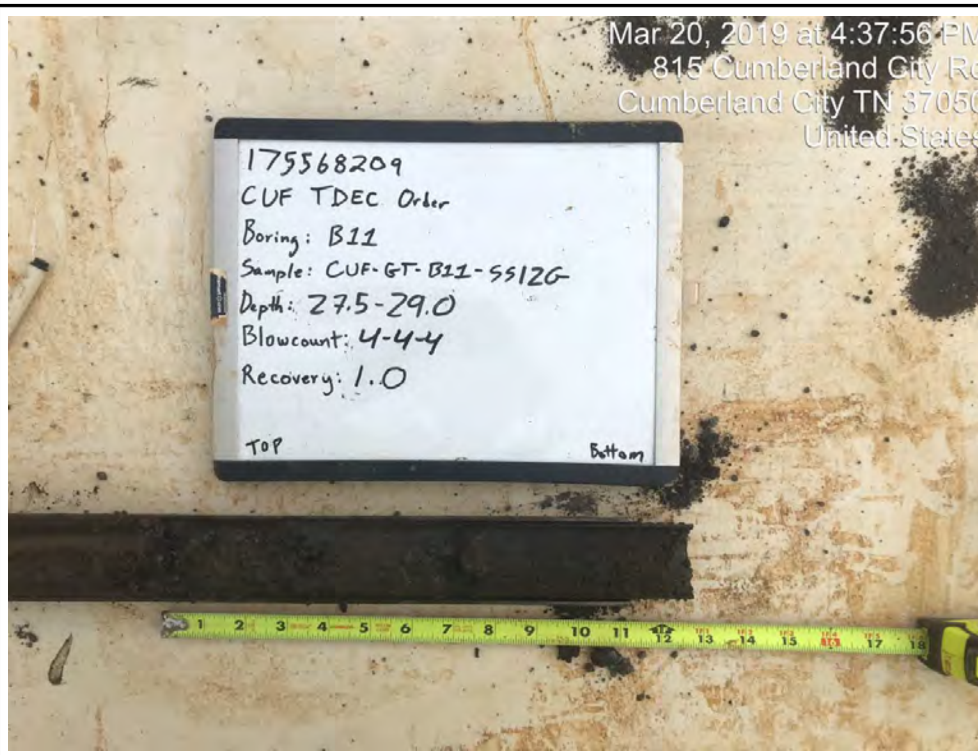
Photo Date:
3/20/2019

Comments:
Interval (17.5-19.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 9 **Photo Location:** CUF-B11 **Photo Date:** 3/20/2019 **Comments:** Interval (20.0-21.5 feet).	
Photograph ID: 10 **Photo Location:** CUF-B11 **Photo Date:** 3/20/2019 **Comments:** Interval (22.5-24.0 feet).	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 11 **Photo Location:** CUF-B11 **Photo Date:** 3/20/2019 **Comments:** Interval (25.0-26.5 feet).	
Photograph ID: 12 **Photo Location:** CUF-B11 **Photo Date:** 3/20/2019 **Comments:** Interval (27.5-29.0 feet).	

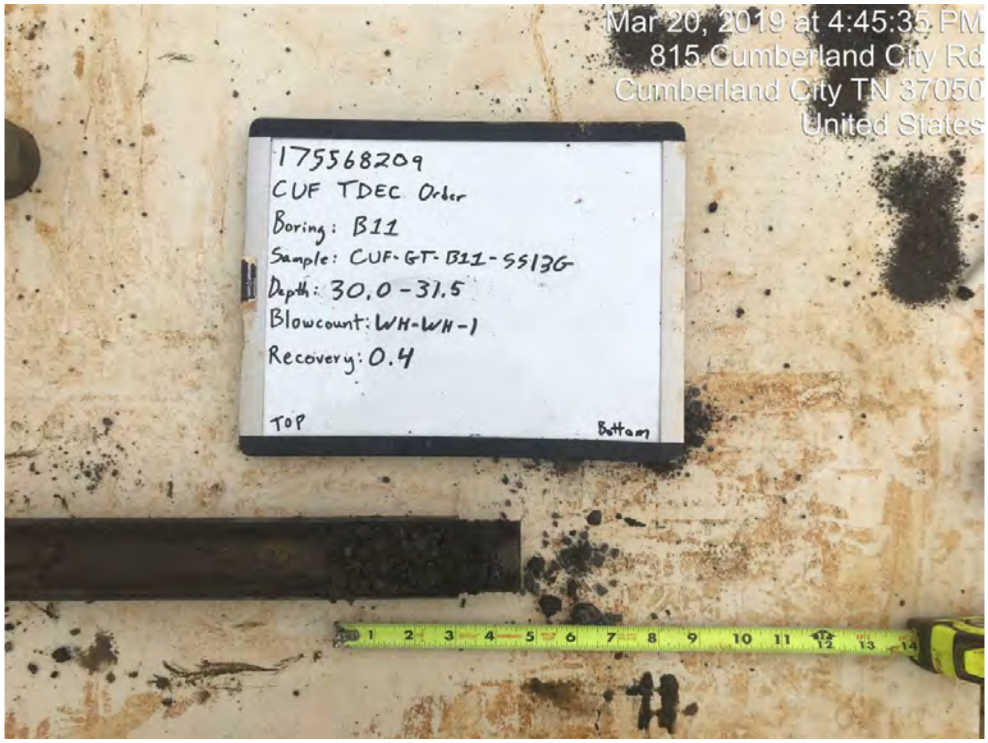
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 13

Photo Location:
CUF-B11

Photo Date:
3/20/2019

Comments:
Interval (30.0-31.5 feet).



Photograph ID: 14

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (32.5-34.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 15

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (35.0-36.5 feet).

Photograph ID: 16

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (37.5-39.0 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 17

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (40.0-41.5 feet).

Photograph ID: 18

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Photo of interval (42.5-44.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 19

Photo Location:
CUF-B11

Photo Date:
3/21/2019

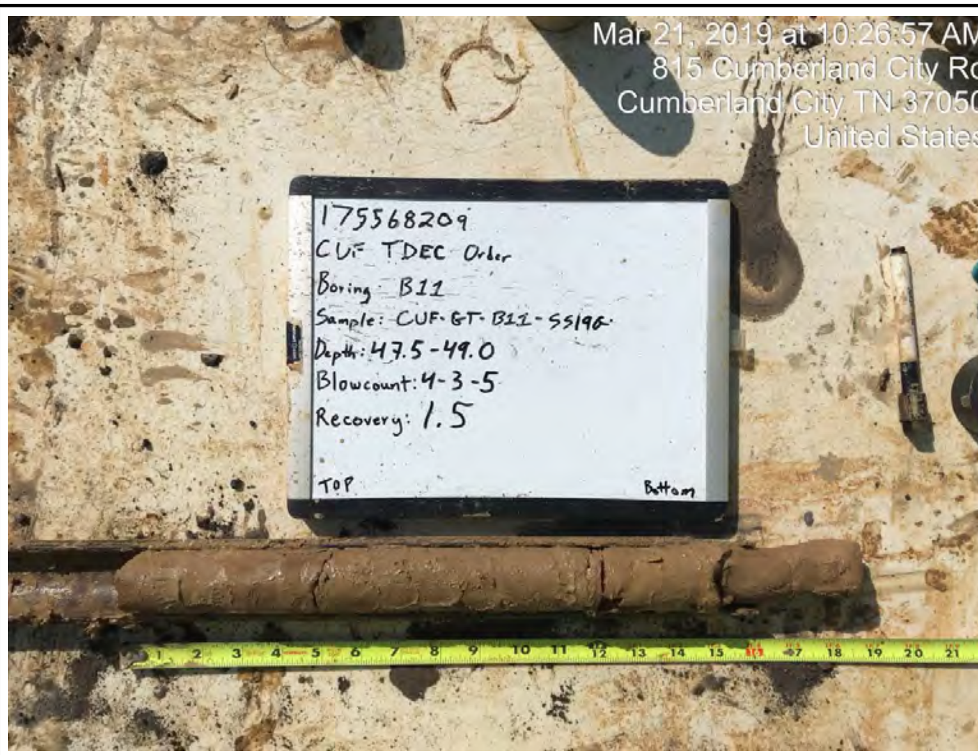
Comments:
Interval (45.0-46.5 feet).

Photograph ID: 20

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (47.5-49.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 21

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (50.0-51.5 feet).

Photograph ID: 22

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (52.5-54.0 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 23

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (55.0-56.5 feet).

Photograph ID: 24

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (57.5-59.0 feet).

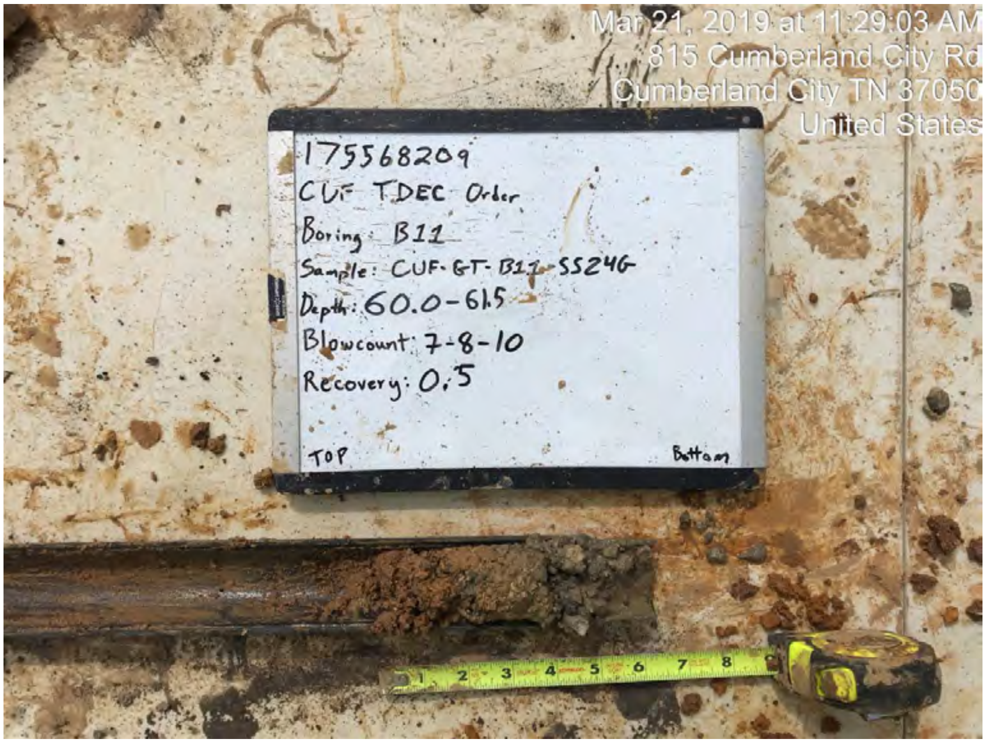
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 25

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (60.0-61.5 feet).



Photograph ID: 26

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (62.5-64.0 feet).

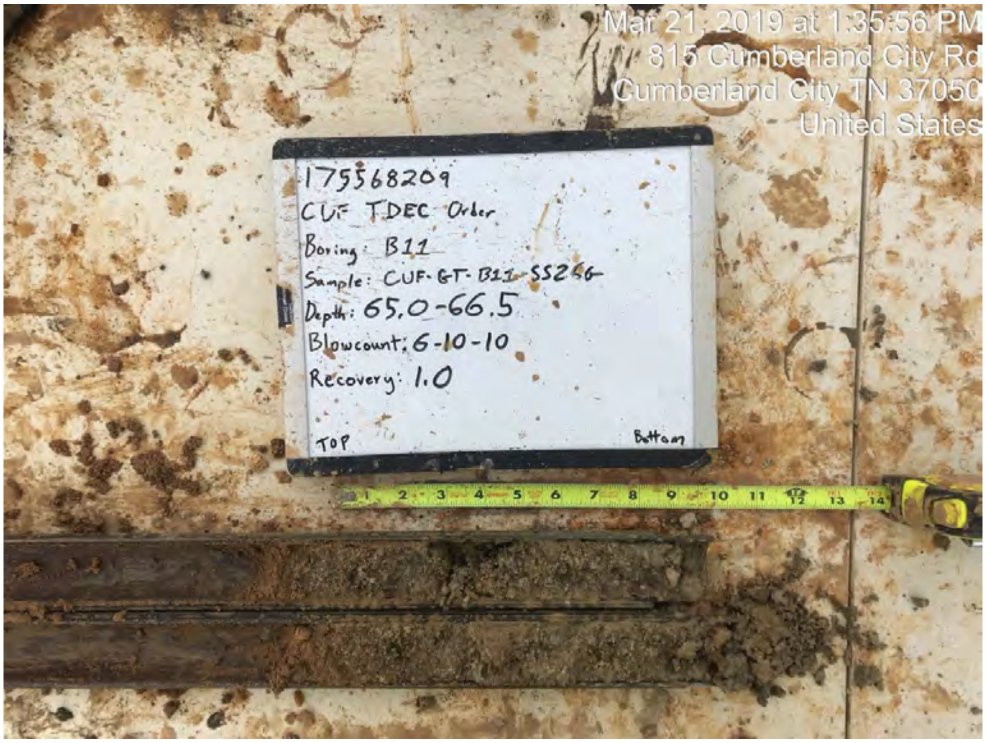
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 27

Photo Location: CUF-B11

Photo Date: 3/21/2019

Comments: Interval (65.0-66.5 feet).



Photograph ID: 28

Photo Location: CUF-B11

Photo Date: 3/21/2019

Comments: Interval (67.5-69.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 29

Photo Location: CUF-B11

Photo Date: 3/21/2019

Comments: Interval (70.0-71.5 feet).

Photograph ID: 30

Photo Location: CUF-B11

Photo Date: 3/21/2019

Comments: Interval (72.5-74.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 31

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (75.0-76.5 feet).

Photograph ID: 32

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (77.5-79.0 feet).

Photographic Log

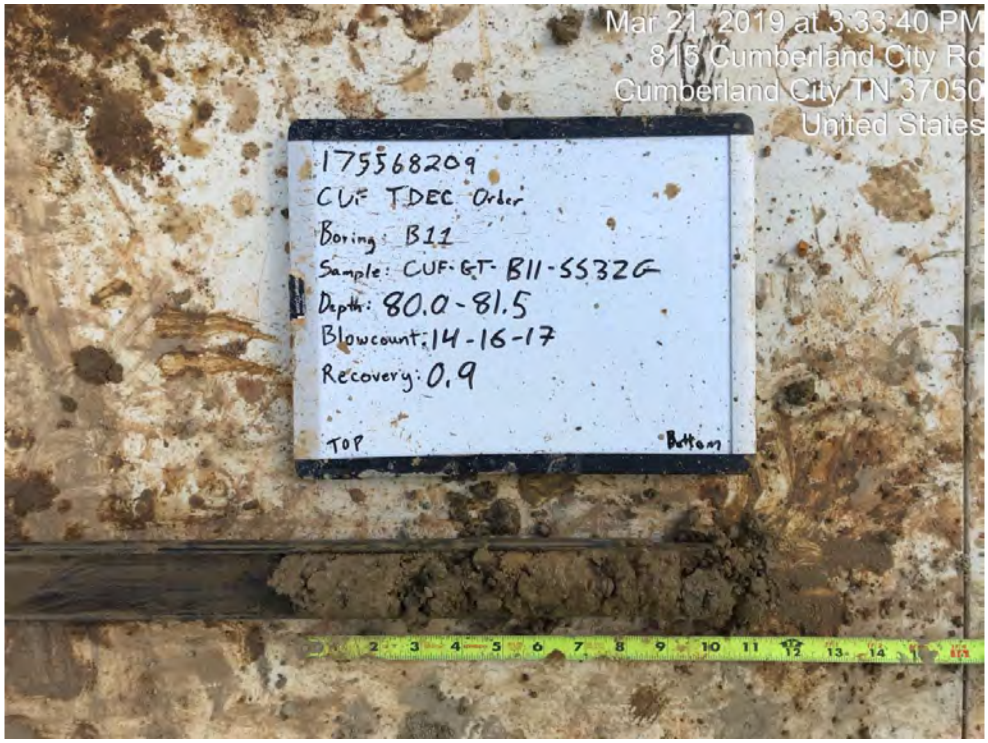
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 33

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (80.0-81.5 feet).



Photograph ID: 34

Photo Location:
CUF-B11

Photo Date:
3/21/2019

Comments:
Interval (82.5-82.9 feet).

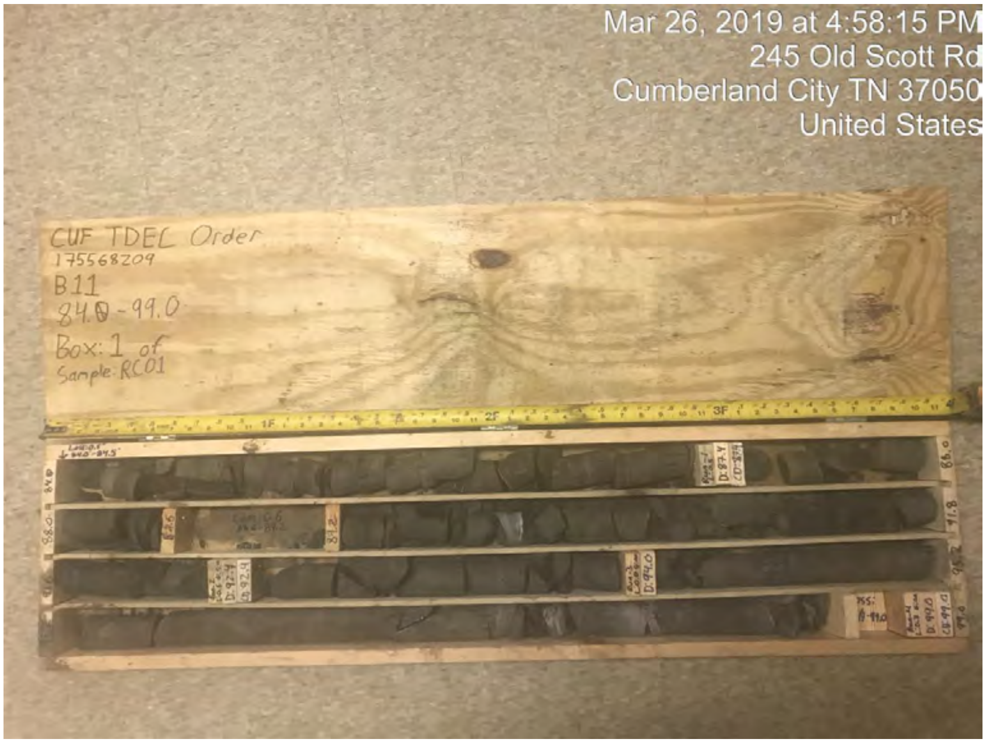
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 35

Photo Location: CUF-B11

Photo Date: 3/26/2019

Comments: Interval (84.0-99.0 feet). Box designation shown on box should be 1 of 2. Metadata date reflects the date the photo was taken, not the date the core was drilled.



Photograph ID: 36

Photo Location: CUF-B11

Photo Date: 3/26/2019

Comments: Interval (99.0-104.0 feet). Metadata date reflects the date the photo was taken, not the date the core was drilled.

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 37

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (0.0-1.5 feet). Blow count shown on white board should be 5-5-6.

Photograph ID: 38

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (2.5-4.0 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 39

Photo Location: CUF-B12

Photo Date: 3/14/2019

Comments: Interval (5.0-6.5 feet).

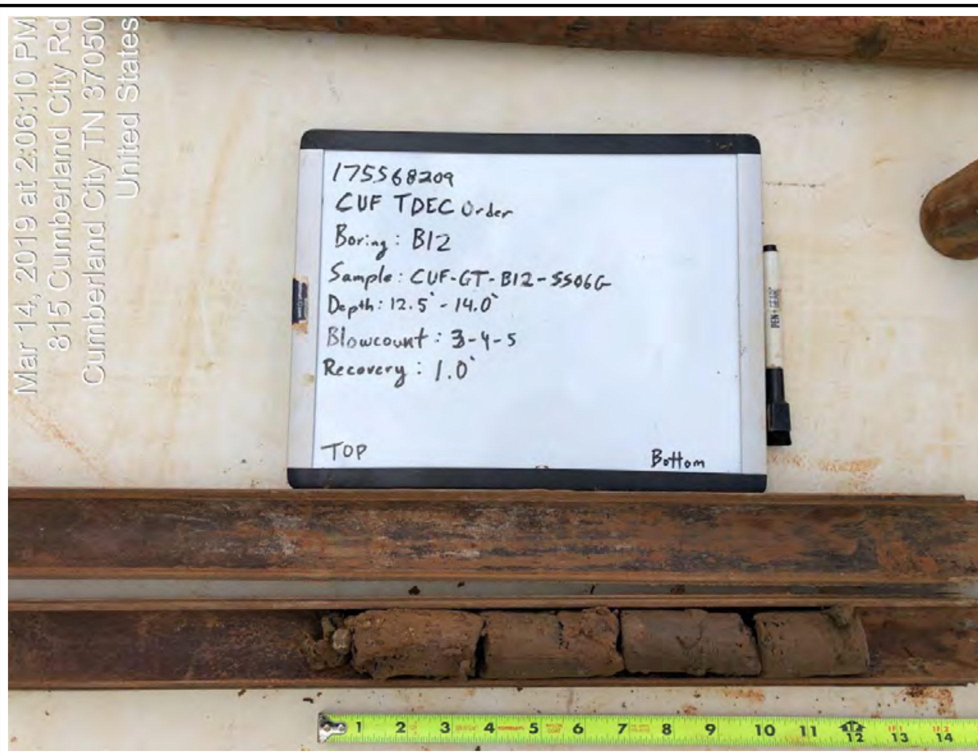
Photograph ID: 40

Photo Location: CUF-B12

Photo Date: 3/14/2019

Comments: Interval (7.5-9.0 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 41 **Photo Location:** CUF-B12 **Photo Date:** 3/14/2019 **Comments:** Interval (10.0-11.5 feet).	
Photograph ID: 42 **Photo Location:** CUF-B12 **Photo Date:** 3/14/2019 **Comments:** Interval (12.5-14.0 feet).	

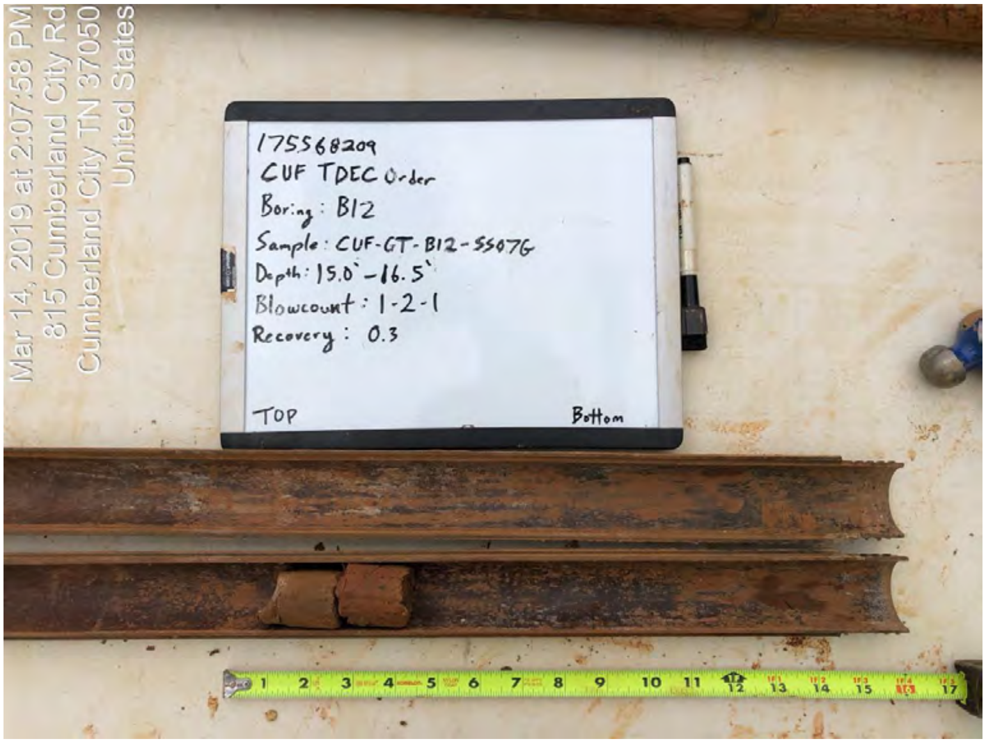
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 43

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (15.0-16.5 feet).



Photograph ID: 44

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (17.5-19.0 feet).

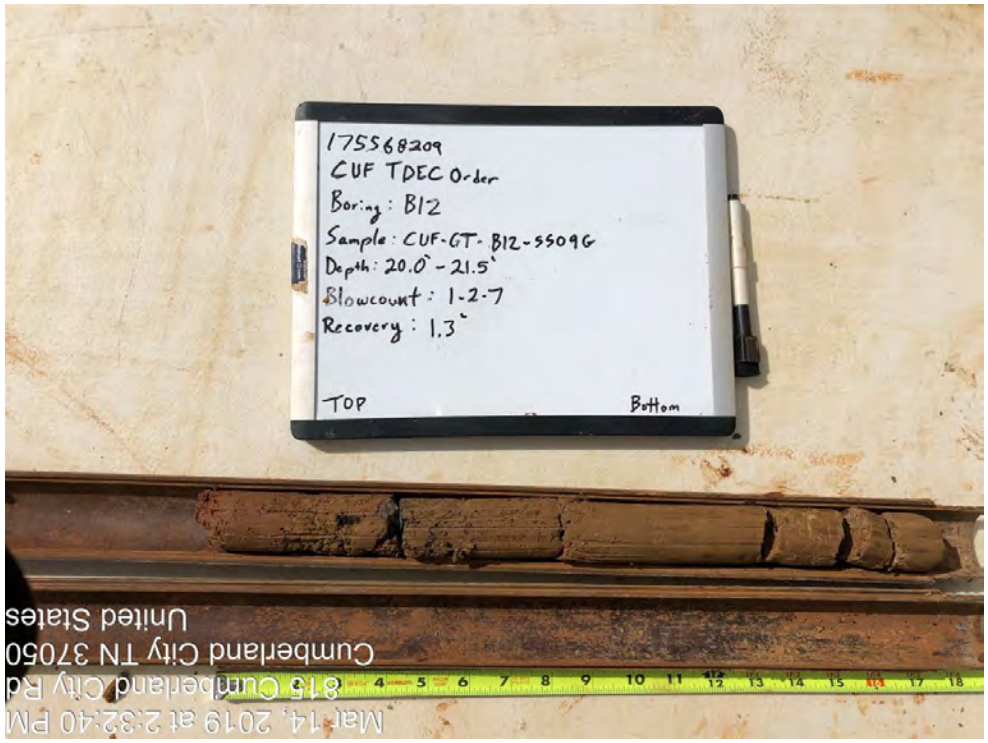
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 45

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (20.0-21.5 feet).

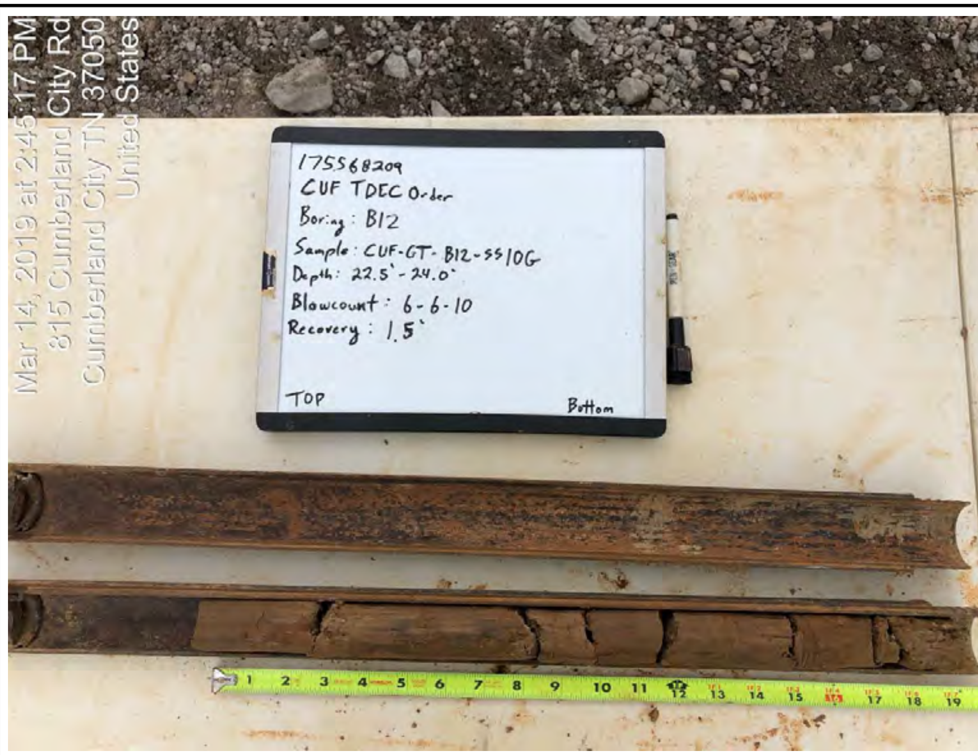


Photograph ID: 46

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (22.5-24.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 47

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (25.0-26.5 feet).

Photograph ID: 48

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (27.5-29.0 feet).

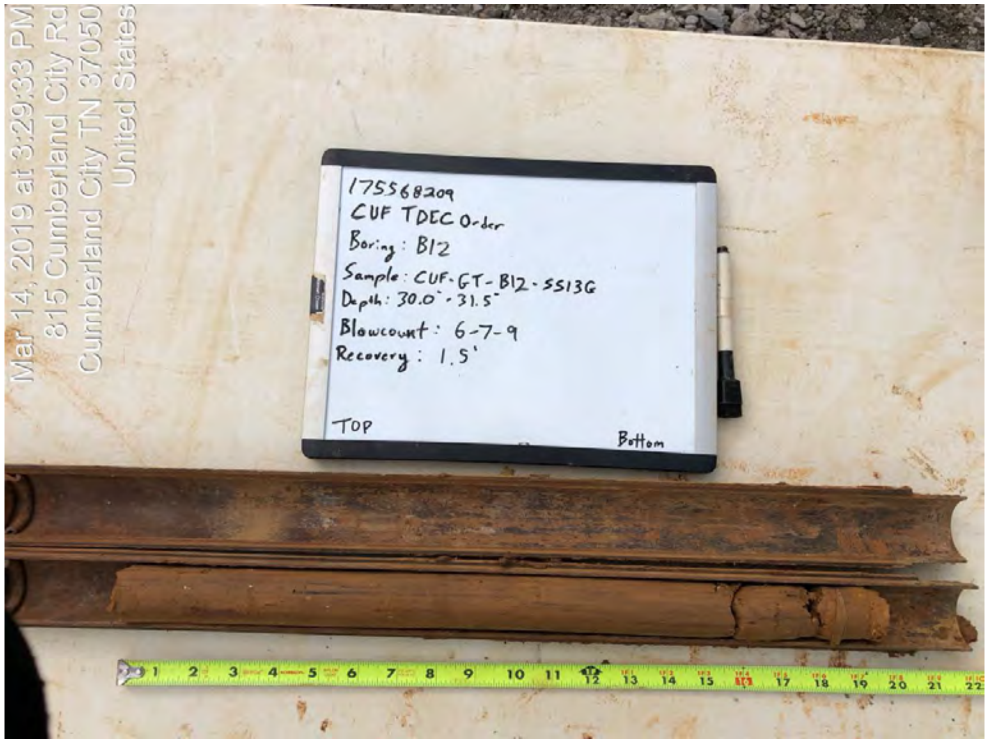
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 49

Photo Location: CUF-B12

Photo Date: 3/14/2019

Comments: Interval (30.0-31.5 feet).



Photograph ID: 50

Photo Location: CUF-B12

Photo Date: 3/14/2019

Comments: Interval (32.5-34.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 51

Photo Location: CUF-B12

Photo Date: 3/14/2019

Comments: Interval (35.0-36.5 feet).

Photograph ID: 52

Photo Location: CUF-B12

Photo Date: 3/14/2019

Comments: Interval (37.5-39.0 feet).

Stantec **Photographic Log**

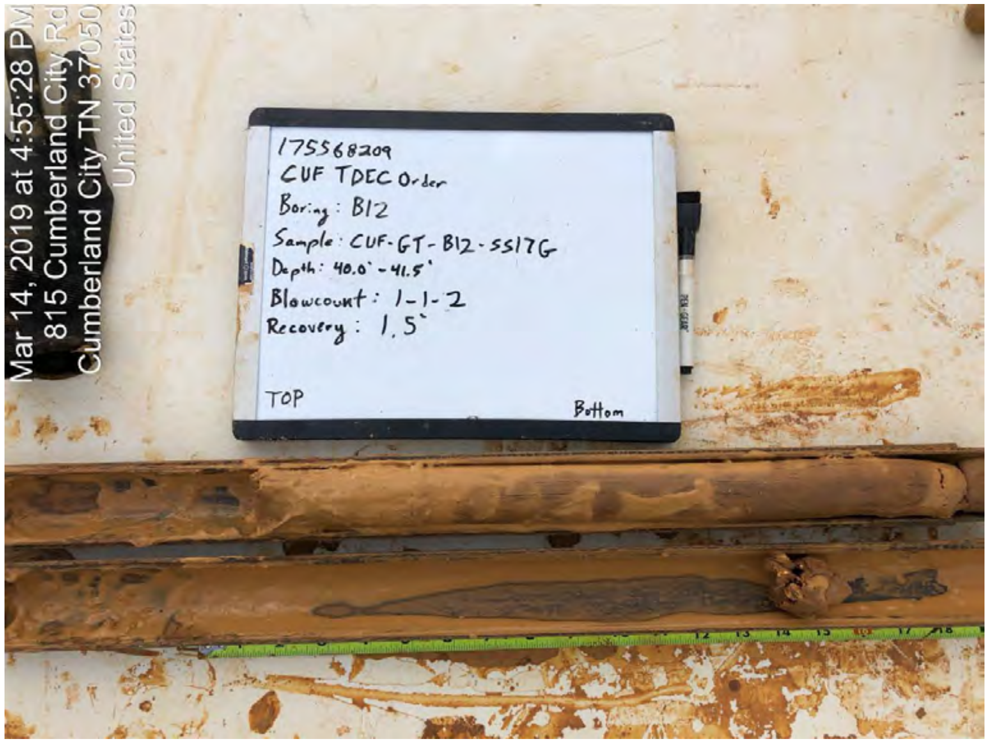
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 53

Photo Location:
CUF-B12

Photo Date:
3/14/2019

Comments:
Interval (40.0-41.5 feet).

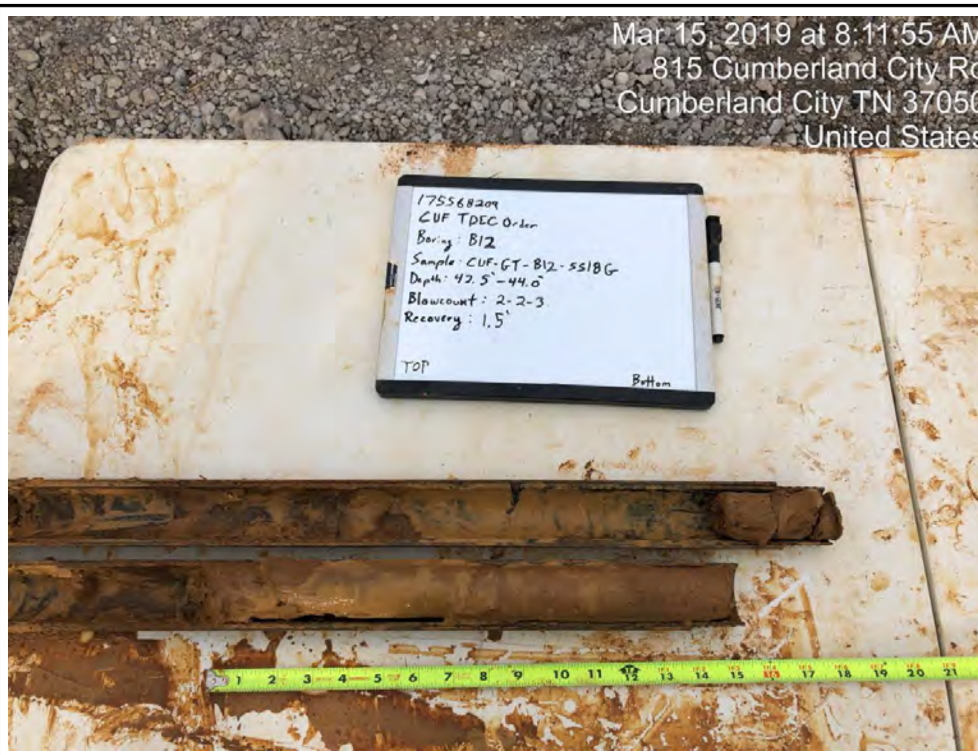


Photograph ID: 54

Photo Location:
CUF-B12

Photo Date:
3/15/2019

Comments:
Interval (42.5-44.0 feet).



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 55

Photo Location:
CUF-B12

Photo Date:
3/15/2019

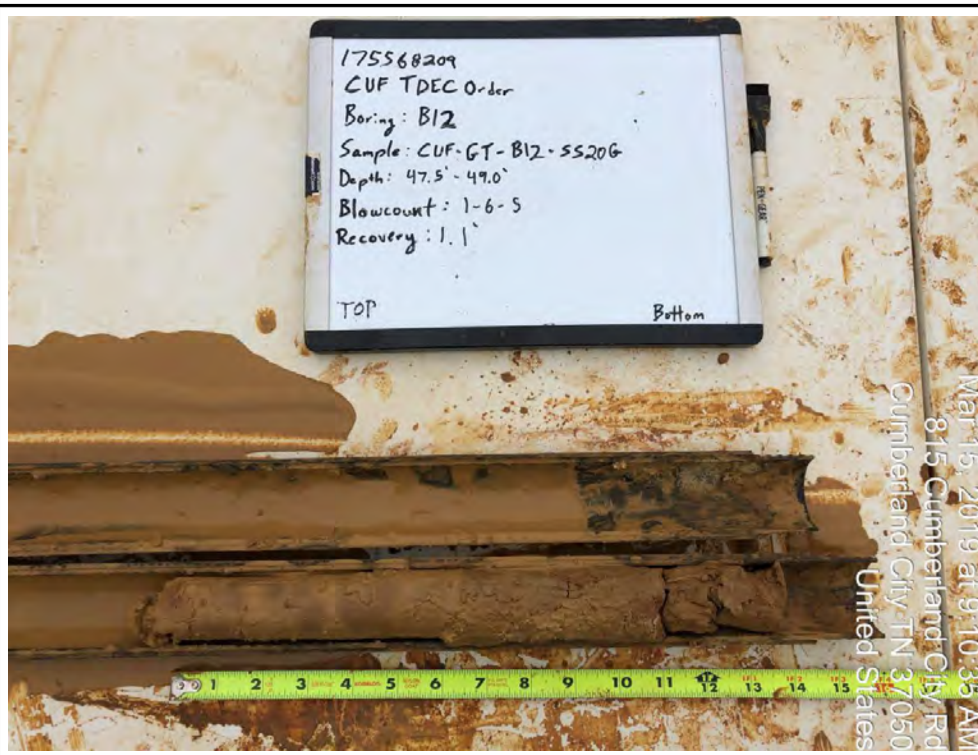
Comments:
Interval (45.0-46.5 feet).

Photograph ID: 56

Photo Location:
CUF-B12

Photo Date:
3/15/2019

Comments:
Interval (47.5-49.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 57

Photo Location:
CUF-B12

Photo Date:
3/15/2019

Comments:
Interval (49.0-50.5 feet).

Photograph ID: 58

Photo Location:
CUF-B12

Photo Date:
3/18/2019

Comments:
Interval (50.0-63.6 feet). Project number, boring identifier, and interval shown on box should be 175568209, B12, and 50.0-63.6 feet, respectively.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 59

Photo Location:
CUF-B12

Photo Date:
3/18/2019

Comments:
Interval (63.6-70.0 feet). Project number, boring identifier, and interval shown on box should be 175568209, B12, and 63.6-70.0 feet, respectively.

Photograph ID: 60

Photo Location:
CUF-B13

Photo Date:
3/11/2019

Comments:
Interval (0.0-1.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 61

Photo Location:
CUF-B13

Photo Date:
3/11/2019

Comments:
Photo of interval (2.5-4.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photograph ID: 62

Photo Location:
CUF-B13

Photo Date:
3/11/2019

Comments:
Interval (5.0-6.5 feet). Sample identifier shown on white board should be SS02.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 63

Photo Location: CUF-B13

Photo Date: 3/11/2019

Comments: Interval (7.5-9.0 feet).

Photograph ID: 64

Photo Location: CUF-B13

Photo Date: 3/11/2019

Comments: Interval (10.0-11.5 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 65

Photo Location: CUF-B13

Photo Date: 3/11/2019

Comments: Interval (12.5-14.0 feet).

Photograph ID: 66

Photo Location: CUF-B13

Photo Date: 3/11/2019

Comments: Interval (15.0-16.5 feet). Sample identifier shown on white board should be SS06.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 67

Photo Location:
CUF-B13

Photo Date:
3/11/2019

Comments:
Photo of interval (17.5-19.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photograph ID: 68

Photo Location:
CUF-B13

Photo Date:
3/12/2019

Comments:
Interval (20.0-21.5 feet).

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 69

Photo Location: CUF-B13

Photo Date: 3/12/2019

Comments: Interval (22.5-24.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 70

Photo Location: CUF-B13

Photo Date: 3/12/2019

Comments: Interval (25.0-26.5 feet). WOH on white board is the same as WH on the boring log.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 71

Photo Location:
CUF-B13

Photo Date:
3/12/2019

Comments:
Interval (28.5-48.5 feet). Project number, boring identifier, and interval shown on box should be 175568209, B13, and 28.5-48.5 feet, respectively.

Photograph ID: 72

Photo Location:
CUF-B13

Photo Date:
3/13/2019

Comments:
Interval (50.0-55.0 feet). WOH on white board is the same as WH on the boring log.

Stantec

Photographic Log

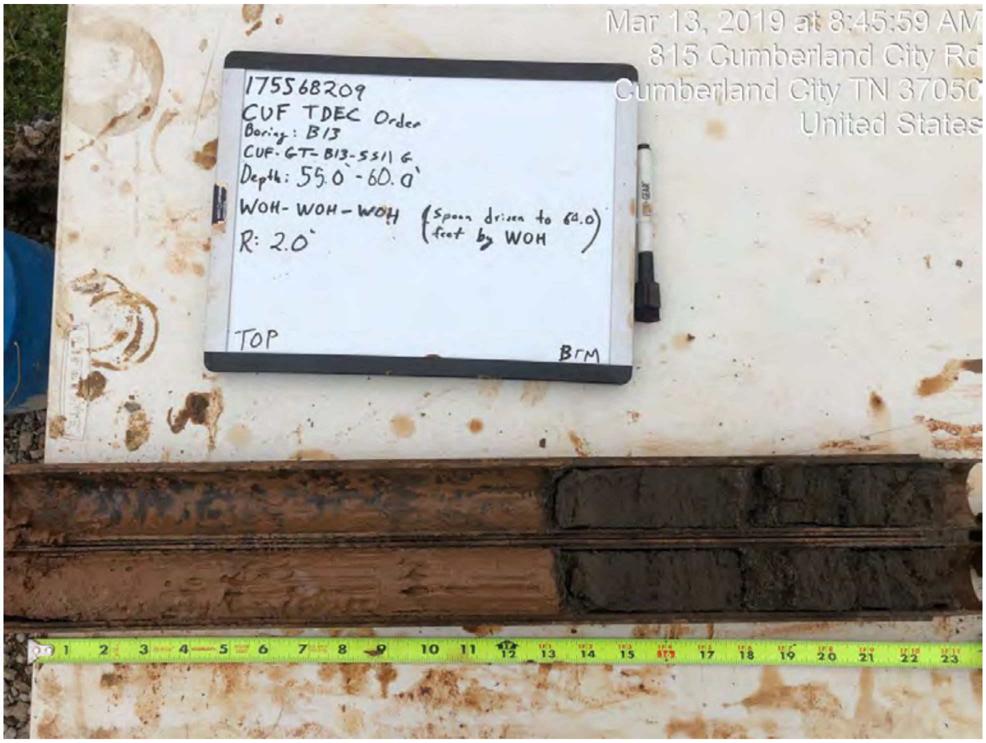
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 73

Photo Location:
CUF-B13

Photo Date:
3/13/2019

Comments:
Interval (55.0-60.0 feet). WOH on white board is the same as WH on the boring log.



Photograph ID: 74

Photo Location:
CUF-B13

Photo Date:
3/13/2019

Comments:
Interval (60.0-61.5 feet). Blowcount shown on white board should be WH-28-25. WOH on white board is the same as WH on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 75

Photo Location:
CUF-B13

Photo Date:
3/13/2019

Comments:
Interval (65.0-66.5 feet).

Photograph ID: 76

Photo Location:
CUF-B13

Photo Date:
3/13/2019

Comments:
Interval (69.7-80.5 feet). Project number, boring identifier, and interval shown on box should be 175568209, B13, and 69.7-80.5 feet, respectively.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 77

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (0.0-1.5 feet)

Photograph ID: 78

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (2.5-4.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 79

Photo Location: CUF-B20

Photo Date: 6/11/2020

Comments: Interval (5.0-6.5 feet)

Photograph ID: 80

Photo Location: CUF-B20

Photo Date: 6/11/2020

Comments: Interval (7.5-9.0 feet)

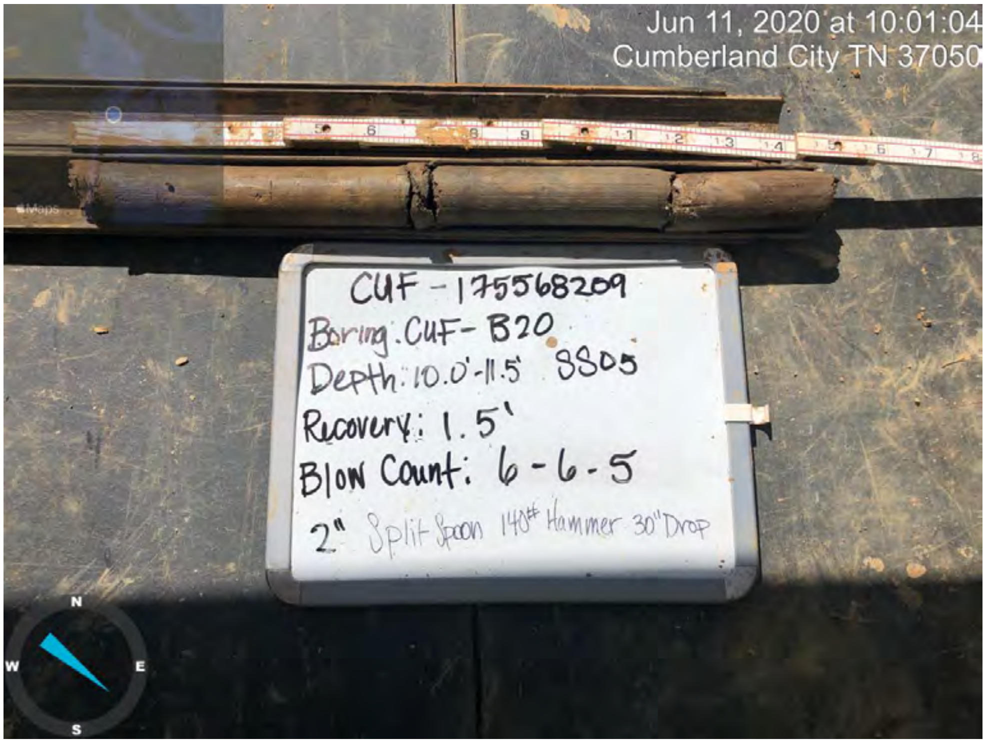
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 81

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (10.0-11.5 feet)



Photograph ID: 82

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (11.5-13.0 feet)

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 83

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (13.0-14.5 feet). Interval shown on white board is shown as 13.0-14.5.

Photograph ID: 84

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (14.5-16.0 feet)

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 85

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (16.0-17.5 feet)

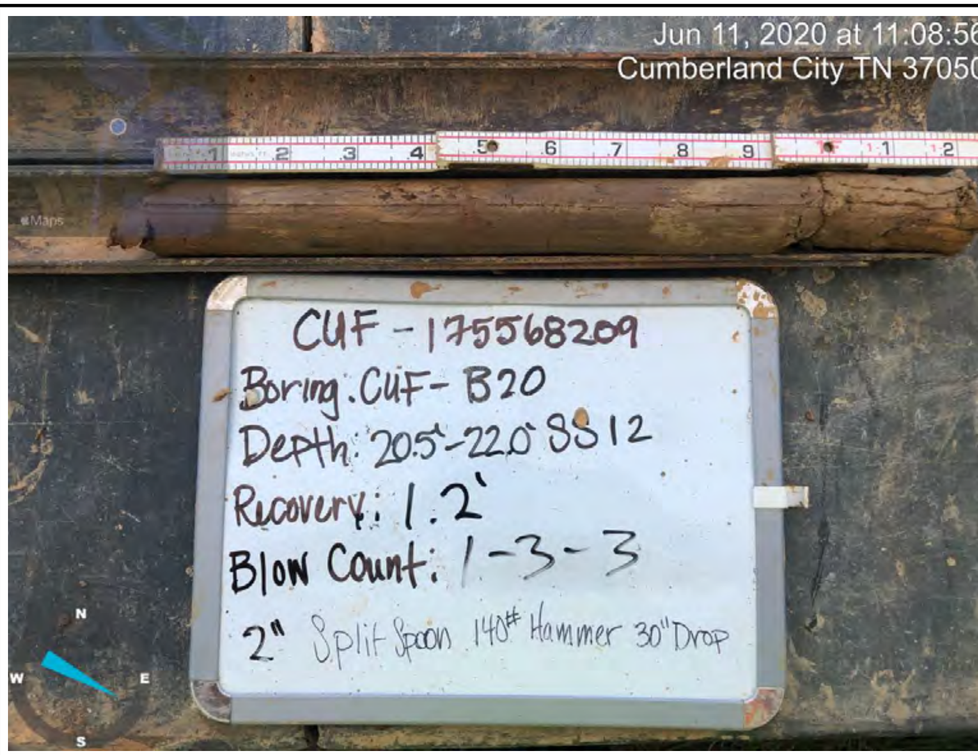
Photograph ID: 86

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (17.5-19.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 87 **Photo Location:** CUF-B20 **Photo Date:** 6/11/2020 **Comments:** Interval (19.0-20.5 feet)	
Photograph ID: 88 **Photo Location:** CUF-B20 **Photo Date:** 6/11/2020 **Comments:** Interval (20.5-22.0 feet)	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 89

Photo Location: CUF-B20

Photo Date: 6/11/2020

Comments: Interval (22.0-23.5 feet)

Photograph ID: 90

Photo Location: CUF-B20

Photo Date: 6/11/2020

Comments: Interval (23.5-25.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 91 **Photo Location:** CUF-B20 **Photo Date:** 6/11/2020 **Comments:** Interval (25.0-26.5 feet)	
Photograph ID: 92 **Photo Location:** CUF-B20 **Photo Date:** 6/11/2020 **Comments:** Interval (26.5-28.0 feet)	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 93

Photo Location: CUF-B20

Photo Date: 6/11/2020

Comments: Interval (28.0-29.5 feet)

Photograph ID: 94

Photo Location: CUF-B20

Photo Date: 6/11/2020

Comments: Interval (29.5-31.0 feet)

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 95

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (31.0-32.5 feet)

Photograph ID: 96

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (32.5-34.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 97

Photo Location:
CUF-B20

Photo Date:
6/11/2020

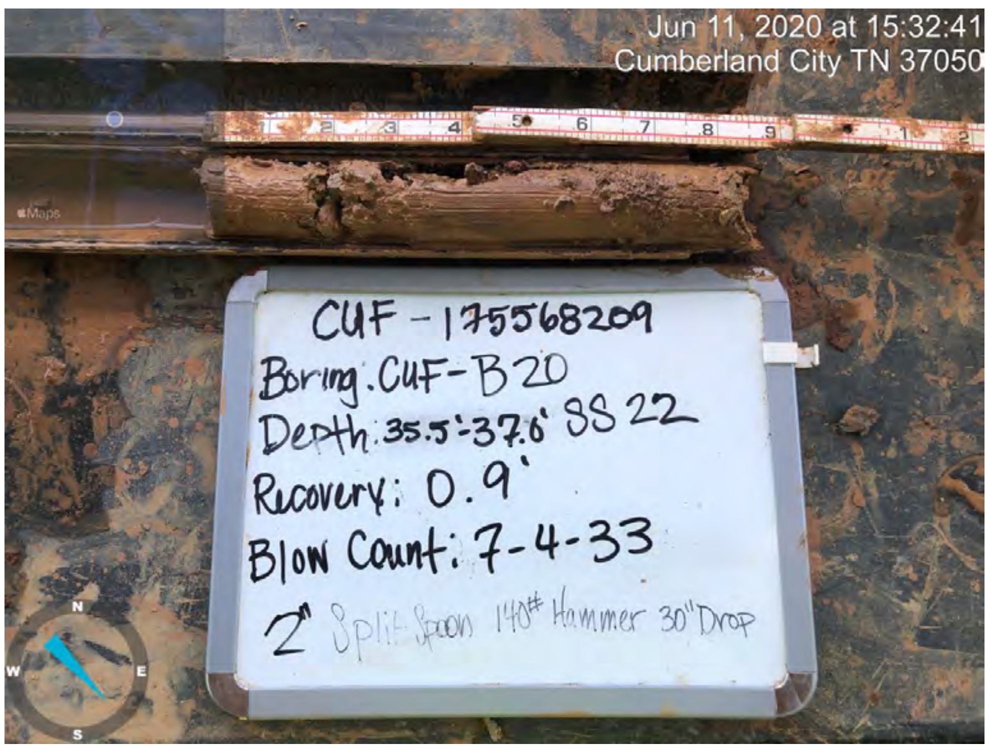
Comments:
Interval (34.0-35.5 feet)

Photograph ID: 98

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (35.5-37.0 feet)



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 99

Photo Location: CUF-B20

Photo Date: 6/11/2020

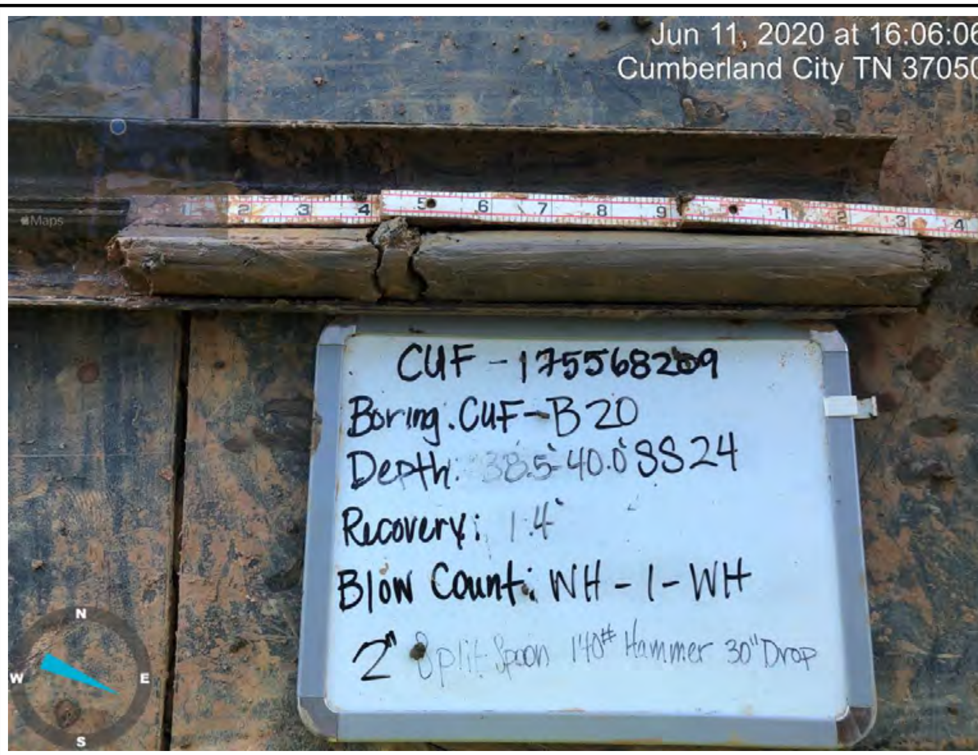
Comments: Interval (37.0-38.5 feet)

Photograph ID: 100

Photo Location: CUF-B20

Photo Date: 6/11/2020

Comments: Interval (38.5-40.0 feet)



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 101

Photo Location:
CUF-B20

Photo Date:
6/11/2020

Comments:
Interval (40.0-41.5 feet)

Photograph ID: 102

Photo Location:
CUF-B20

Photo Date:
6/12/2020

Comments:
Interval (41.5-43.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 103 **Photo Location:** CUF-B20 **Photo Date:** 6/12/2020 **Comments:** Interval (43.0-44.5 feet)	
Photograph ID: 104 **Photo Location:** CUF-B20 **Photo Date:** 6/12/2020 **Comments:** Interval (44.5-46.0 feet)	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 105 **Photo Location:** CUF-B20 **Photo Date:** 6/12/2020 **Comments:** Interval (46.0-47.5 feet)	
Photograph ID: 106 **Photo Location:** CUF-B20 **Photo Date:** 6/12/2020 **Comments:** Interval (47.5-49.0 feet)	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 107 **Photo Location:** CUF-B20 **Photo Date:** 6/12/2020 **Comments:** Interval (49.0-50.5 feet)	
Photograph ID: 108 **Photo Location:** CUF-B20 **Photo Date:** 6/15/2020 **Comments:** Interval (55.0-56.5 feet)	

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 109

Photo Location:
CUF-B20

Photo Date:
6/15/2020

Comments:
Interval (60.0-61.5 feet)

Photograph ID: 110

Photo Location:
CUF-B20

Photo Date:
6/15/2020

Comments:
Interval (65.0-66.5 feet)

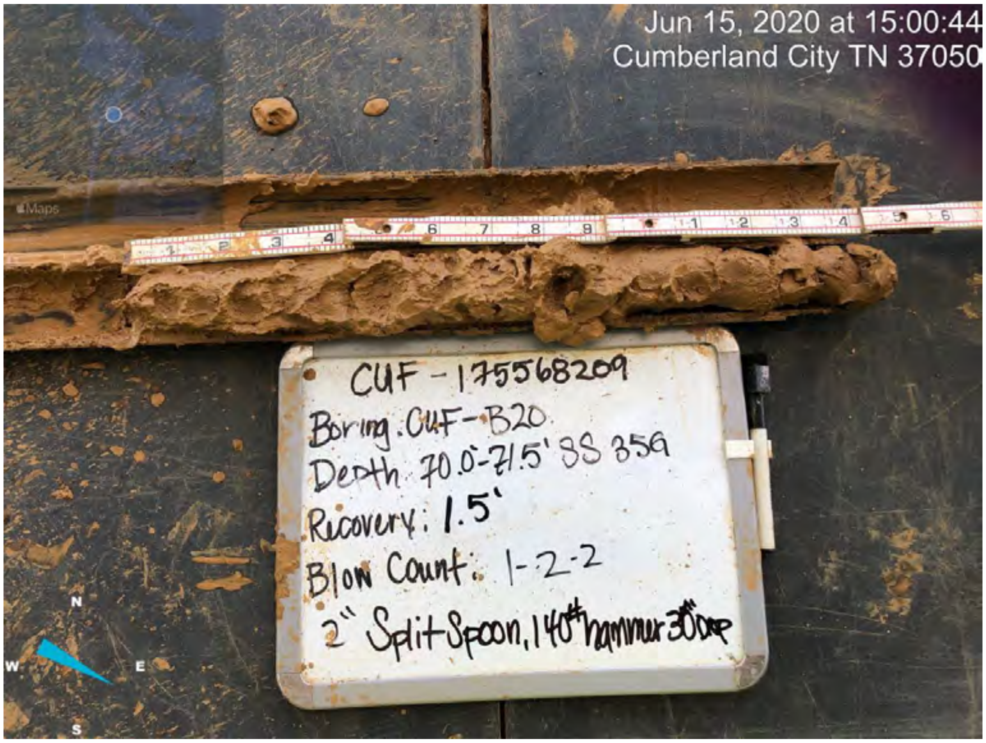
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 111

Photo Location:
CUF-B20

Photo Date:
6/15/2020

Comments:
Interval (70.0-71.5 feet)



Photograph ID: 112

Photo Location:
CUF-B20

Photo Date:
6/15/2020

Comments:
Interval (75.0-76.4 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 113

Photo Location: CUF-B21

Photo Date: 6/8/2020

Comments: Interval (0.0-1.5 feet)

Photograph ID: 114

Photo Location: CUF-B21

Photo Date: 6/8/2020

Comments: Interval (2.5-4.0 feet)

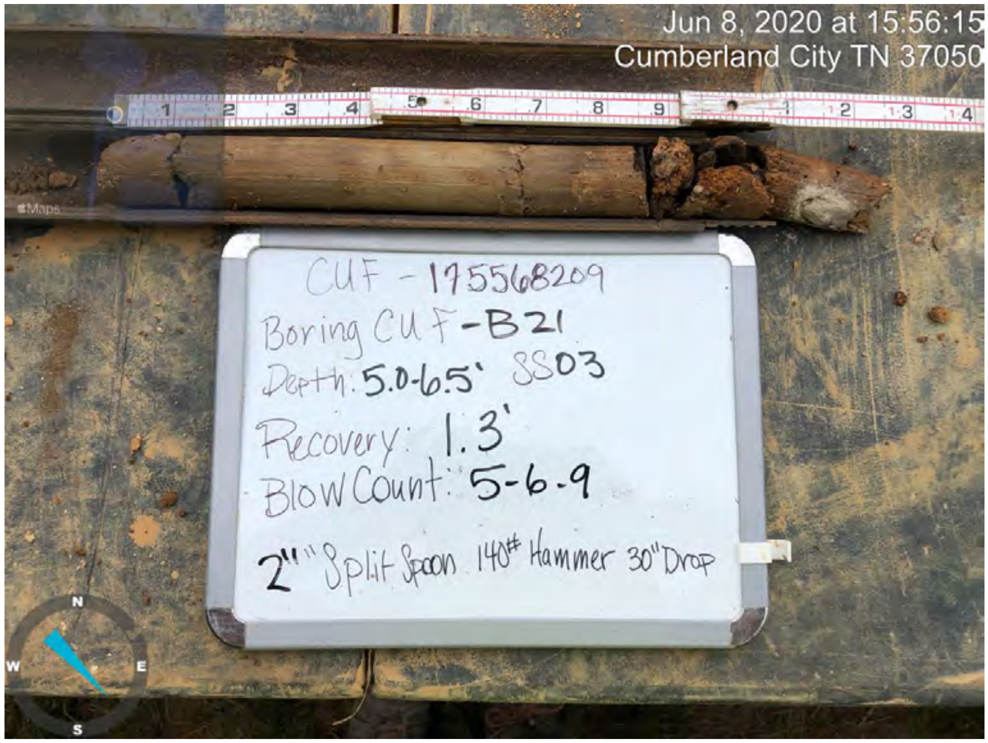
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 115

Photo Location:
CUF-B21

Photo Date:
6/8/2020

Comments:
Interval (5.0-6.5 feet)



Photograph ID: 116

Photo Location:
CUF-B21

Photo Date:
6/8/2020

Comments:
Interval (7.5-9.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 117

Photo Location:
CUF-B21

Photo Date:
6/8/2020

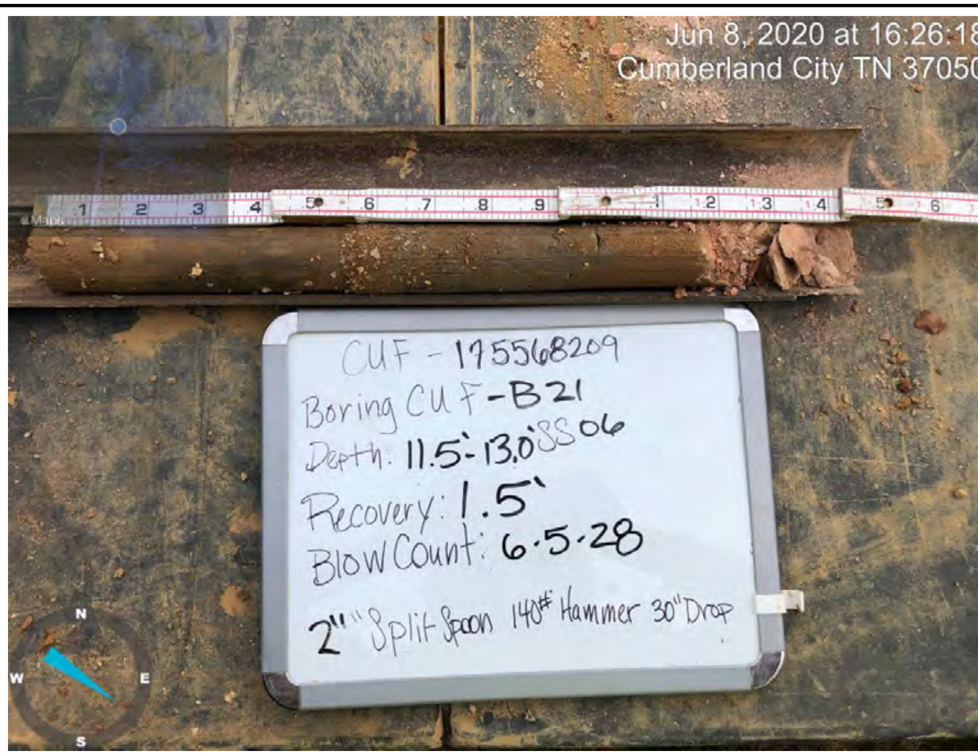
Comments:
Interval (10.0-11.5 feet)

Photograph ID: 118

Photo Location:
CUF-B21

Photo Date:
6/8/2020

Comments:
Interval (11.5-13.0 feet)



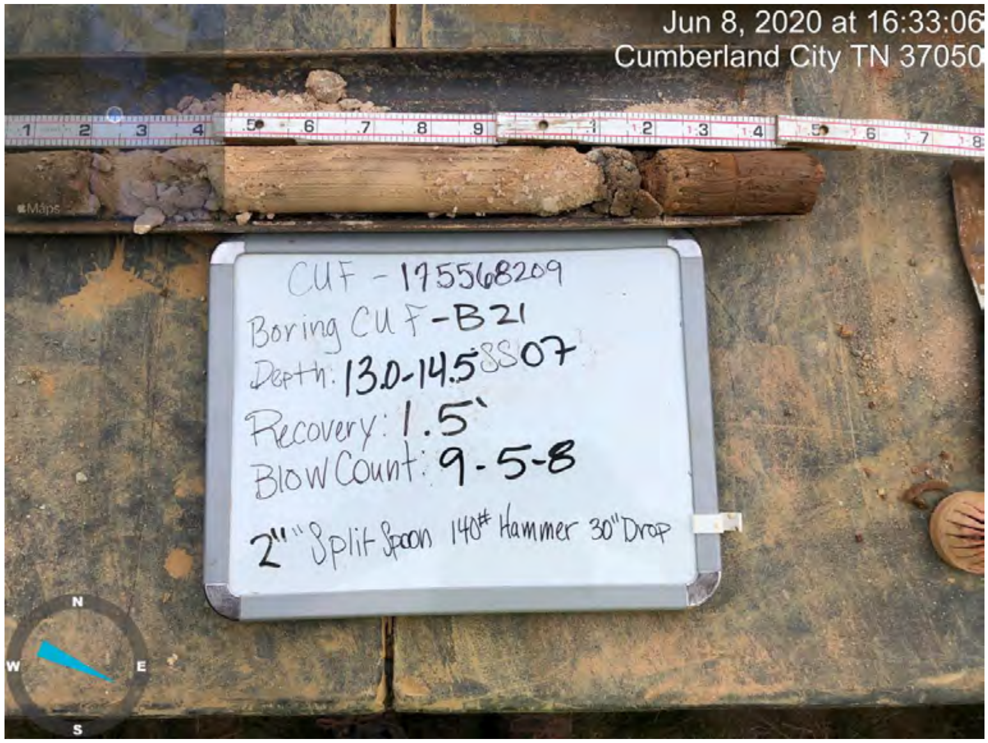
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 119

Photo Location: CUF-B21

Photo Date: 6/8/2020

Comments: Interval (13.0-14.5 feet)



Photograph ID: 120

Photo Location: CUF-B21

Photo Date: 6/8/2020

Comments: Interval (14.5-16.0 feet)

Stantec

Photographic Log

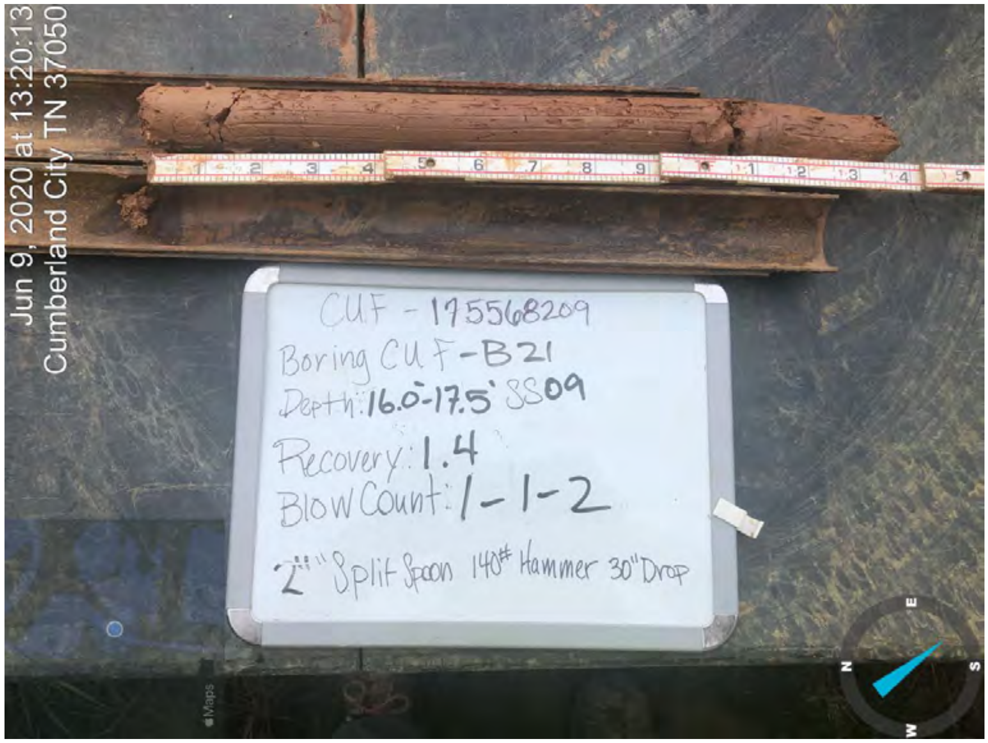
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 121

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (16.0-17.5 feet)



Photograph ID: 122

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (17.5-18.4 feet). Interval on shown on whiteboard should be 17.5-18.4 feet. Sampler refusal at 18.4 feet. Blow count on white board should be 1-50/0.4'

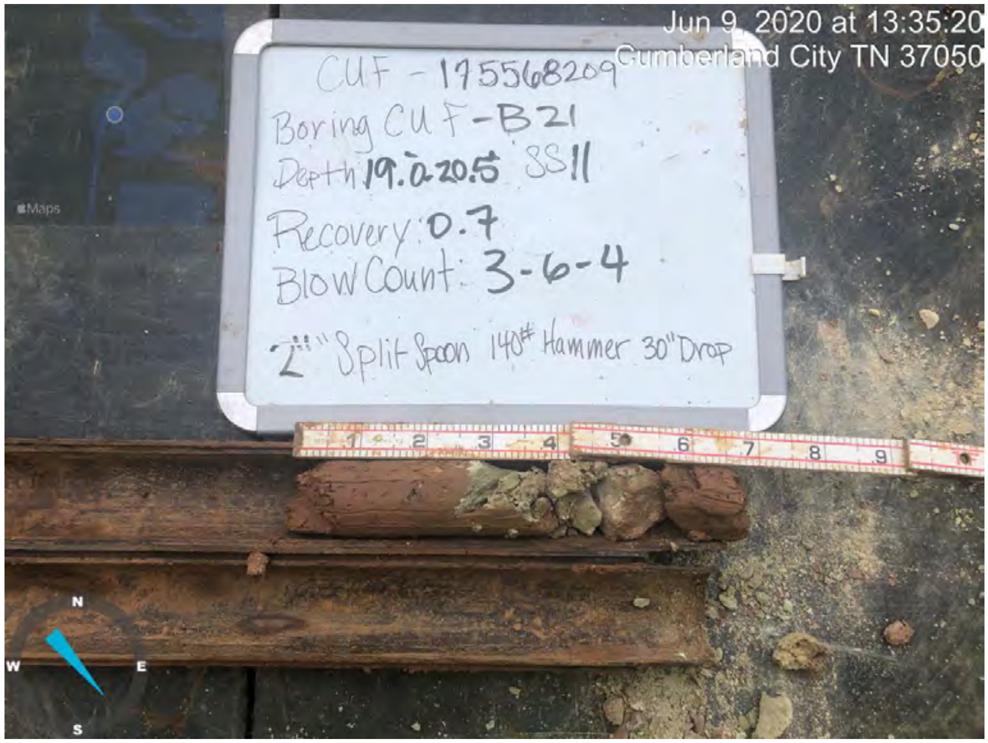
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 123

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (19.0-20.5 feet)

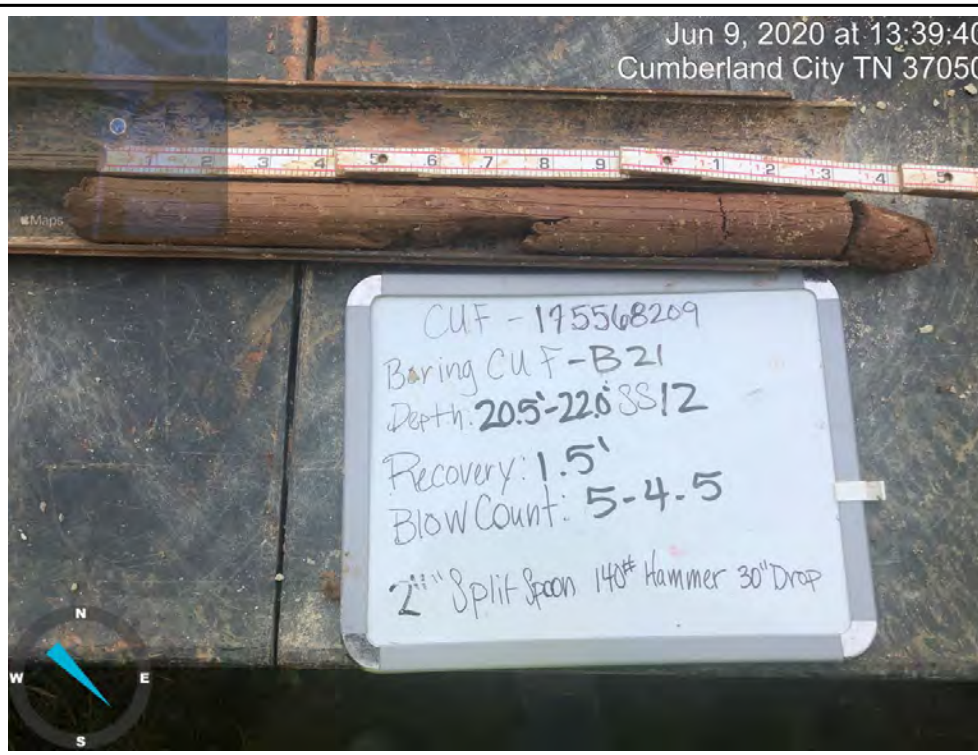


Photograph ID: 124

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (20.5-22.0 feet)



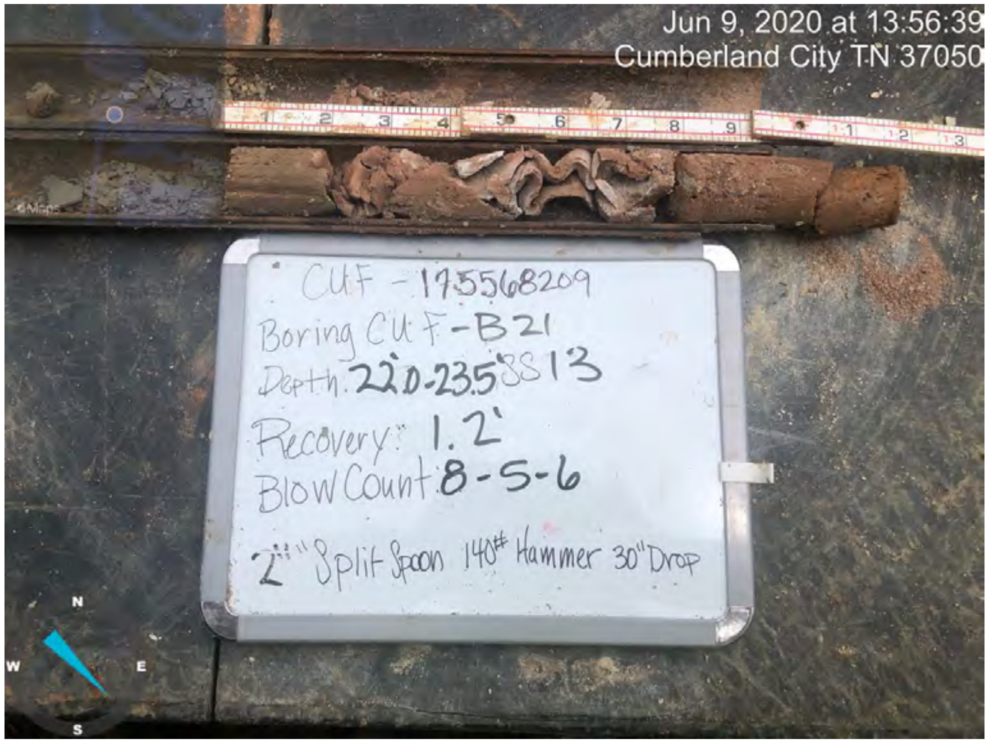
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 125

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (22.0-23.5 feet)

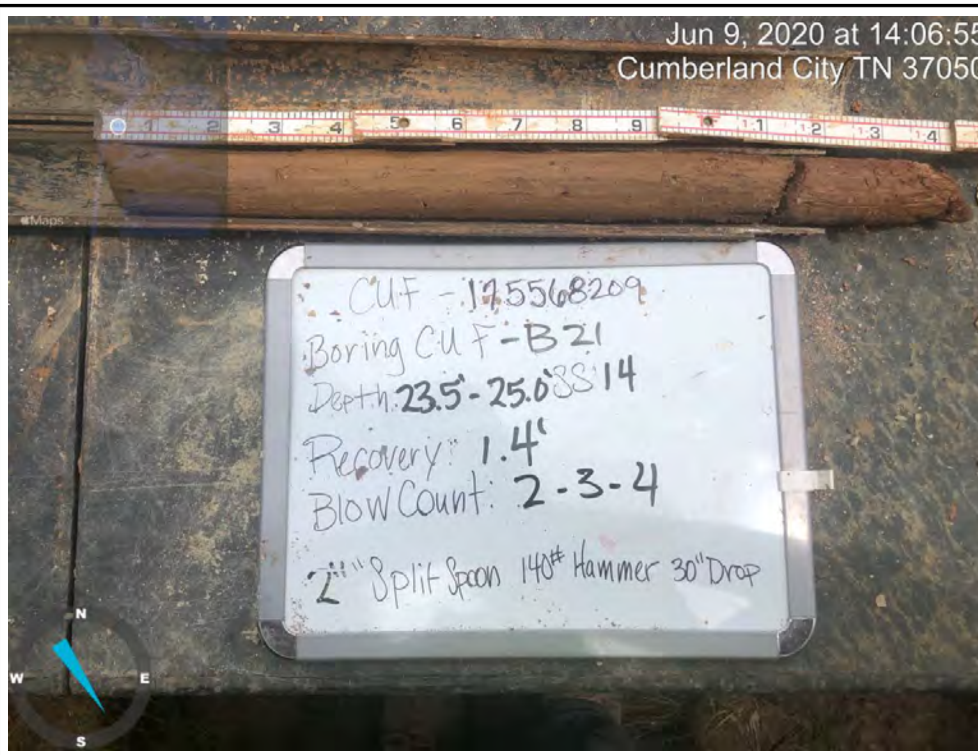


Photograph ID: 126

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (23.5-25.0 feet)



Stantec

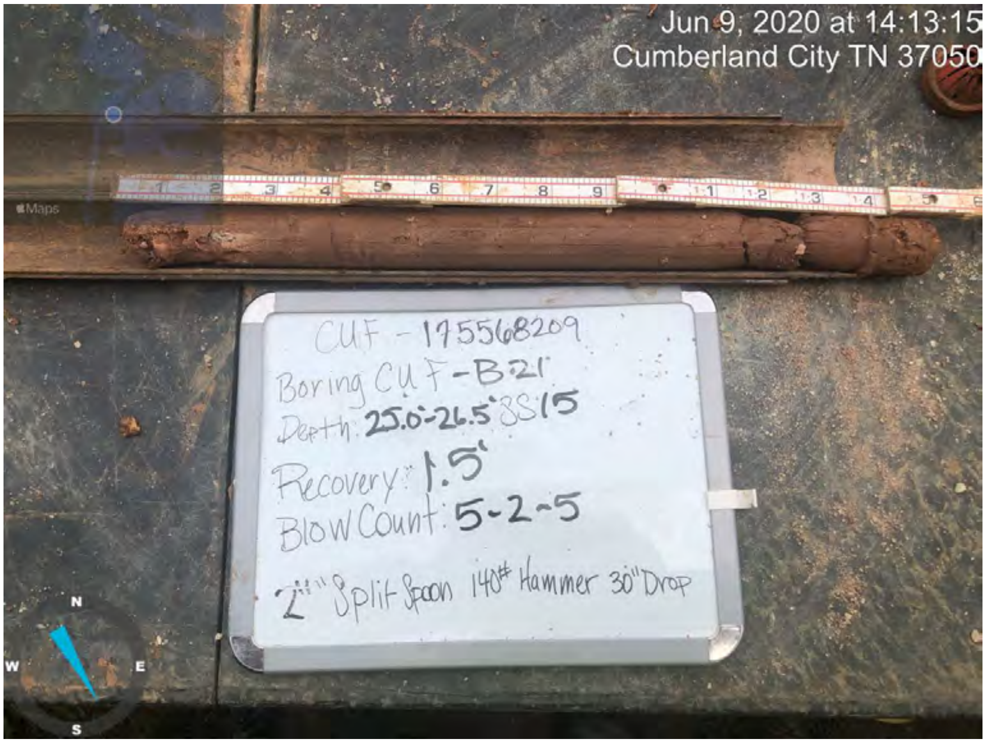
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 127

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (25.0-26.5 feet)

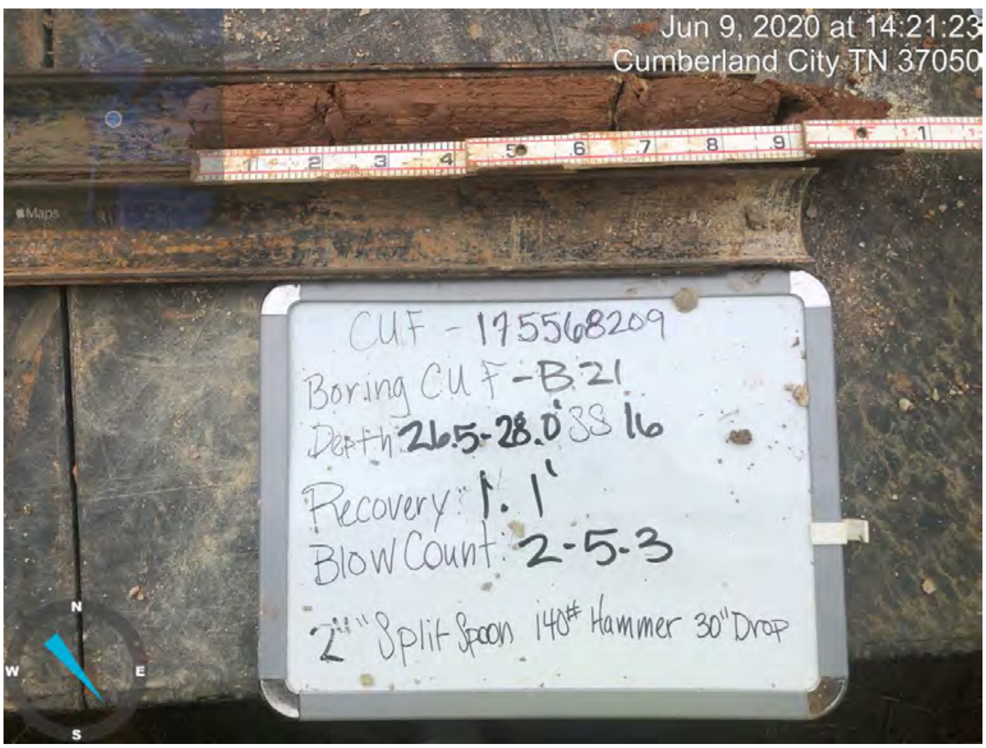


Photograph ID: 128

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (26.5-28.0 feet)



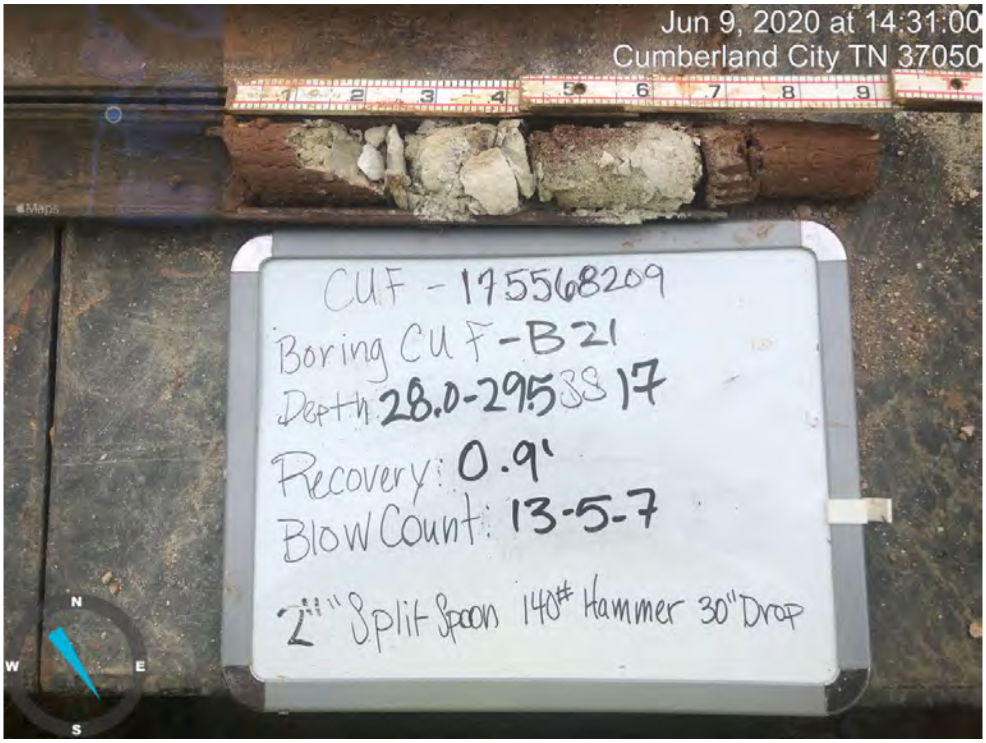
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 129

Photo Location: CUF-B21

Photo Date: 6/9/2020

Comments: Interval (28.0-29.5 feet)

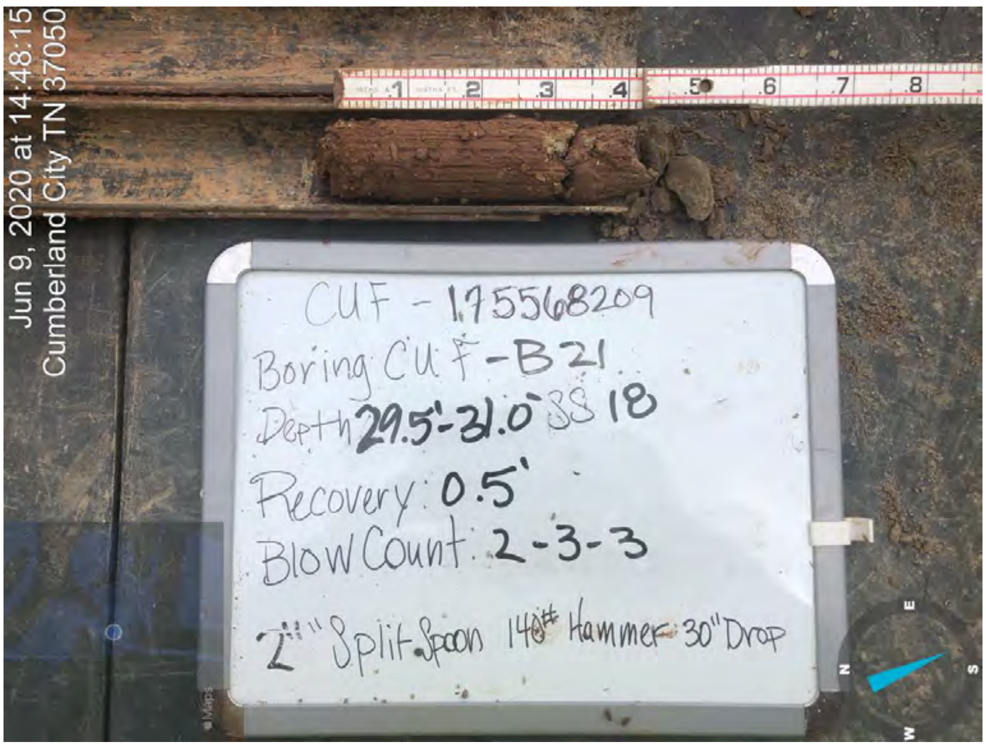


Photograph ID: 130

Photo Location: CUF-B21

Photo Date: 6/9/2020

Comments: Interval (29.5-31.0 feet)



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 131

Photo Location: CUF-B21

Photo Date: 6/9/2020

Comments: Interval (31.0-32.5 feet)

Photograph ID: 132

Photo Location: CUF-B21

Photo Date: 6/9/2020

Comments: Interval (32.5-34.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 133

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (34.0-35.5 feet)

Photograph ID: 134

Photo Location:
CUF-B21

Photo Date:
6/9/2020

Comments:
Interval (35.5-37.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 135

Photo Location: CUF-B21

Photo Date: 6/10/2020

Comments: Interval (37.0-38.5 feet)

Photograph ID: 136

Photo Location: CUF-B21

Photo Date: 6/10/2020

Comments: Interval (38.5-40.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 137 **Photo Location:** CUF-B21 **Photo Date:** 6/10/2020 **Comments:** Interval (40.0-41.5 feet)	
Photograph ID: 138 **Photo Location:** CUF-B21 **Photo Date:** 6/10/2020 **Comments:** Interval (41.5-43.0 feet)	

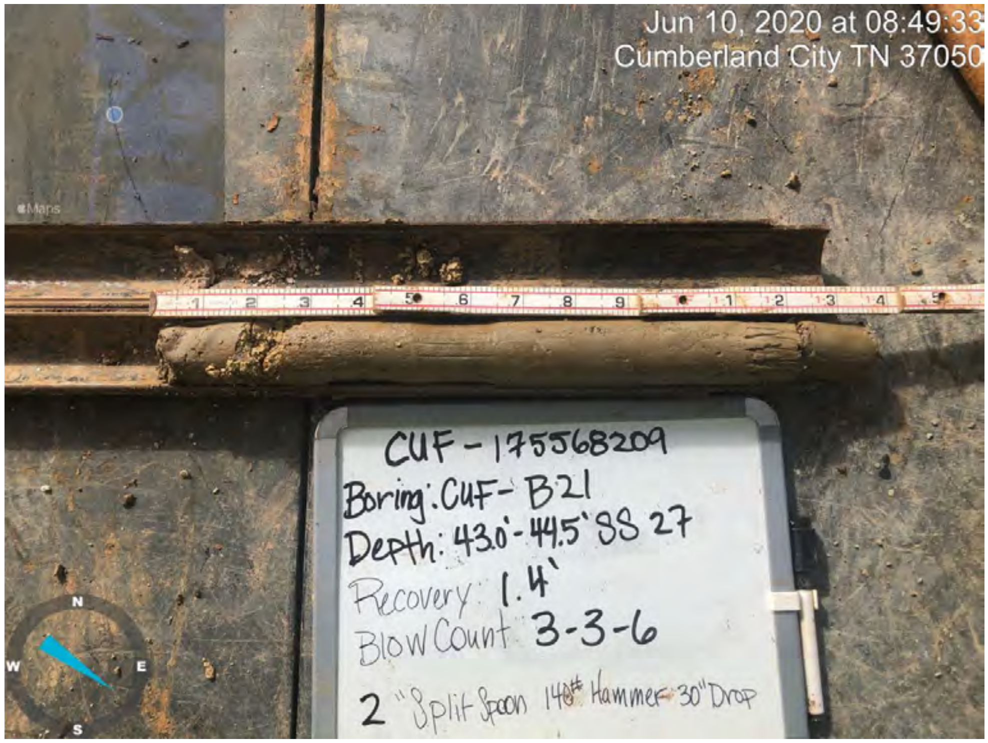
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 139

Photo Location:
CUF-B21

Photo Date:
6/10/2020

Comments:
Interval (43.0-44.5 feet)



Photograph ID: 140

Photo Location:
CUF-B21

Photo Date:
6/10/2020

Comments:
Interval (44.5-46.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 141

Photo Location:
CUF-B21

Photo Date:
6/10/2020

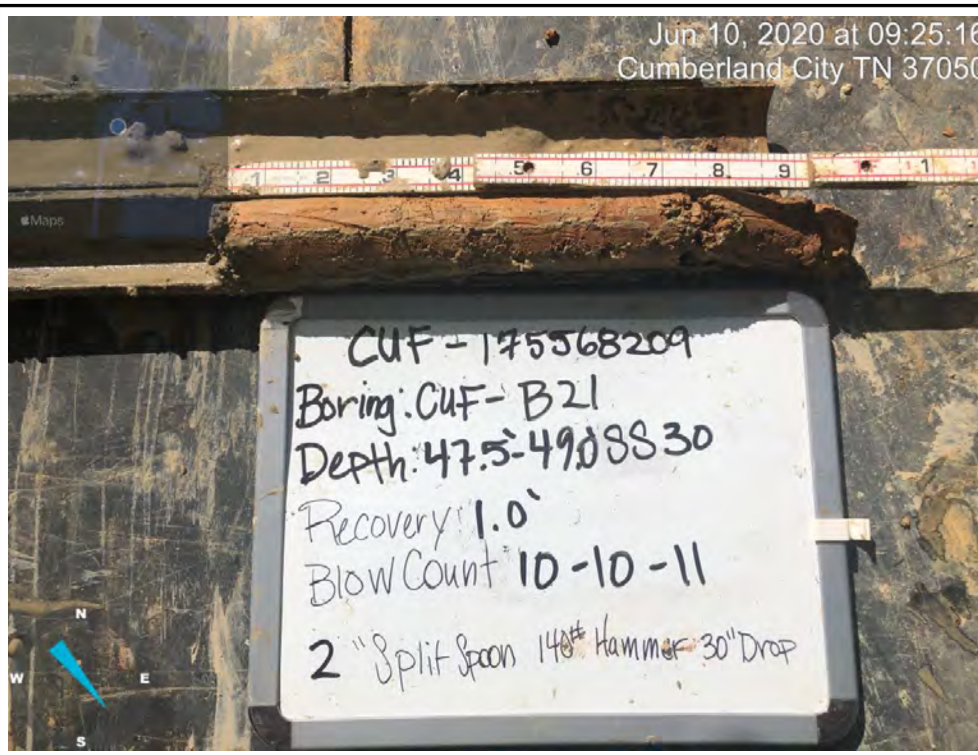
Comments:
Interval (46.0-47.5 feet)

Photograph ID: 142

Photo Location:
CUF-B21

Photo Date:
6/10/2020

Comments:
Interval (47.5-49.0 feet)



Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 143

Photo Location:
CUF-B21

Photo Date:
6/10/2020

Comments:
Interval (49.0-50.2 feet)

Photograph ID: 144

Photo Location:
CUF-B21

Photo Date:
6/10/2020

Comments:
Interval (55.0-56.5 feet). Sample identifier shown on white board should be SS32.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 145 **Photo Location:** CUF-B21 **Photo Date:** 6/10/2020 **Comments:** Interval (60.0-61.5 feet)	
Photograph ID: 146 **Photo Location:** CUF-B21 **Photo Date:** 6/10/2020 **Comments:** Interval (65.0-65.9 feet)	

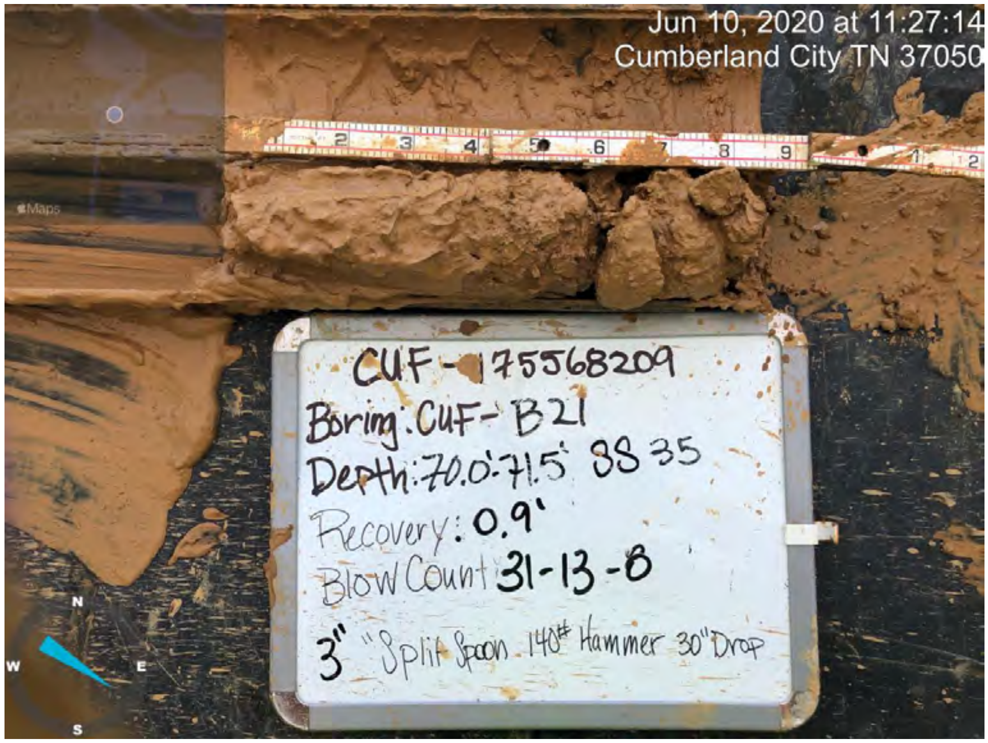
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 147

Photo Location: CUF-B21

Photo Date: 6/10/2020

Comments: Interval (70.0-71.5 feet)

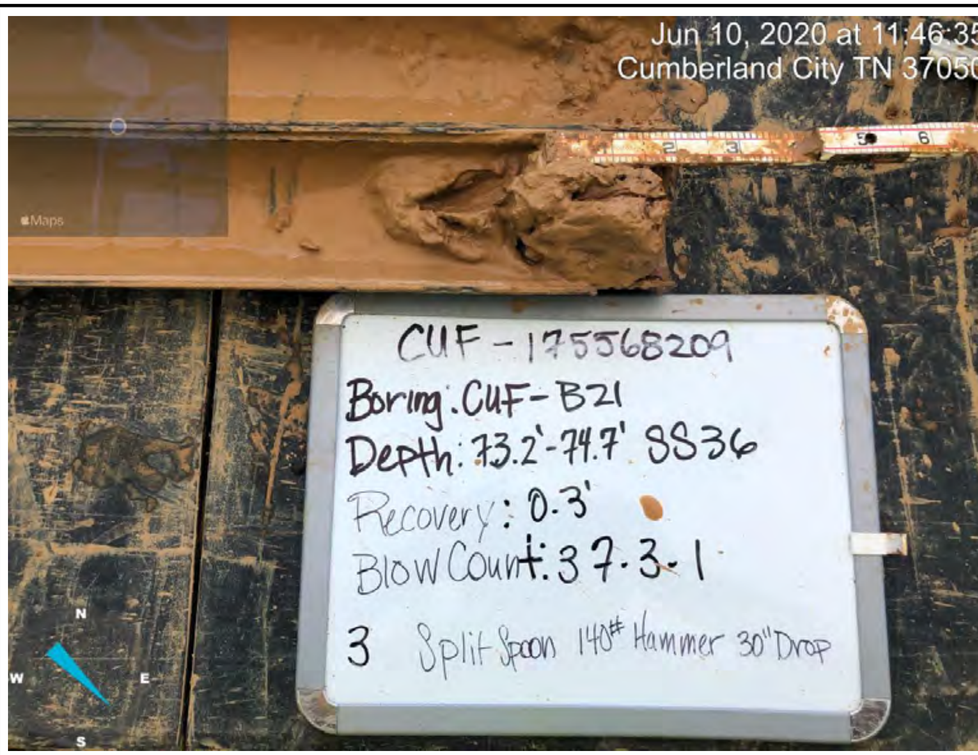


Photograph ID: 148

Photo Location: CUF-B21

Photo Date: 6/10/2020

Comments: Interval (73.2-74.7 feet)



Stantec

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 149

Photo Location: CUF-B21

Photo Date: 6/10/2020

Comments: Interval (75.0-76.5 feet)

Photograph ID: 150

Photo Location: CUF-B21

Photo Date: 6/10/2020

Comments: Interval (79.5-79.5) no recovery, photo unavailable.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 151

Photo Location:
CUF-B22

Photo Date:
6/3/2020

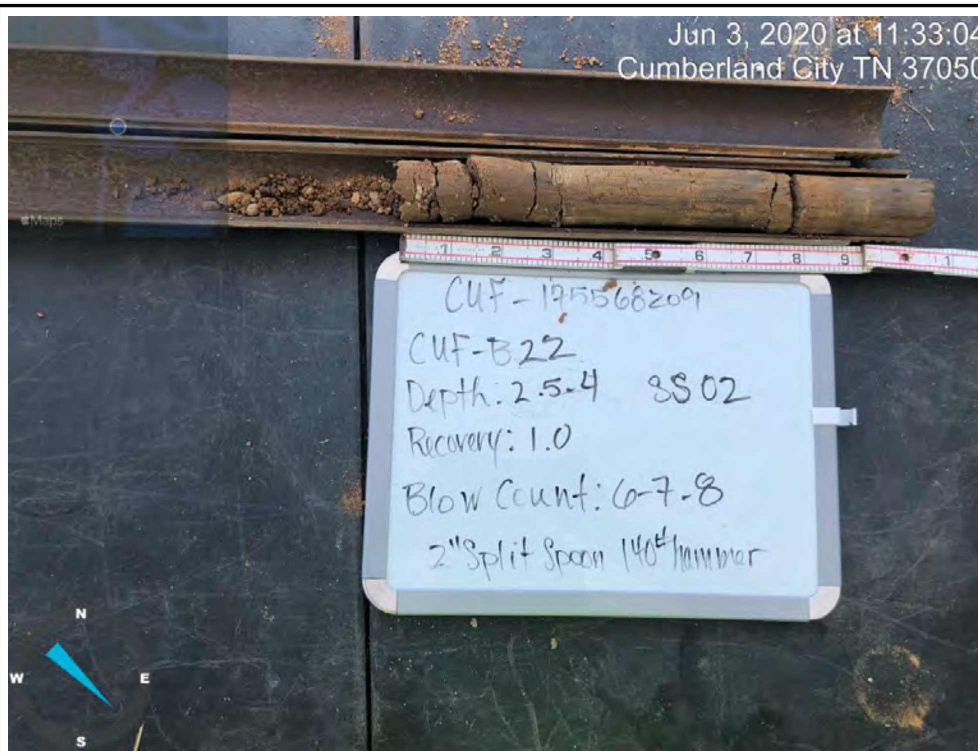
Comments:
Interval (0.0-1.5 feet). Recovery on white board should be 0.4'.

Photograph ID: 152

Photo Location:
CUF-B22

Photo Date:
6/3/2020

Comments:
Interval (2.5-4.0 feet)



Stantec

Photographic Log

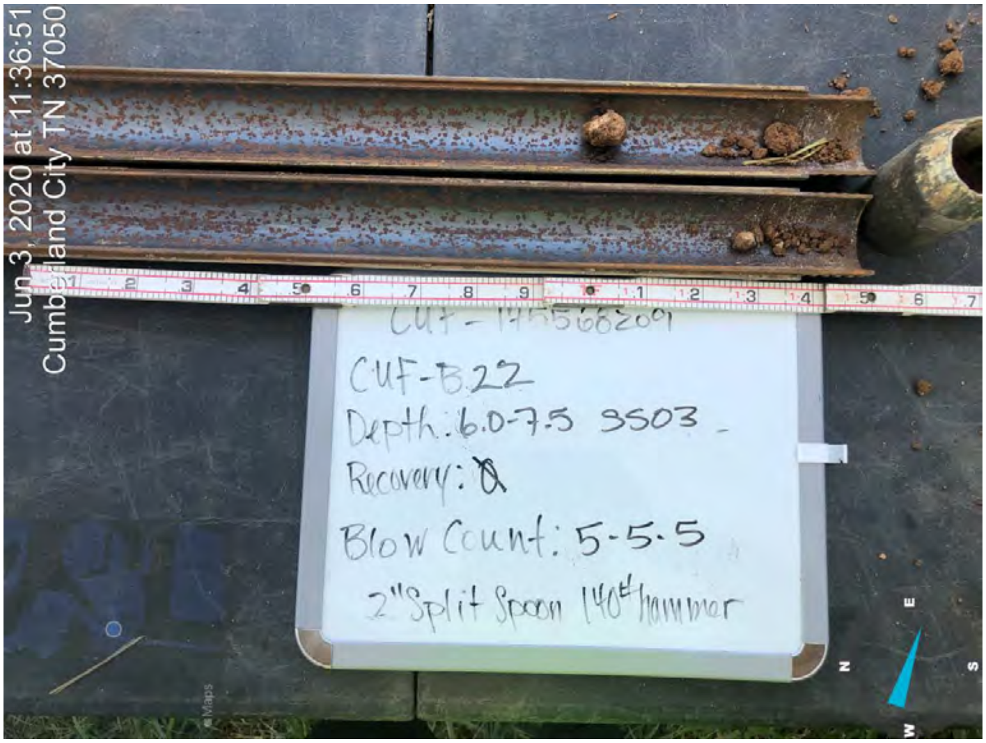
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 153

Photo Location: CUF-B22

Photo Date: 6/3/2020

Comments: Interval (5.0-6.5 feet). Interval on white board should be 5.0-6.5 feet.



Photograph ID: 154

Photo Location: CUF-B22

Photo Date: 6/3/2020

Comments: Interval (7.5-9.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 155 **Photo Location:** CUF-B22 **Photo Date:** 6/3/2020 **Comments:** Interval (10.0-11.5 feet)	
Photograph ID: 156 **Photo Location:** CUF-B22 **Photo Date:** 6/3/2020 **Comments:** Interval (11.5-13.0 feet)	

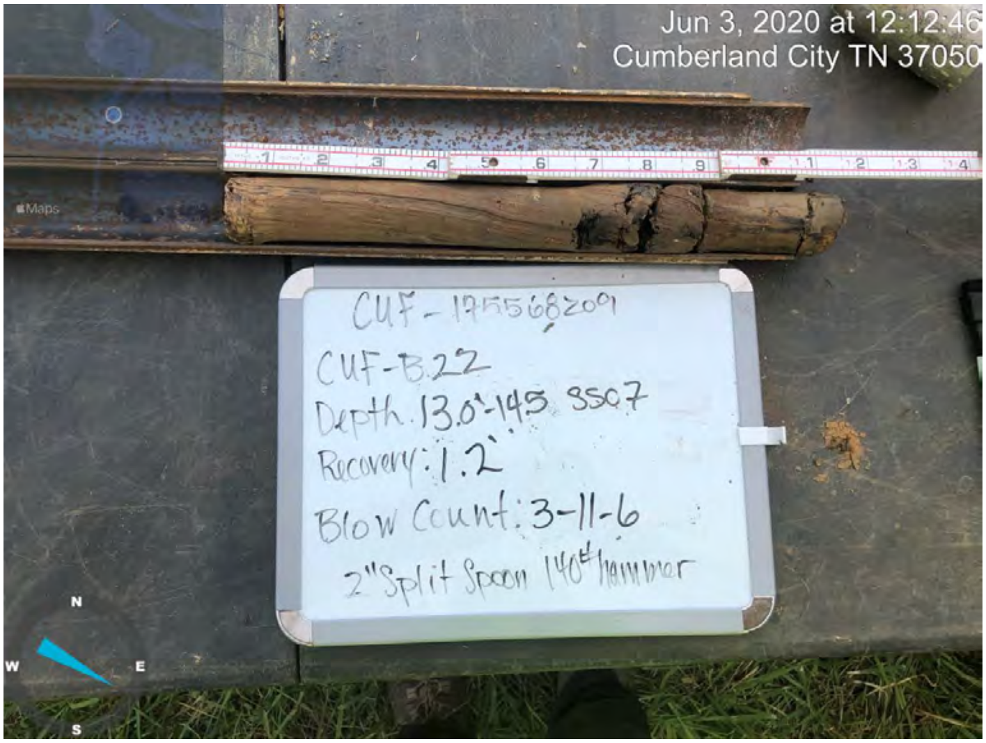
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 157

Photo Location:
CUF-B22

Photo Date:
6/3/2020

Comments:
Interval (13.0-14.5 feet)



Photograph ID: 158

Photo Location:
CUF-B22

Photo Date:
6/3/2020

Comments:
Interval (14.5-16.0 feet)

Stantec

Photographic Log

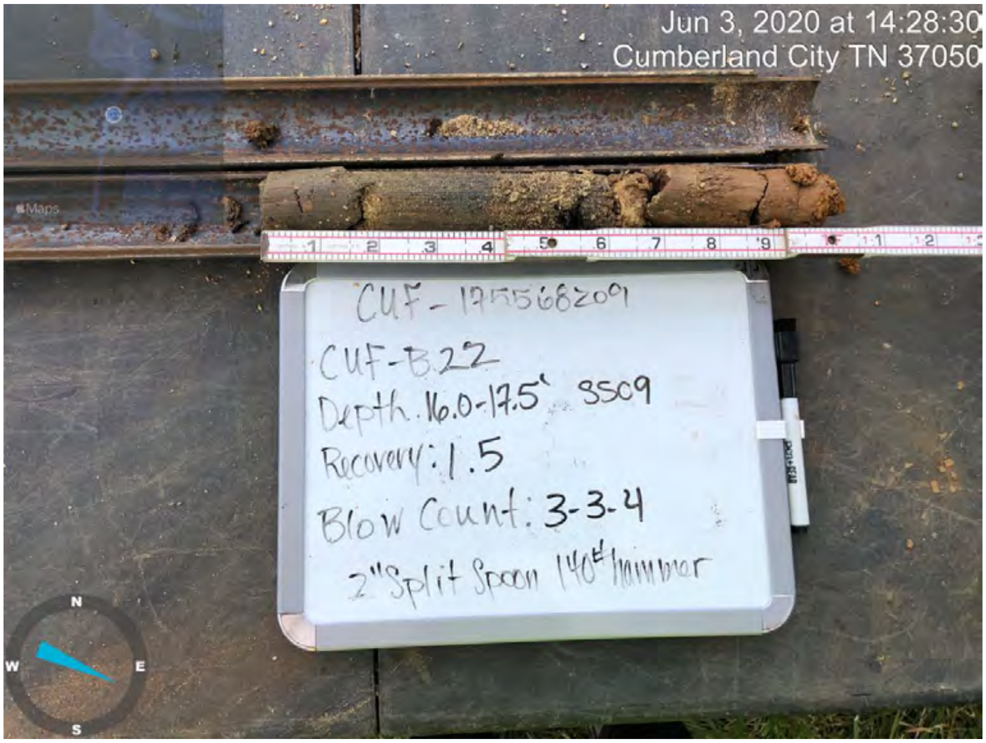
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 159

Photo Location:
CUF-B22

Photo Date:
6/3/2020

Comments:
Interval (16.0-17.5 feet). Recovery on white board should be 1.0'.



Photograph ID: 160

Photo Location:
CUF-B22

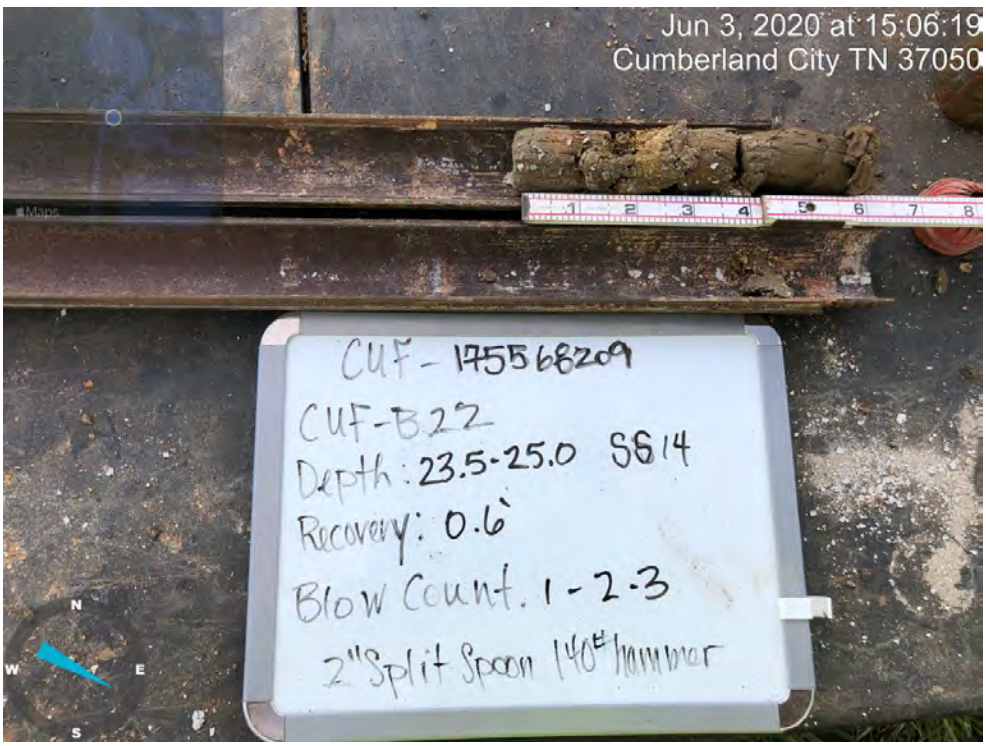
Photo Date:
6/3/2020

Comments:
Interval (17.5-19.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 161 **Photo Location:** CUF-B22 **Photo Date:** 6/3/2020 **Comments:** Interval (19.0-20.5 feet)	
Photograph ID: 162 **Photo Location:** CUF-B22 **Photo Date:** 6/3/2020 **Comments:** Interval (20.5-22.0 feet)	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 163 **Photo Location:** CUF-B22 **Photo Date:** 6/3/2020 **Comments:** Interval (22.0-23.5 feet). Recovery on white board should be 1.3'.	
Photograph ID: 164 **Photo Location:** CUF-B22 **Photo Date:** 6/3/2020 **Comments:** Interval (23.5-25.0 feet)	

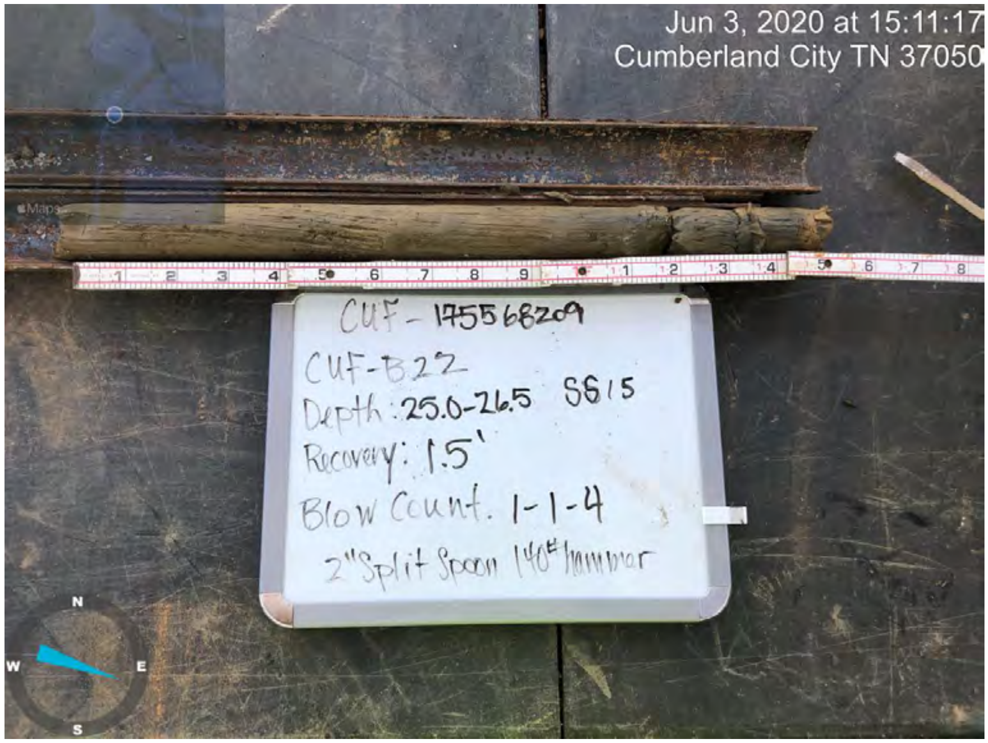
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 165

Photo Location:
CUF-B22

Photo Date:
6/3/2020

Comments:
Interval (25.0-26.5 feet)



Photograph ID: 166

Photo Location:
CUF-B22

Photo Date:
6/3/2020

Comments:
Interval (26.5-28.0 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 167

Photo Location: CUF-B22

Photo Date: 6/3/2020

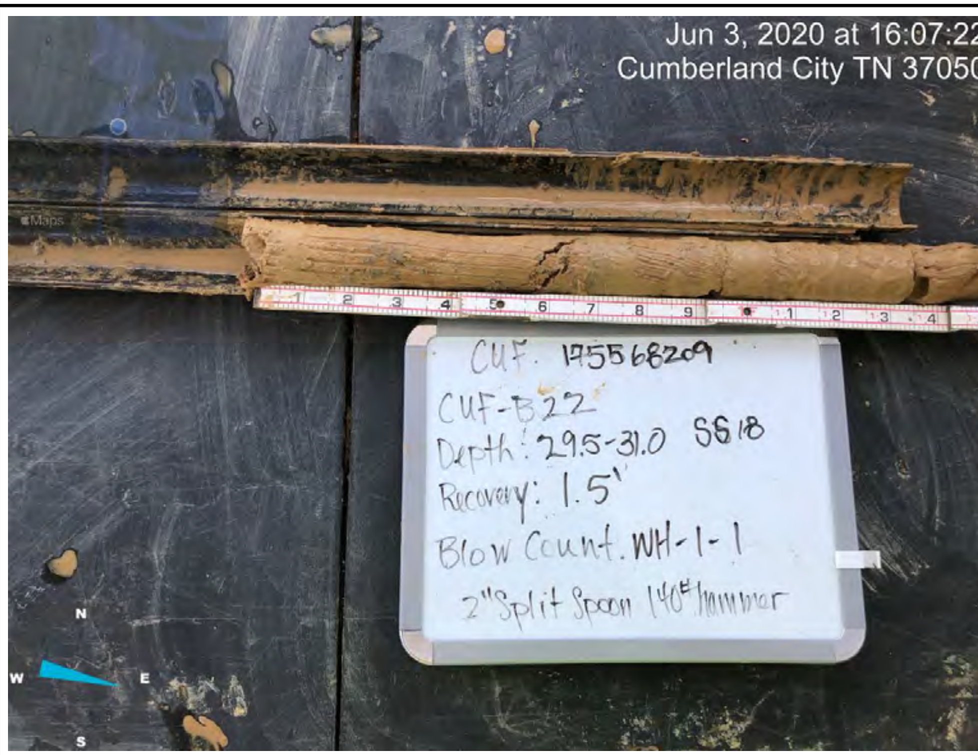
Comments: Interval (28.0-29.5 feet)

Photograph ID: 168

Photo Location: CUF-B22

Photo Date: 6/3/2020

Comments: Interval (29.5-31.0 feet)



Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 169 **Photo Location:** CUF-B22 **Photo Date:** 6/3/2020 **Comments:** Interval (31.0-32.5 feet)	
Photograph ID: 170 **Photo Location:** CUF-B22 **Photo Date:** 6/3/2020 **Comments:** Interval (32.5-34.0 feet)	

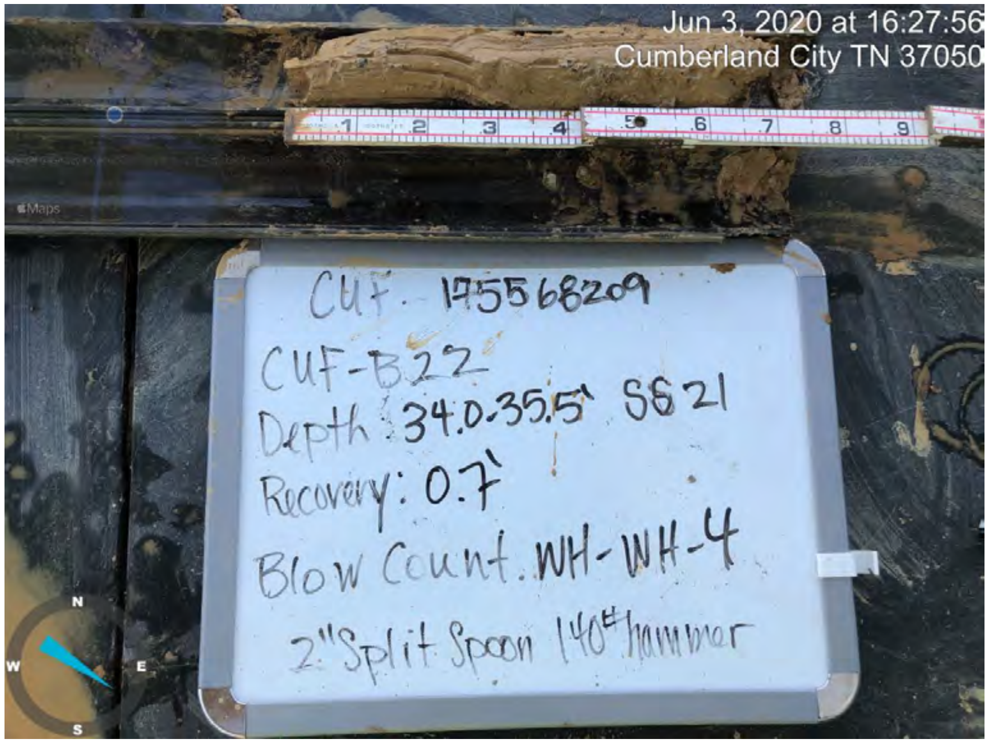
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 171

Photo Location: CUF-B22

Photo Date: 6/3/2020

Comments: Interval (34.0-35.5 feet)



Photograph ID: 172

Photo Location: CUF-B22

Photo Date: 6/4/2020

Comments: Interval (35.5-37.0 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 173

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (37.0-38.5 feet)

Photograph ID: 174

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (38.5-40.0 feet)

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 175

Photo Location:
CUF-B22

Photo Date:
6/4/2020

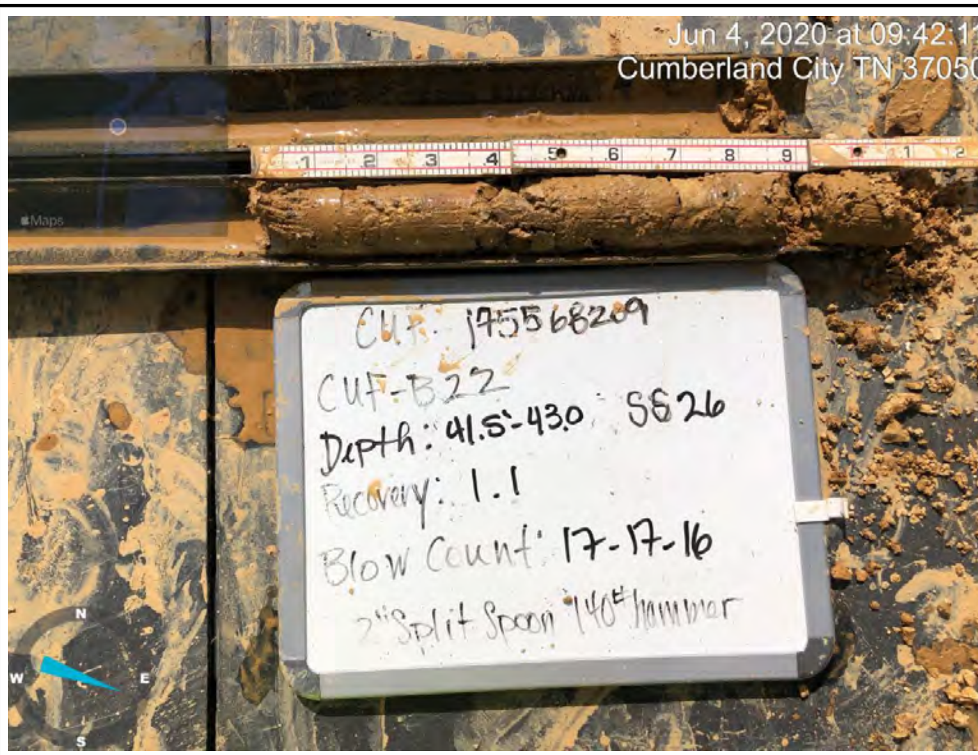
Comments:
Interval (40.0-41.5 feet)

Photograph ID: 176

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (41.5-43.0 feet)



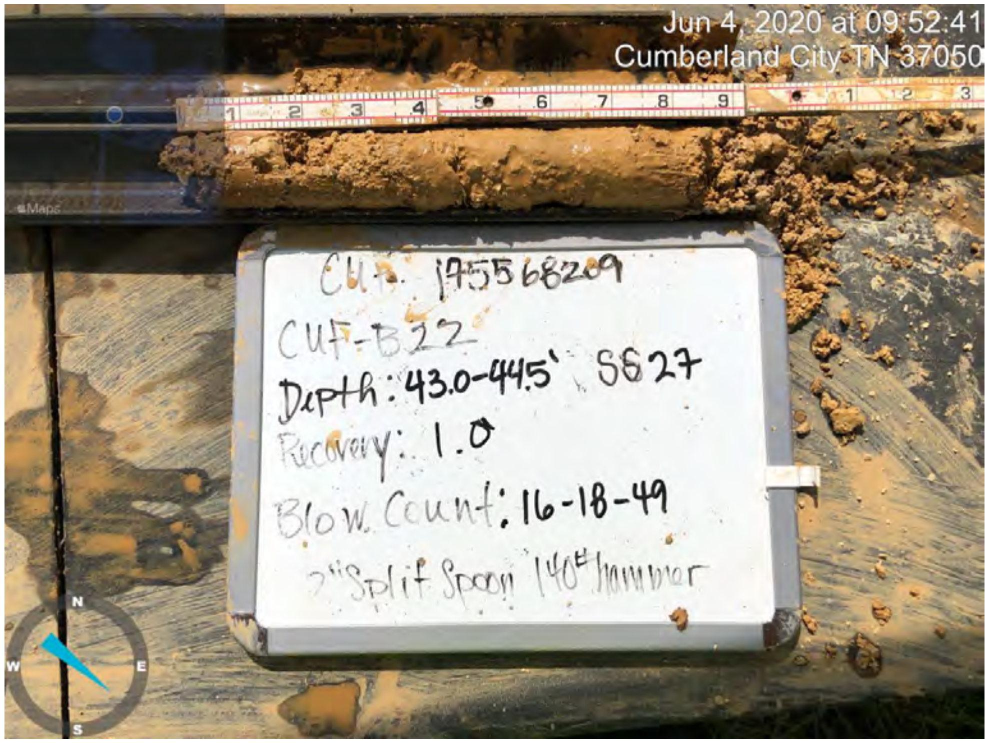
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 177

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (43.0-44.5 feet)

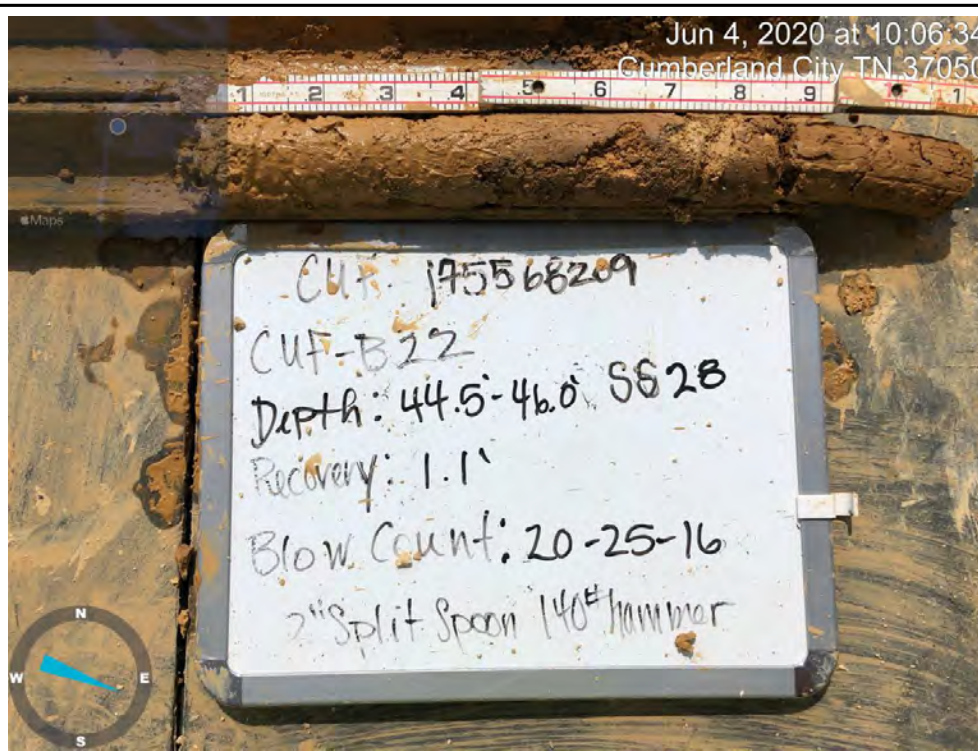


Photograph ID: 178

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (44.5-46.0 feet)



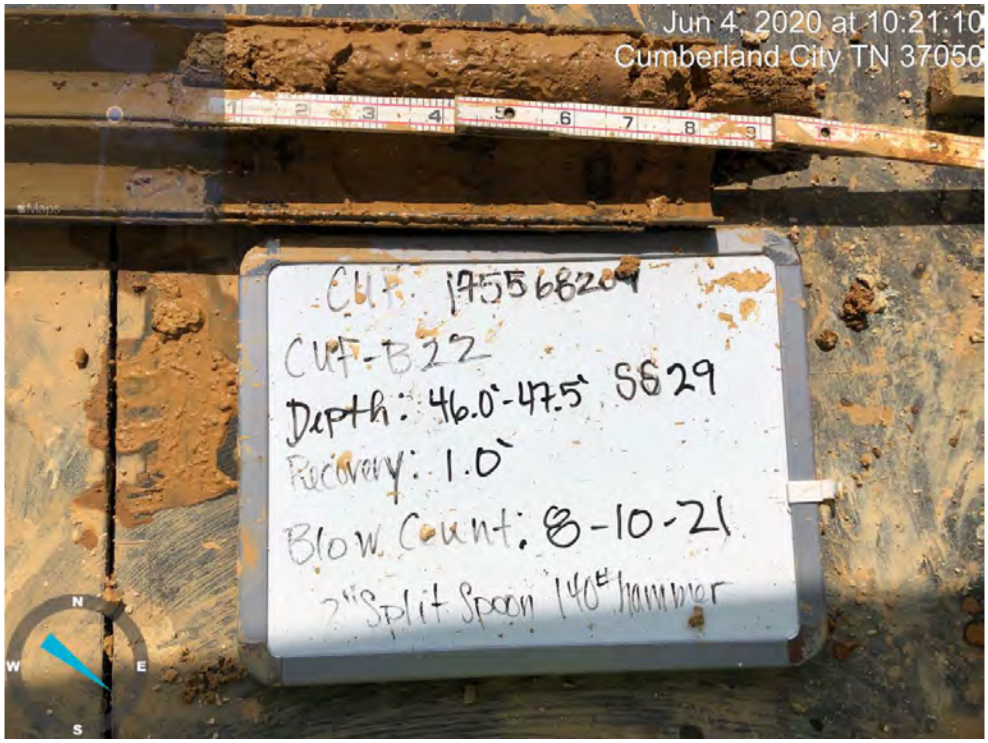
Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 179

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (46.0-47.5 feet)



Photograph ID: 180

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (47.5-48.9 feet)

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 181 **Photo Location:** CUF-B22 **Photo Date:** 6/4/2020 **Comments:** Interval (49.0-49.2 feet)	
Photograph ID: 182 **Photo Location:** CUF-B22 **Photo Date:** 6/4/2020 **Comments:** Interval (50.0-51.5 feet)	

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 183

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (55.0-56.5 feet)

Photograph ID: 184

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (60.0-61.5 feet)

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 185

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (65.0-66.5 feet)

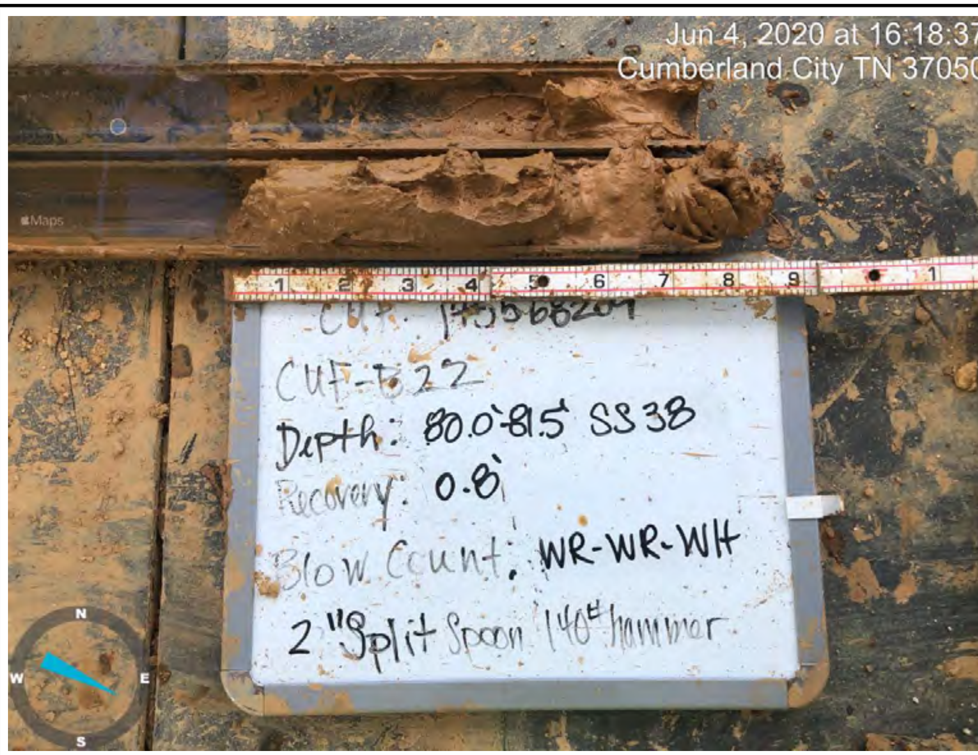
Photograph ID: 186

Photo Location:
CUF-B22

Photo Date:
6/4/2020

Comments:
Interval (70.0-71.5 feet). Photo of split spoon with sample unavailable.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 187 **Photo Location:** CUF-B22 **Photo Date:** 6/4/2020 **Comments:** Interval (75.0-76.5 feet)	
Photograph ID: 188 **Photo Location:** CUF-B22 **Photo Date:** 6/4/2020 **Comments:** Interval (80.0-81.5 feet)	

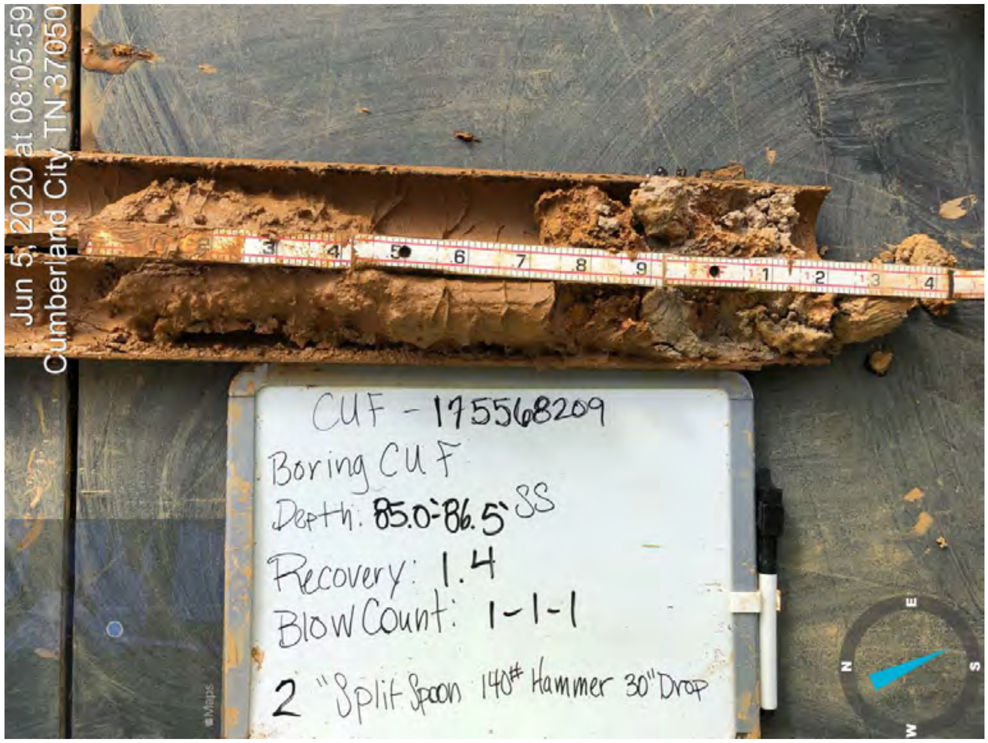
Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 189

Photo Location: CUF-B22

Photo Date: 6/5/2020

Comments: Interval (85.0-86.5 feet). Sample identifier shown on white board should be SS39.



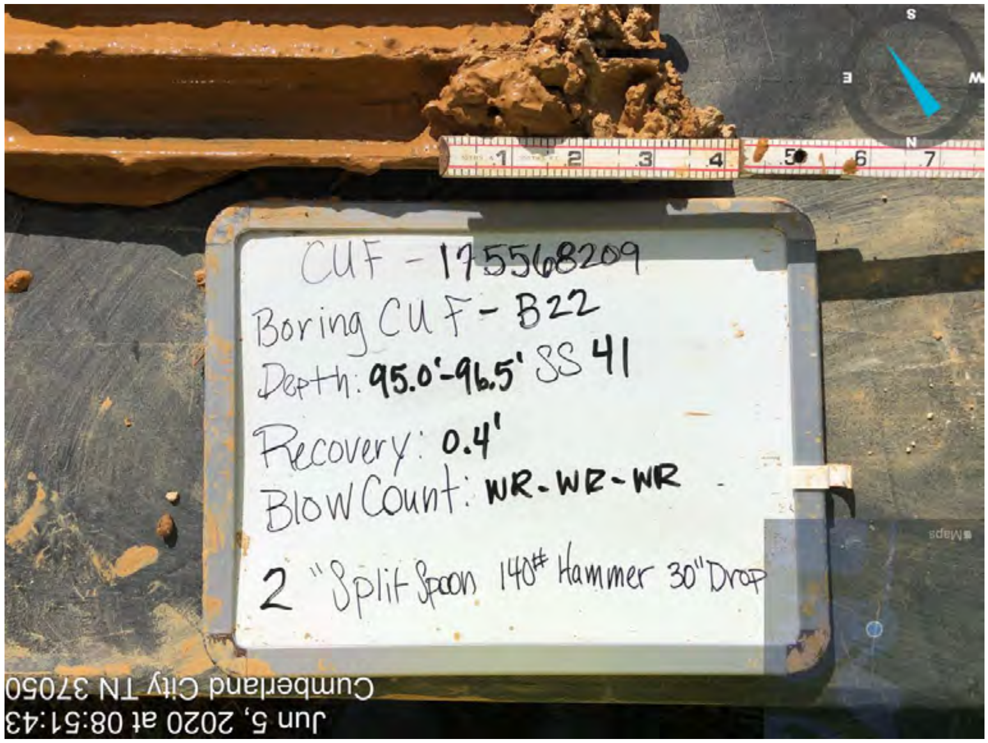
Photograph ID: 190

Photo Location: CUF-B22

Photo Date: 6/5/2020

Comments: Interval (90.0-91.5 feet)

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 191 **Photo Location:** CUF-B22 **Photo Date:** 6/5/2020 **Comments:** Interval (95.0-96.5 feet)	
Photograph ID: 192 **Photo Location:** CUF-B22 **Photo Date:** 6/5/2020 **Comments:** Interval (100.0-101.5 feet)	

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 193

Photo Location:
CUF-B22

Photo Date:
6/5/2020

Comments:
Interval (105.0-106.5 feet)

ATTACHMENT D.2

Photographic Log of Site Conditions, Temporary Wells, and Vibrating Wire Piezometers

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 1

Photo Location:
CUF-TW01

Photo Date:
1/12/2021

Comments:
Surface protection at CUF-TW01, looking east.

Photograph ID: 2

Photo Location:
CUF-TW03

Photo Date:
1/12/2021

Comments:
Surface protection at CUF-TW03, looking east.

Client:	**Tennessee Valley Authority**	**Project:**	**CUF TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 3

Photo Location: CUF-TW05

Photo Date: 1/12/2021

Comments: Surface protection at CUF-TW05, looking east.

Photograph ID: 4

Photo Location: CUF-TW07

Photo Date: 04/01/2019

Comments: Surface protection at CUF-TW07, looking west.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 5

Photo Location:
CUF-TW08

Photo Date:
04/01/2019

Comments:
Surface protection at CUF-TW08, looking west.

Photograph ID: 6

Photo Location:
CUF-TW09

Photo Date:
04/01/2019

Comments:
Surface protection at CUF-TW09, looking west.

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 7 **Photo Location:** CUF-B14 **Photo Date:** 1/12/2021 **Comments:** Typical surface protection for the VWPZ installation at CUF-B14, looking east.	
Photograph ID: 8 **Photo Location:** CUF-B15 **Photo Date:** 1/12/2021 **Comments:** Typical surface protection for the VWPZ installation at CUF-B15, looking south.	

Client:	Tennessee Valley Authority	Project:	CUF TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 9 **Photo Location:** CUF-B16 **Photo Date:** 04/01/2019 **Comments:** Typical surface protection for the VWPZ installation at CUF-B16, looking west.	
Photograph ID: 10 **Photo Location:** CUF-B17 **Photo Date:** 04/01/2019 **Comments:** Typical surface protection for the VWPZ installation at CUF-B17, looking west.	

APPENDIX E – IN-SITU TESTING RESULTS

ATTACHMENT E.1

Cone Penetration Testing Results

PRESENTATION OF SITE INVESTIGATION RESULTS

CUF TDEC Order – Cumberland City, TN

Prepared for:

Stantec Consulting Services Inc.

ConeTec Job No: 19-54002

Project Start Date: 08-Jan-2019
Project End Date: 23-Jan-2019
Report Date: 06-Feb-2019

Prepared by:

ConeTec Inc.
606-S Roxbury Industrial Center
Charles City, VA 23030

Tel: (804) 966-5696
Fax: (804) 966-5697

Email: virginia@conetec.com
www.conetec.com
www.conetecdataservices.com

Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Inc. for Stantec Consulting Services Inc. at Cumberland Fossil Plant in Cumberland City, TN. The program consisted of 33 cone penetration tests (CPTu) at locations selected and numbered under the direction of Stantec personnel. The purpose of the program was to evaluate existing site conditions.

Project Information

Project	
Client	Stantec Consulting Services Inc.
Project	CUF TDEC Order
ConeTec project number	19-54002

Coordinates will be provided by Stantec at a later date and will be added to the report as an addendum. A map from Cesium displaying the CPTu test locations will also be provided once the client has released the surveyed coordinates.

Rig Description	Deployment System	Test Type
20-Ton Track Rig	Integrated CPT Ramset	CPTu
25-Ton Truck Rig	Integrated CPT Ramset	CPTu

Coordinates		
Test Type	Collection Method	EPSG Number
CPTu	To be provided by the client	4326

Cone Penetration Test (CPT)	
Depth reference	Depths are referenced to the existing ground surface at the time of each test.
Tip and sleeve data offset	0.1 meter This has been accounted for in the CPT data files.
Additional plots	CPT scatter plots are provided for all locations.
Additional comments	Locations CPT17, 22, 24, and 25 were re-pushed due to concerns over muted dynamic pore pressure data.

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
555:T1500F15U500	EC555	15	225	1500	15	500
367:T1500F15U500	AD367	15	225	1500	15	500
The CPT summary indicates which cone was used for each sounding.						

Interpretation Tables	
Additional information	The Normalized Soil Behaviour Type (SBT Qtn) classification chart (Robertson, 2009) was used to classify the soil for this project. A detailed set of CPT interpretations were generated and are provided in Excel format files in the release folder. The CPT interpretations are based on values of corrected tip (q_t), sleeve friction (f_s) and pore pressure (u_2) measured every 2.5 cm. Soils were classified as either drained or undrained based on the Normalized Soil Behaviour Type (SBT Qtn) classification chart (Robertson, 2009).

Limitations

This report has been prepared for the exclusive use of Stantec Consulting Services Inc. (Client) for the project titled "CUF TDEC Order". The report's contents may not be relied upon by any other party without the express written permission of ConeTec Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

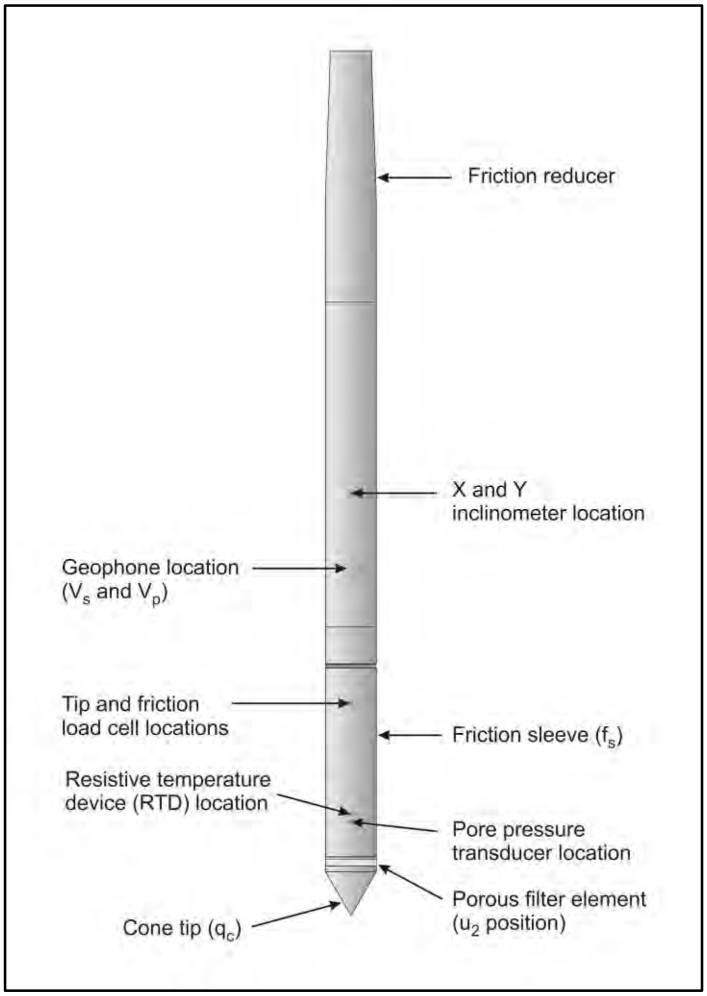


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

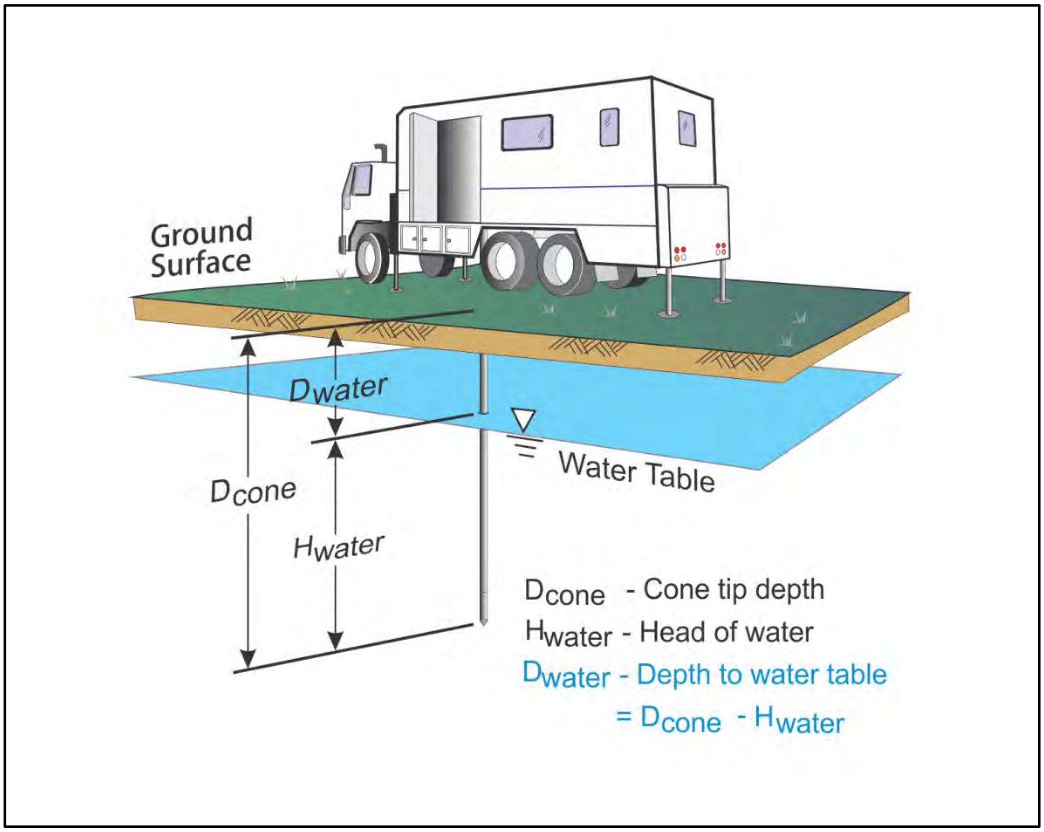


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

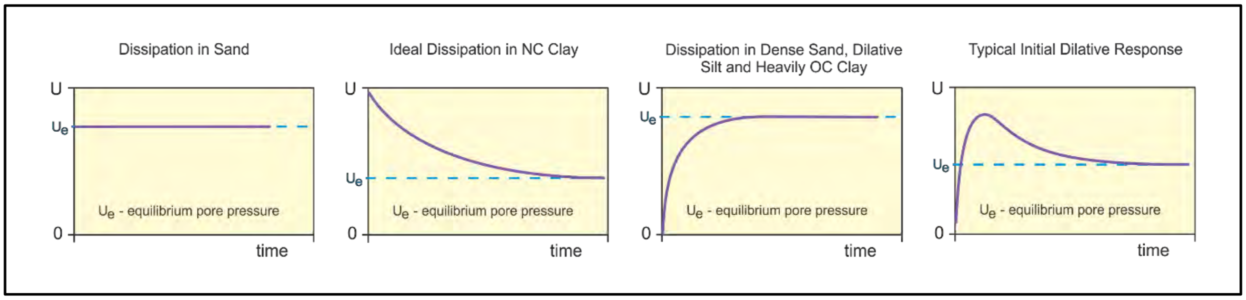


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

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Robertson, P.K., 1990, “Soil Classification Using the Cone Penetration Test”, Canadian Geotechnical Journal, Volume 27: 151-158.

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Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, “An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils”, Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, “An analytical study of the cone penetration test in clay”, Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Cone Penetration Test Scatter Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and

Standard Cone Penetration Test Plots

ConeTec

Job No: 19-54002
Client: Stantec Consulting Services Inc.
Project: CUF TDEC Order
Start Date: 08-Jan-2019
End Date: 23-Jan-2019

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[2] (ft)	Final Depth (ft)	Latitude[1] (degrees)	Longitude[1] (degrees)	Refer to Note
CPT01	19-54002_CPT01	10-Jan-2019	555:T1500F15U500	30	33.5			
CPT02	19-54002_CPT02	9-Jan-2019	555:T1500F15U500		19.9			3
CPT03	19-54002_CPT03	9-Jan-2019	555:T1500F15U500		23.1			3
CPT04	19-54002_CPT04	8-Jan-2019	555:T1500F15U500		21.0			3
CPT05	19-54002_CPT05	8-Jan-2019	555:T1500F15U500	25	32.8			
CPT06	19-54002_CPT06	9-Jan-2019	555:T1500F15U500	29	31.0			
CPT07	19-54002_CPT07	9-Jan-2019	555:T1500F15U500	27	33.8			
CPT08	19-54002_CPT08	22-Jan-2019	367:T1500F15U500	10	29.4			4
CPT09	19-54002_CPT09	22-Jan-2019	367:T1500F15U500	11	31.9			4
CPT10	19-54002_CPT10	22-Jan-2019	367:T1500F15U500	11	29.1			4
CPT11	19-54002_CPT11	21-Jan-2019	367:T1500F15U500	11	30.3			4
CPT12	19-54002_CPT12	21-Jan-2019	367:T1500F15U500	11	23.6			4, 5
CPT13	19-54002_CPT13	21-Jan-2019	367:T1500F15U500	11	33.1			4
CPT14	19-54002_CPT14	18-Jan-2019	367:T1500F15U500	10	74.0			4
CPT15	19-54002_CPT15	17-Jan-2019	367:T1500F15U500	10	43.1			4
CPT16	19-54002_CPT16	17-Jan-2019	367:T1500F15U500	10	43.4			4
CPT17	19-54002_CPT17	17-Jan-2019	367:T1500F15U500	10	42.8			4
CPT17a	19-54002_CPT17a	22-Jan-2019	367:T1500F15U500	9	41.4			4
CPT18	19-54002_CPT18	16-Jan-2019	367:T1500F15U500	9	25.9			4, 5
CPT19	19-54002_CPT19	16-Jan-2019	367:T1500F15U500	9	41.6			4
CPT20	19-54002_CPT20	16-Jan-2019	367:T1500F15U500	9	40.5			4, 5

Job No:	19-54002
Client:	Stantec Consulting Services Inc.
Project:	CUF TDEC Order
Start Date:	08-Jan-2019
End Date:	23-Jan-2019

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[2] (ft)	Final Depth (ft)	Latitude[1] (degrees)	Longitude[1] (degrees)	Refer to Note
CPT21	19-54002_CPT21	16-Jan-2019	367:T1500F15U500	10	23.3			4, 5
CPT22	19-54002_CPT22	15-Jan-2019	367:T1500F15U500	10	44.7			4
CPT22a	19-54002_CPT22a	23-Jan-2019	367:T1500F15U500	9	42.4			4
CPT23	19-54002_CPT23	14-Jan-2019	367:T1500F15U500	10	42.3			4
CPT24	19-54002_CPT24	15-Jan-2019	367:T1500F15U500	10	20.3			4, 5
CPT24a	19-54002_CPT24a	23-Jan-2019	367:T1500F15U500	10	21.6			4, 5
CPT25	19-54002_CPT25	15-Jan-2019	367:T1500F15U500	10	77.5			4, 5
CPT25a	19-54002_CPT25a	23-Jan-2019	367:T1500F15U500	9	41.3			4
CPT26	19-54002_CPT26	16-Jan-2019	367:T1500F15U500	10	20.7			4, 5
CPT27	19-54002_CPT27	10-Jan-2019	555:T1500F15U500		19.4			3
CPT28	19-54002_CPT28	11-Jan-2019	555:T1500F15U500		23.1			3
CPT29	19-54002_CPT29	10-Jan-2019	555:T1500F15U500		18.9			3
Totals	33 Soundings				1120.7			

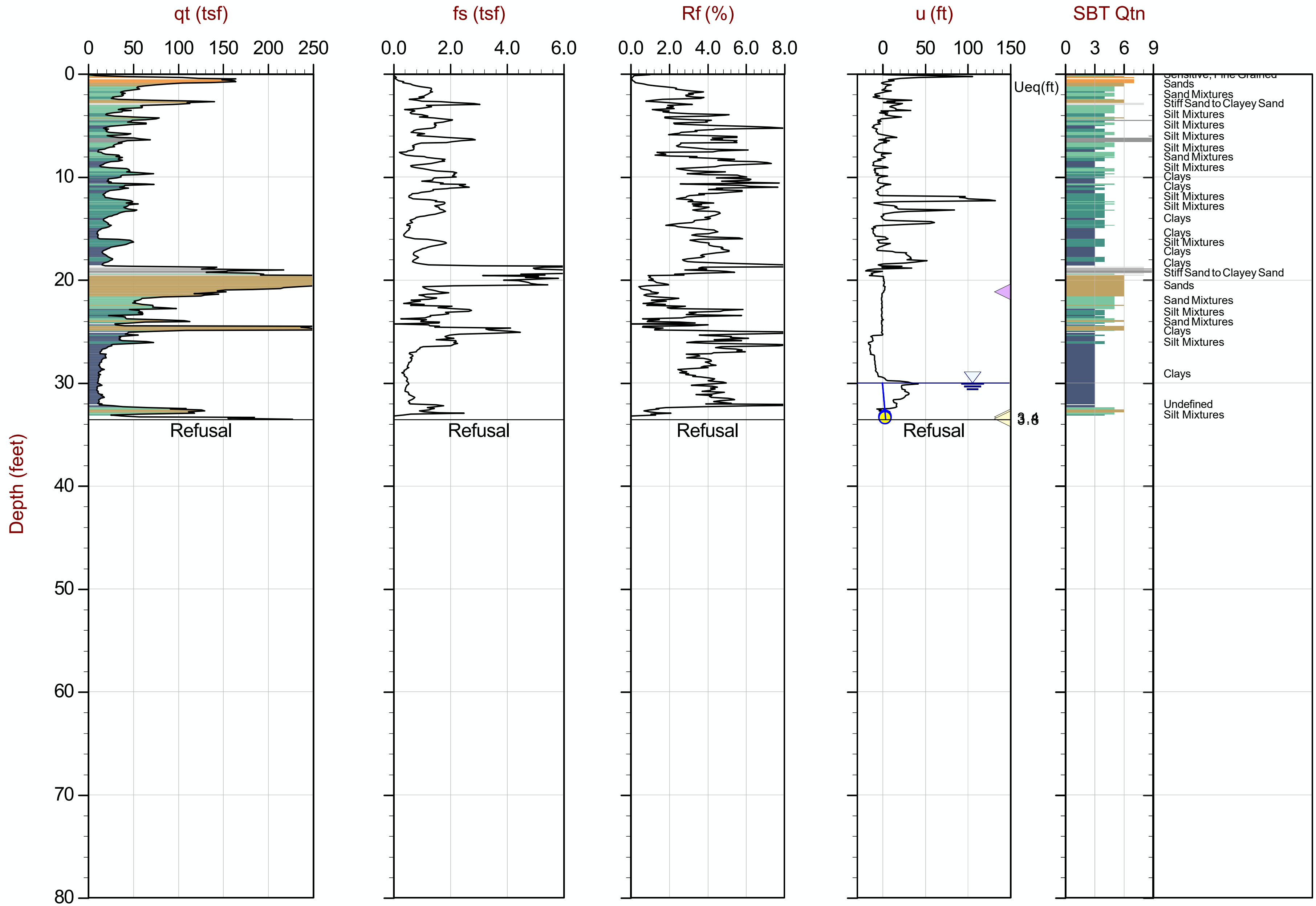
1. Coordinates will be provided by Stantec Consulting Services Inc. at a later date, and will be added to the report as an addendum.
2. The assumed phreatic surface was estimated using representative pore pressure dissipation tests. Hydrostatically increasing pore water pressures with depth were used for interpretation tables.
3. The phreatic surface was assumed not to be encountered within exploration depth.
4. Pore pressure dissipation tests indicate the presence of perched water. The perched water level was used for data processing purposes.
5. The assumed phreatic surface was estimated from dissipation data collected at nearby CPT locations.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-10 09:08
Site: CUF TDEC Order

Sounding: CPT01
Cone: 555:T1500F15U500



Max Depth: 10.225 m / 33.55 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT01.COR
Unit Wt: SBTQtn (PKR2009)

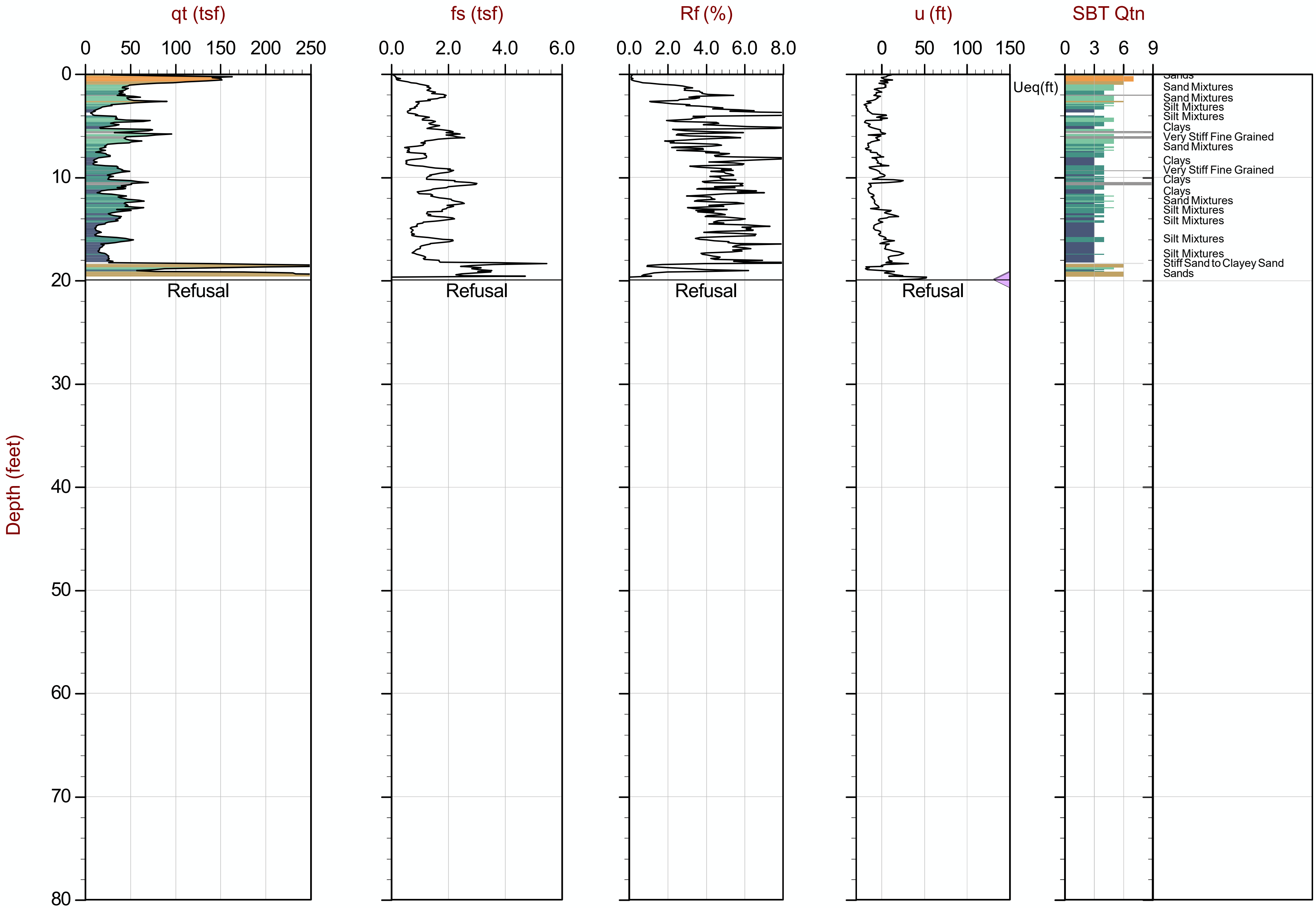
SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-09 15:43
Site: CUF TDEC Order
Sounding: CPT02
Cone: 555:T1500F15U500



Max Depth: 6.075 m / 19.93 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

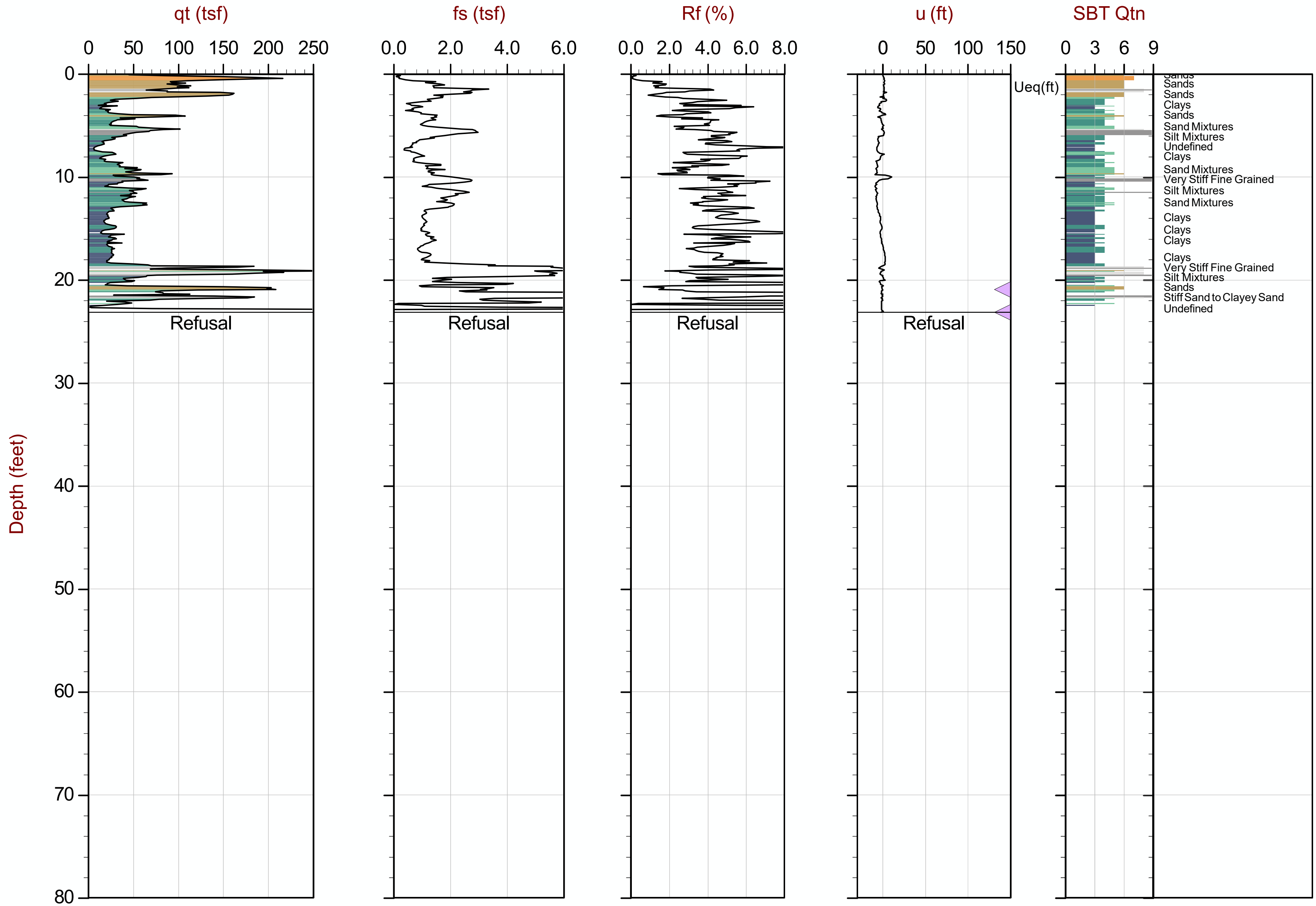
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-09 14:37
Site: CUF TDEC Order

Sounding: CPT03
Cone: 555:T1500F15U500



Max Depth: 7.050 m / 23.13 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT03.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

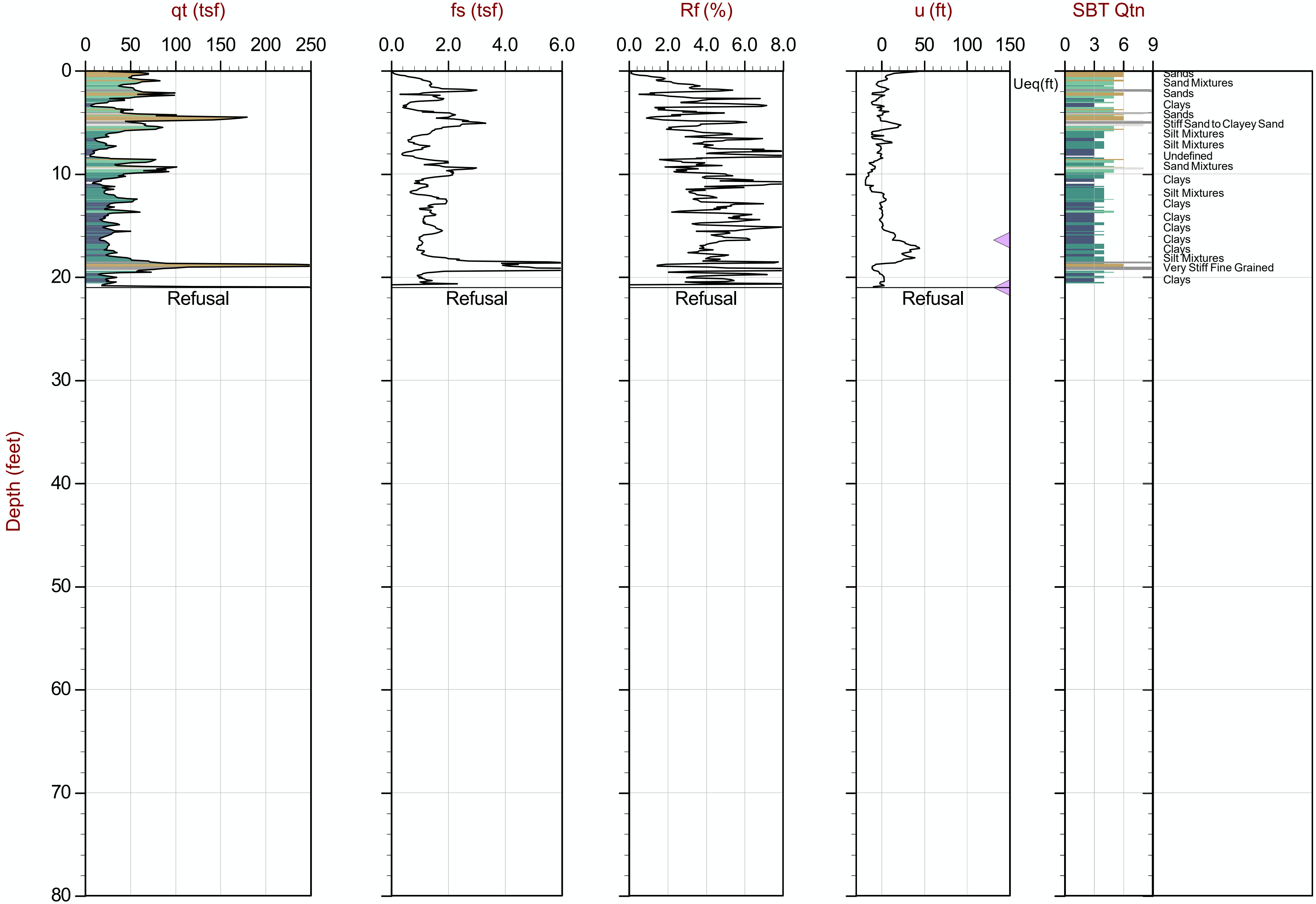
△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-08 13:47
Site: CUF TDEC Order

Sounding: CPT04
Cone: 555:T1500F15U500



Max Depth: 6.400 m / 21.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT04.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

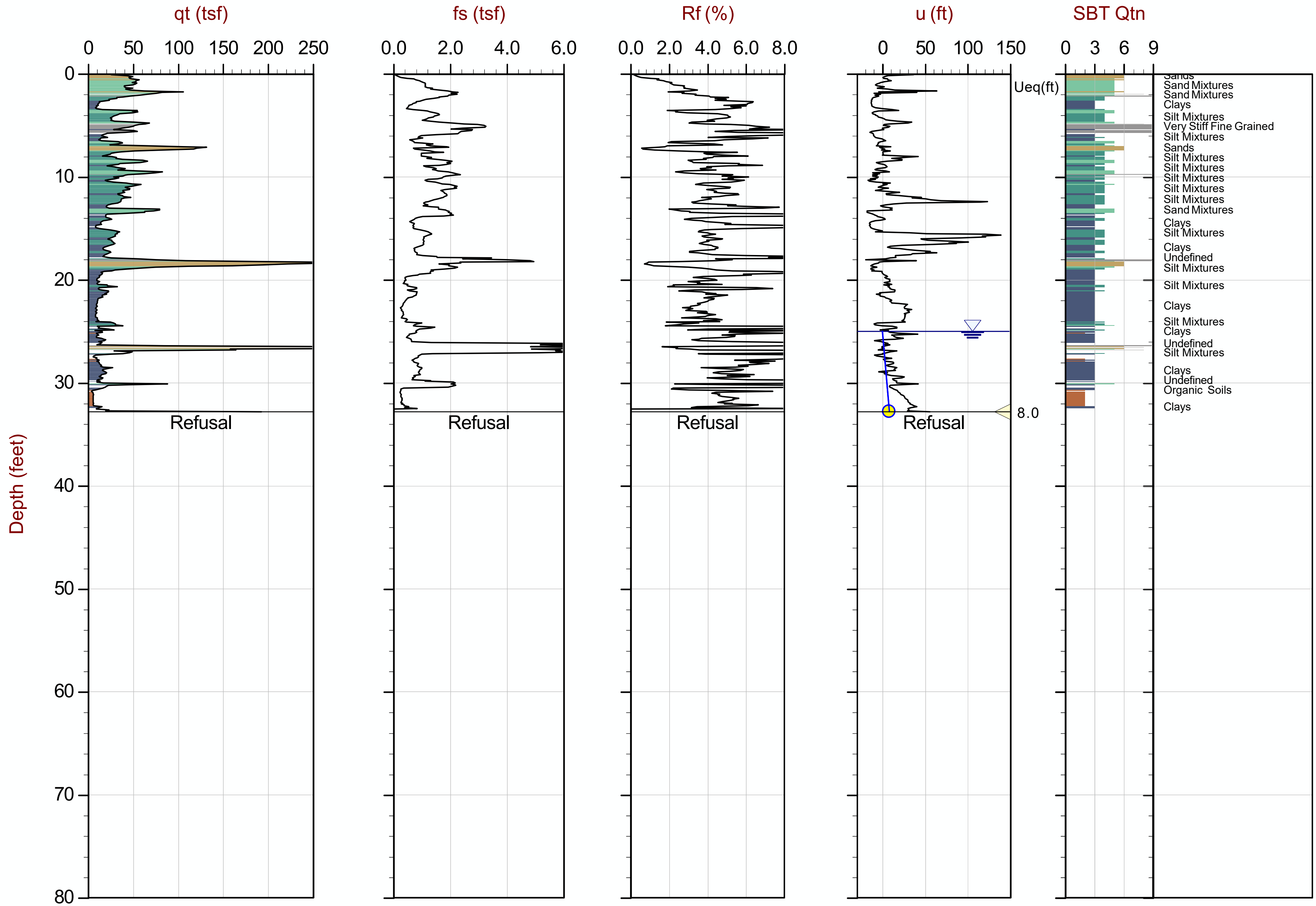
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-08 15:19
Site: CUF TDEC Order

Sounding: CPT05
Cone: 555:T1500F15U500



Max Depth: 10.000 m / 32.81 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT05.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

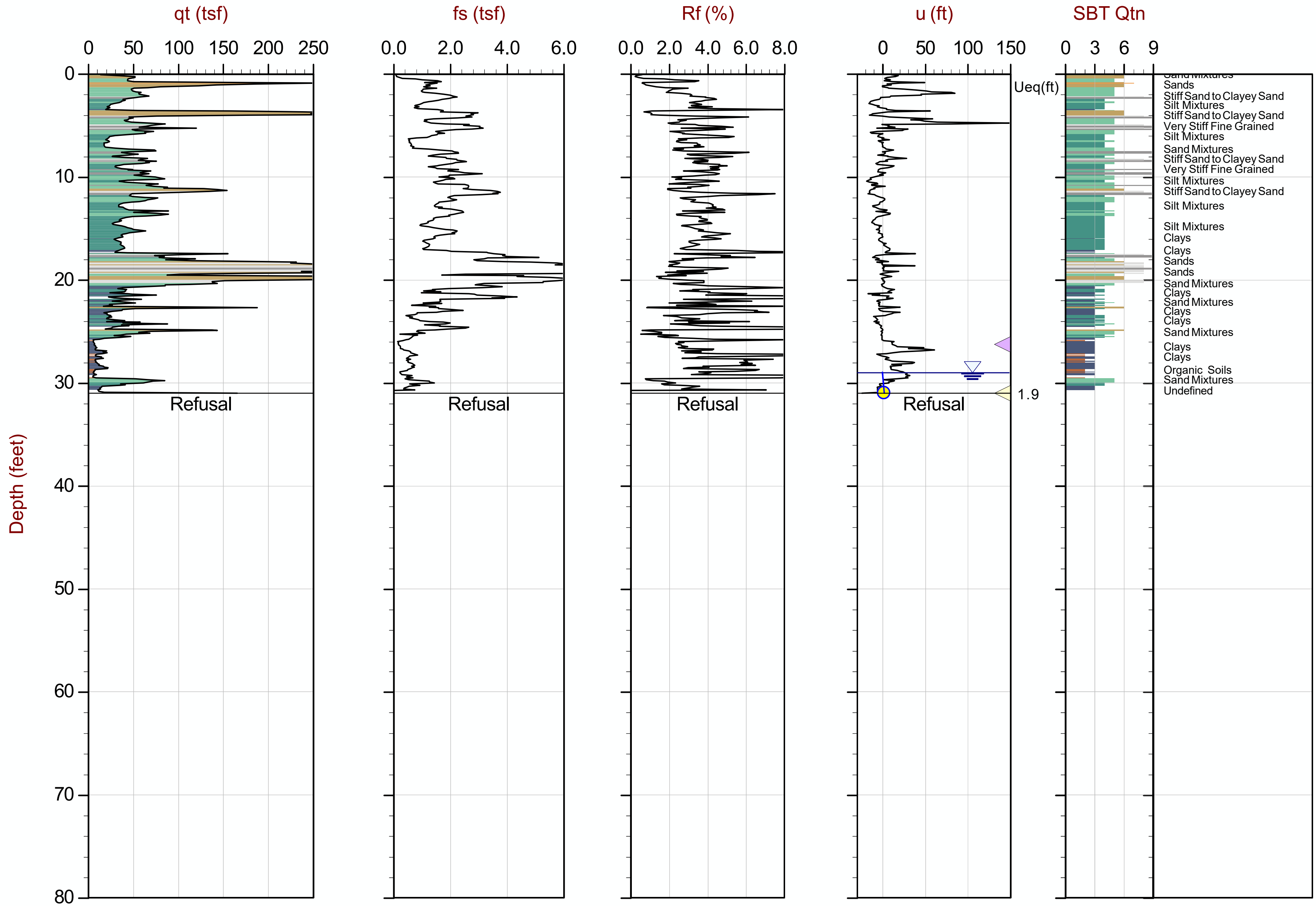
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-09 11:21
Site: CUF TDEC Order

Sounding: CPT06
Cone: 555:T1500F15U500



Max Depth: 9.450 m / 31.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT06.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

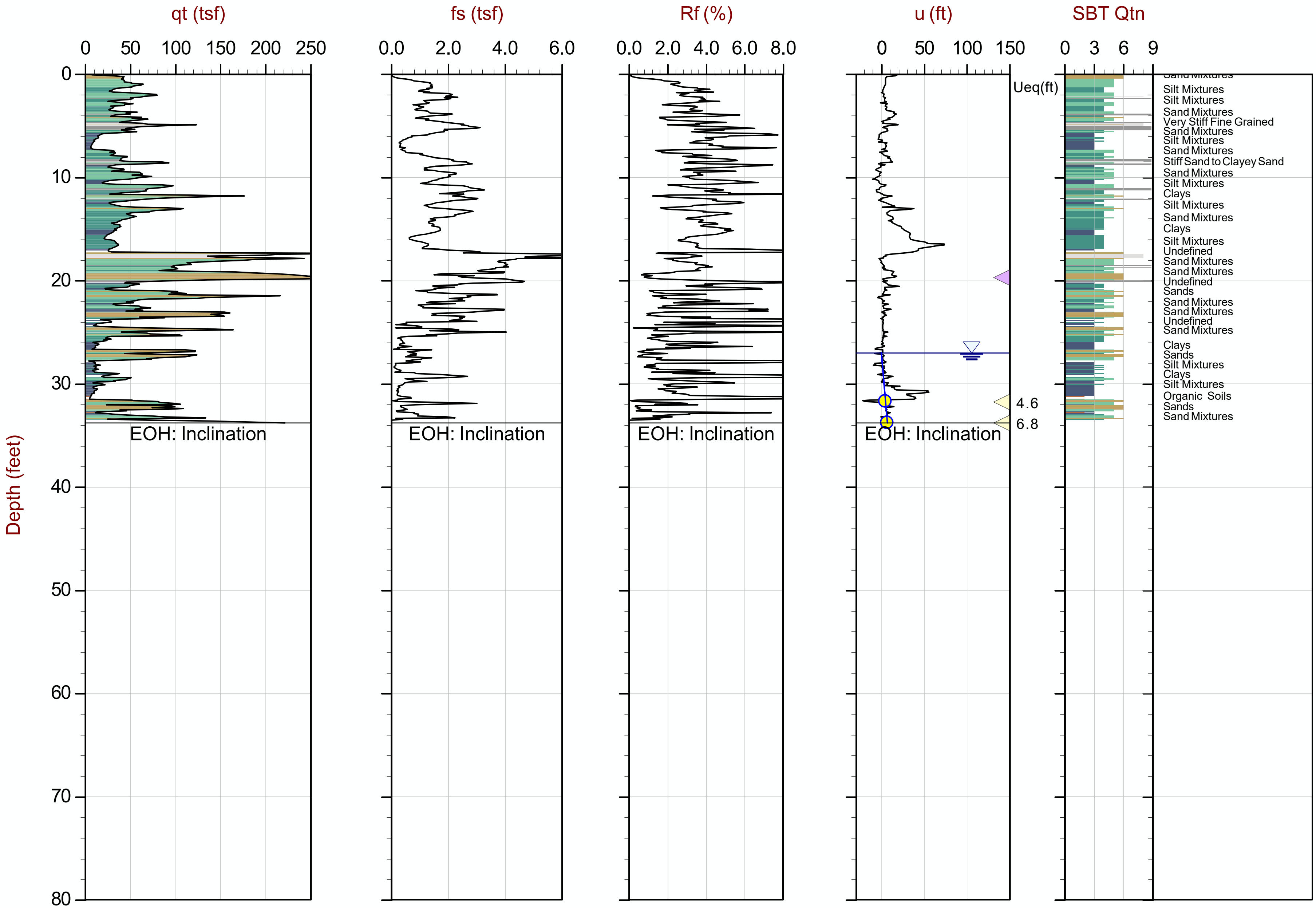
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-09 09:04
Site: CUF TDEC Order

Sounding: CPT07
Cone: 555:T1500F15U500



Max Depth: 10.300 m / 33.79 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT07.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

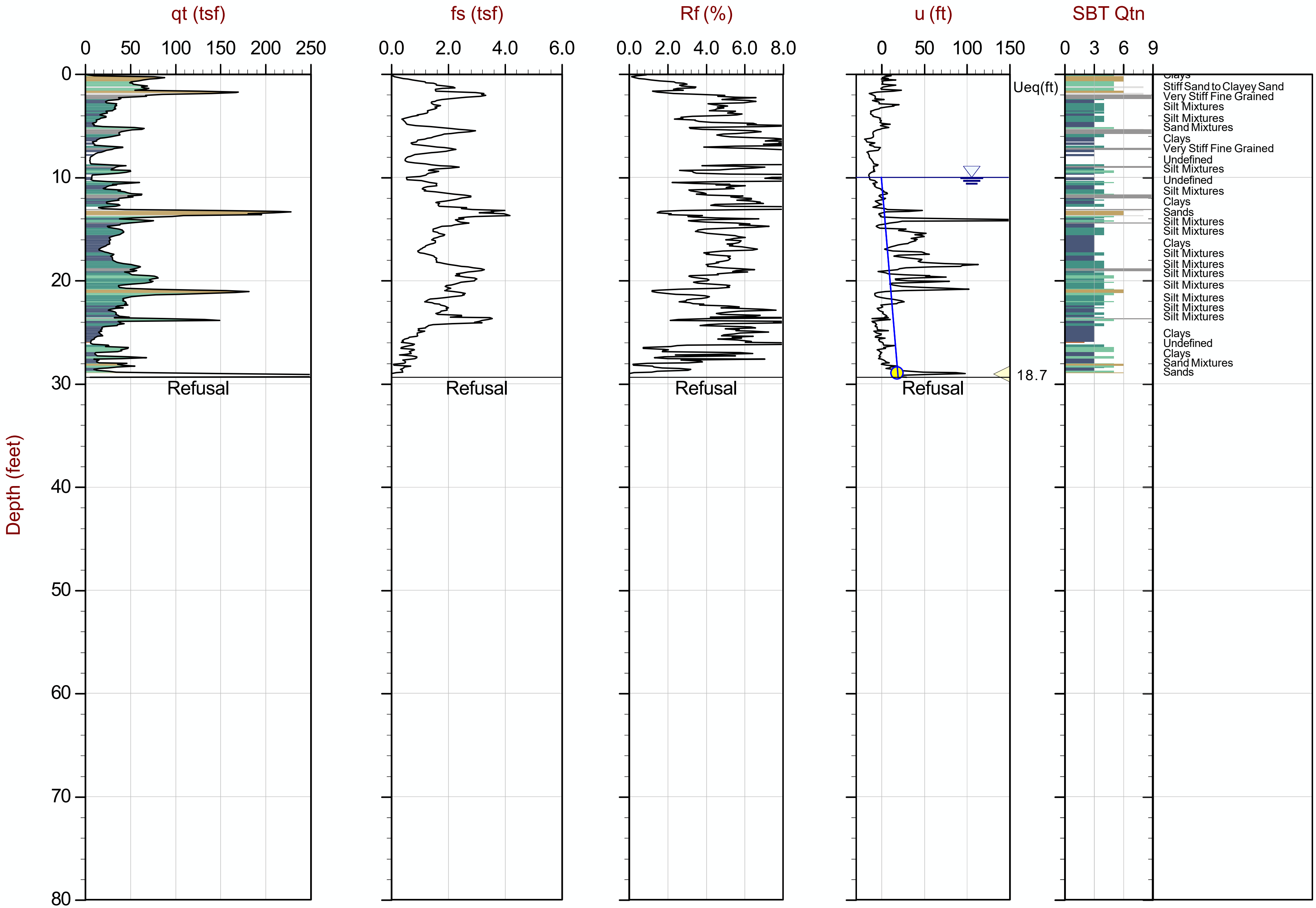
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-22 10:52
Site: CUF TDEC Order

Sounding: CPT08
Cone: 367:T1500F15U500



Max Depth: 8.950 m / 29.36 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT08.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

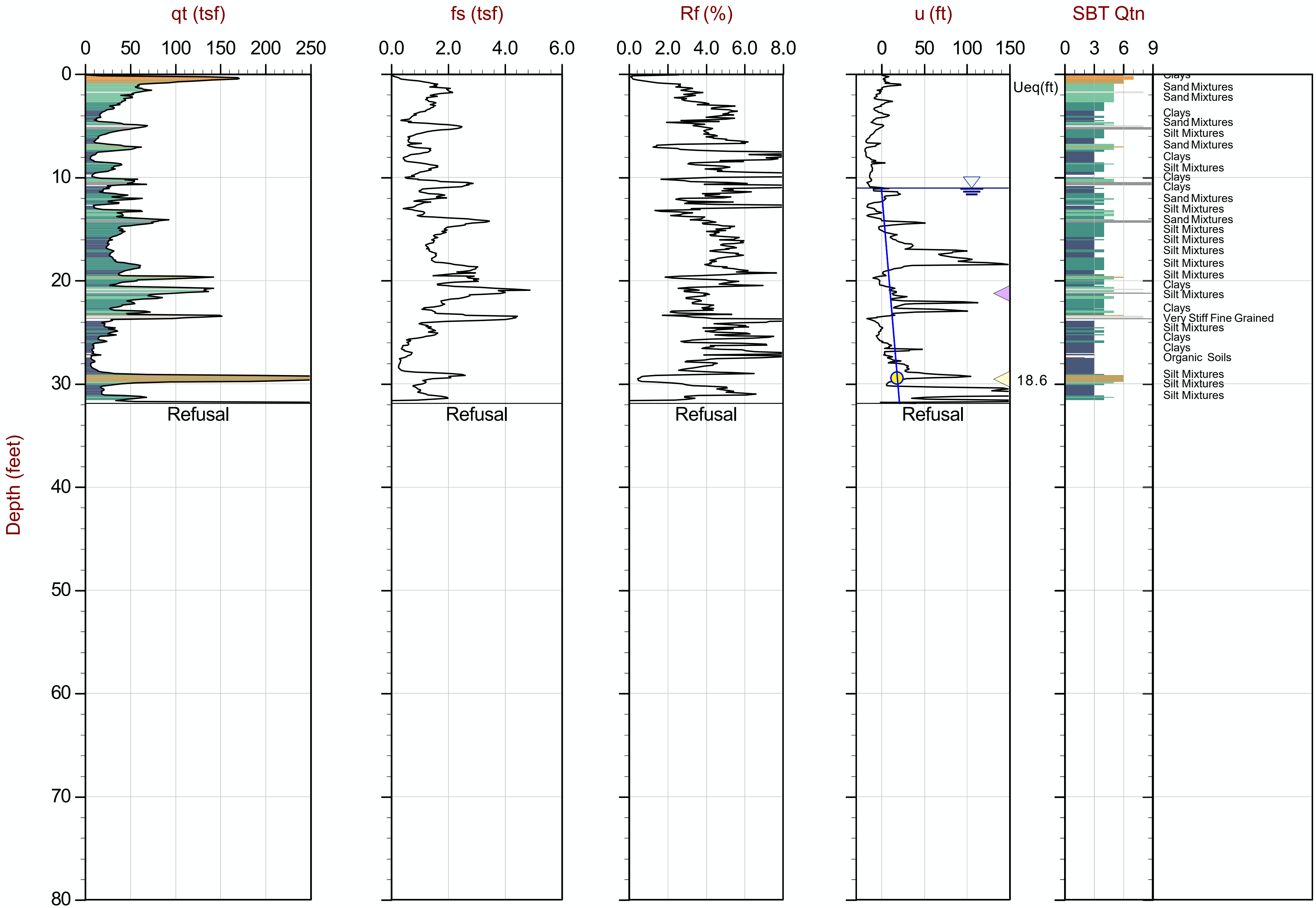
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-22 09:18
Site: CUF TDEC Order

Sounding: CPT09
Cone: 367:T1500F15U500



Max Depth: 9.725 m / 31.91 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT09.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

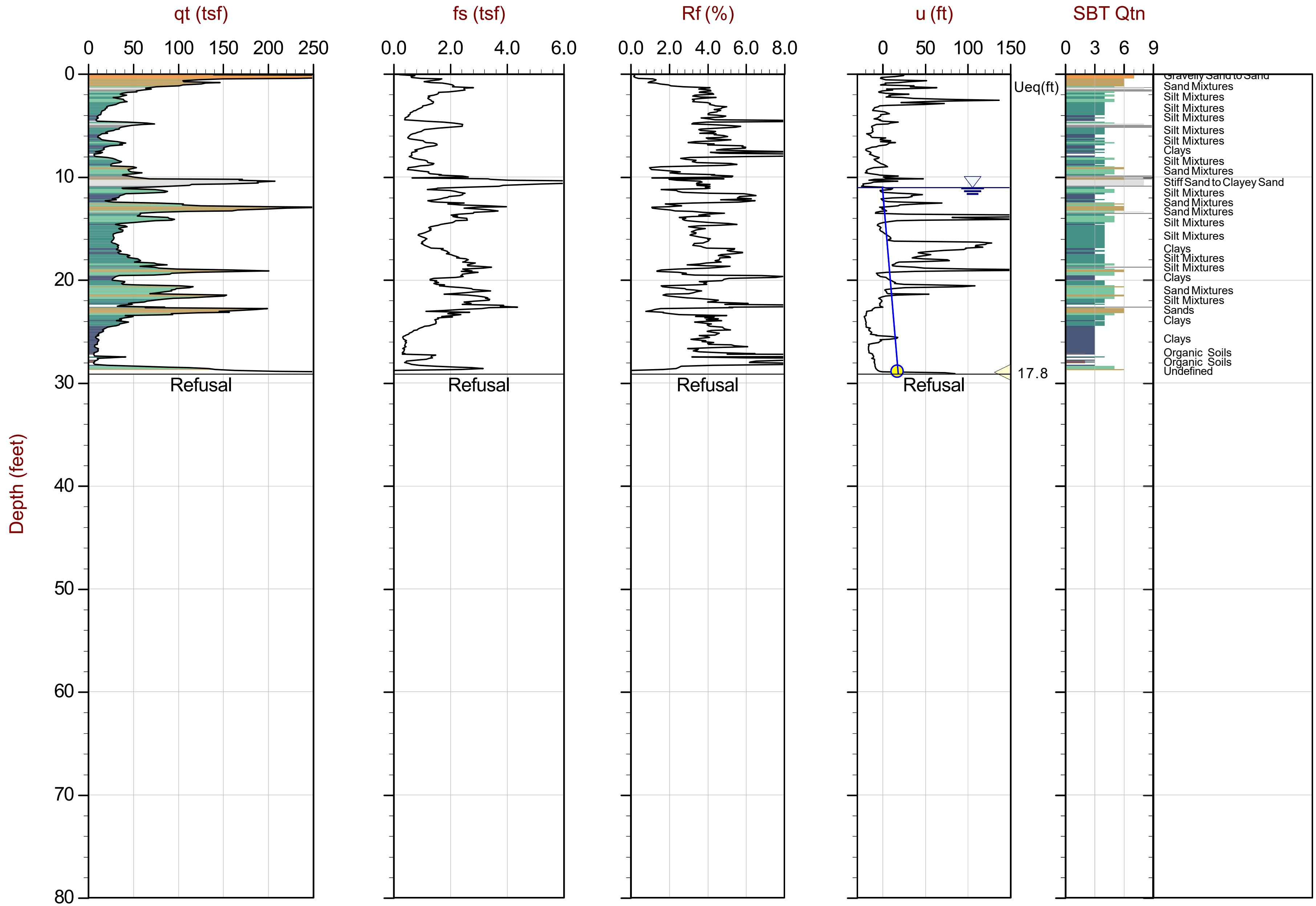
△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-22 07:47
Site: CUF TDEC Order

Sounding: CPT10
Cone: 367:T1500F15U500



Max Depth: 8.875 m / 29.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT10.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

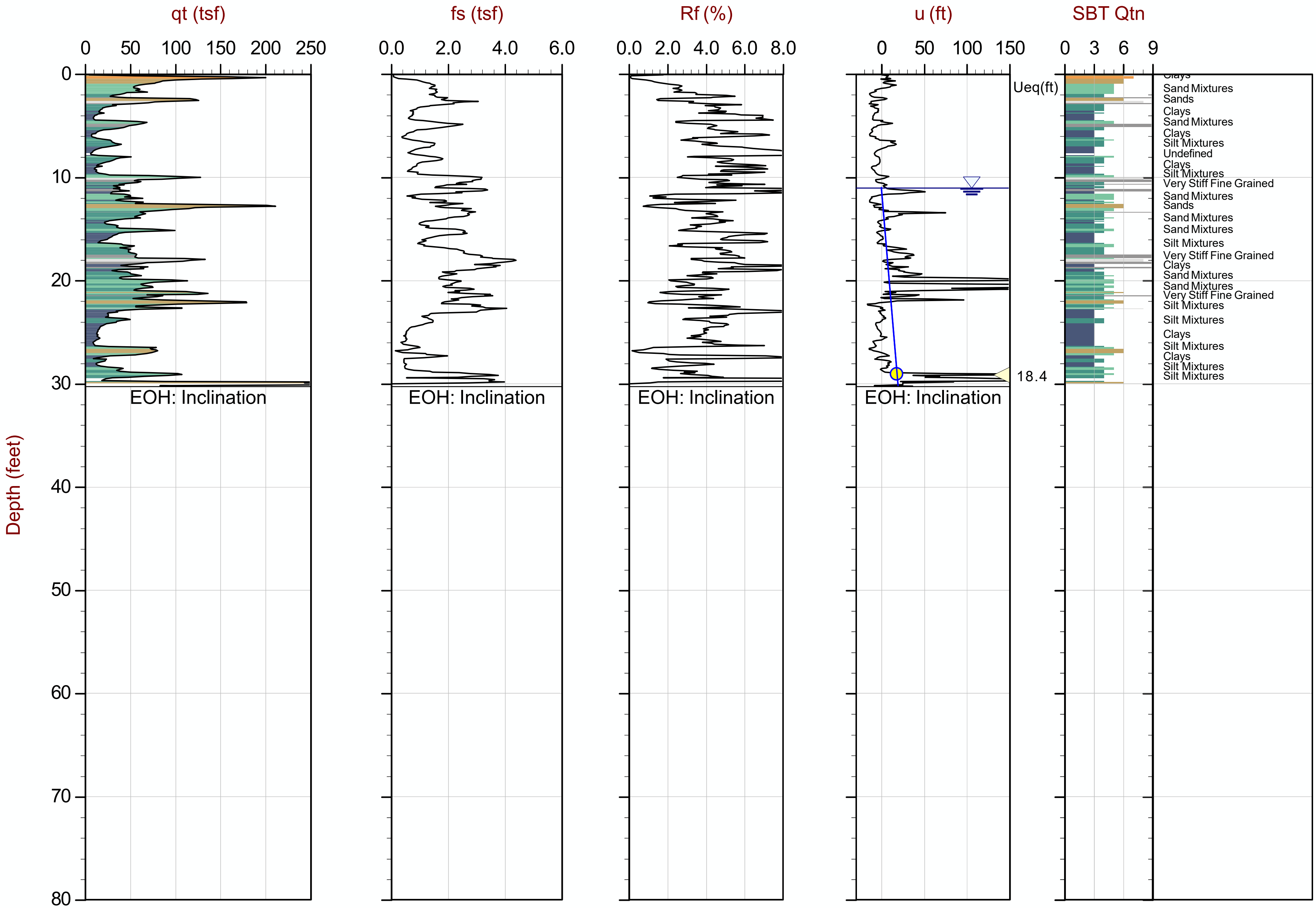
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-21 15:19
Site: CUF TDEC Order

Sounding: CPT11
Cone: 367:T1500F15U500



Max Depth: 9.225 m / 30.27 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT11.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

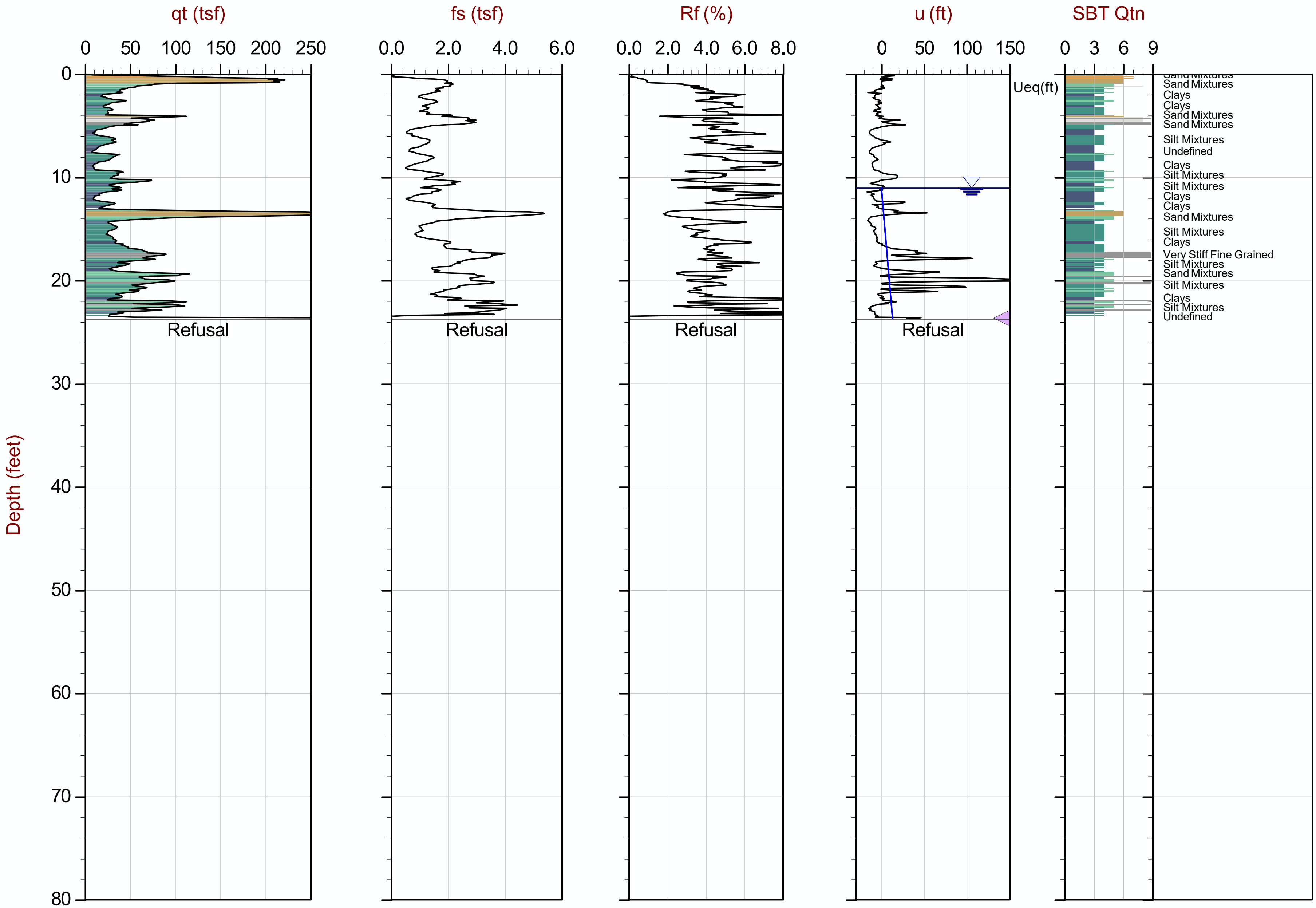
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-21 14:08
Site: CUF TDEC Order

Sounding: CPT12
Cone: 367:T1500F15U500



Max Depth: 7.225 m / 23.70 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT12.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

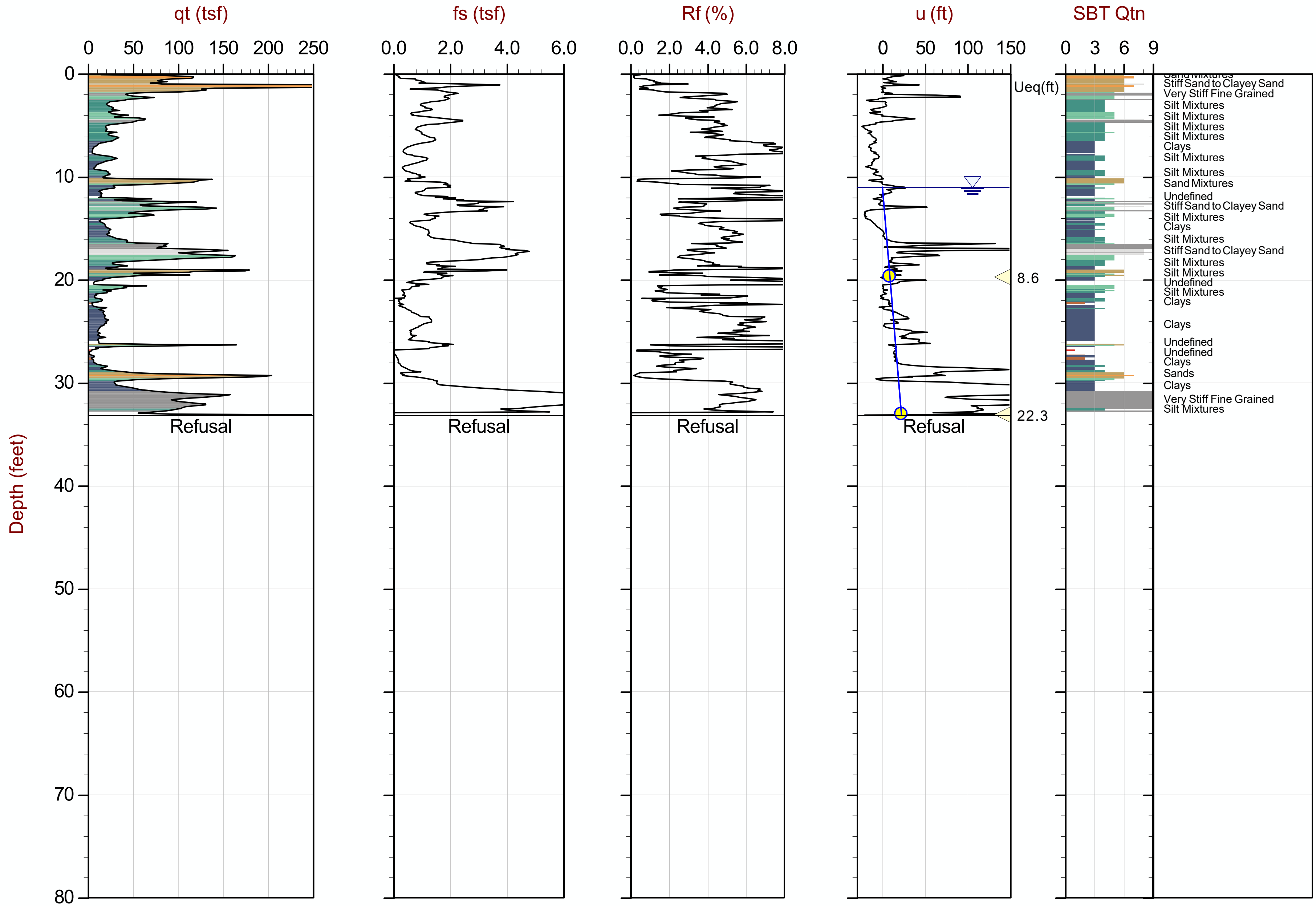
△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-21 12:31
Site: CUF TDEC Order

Sounding: CPT13
Cone: 367:T1500F15U500



Max Depth: 10.100 m / 33.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT13.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

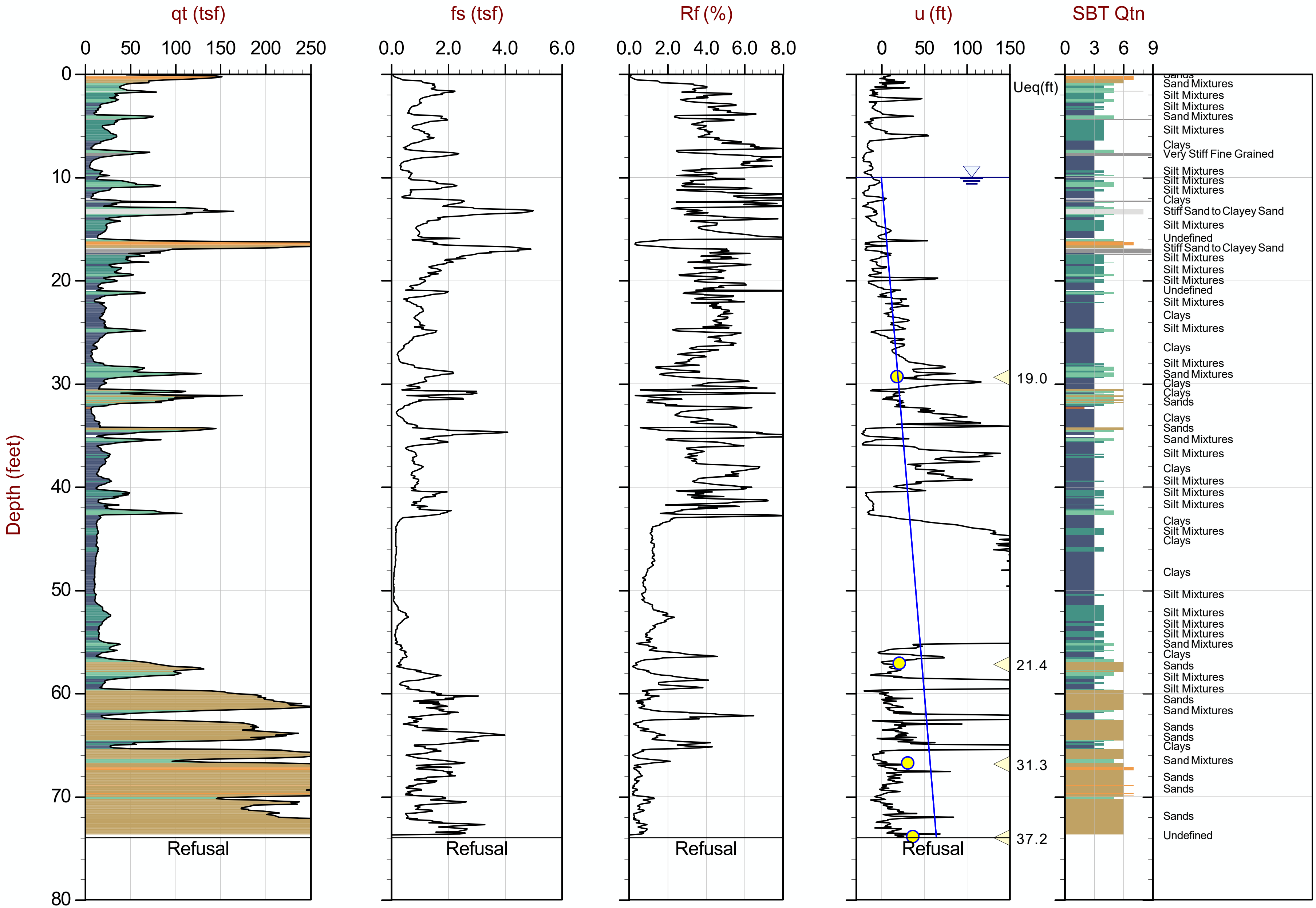
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-18 07:38
Site: CUF TDEC Order

Sounding: CPT14
Cone: 367:T1500F15U500



Max Depth: 22.550 m / 73.98 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT14.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

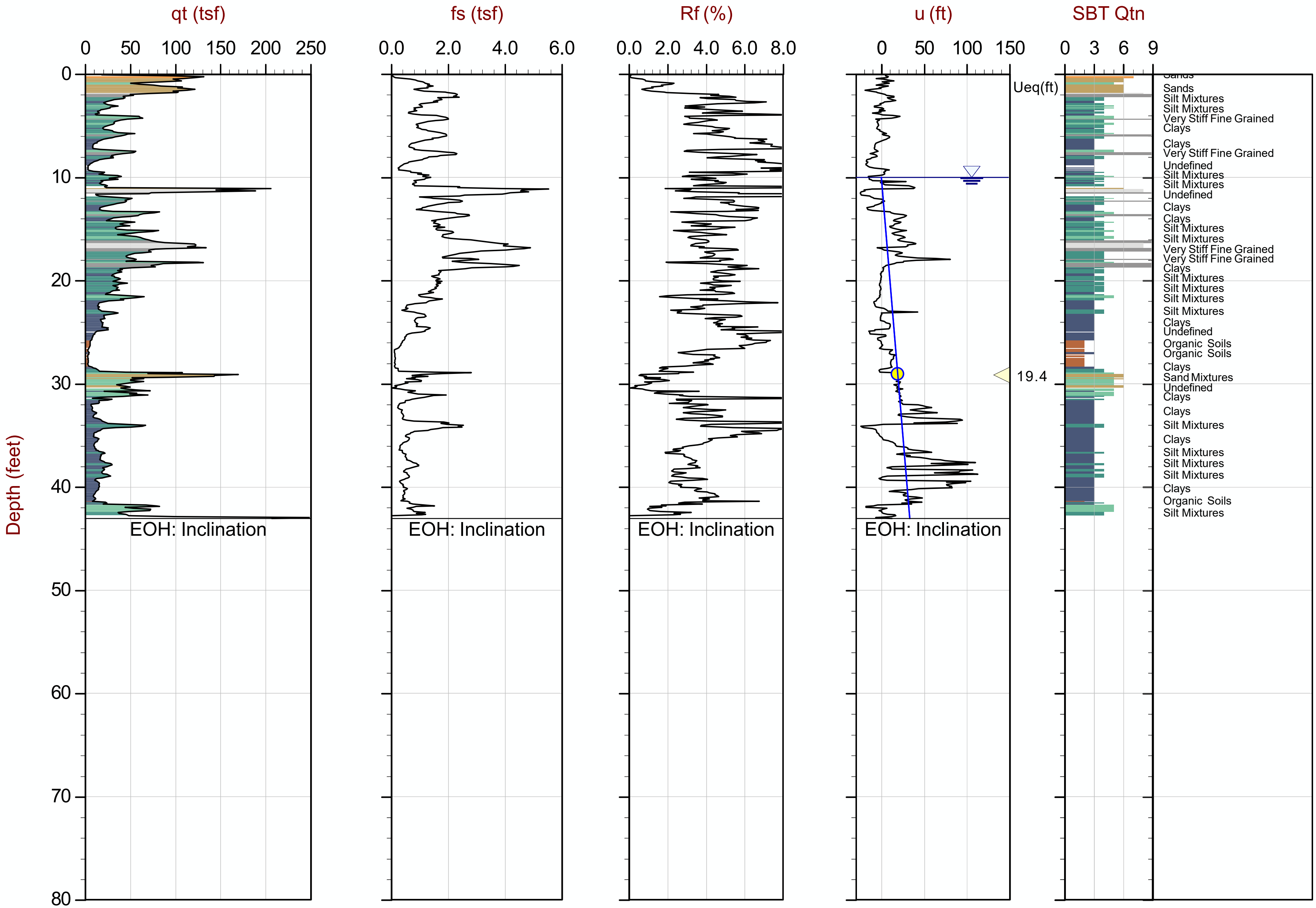
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-17 13:05
Site: CUF TDEC Order

Sounding: CPT15
Cone: 367:T1500F15U500



Max Depth: 13.125 m / 43.06 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT15.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

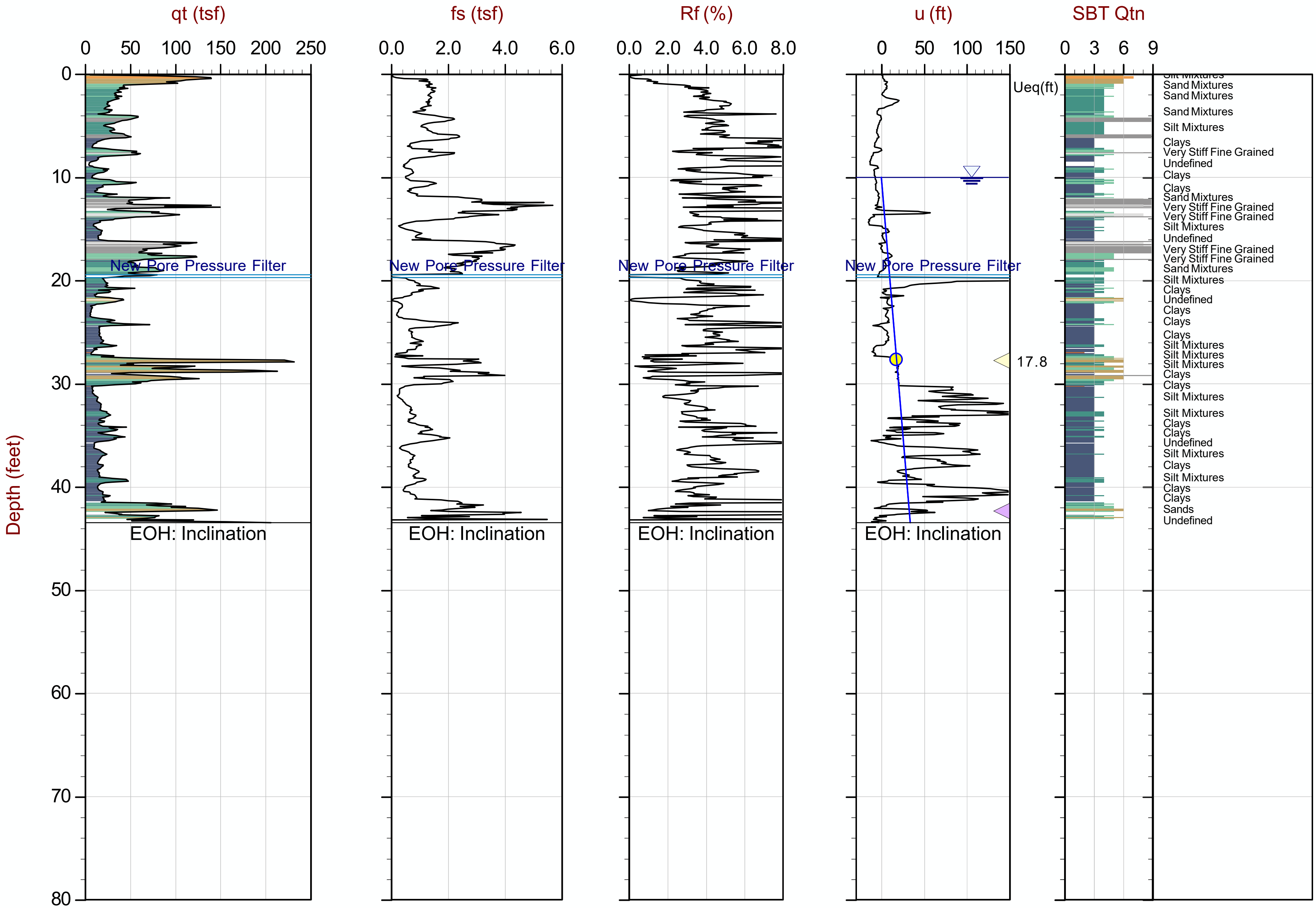
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-17 10:17
Site: CUF TDEC Order

Sounding: CPT16
Cone: 367:T1500F15U500



Max Depth: 13.250 m / 43.47 ft
Depth Inc: 0.025 m / 0.082
Avg Int: Every Point

File: 19-54002_CPT16.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

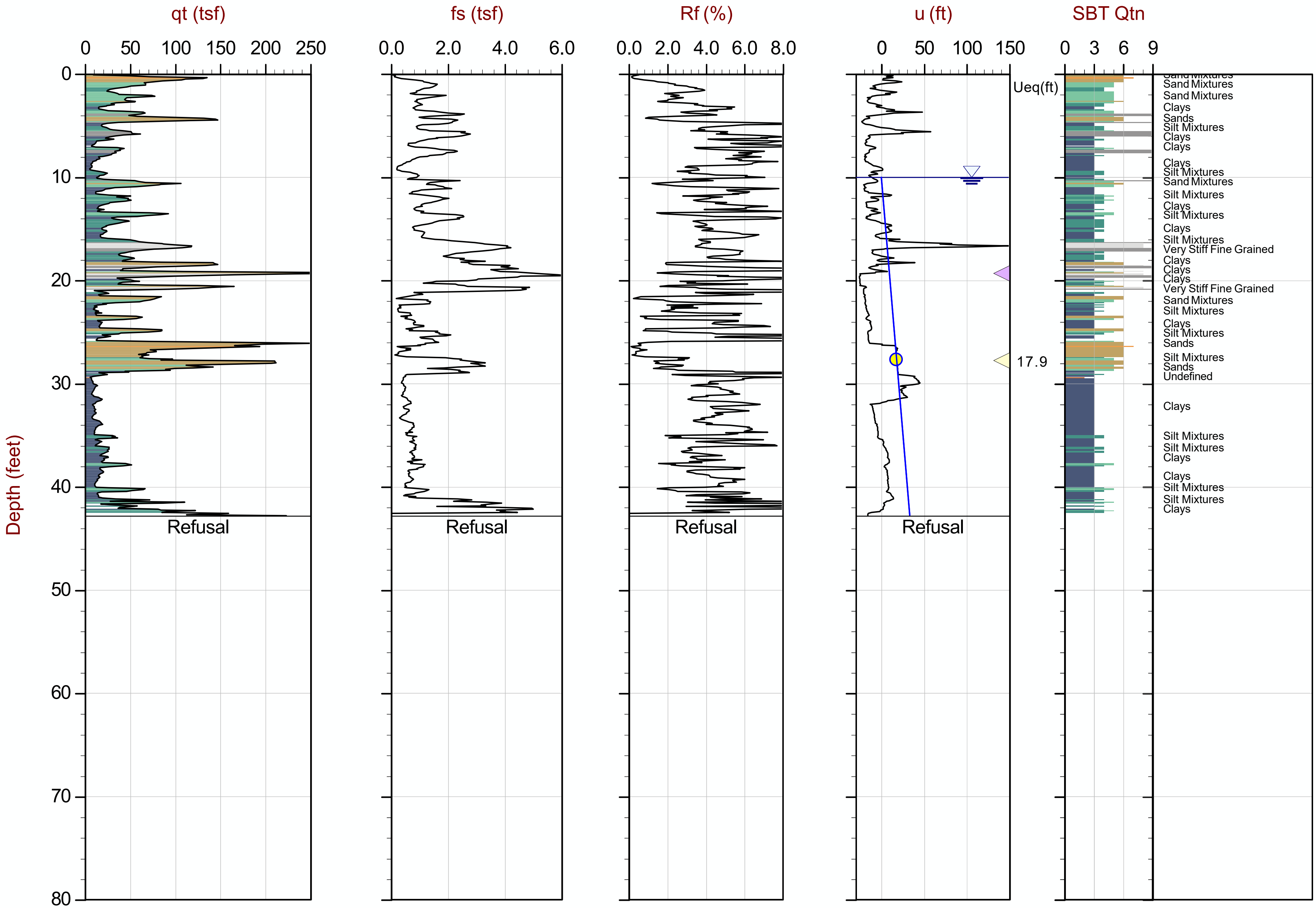
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-17 08:36
Site: CUF TDEC Order

Sounding: CPT17
Cone: 367:T1500F15U500



Max Depth: 13.050 m / 42.81 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT17.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

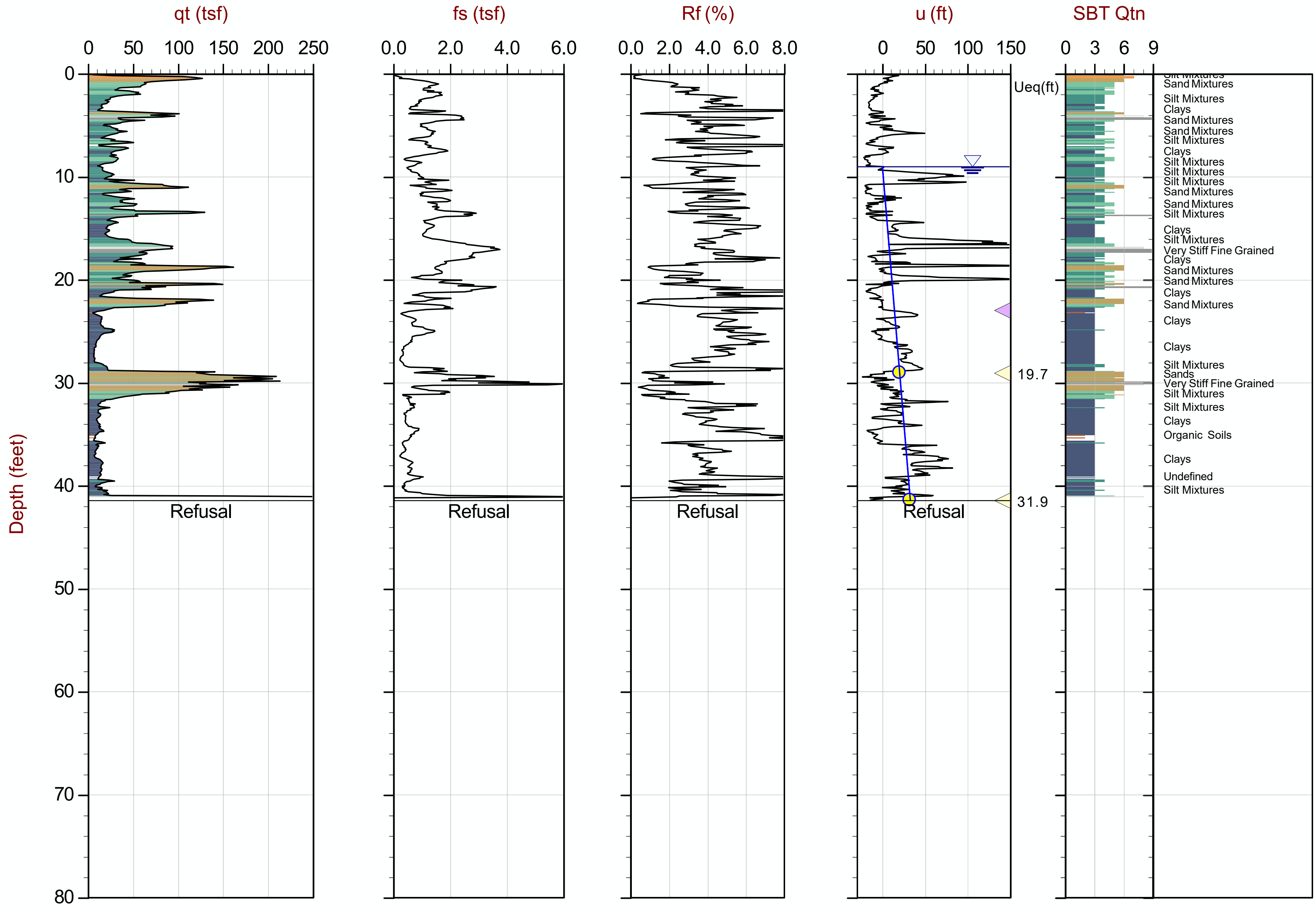
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-22 15:14
Site: CUF TDEC Order

Sounding: CPT17a
Cone: 367:T1500F15U500



Max Depth: 12.625 m / 41.42 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT17A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

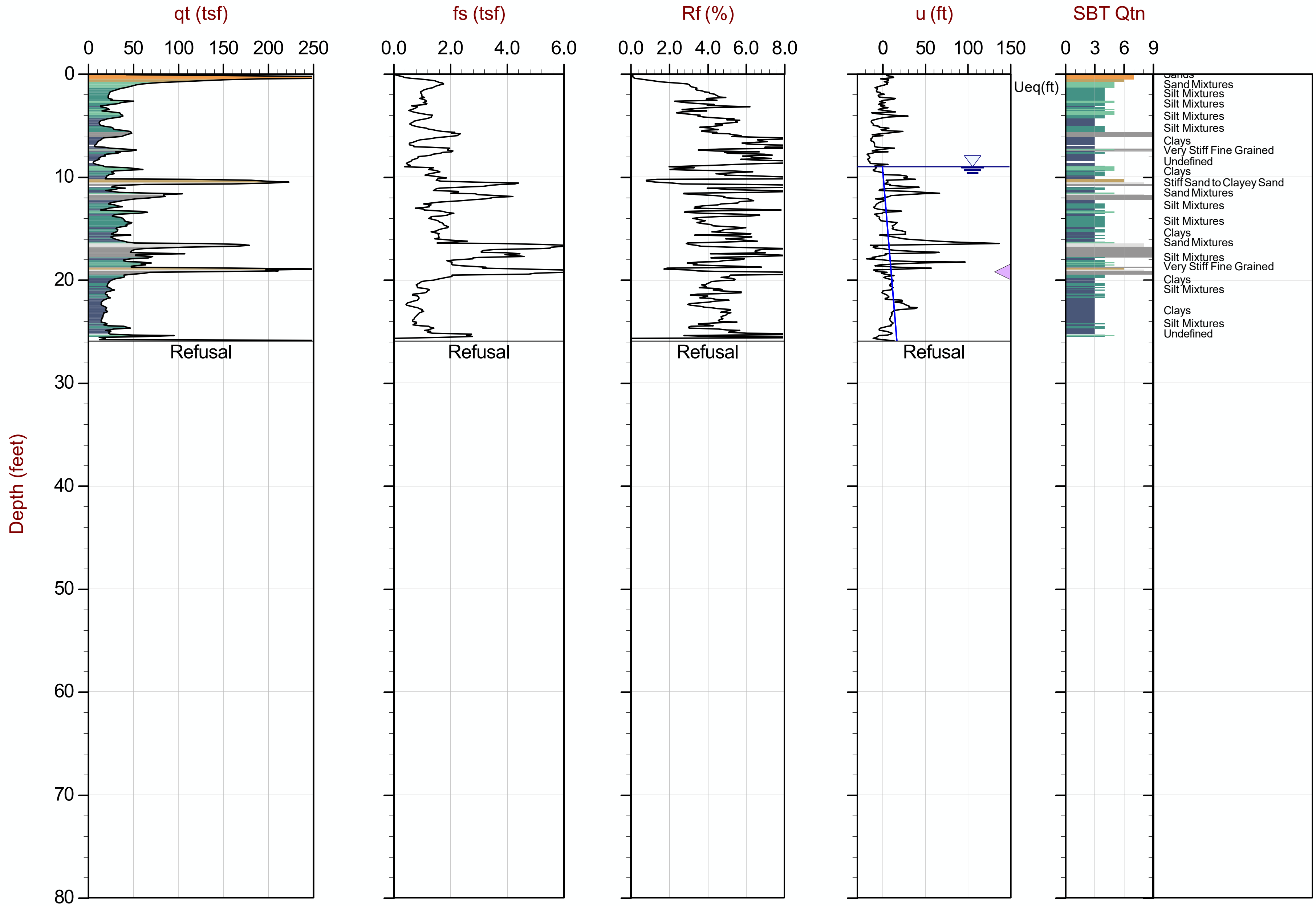
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-16 14:48
Site: CUF TDEC Order

Sounding: CPT18
Cone: 367:T1500F15U500



Max Depth: 7.900 m / 25.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT18.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

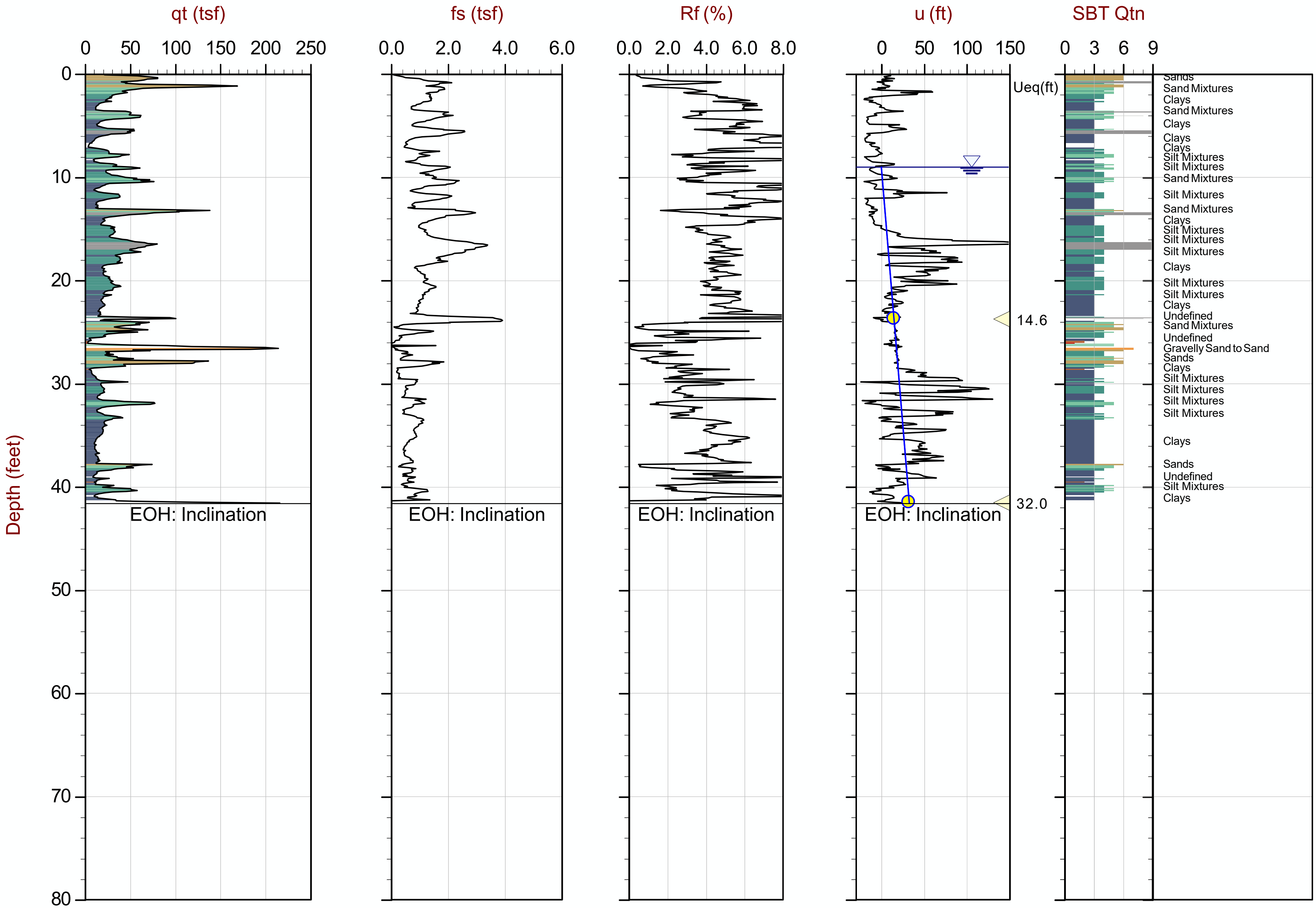
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-16 11:39
Site: CUF TDEC Order

Sounding: CPT19
Cone: 367:T1500F15U500



Max Depth: 12.675 m / 41.58 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT19.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

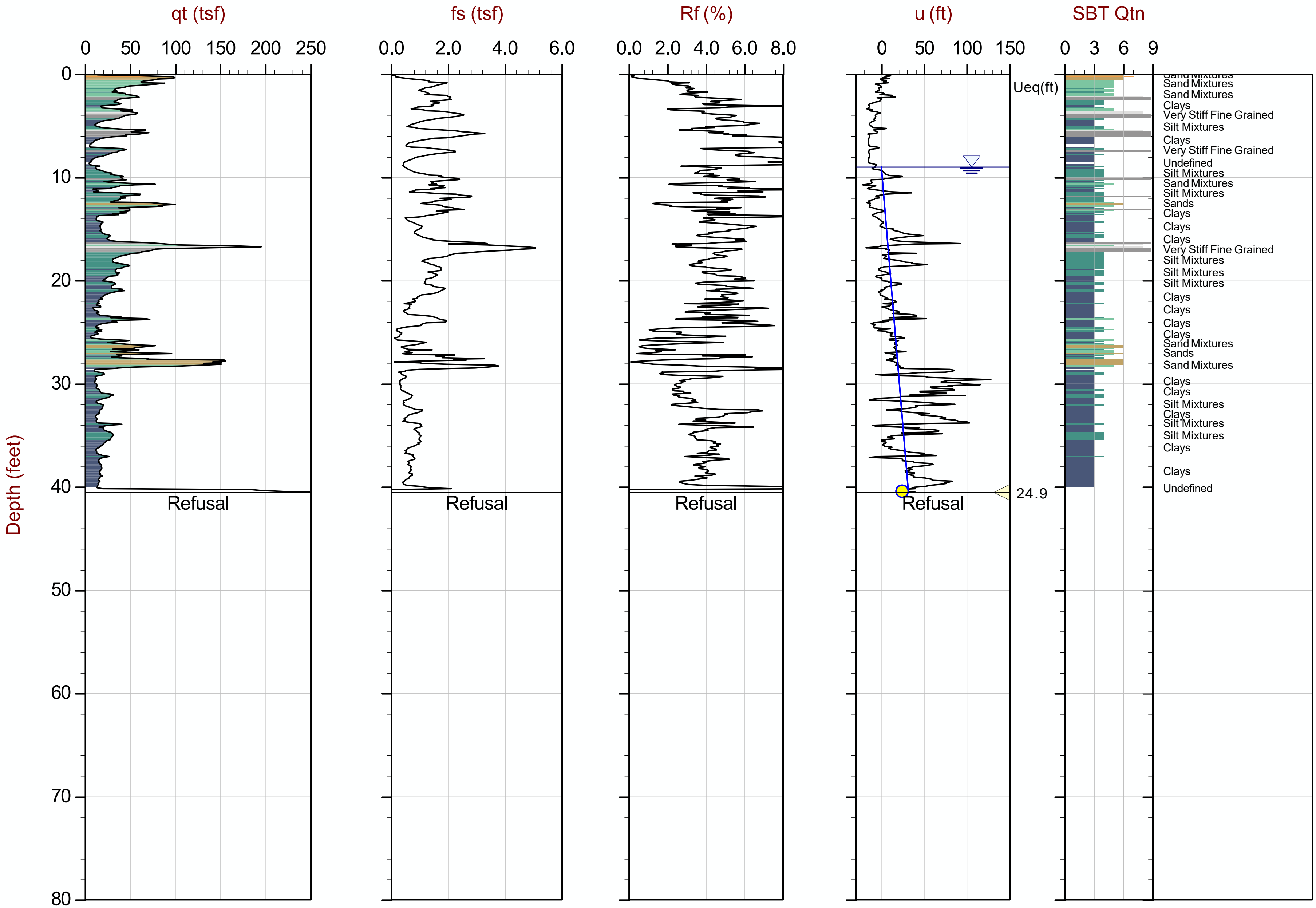
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-16 10:19
Site: CUF TDEC Order

Sounding: CPT20
Cone: 367:T1500F15U500



Max Depth: 12.350 m / 40.52 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT20.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

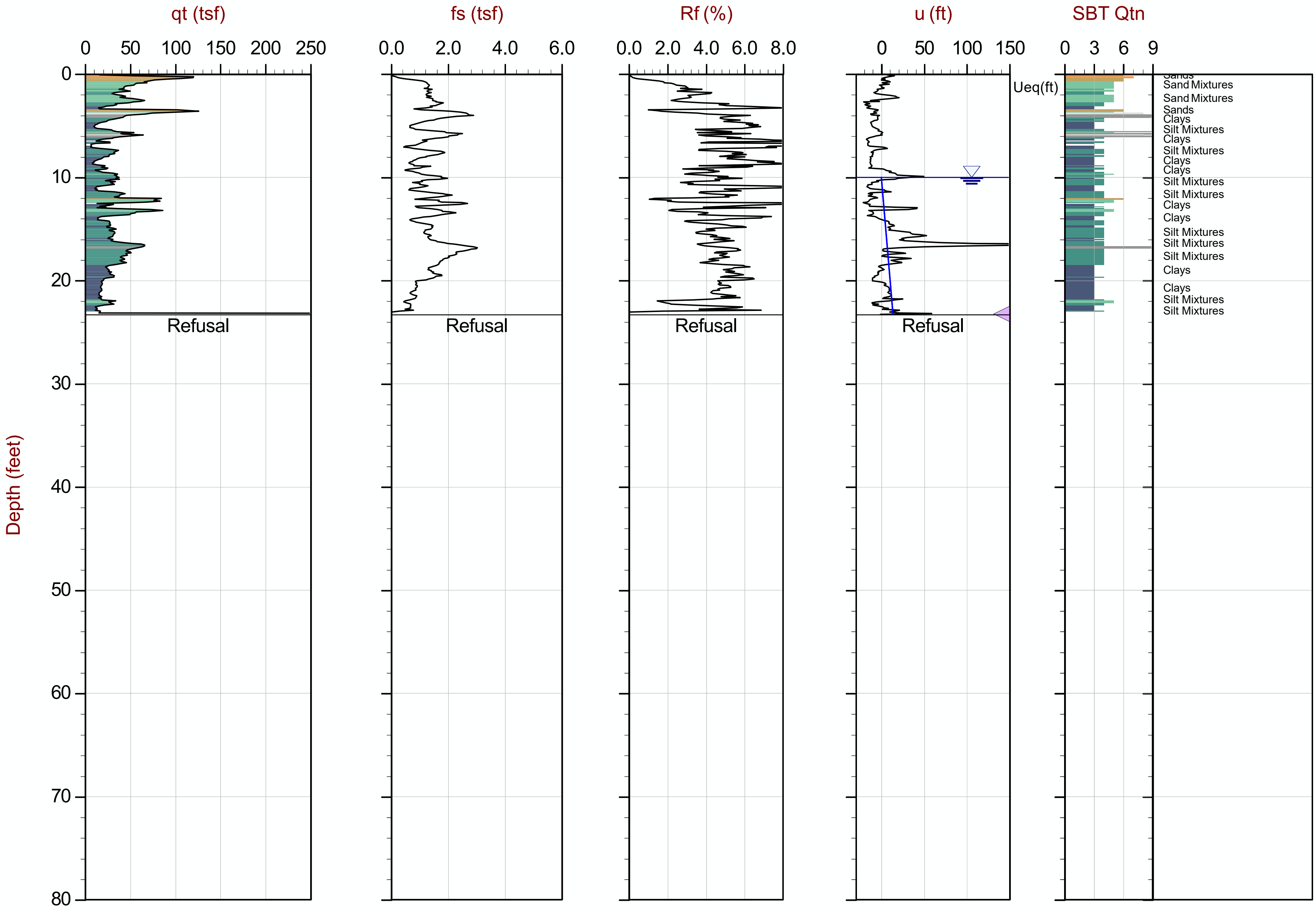
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-16 09:06
Site: CUF TDEC Order

Sounding: CPT21
Cone: 367:T1500F15U500



Max Depth: 7.100 m / 23.29 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT21.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

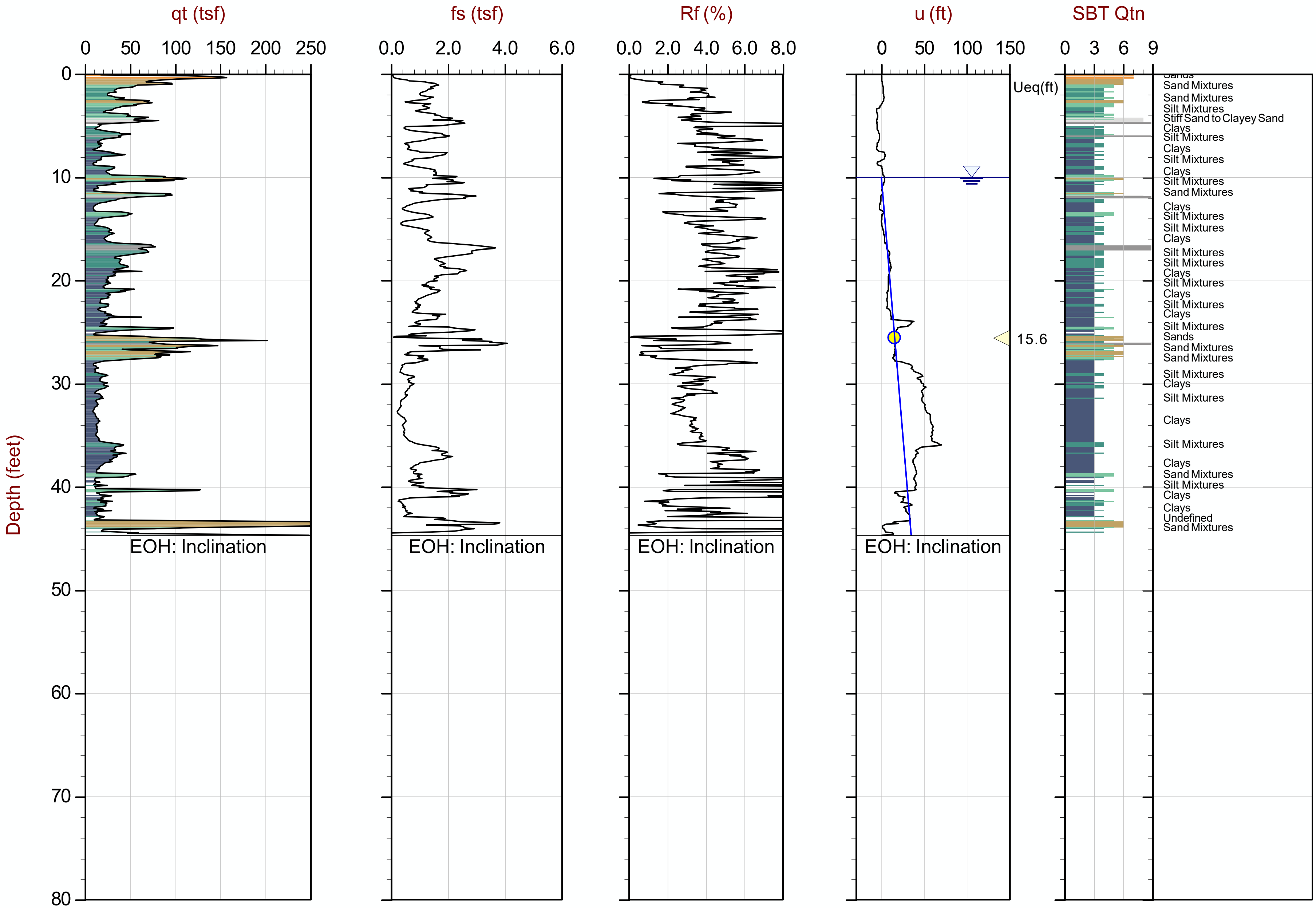
△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-15 07:51
Site: CUF TDEC Order

Sounding: CPT22
Cone: 367:T1500F15U500



Max Depth: 13.625 m / 44.70 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT22.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

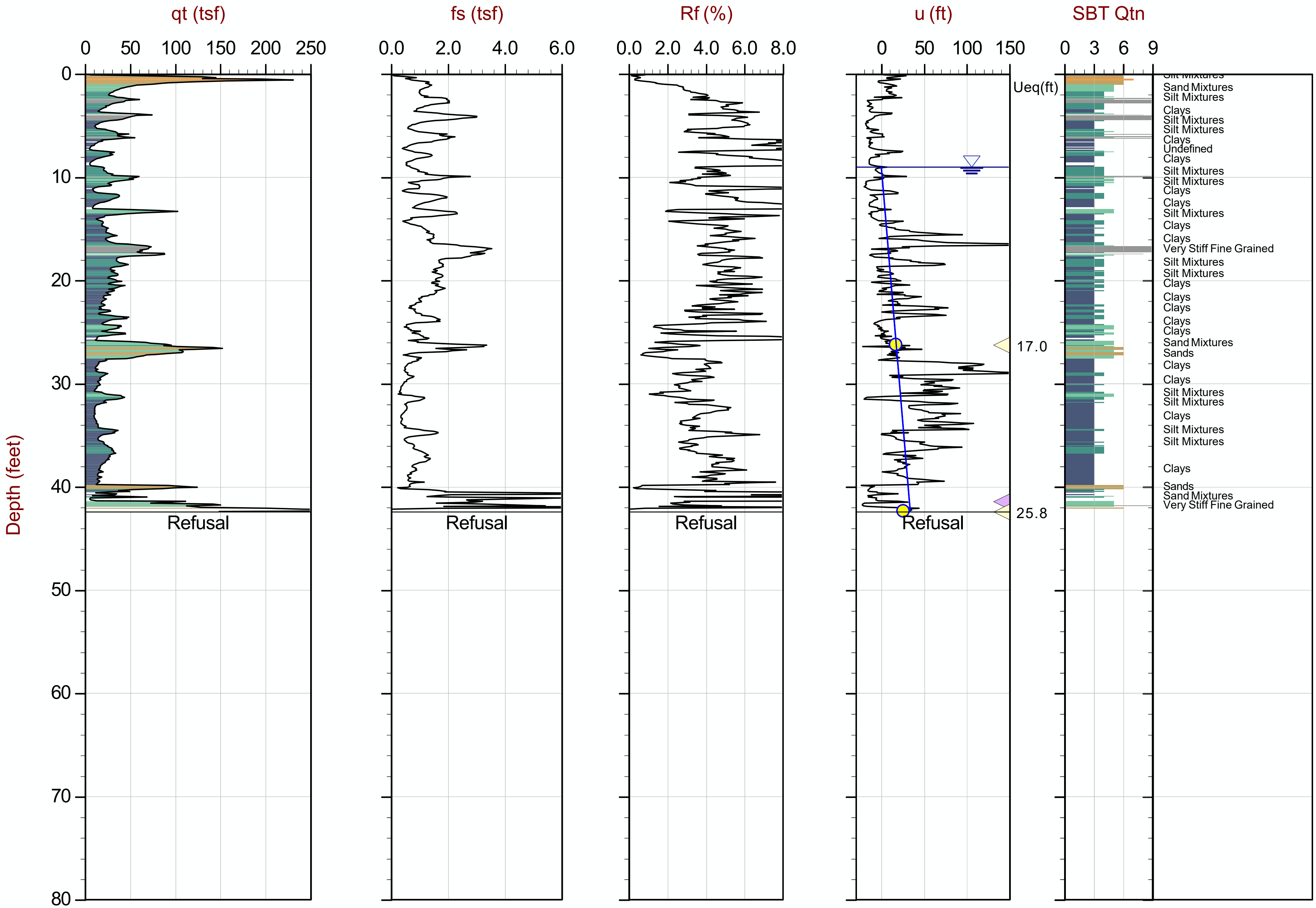
△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-23 07:33
Site: CUF TDEC Order

Sounding: CPT22a
Cone: 367:T1500F15U500



Max Depth: 12.925 m / 42.40 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT22A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

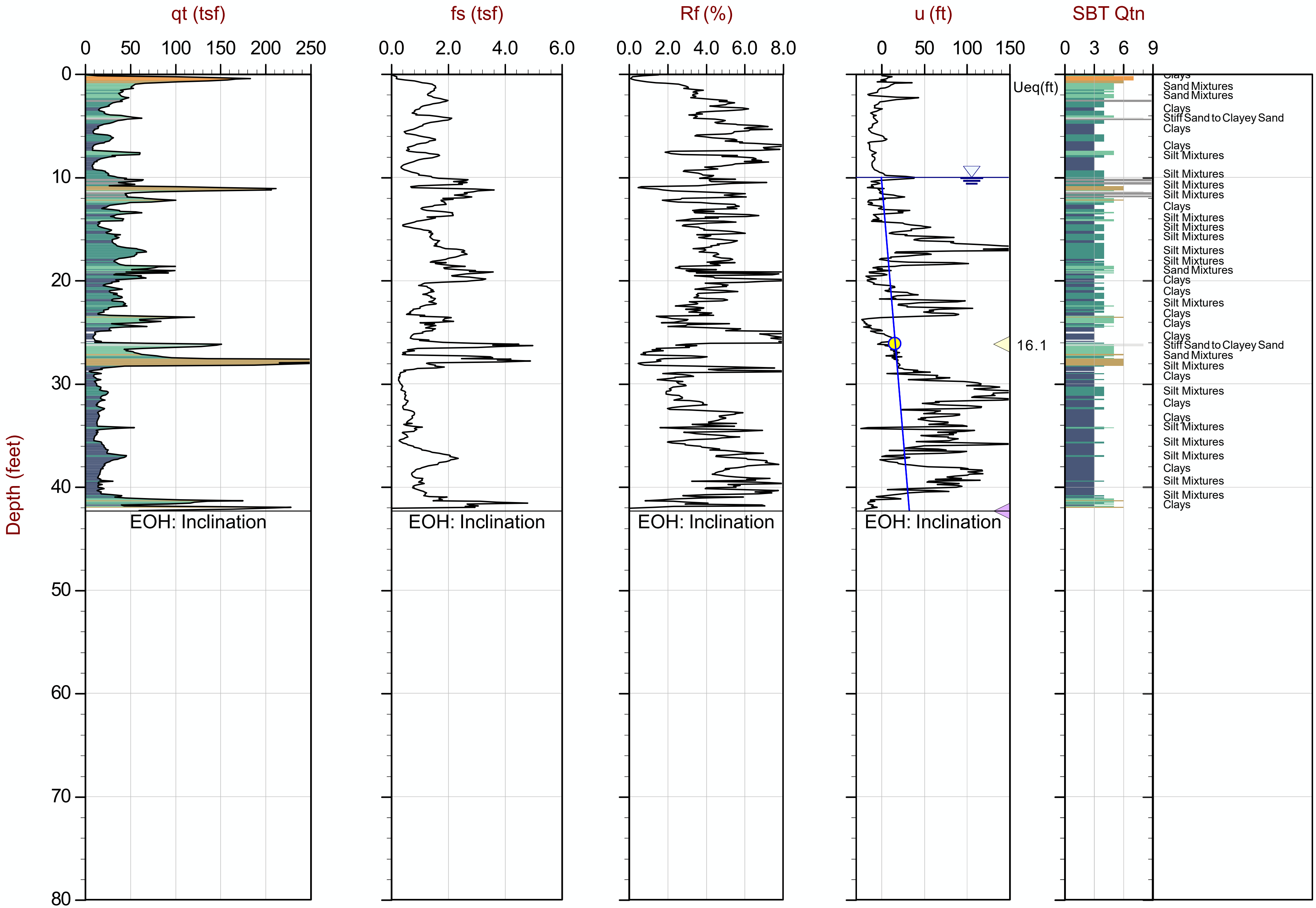
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-14 13:17
Site: CUF TDEC Order

Sounding: CPT23
Cone: 367:T1500F15U500



Max Depth: 12.900 m / 42.32 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT23.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

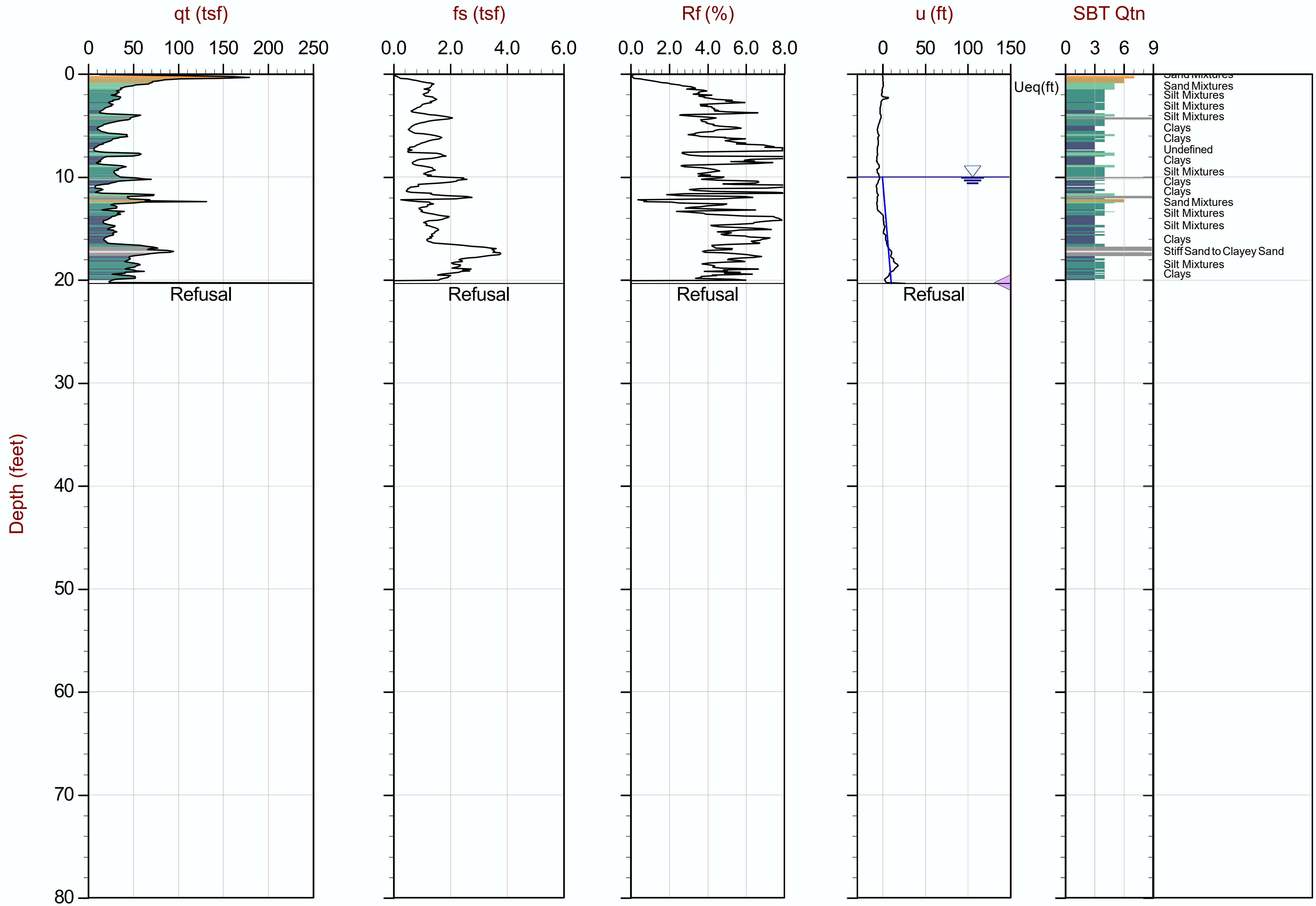
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-15 09:47
Site: CUF TDEC Order

Sounding: CPT24
Cone: 367:T1500F15U500



Max Depth: 6.200 m / 20.34 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT24.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

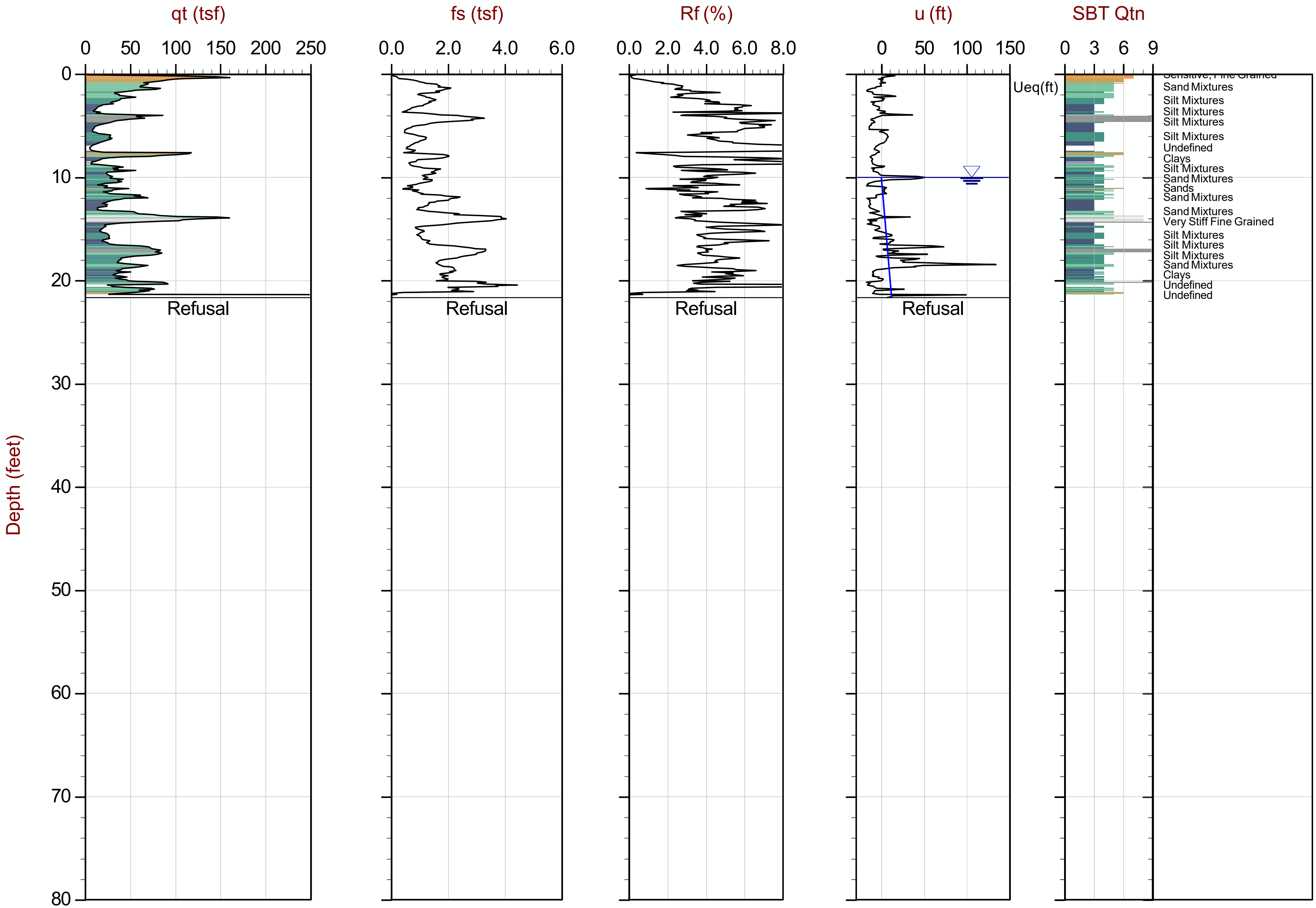
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-23 09:15
Site: CUF TDEC Order

Sounding: CPT24a
Cone: 367:T1500F15U500



Max Depth: 6.600 m / 21.65 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT24A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

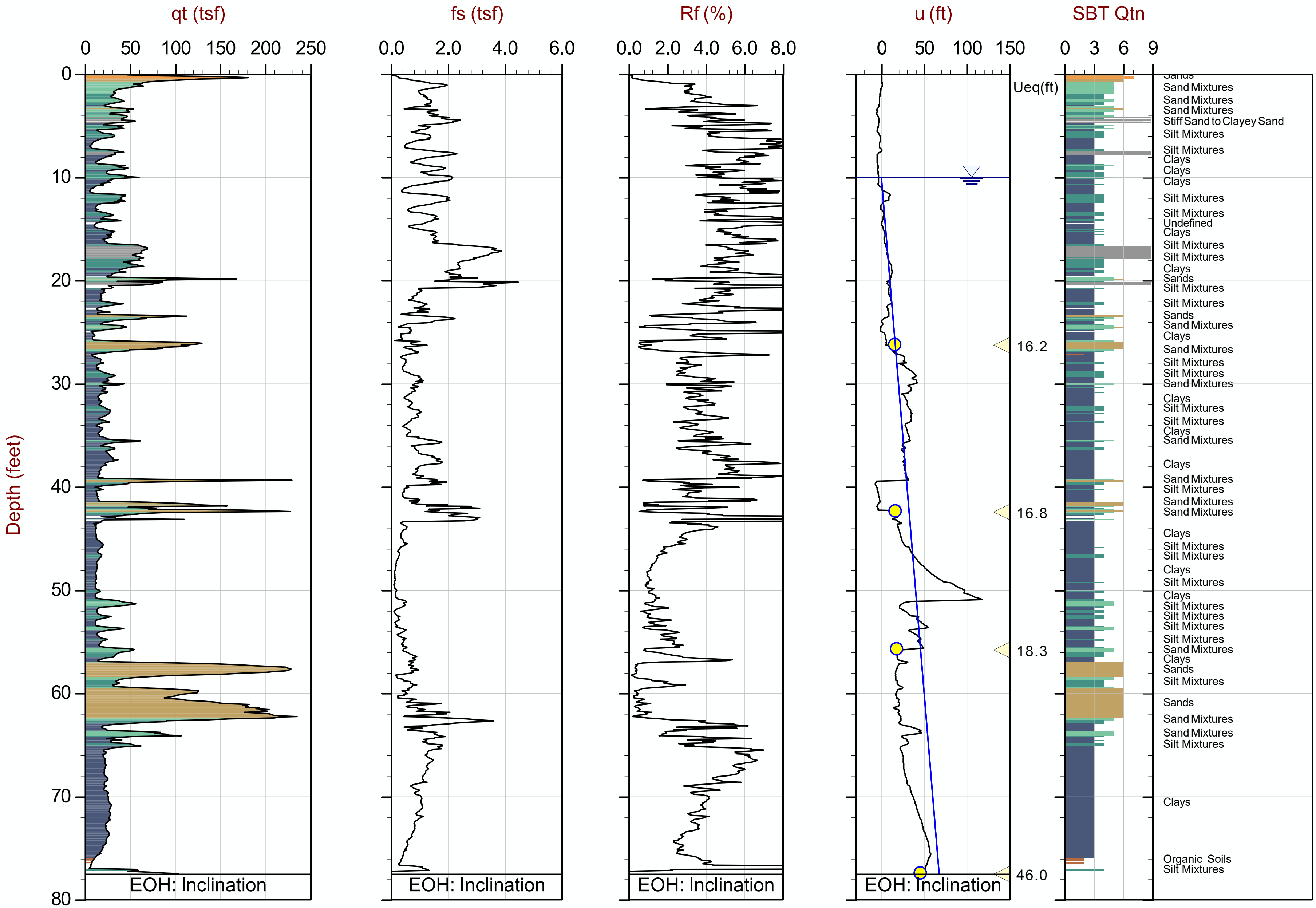
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-15 11:13
Site: CUF TDEC Order

Sounding: CPT25
Cone: 367:T1500F15U500



Max Depth: 23.625 m / 77.51 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT25.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

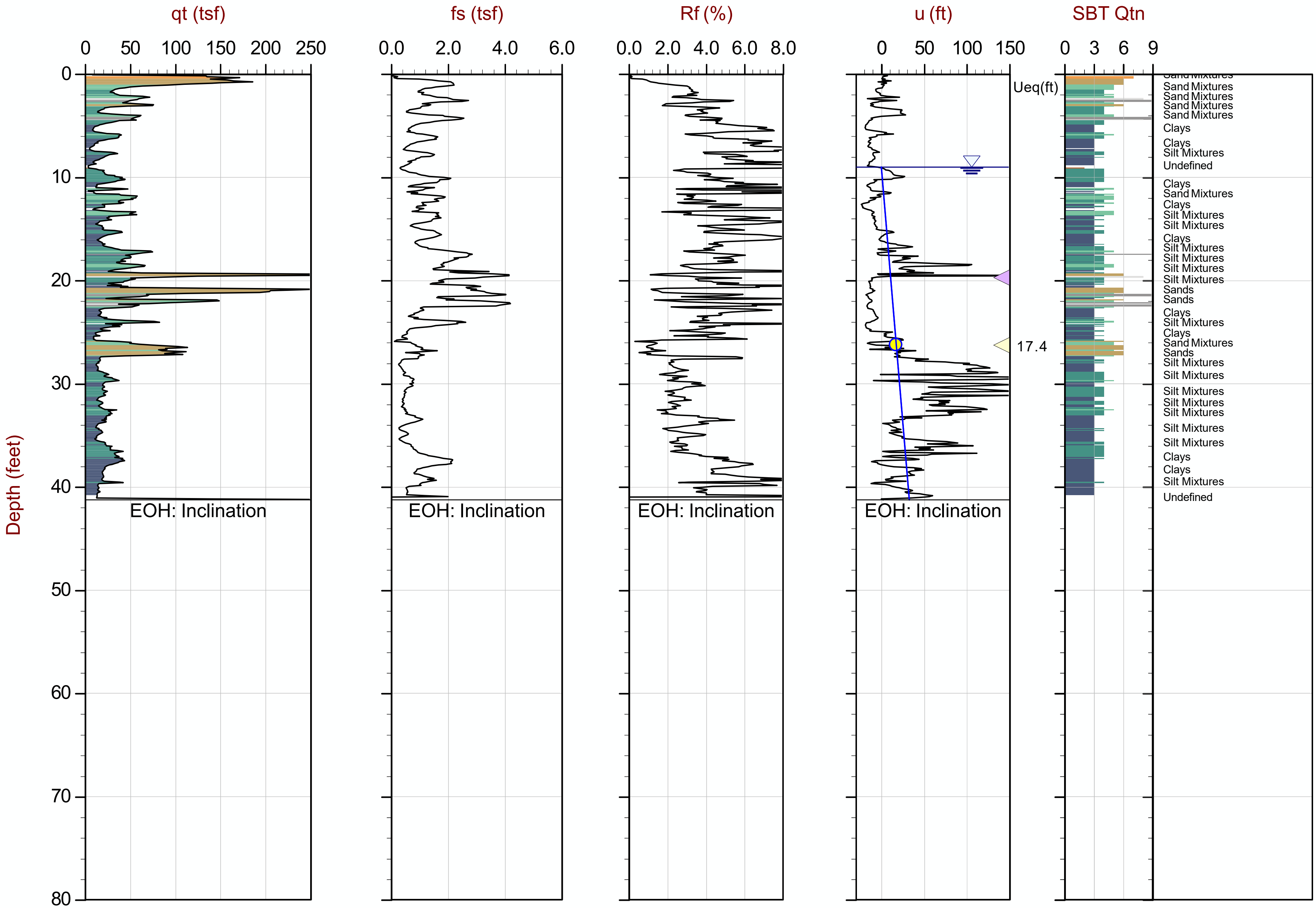
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-23 10:04
Site: CUF TDEC Order

Sounding: CPT25a
Cone: 367:T1500F15U500



Max Depth: 12.575 m / 41.26 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

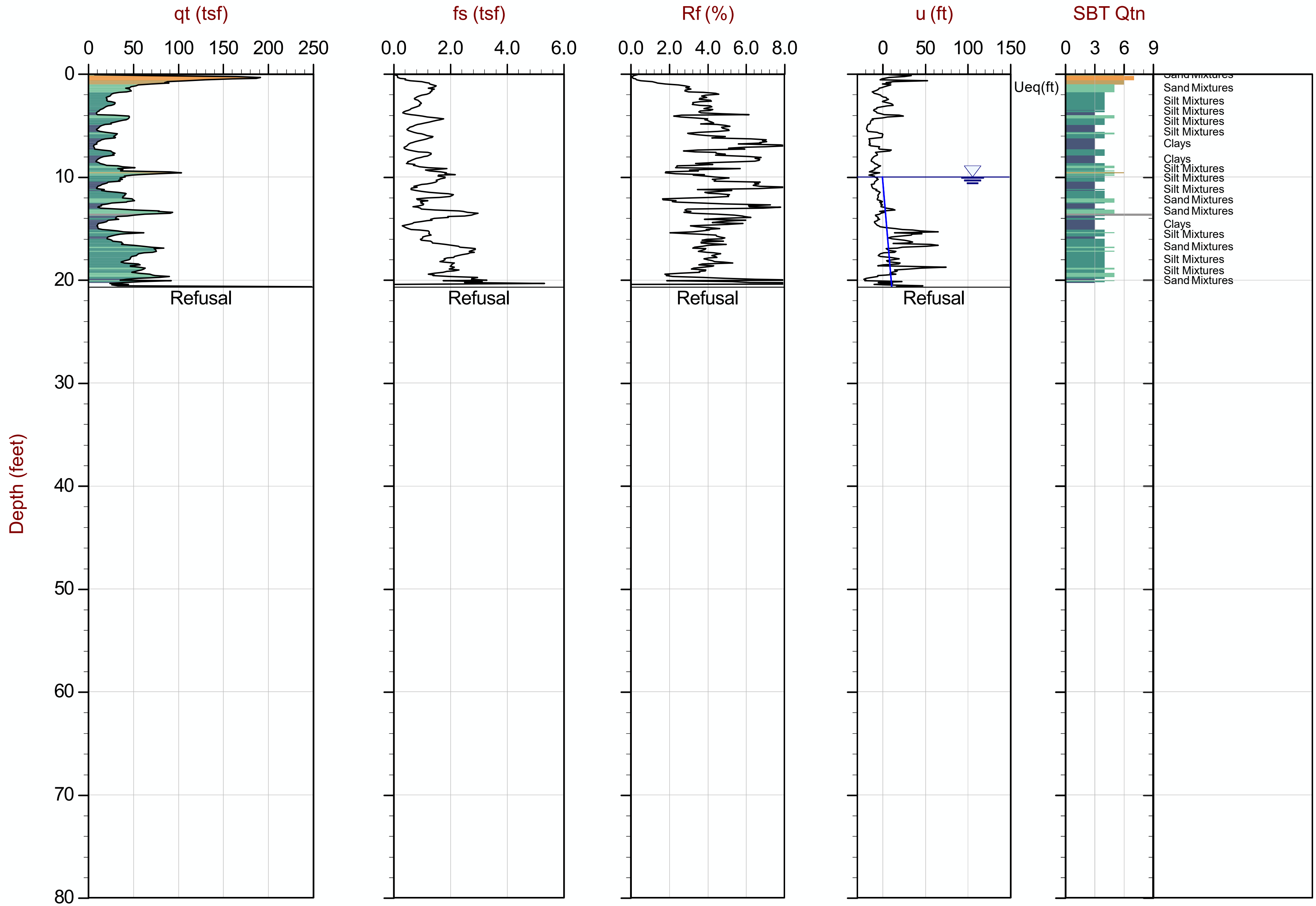
File: 19-54002_CPT25A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ● Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Job No: 19-54002
Sounding: CPT26
Stantec Consulting Services Inc.
Date: 2019-01-16 08:13
Cone: 367:T1500F15U500
Site: CUF TDEC Order



Max Depth: 6.300 m / 20.67 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT26.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

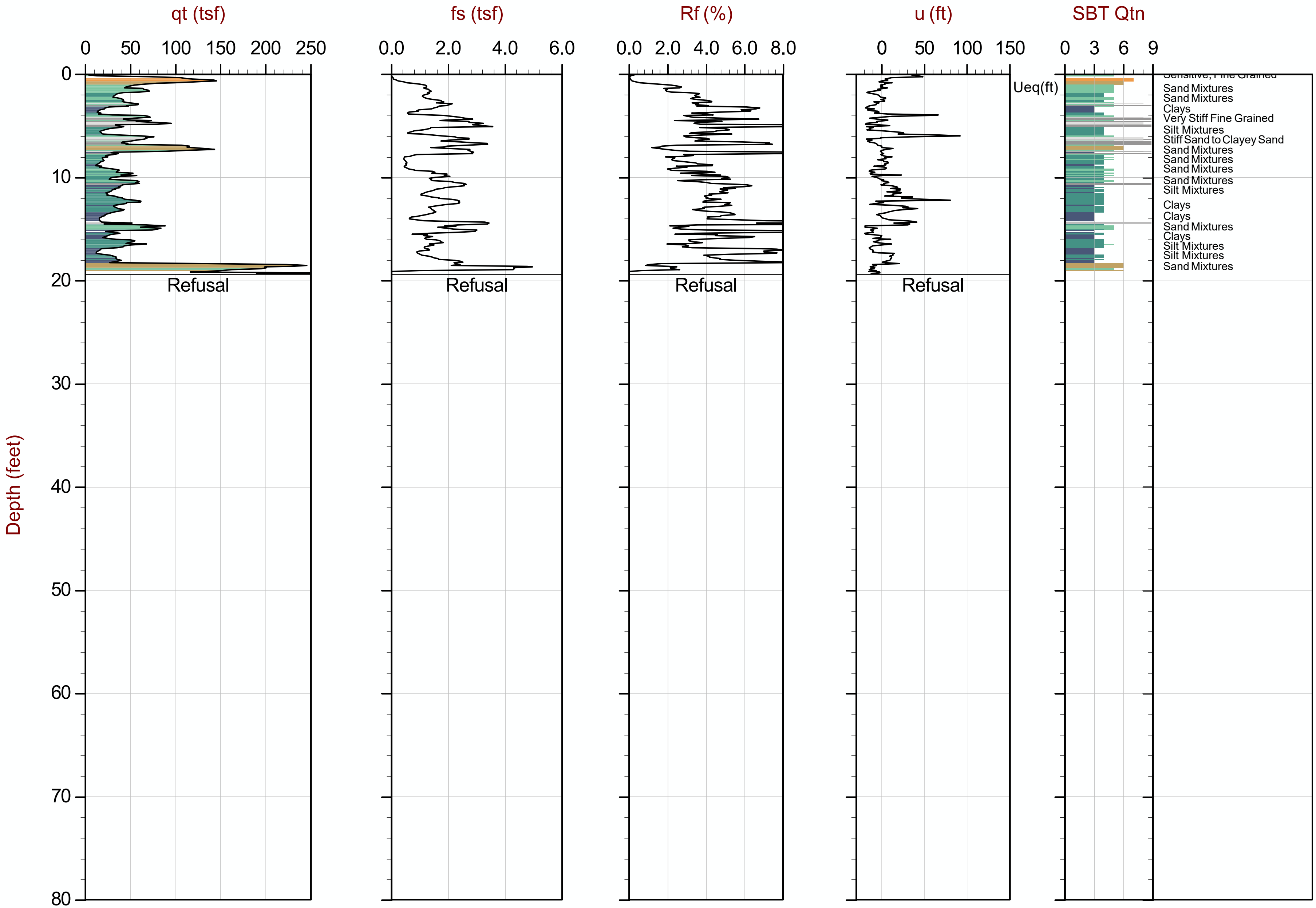
△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-10 12:46
Site: CUF TDEC Order

Sounding: CPT27
Cone: 555:T1500F15U500



Max Depth: 5.900 m / 19.36 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT27.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

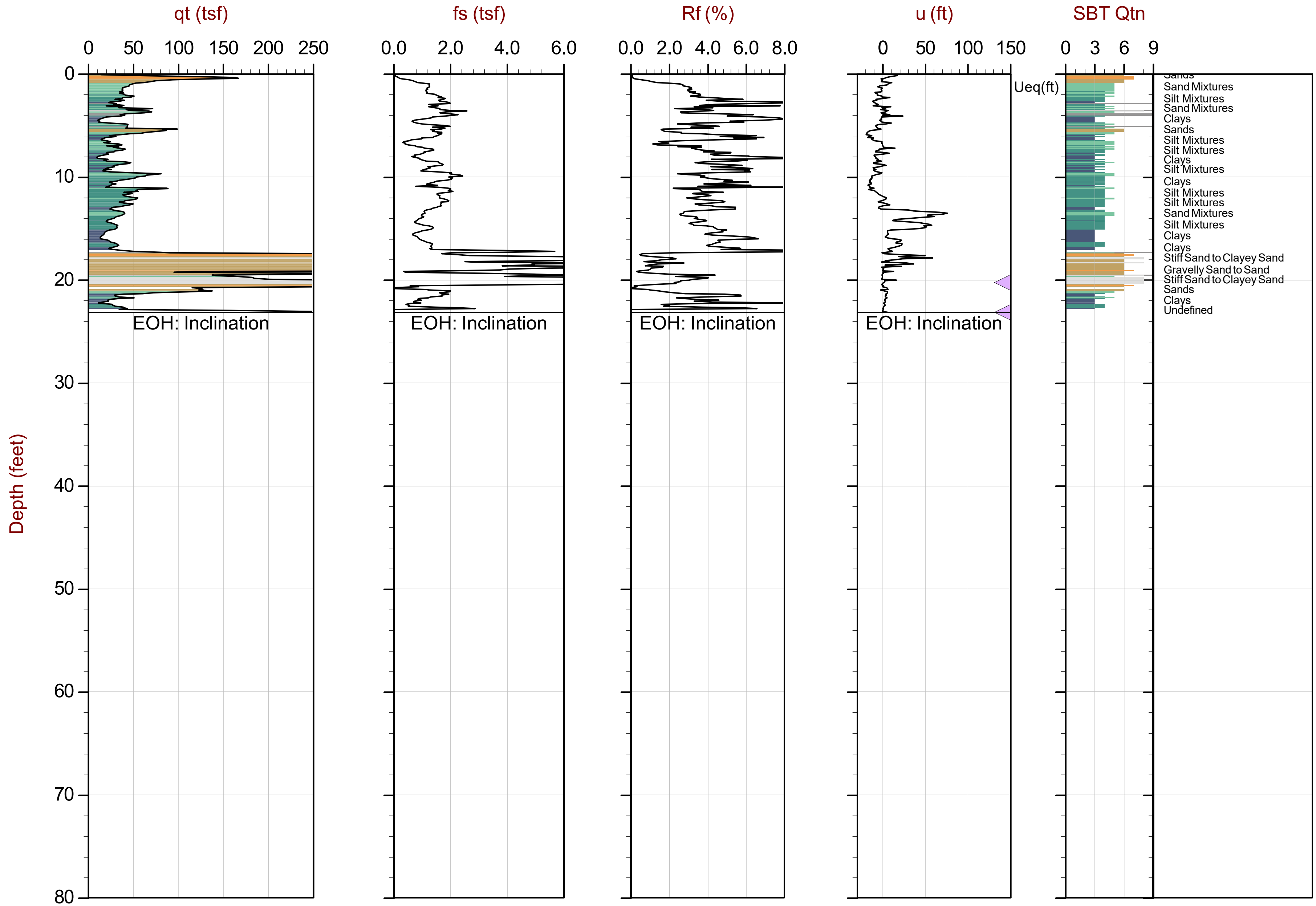
△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-11 08:47
Site: CUF TDEC Order

Sounding: CPT28
Cone: 555:T1500F15U500



Max Depth: 7.050 m / 23.13 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT28.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

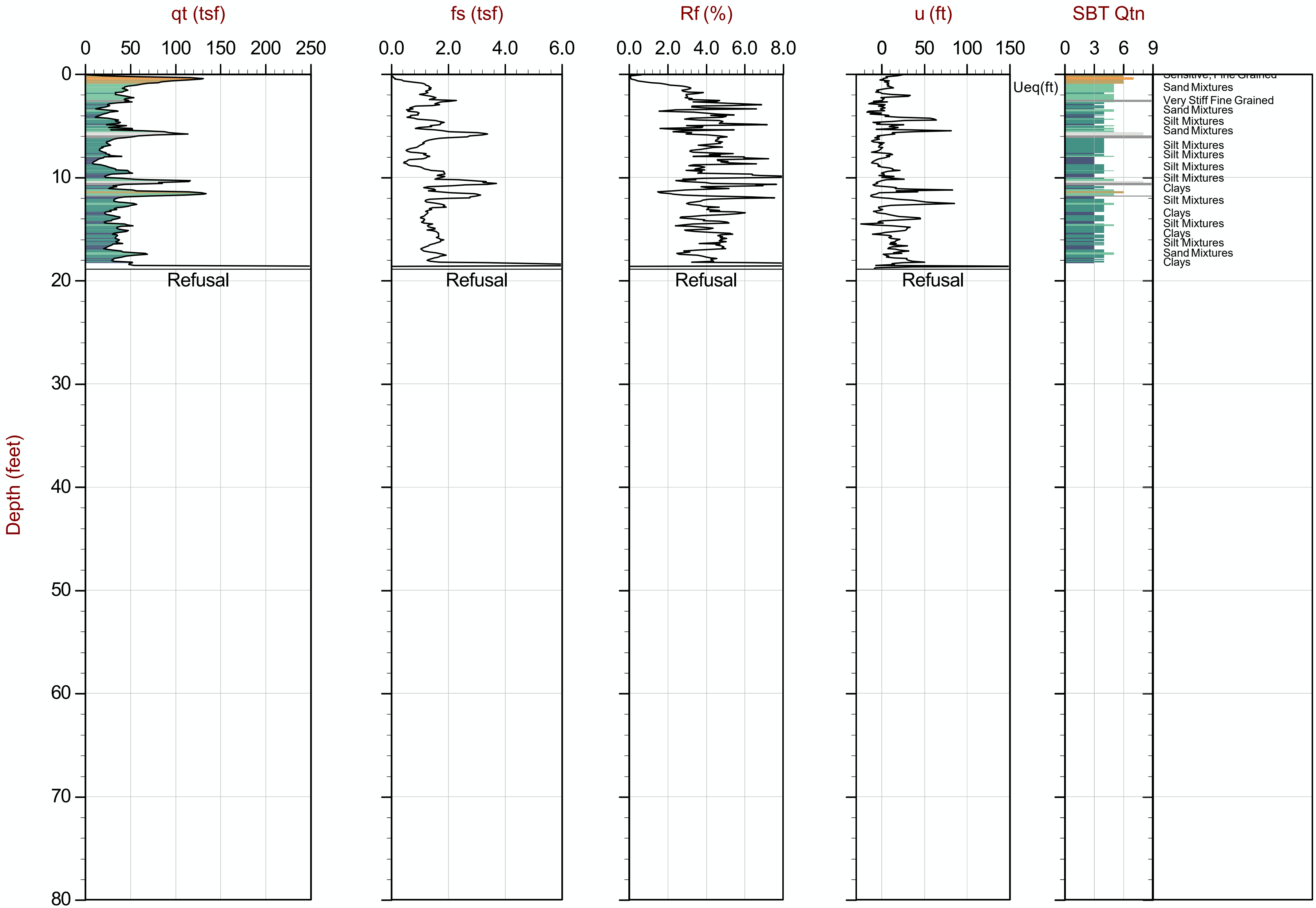
The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-10 15:11
Site: CUF TDEC Order

Sounding: CPT29
Cone: 555:T1500F15U500



Max Depth: 5.750 m / 18.86 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-54002_CPT29.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: Lat: N/A Long: N/A

△ Dissipation with estimated Ueq value △ Dissipation, equilibrium not achieved ○ Equilibrium Pore Pressure (Ueq)

The reported coordinates were acquired from hand-held GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

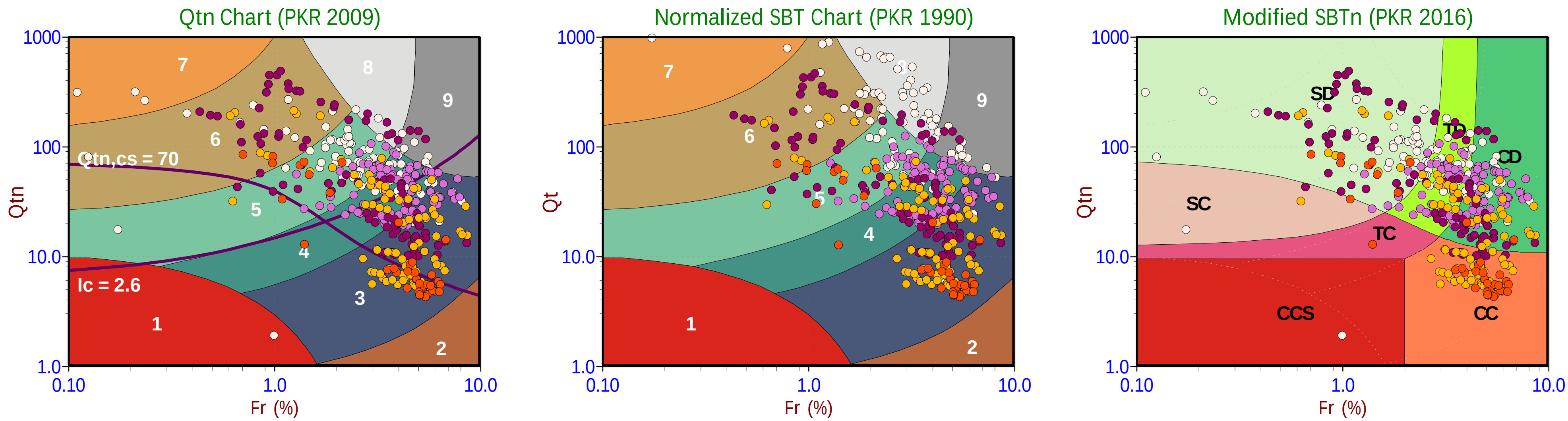
Cone Penetration Test Scatter Plots

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-10 09:08
Site: CUF TDEC Order

Sounding: CPT01
Cone: 555:T1500F15U500



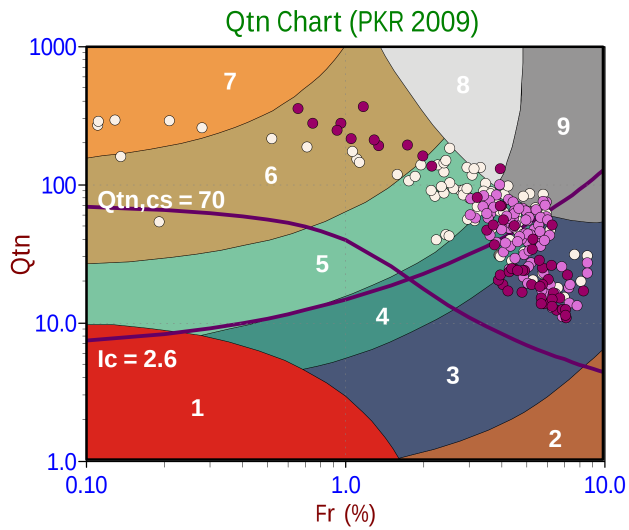
Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

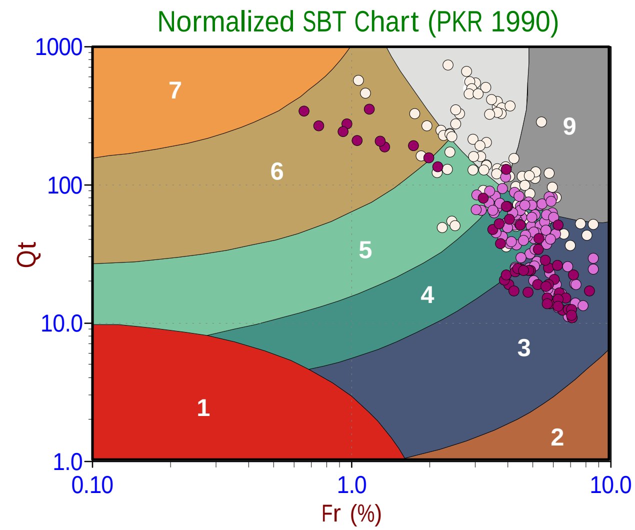
Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

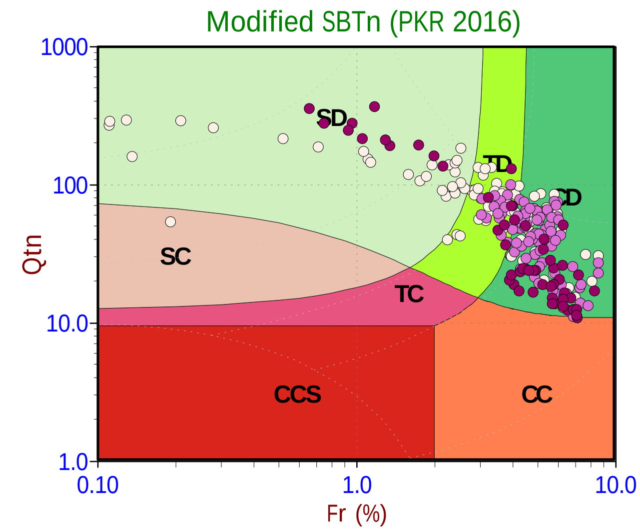
Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 2019-01-09 15:43 Site: CUF TDEC Order	Sounding: CPT02 Cone: 555:T1500F15U500







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

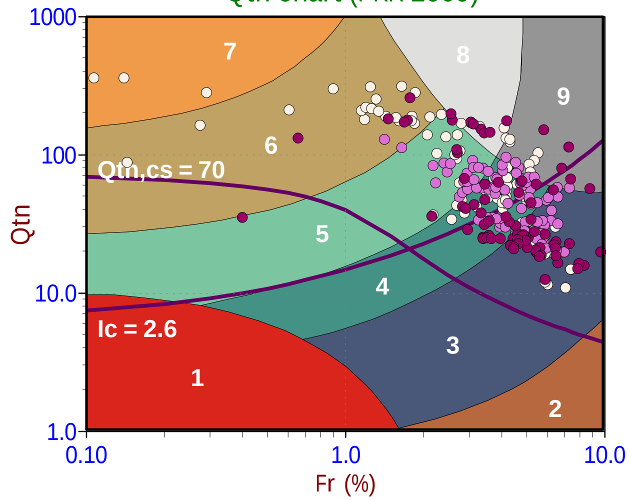
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.

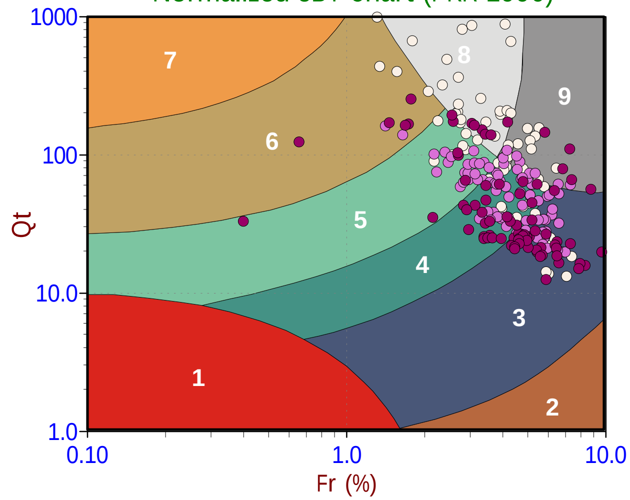
Job No: 19-54002
Date: 2019-01-09 14:37
Site: CUF TDEC Order

Sounding: CPT03
Cone: 555:T1500F15U500

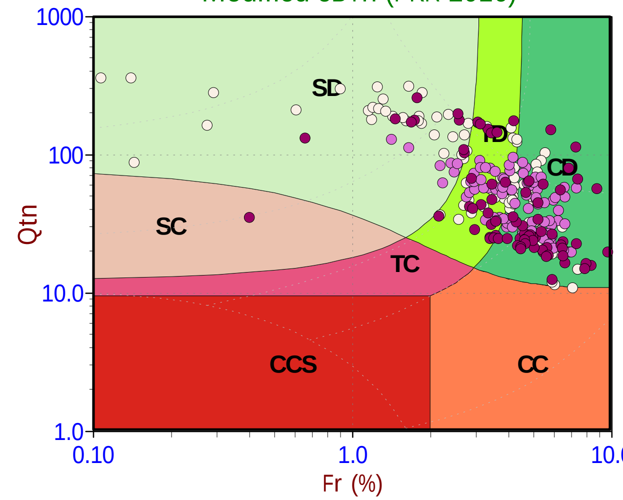
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

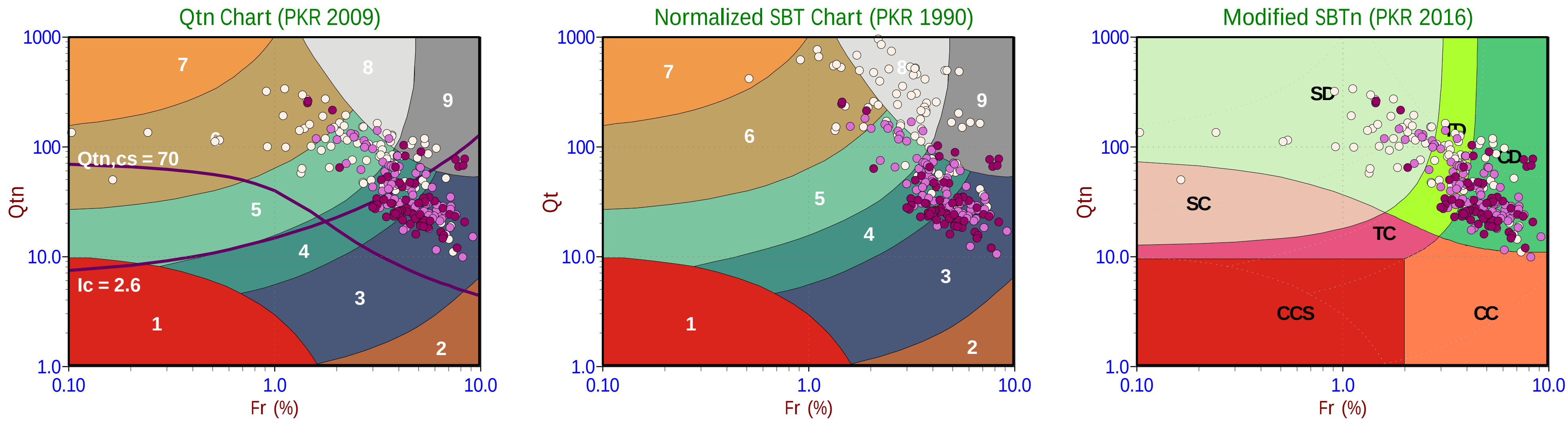
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-08 13:47
Site: CUF TDEC Order

Sounding: CPT04
Cone: 555:T1500F15U500



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

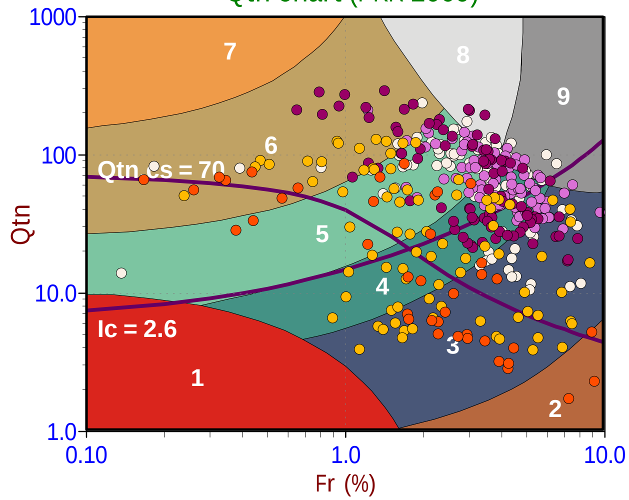
CONETEC

Stantec Consulting Services Inc.

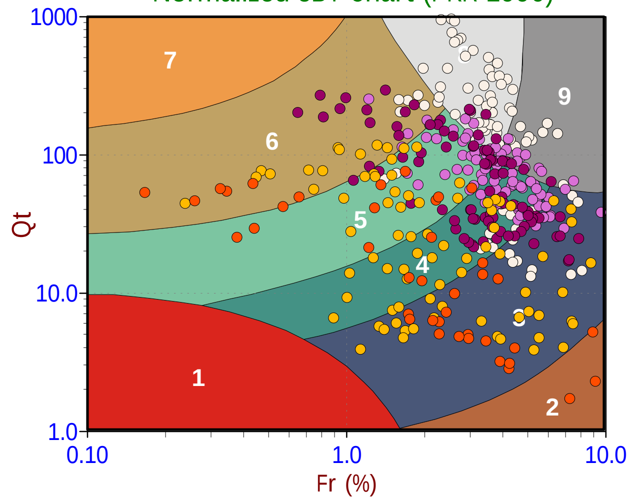
Job No: 19-54002
Date: 2019-01-09 09:04
Site: CUF TDEC Order

Sounding: CPT07
Cone: 555:T1500F15U500

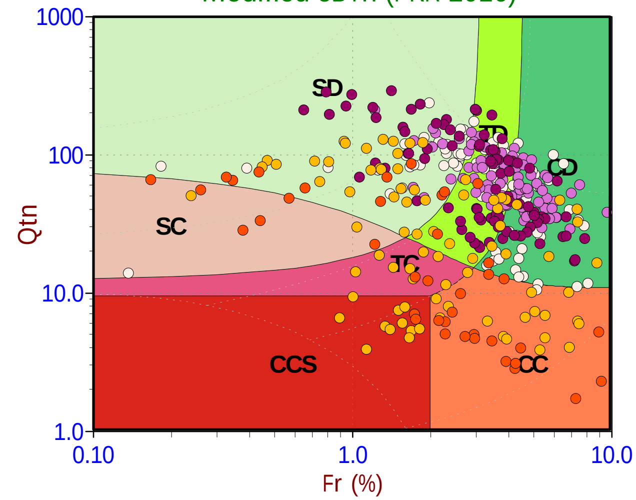
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

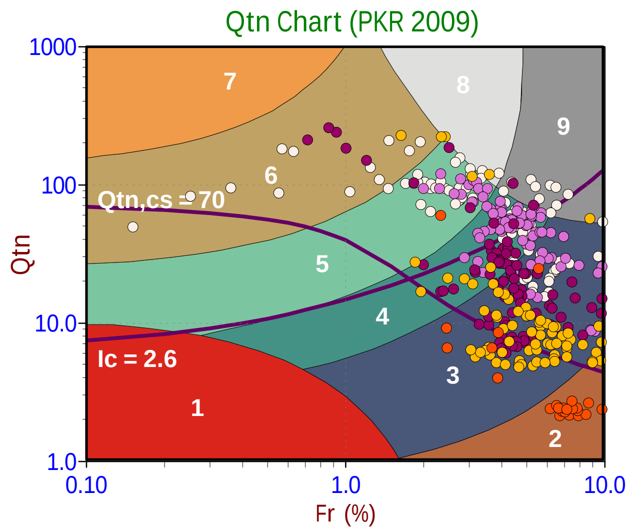
Legend

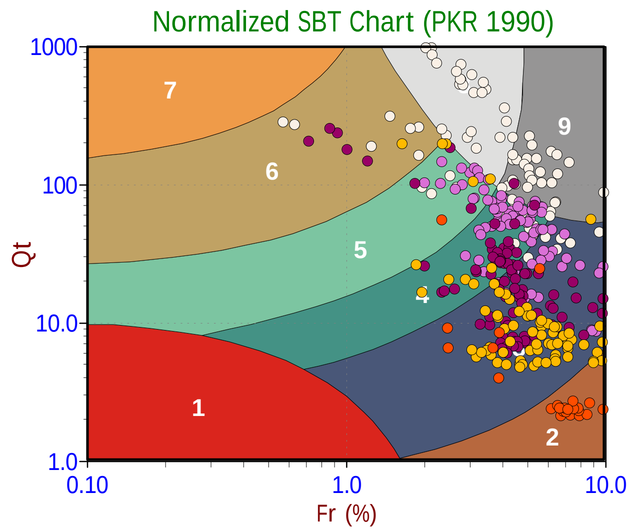
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

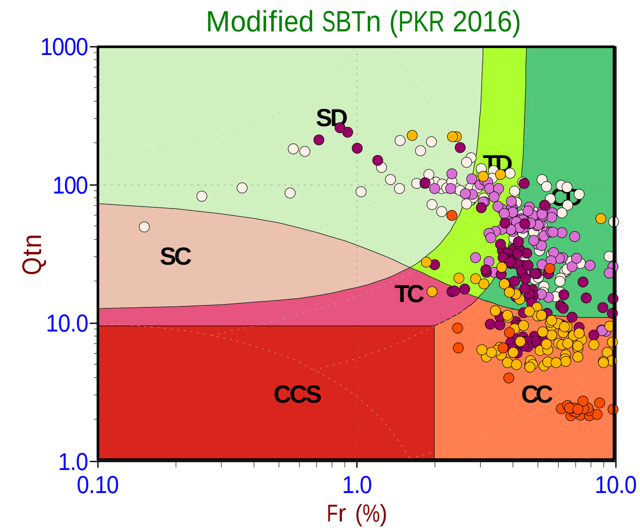
Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-08 15:19
Site: CUF TDEC Order

Sounding: CPT05
Cone: 555:T1500F15U500







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

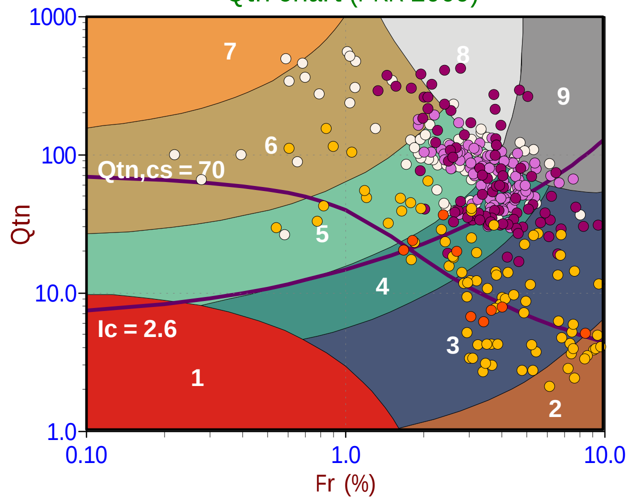
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.

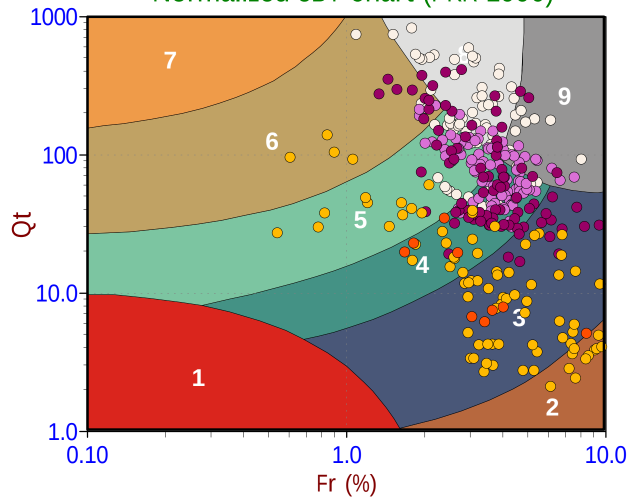
Job No: 19-54002
Date: 2019-01-09 11:21
Site: CUF TDEC Order

Sounding: CPT06
Cone: 555:T1500F15U500

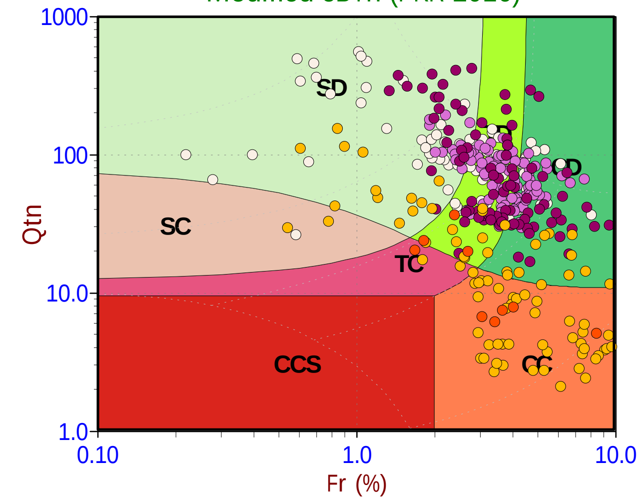
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

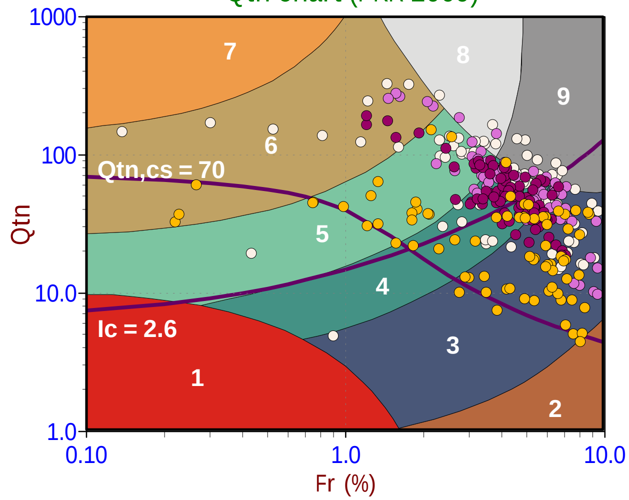
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

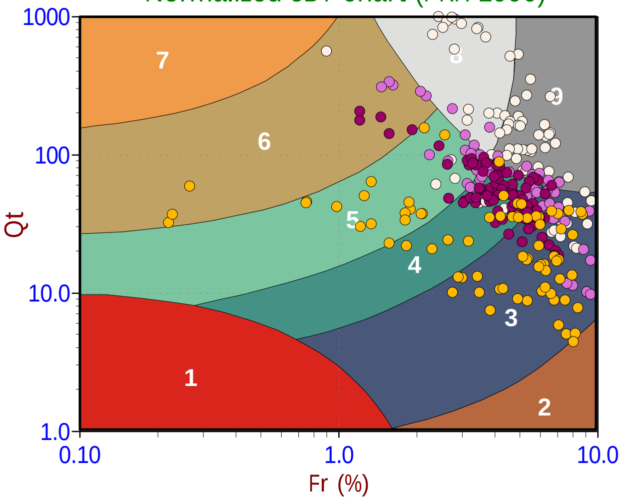
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 2019-01-22 10:52 Site: CUF TDEC Order	Sounding: CPT08 Cone: 367:T1500F15U500

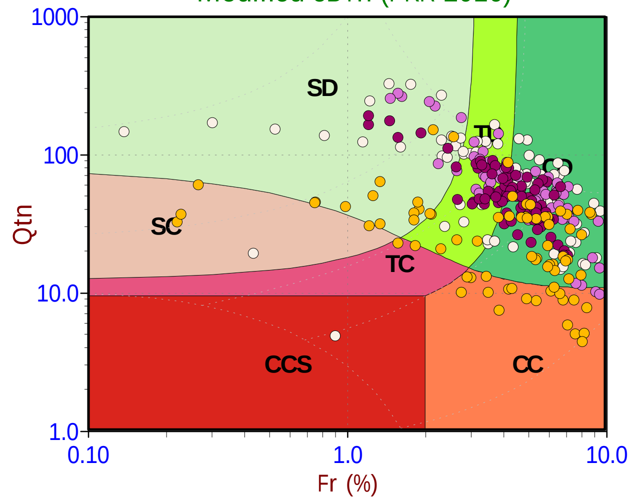
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

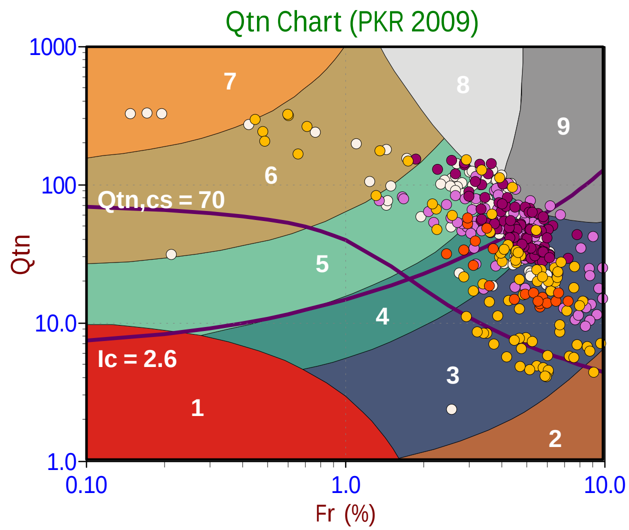
Legend

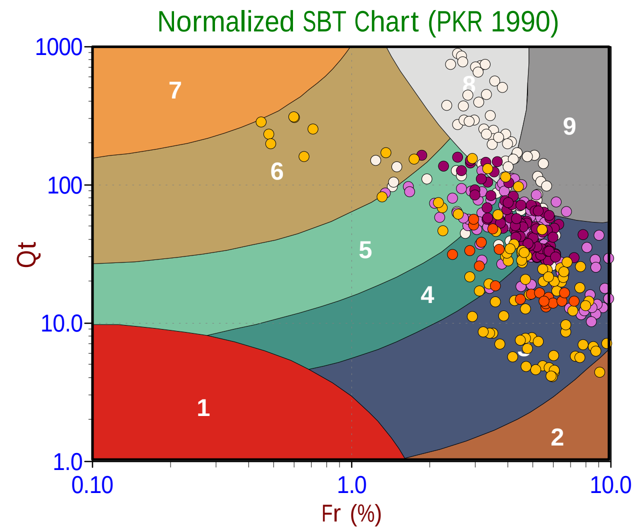
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

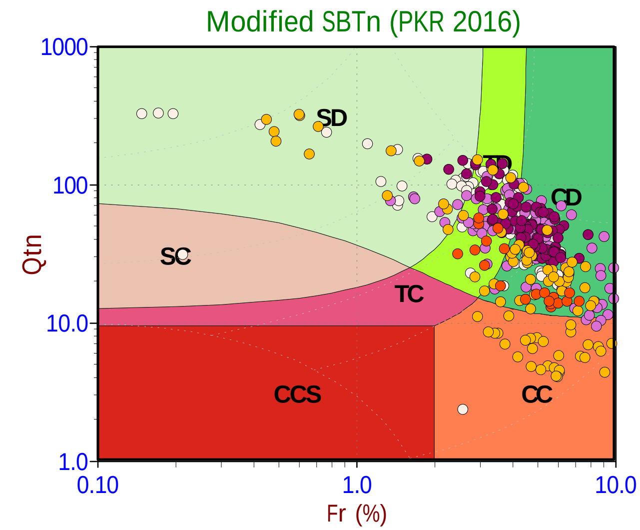
Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-22 09:18
Site: CUF TDEC Order

Sounding: CPT09
Cone: 367:T1500F15U500







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

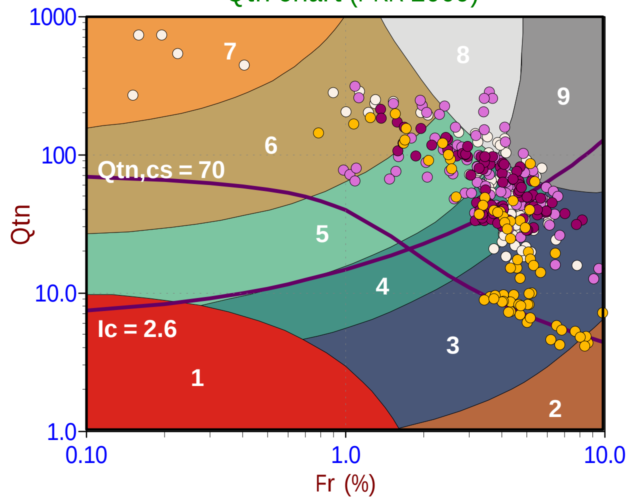
CONETEC

Stantec Consulting Services Inc.

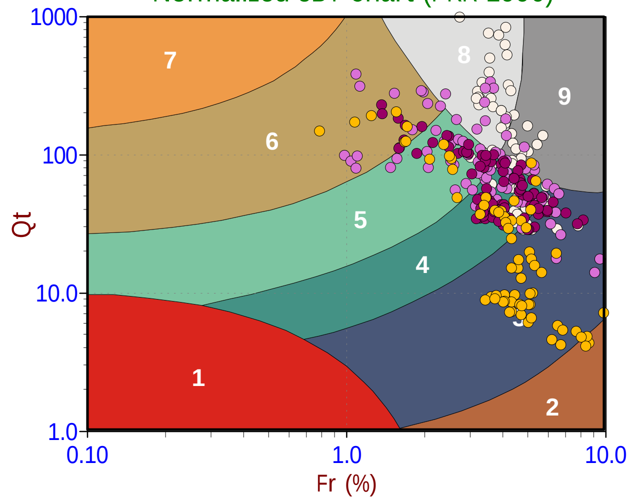
Job No: 19-54002
Date: 2019-01-22 07:47
Site: CUF TDEC Order

Sounding: CPT10
Cone: 367:T1500F15U500

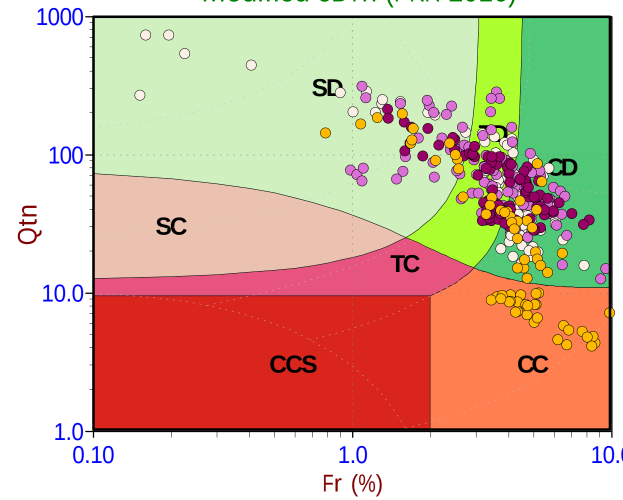
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



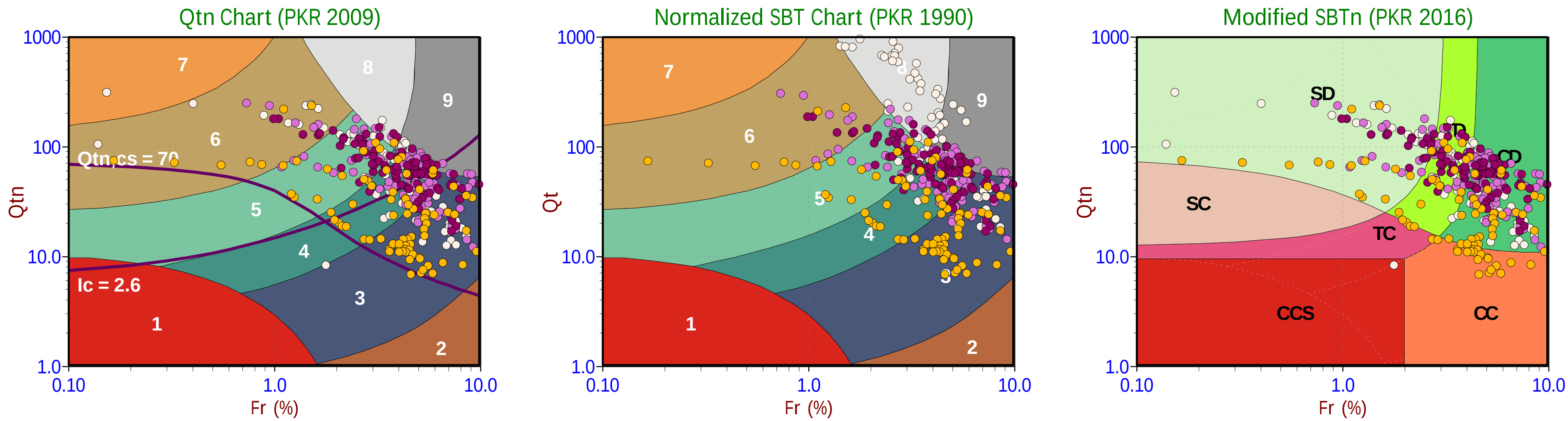
Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 2019-01-21 15:19 Site: CUF TDEC Order	Sounding: CPT11 Cone: 367:T1500F15U500



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

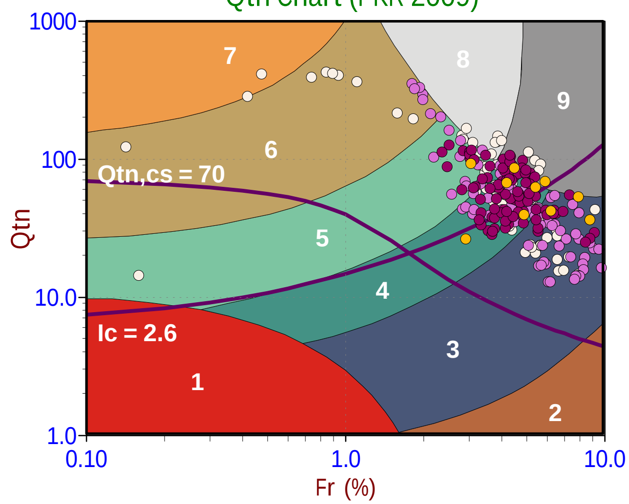
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.

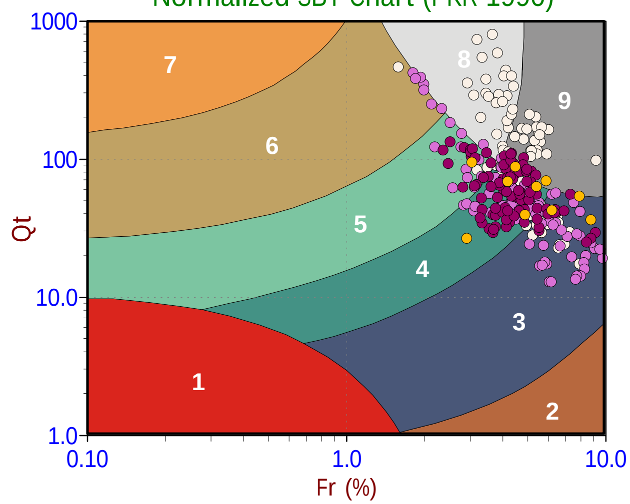
Job No: 19-54002
Date: 2019-01-21 14:08
Site: CUF TDEC Order

Sounding: CPT12
Cone: 367:T1500F15U500

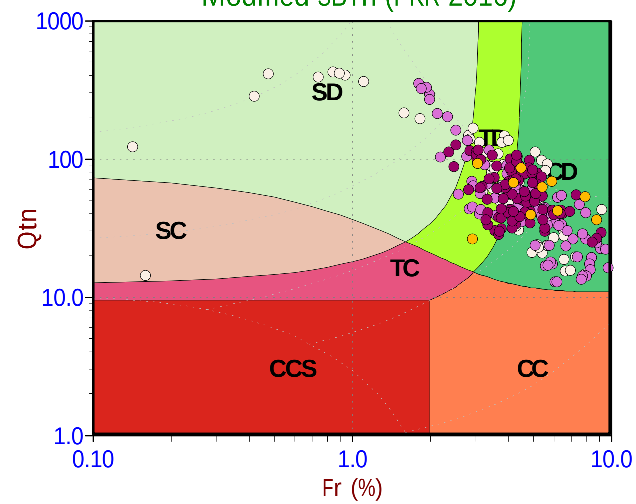
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

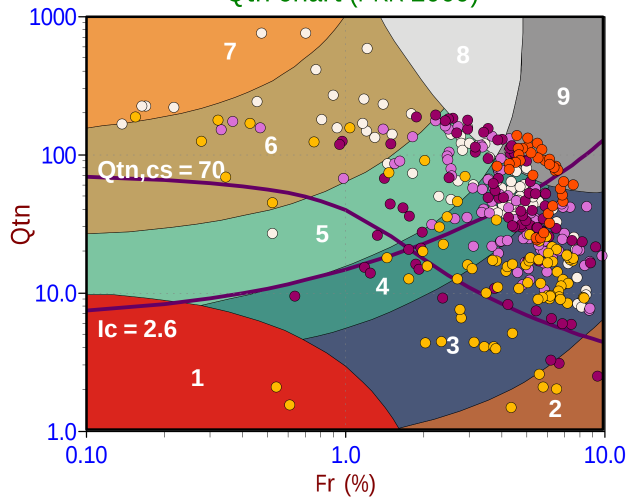
CONETEC

Stantec Consulting Services Inc.

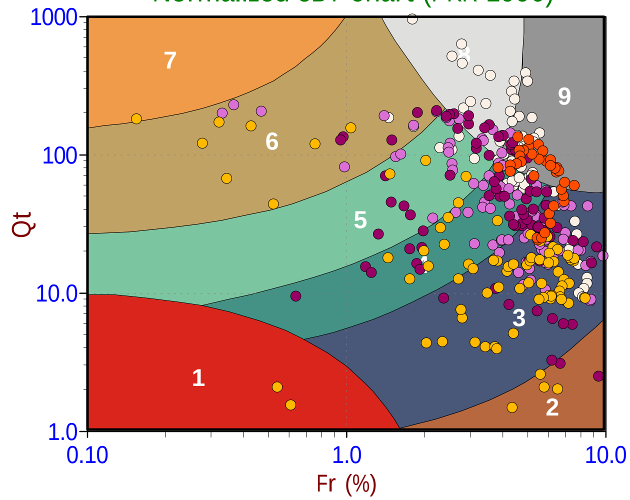
Job No: 19-54002
Date: 2019-01-21 12:31
Site: CUF TDEC Order

Sounding: CPT13
Cone: 367:T1500F15U500

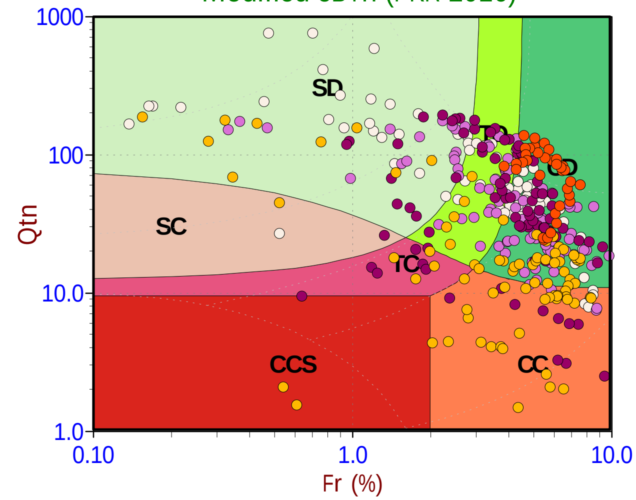
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

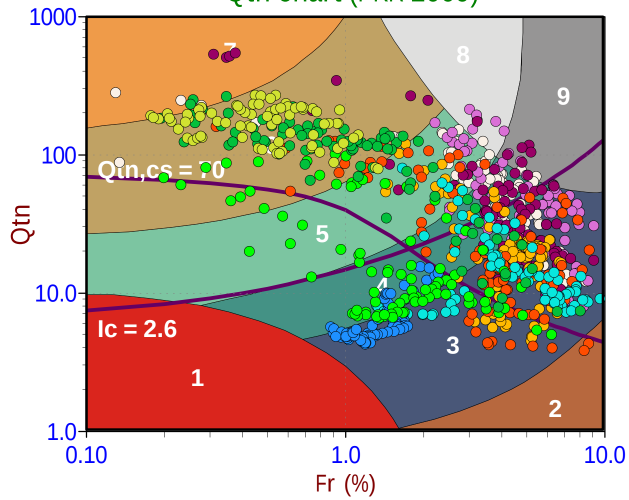
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.

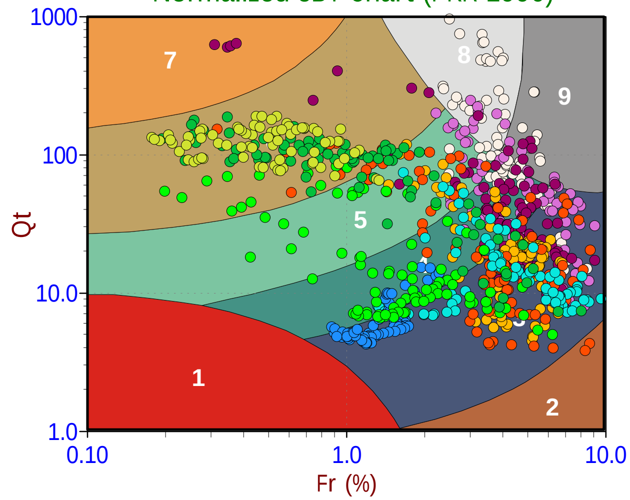
Job No: 19-54002
Date: 2019-01-18 07:38
Site: CUF TDEC Order

Sounding: CPT14
Cone: 367:T1500F15U500

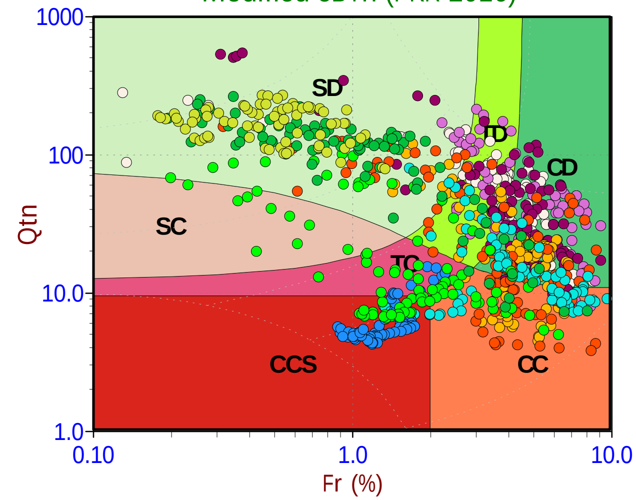
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

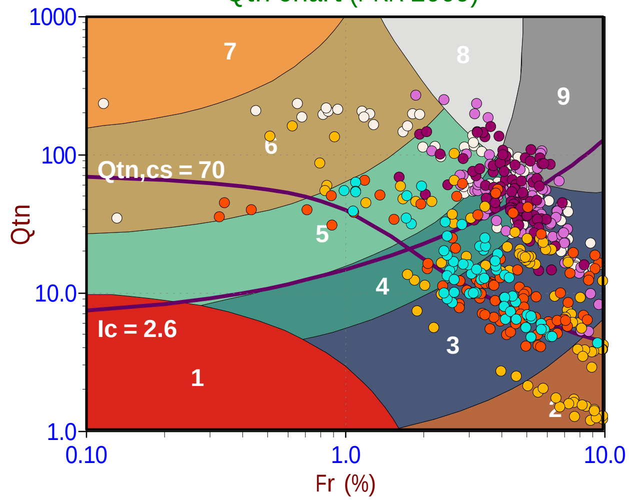
CONETEC

Stantec Consulting Services Inc.

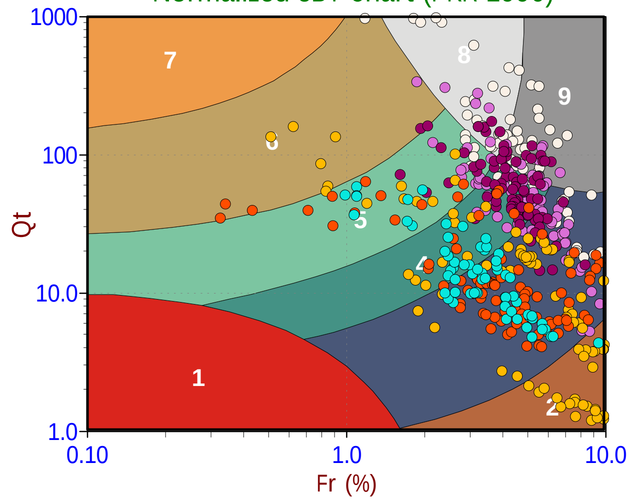
Job No: 19-54002
Date: 2019-01-17 13:05
Site: CUF TDEC Order

Sounding: CPT15
Cone: 367:T1500F15U500

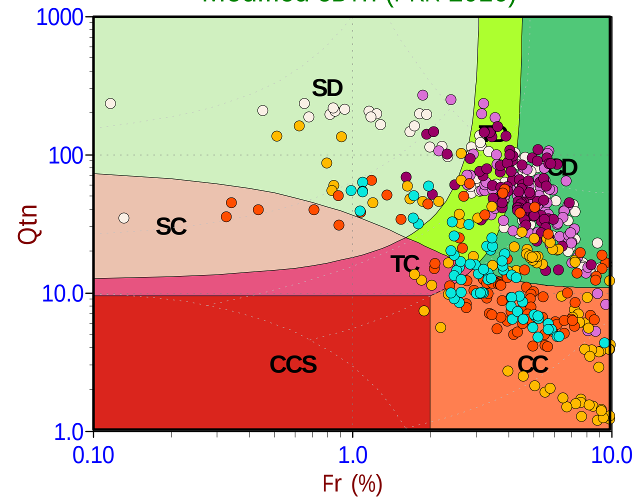
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

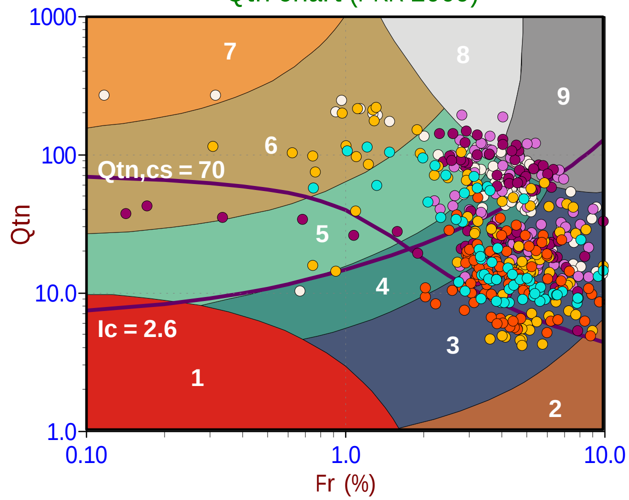
CONETEC

Stantec Consulting Services Inc.

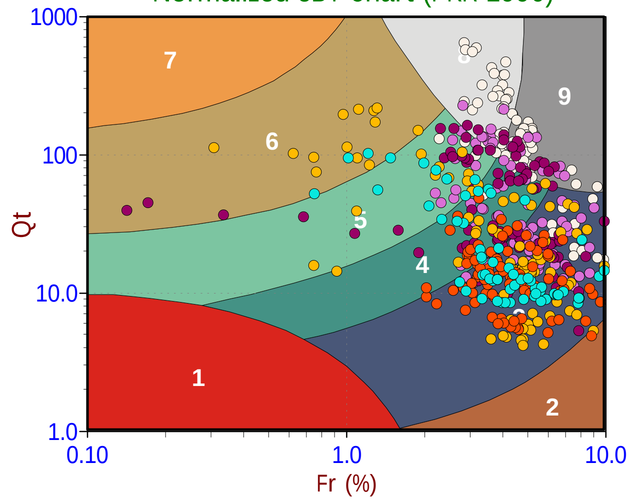
Job No: 19-54002
Date: 2019-01-17 10:17
Site: CUF TDEC Order

Sounding: CPT16
Cone: 367:T1500F15U500

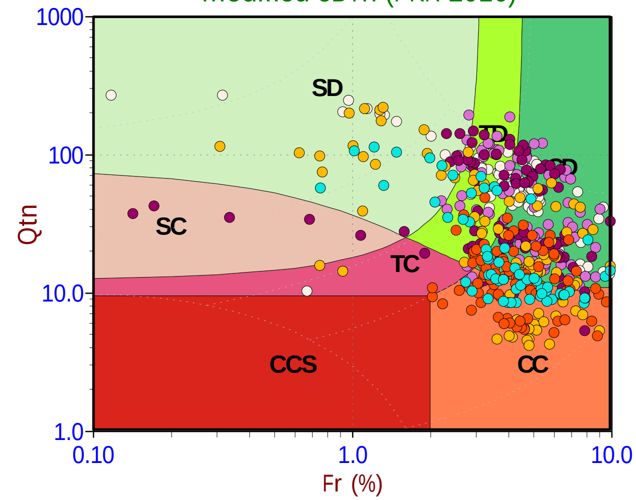
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

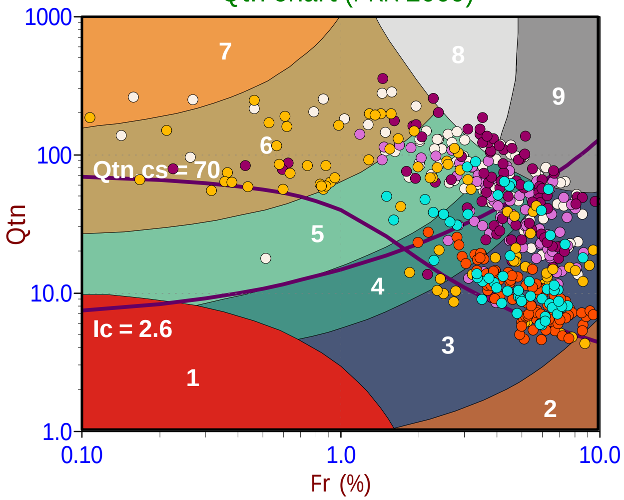
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

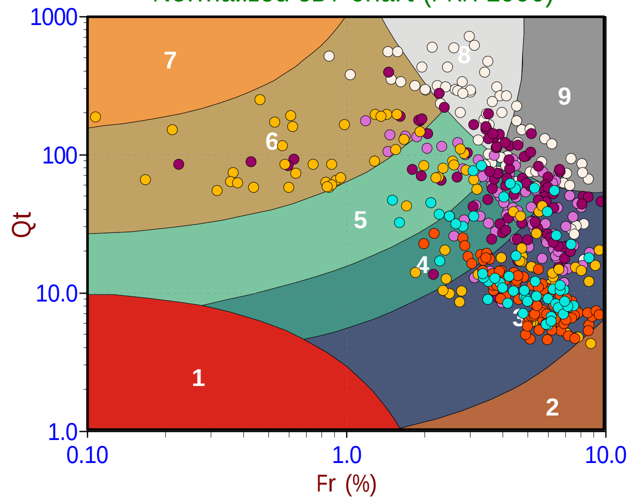
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 2019-01-17 08:36 Site: CUF TDEC Order	Sounding: CPT17 Cone: 367:T1500F15U500

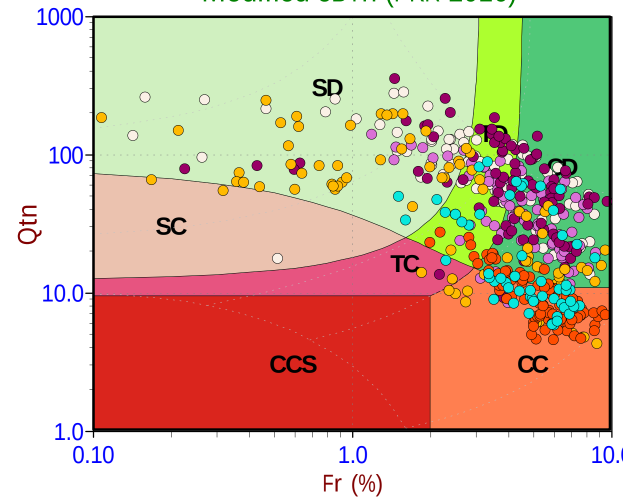
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

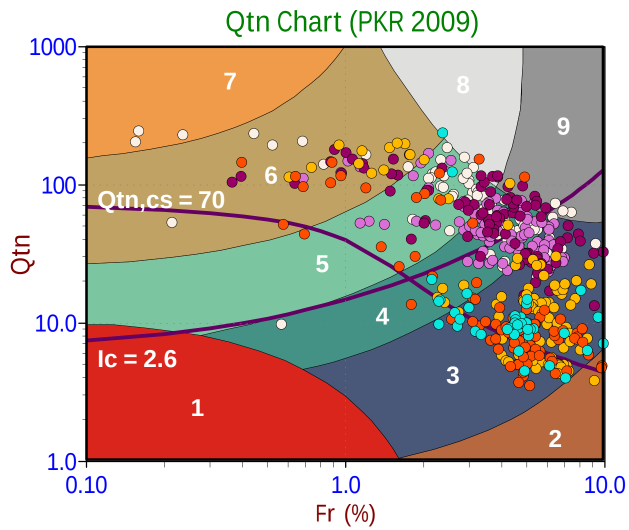
Legend

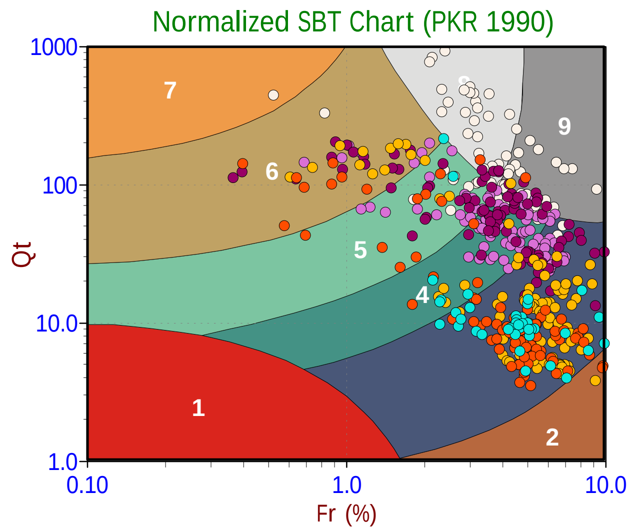
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

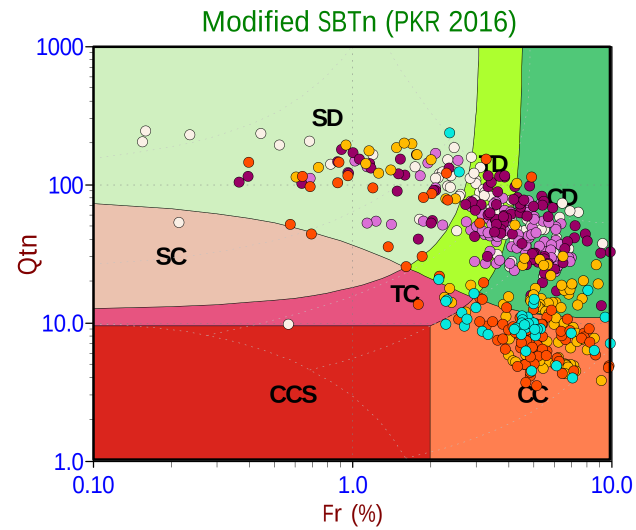
CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-22 15:14
Site: CUF TDEC Order
Sounding: CPT17a
Cone: 367:T1500F15U500







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

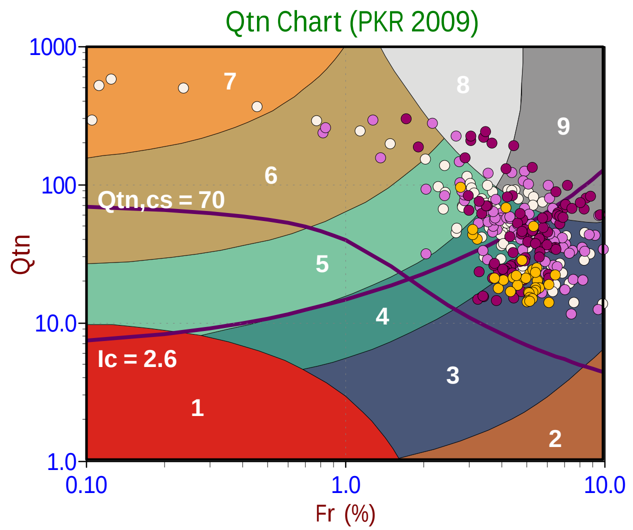
Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

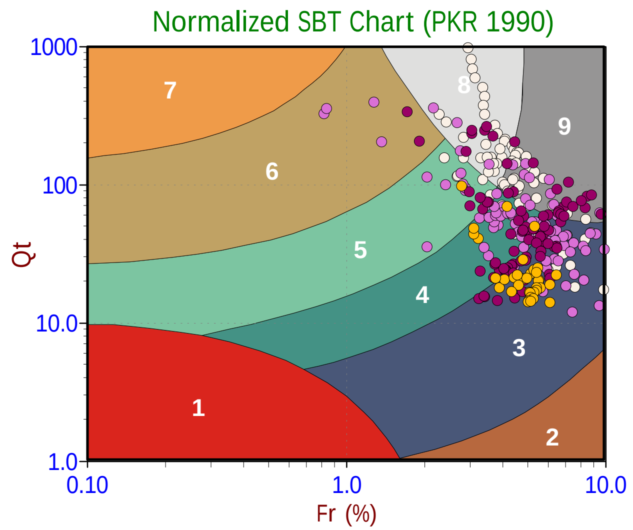
Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

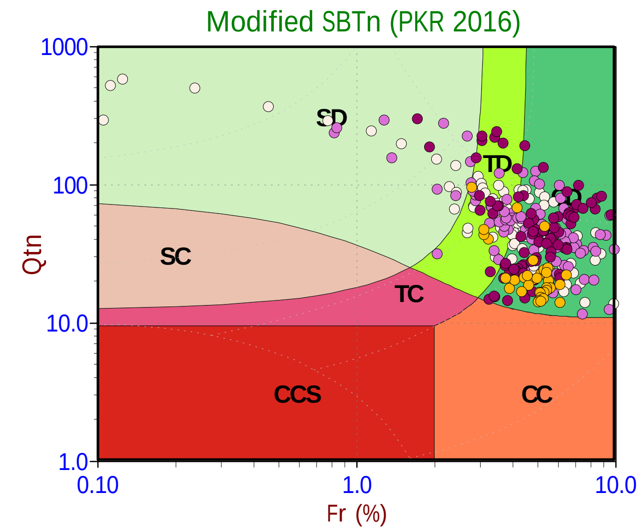
Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

ConeTec

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 2019-01-16 14:48 Site: CUF TDEC Order	Sounding: CPT18 Cone: 367:T1500F15U500







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

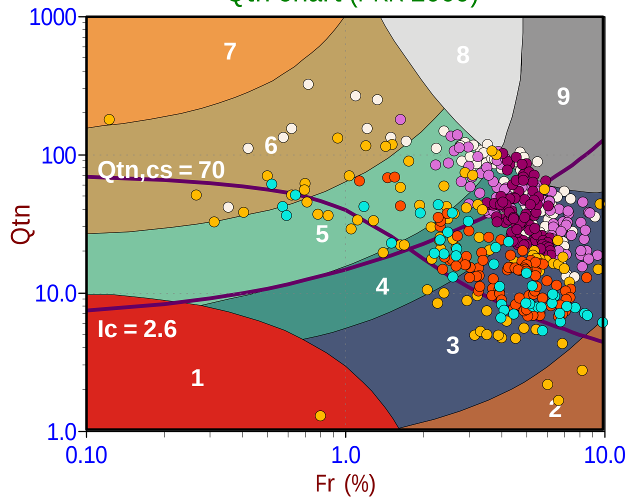
CONETEC

Stantec Consulting Services Inc.

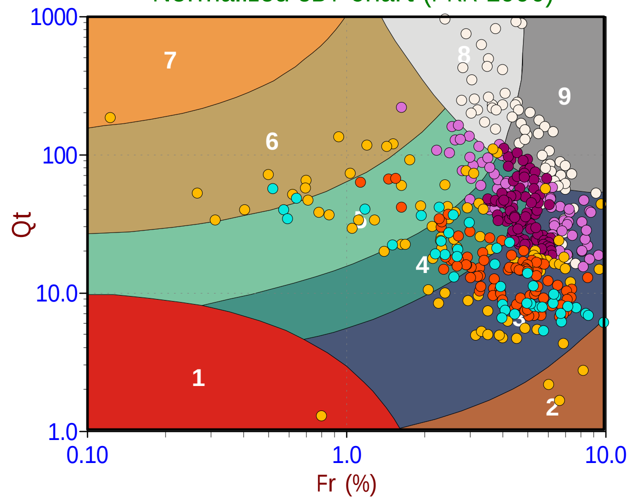
Job No: 19-54002
Date: 2019-01-16 11:39
Site: CUF TDEC Order

Sounding: CPT19
Cone: 367:T1500F15U500

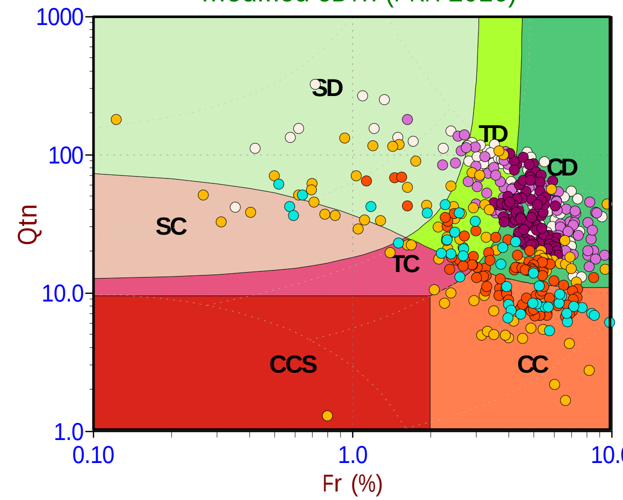
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

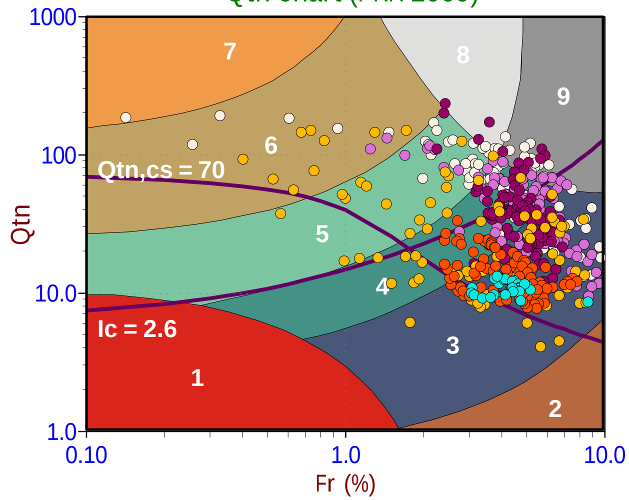
CONETEC

Stantec Consulting Services Inc.

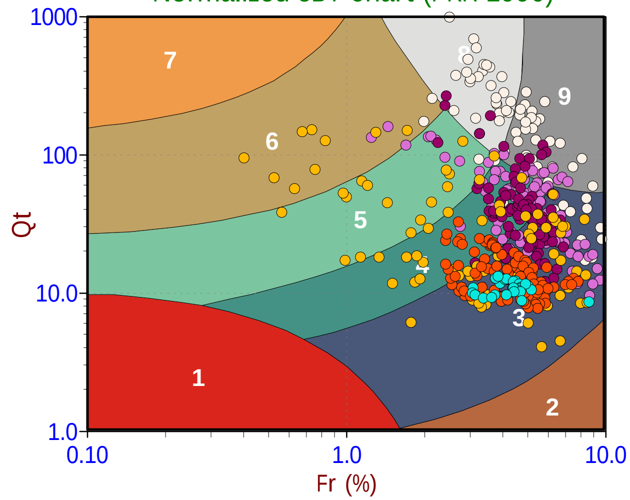
Job No: 19-54002
Date: 2019-01-16 10:19
Site: CUF TDEC Order

Sounding: CPT20
Cone: 367:T1500F15U500

Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



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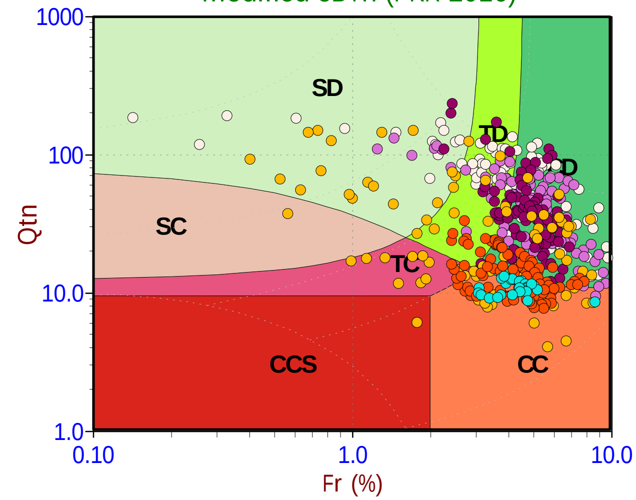


Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

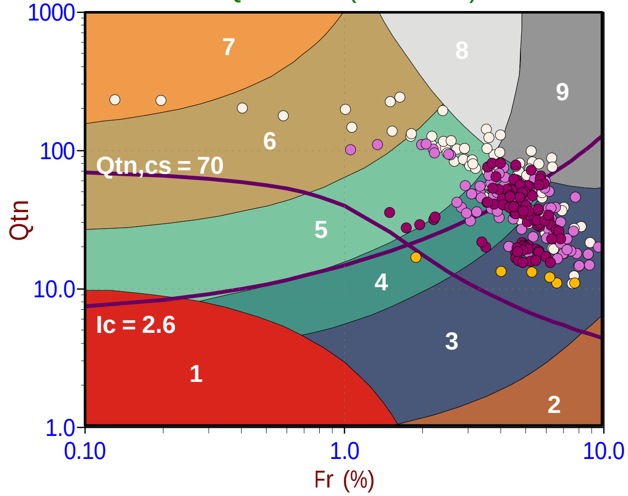
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

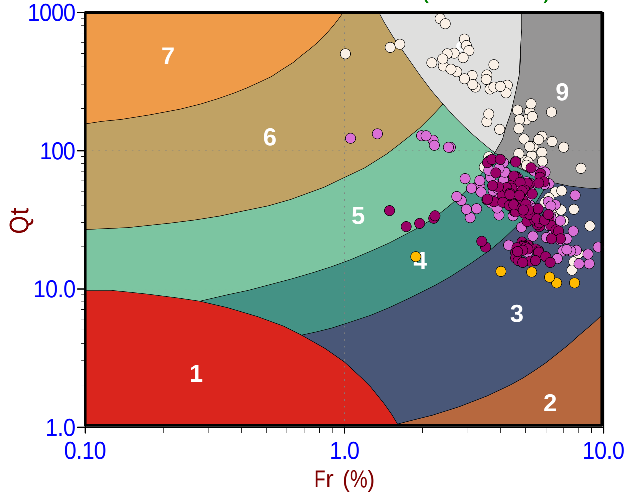
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.	Job No: 19-54002	Sounding: CPT21
	Date: 2019-01-16 09:06	Cone: 367:T1500F15U500
	Site: CUF TDEC Order	

Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



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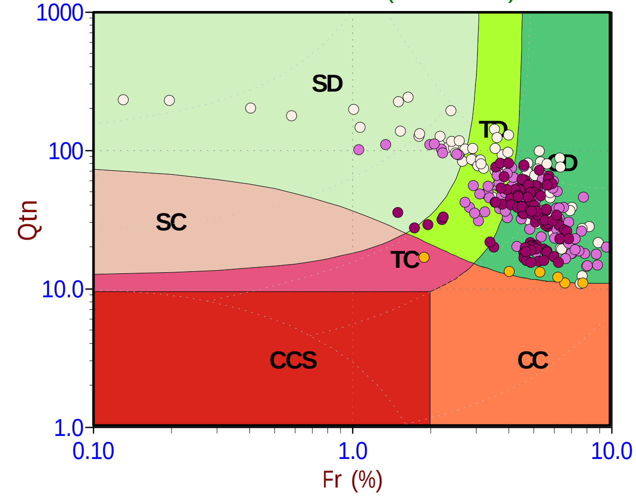


Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

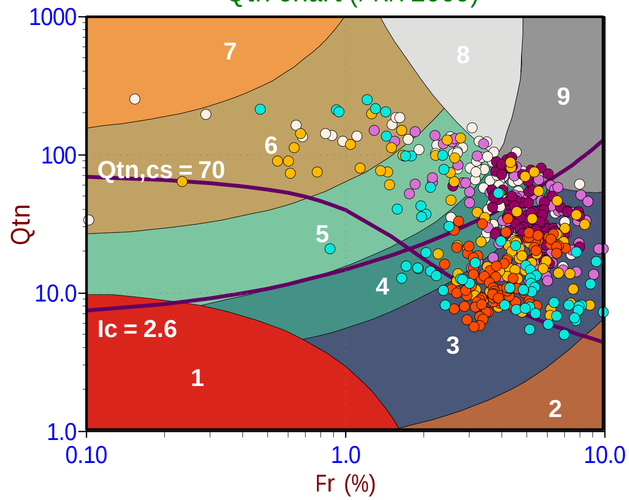
CONETEC

Stantec Consulting Services Inc.

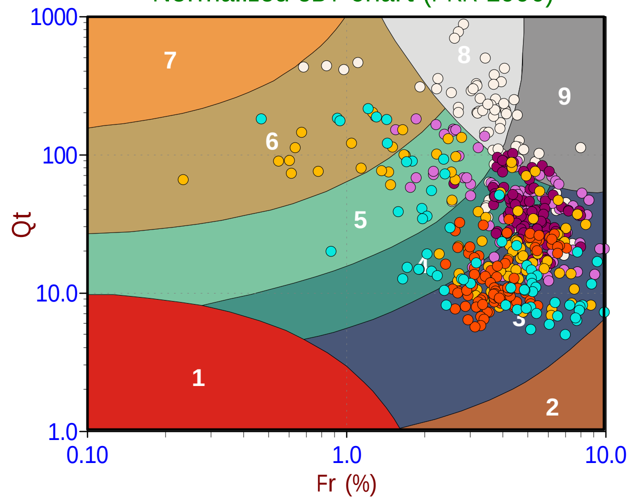
Job No: 19-54002
Date: 2019-01-15 07:51
Site: CUF TDEC Order

Sounding: CPT22
Cone: 367:T1500F15U500

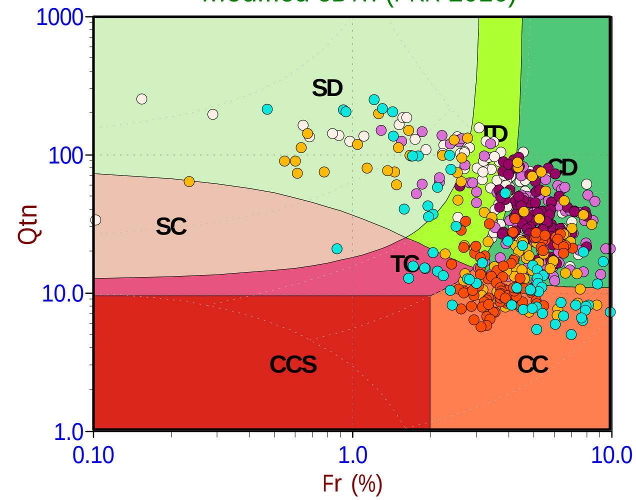
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

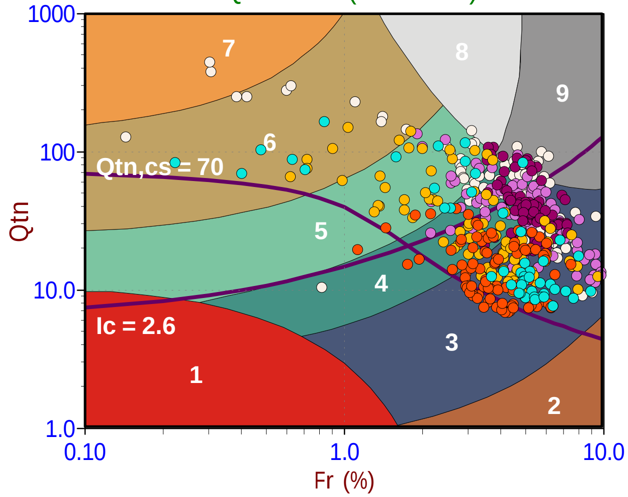
CONETEC

Stantec Consulting Services Inc.

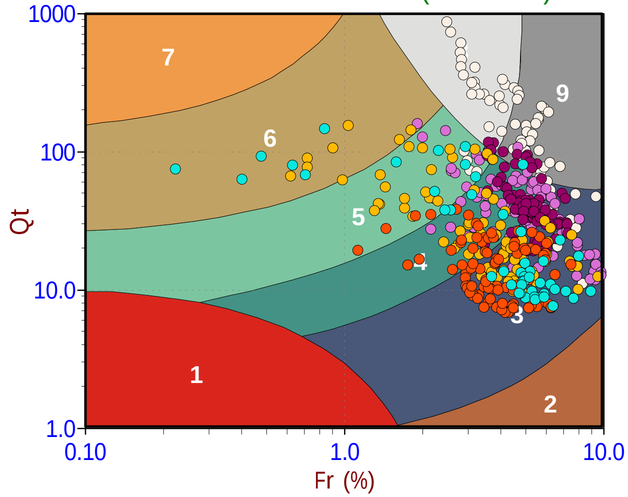
Job No: 19-54002
Date: 2019-01-23 07:33
Site: CUF TDEC Order

Sounding: CPT22a
Cone: 367:T1500F15U500

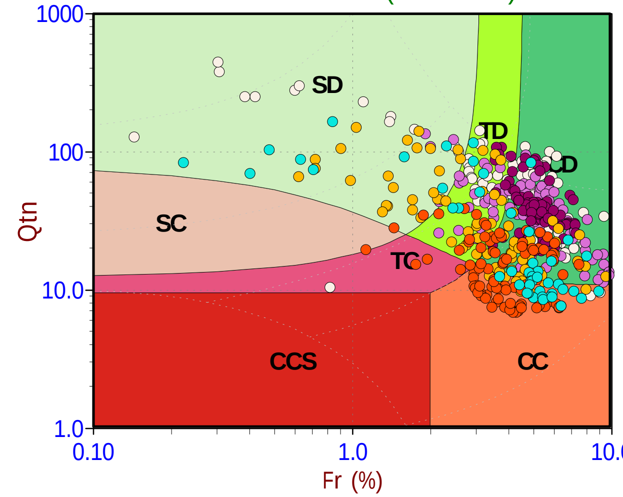
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

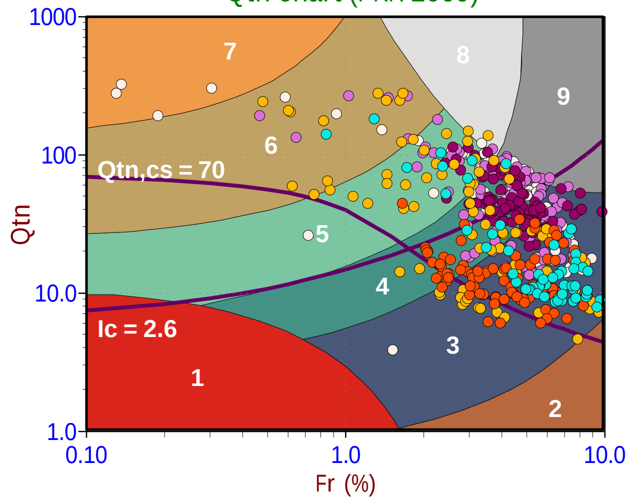
CONETEC

Stantec Consulting Services Inc.

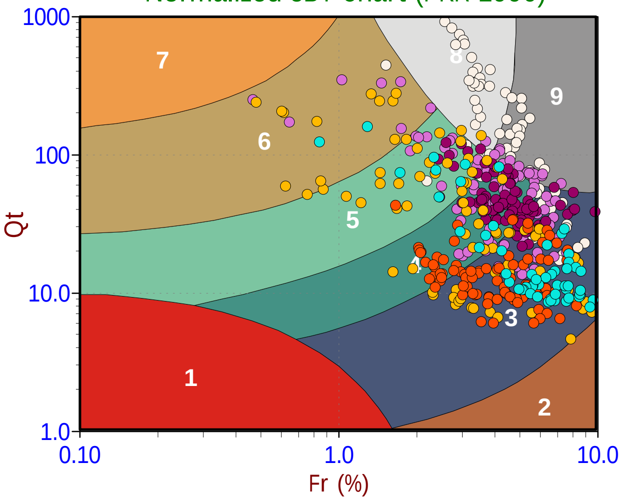
Job No: 19-54002
Date: 2019-01-14 13:17
Site: CUF TDEC Order

Sounding: CPT23
Cone: 367:T1500F15U500

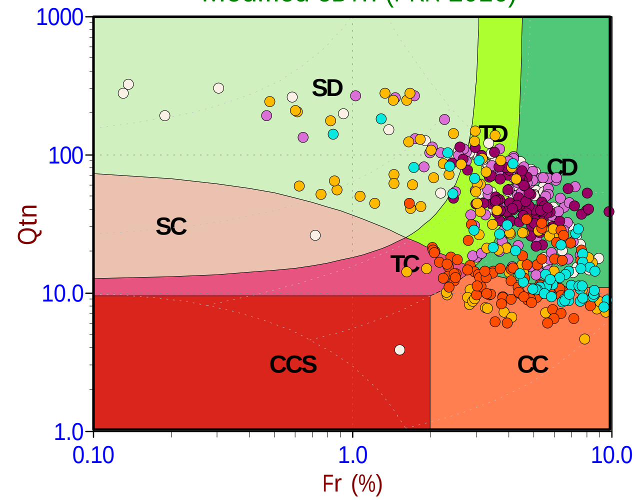
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

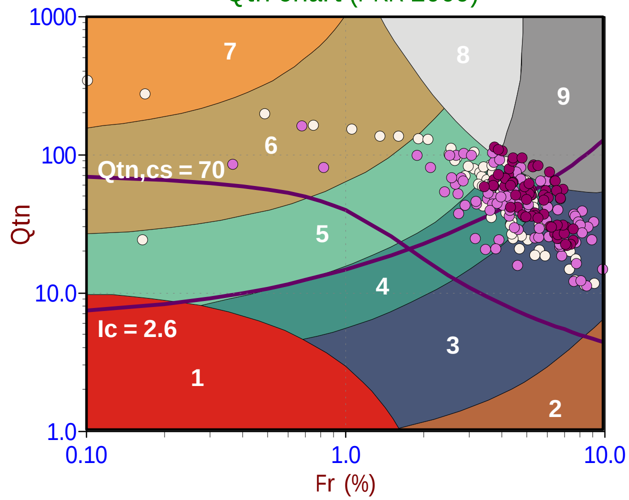
CONETEC

Stantec Consulting Services Inc.

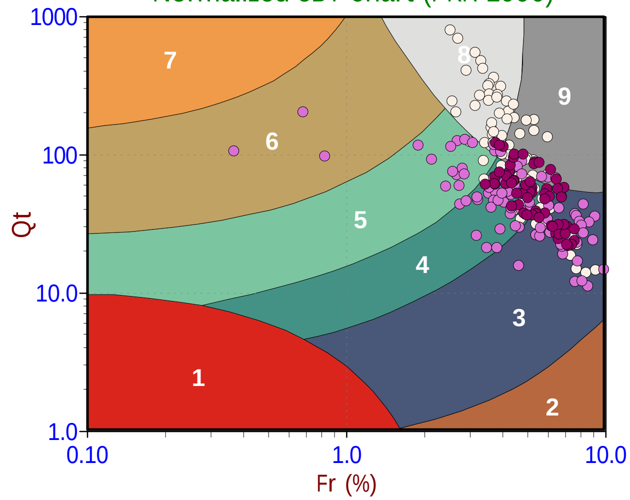
Job No: 19-54002
Date: 2019-01-15 09:47
Site: CUF TDEC Order

Sounding: CPT24
Cone: 367:T1500F15U500

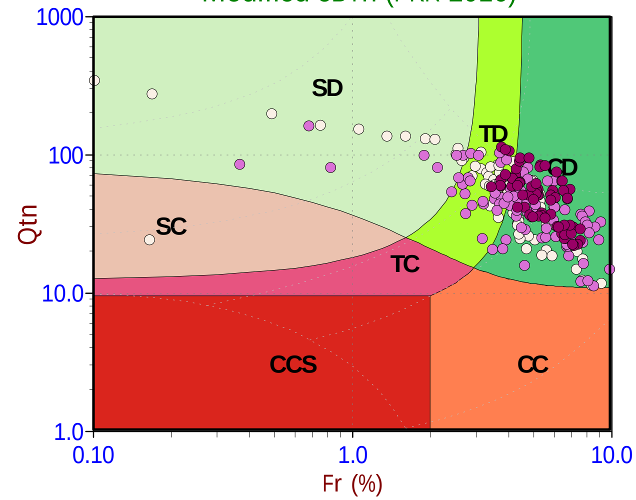
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

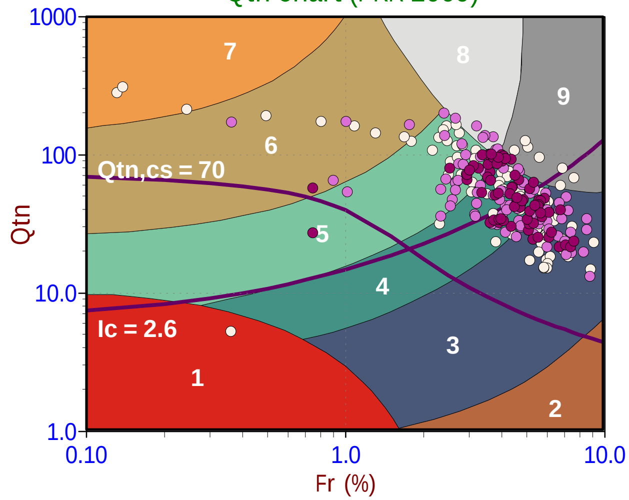
Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

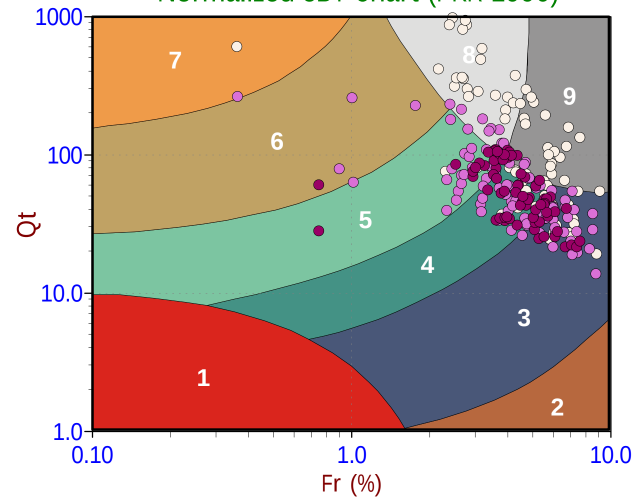
CONETEC

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 2019-01-23 09:15 Site: CUF TDEC Order	Sounding: CPT24a Cone: 367:T1500F15U500

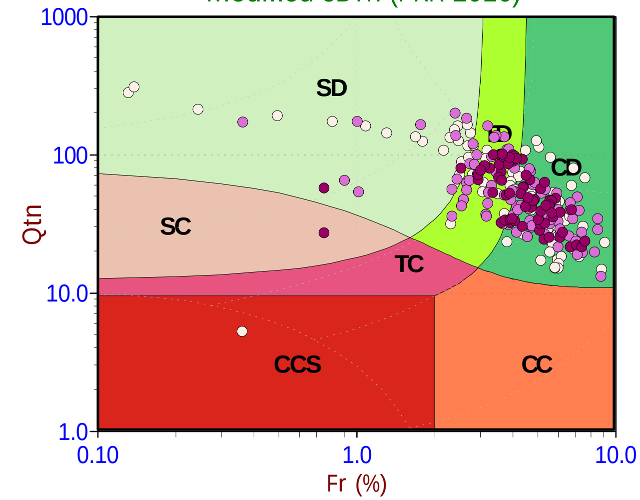
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

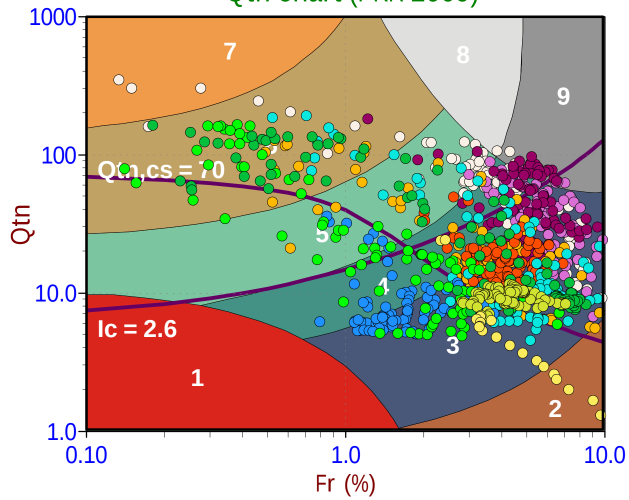
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

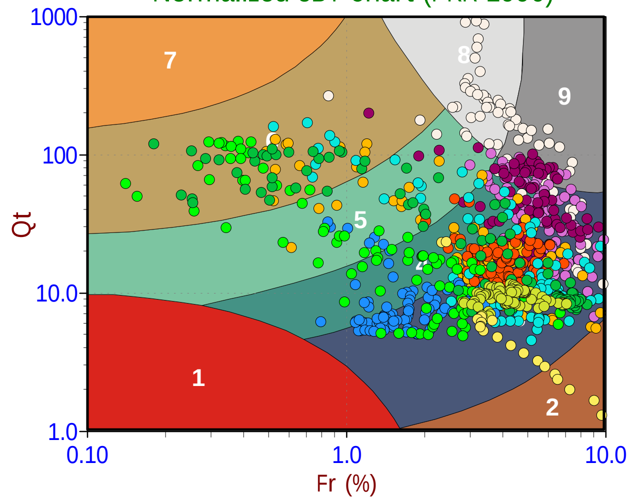
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 2019-01-15 11:13 Site: CUF TDEC Order	Sounding: CPT25 Cone: 367:T1500F15U500

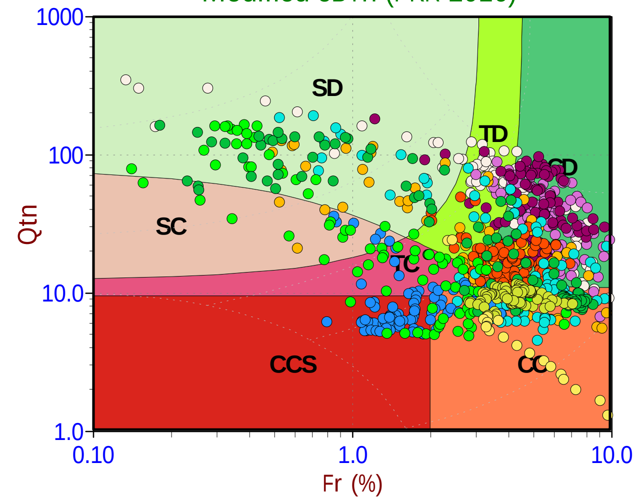
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

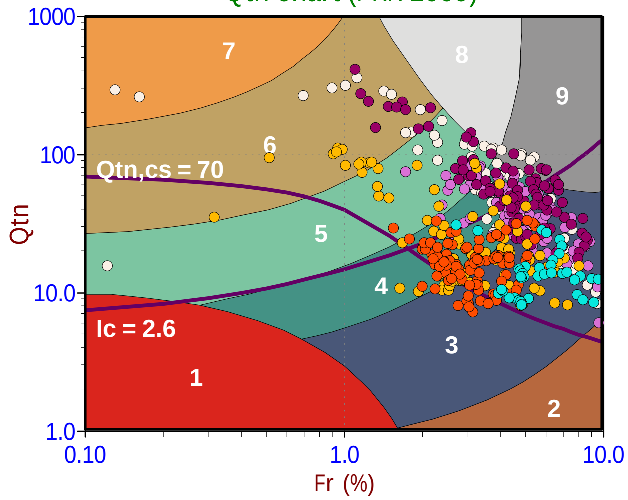
CONETEC

Stantec Consulting Services Inc.

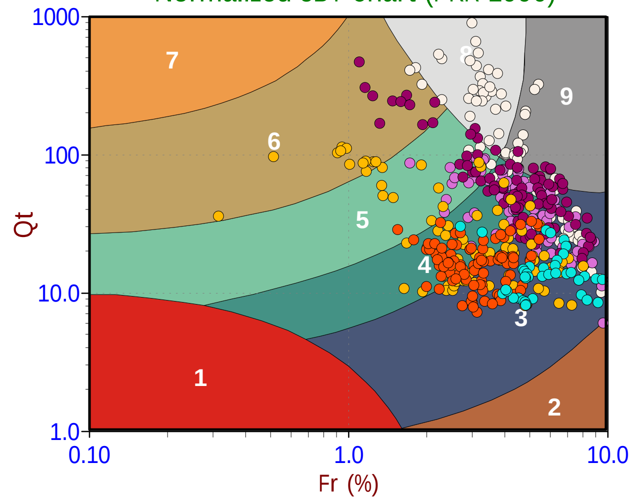
Job No: 19-54002
Date: 2019-01-23 10:04
Site: CUF TDEC Order

Sounding: CPT25a
Cone: 367:T1500F15U500

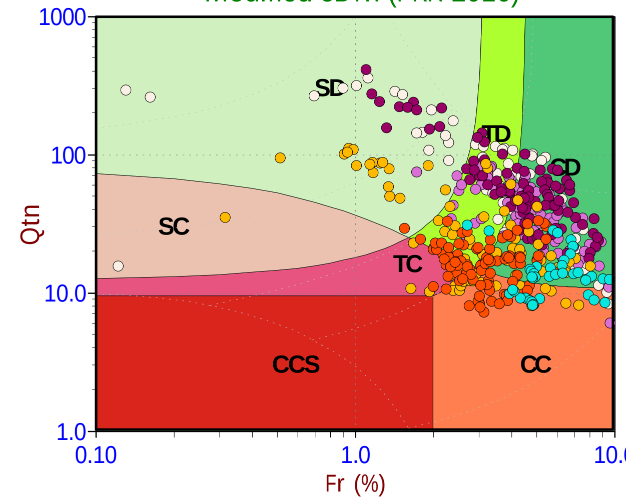
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

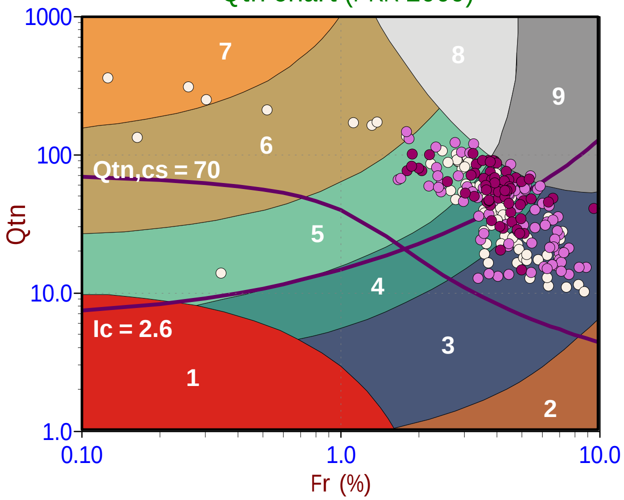
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

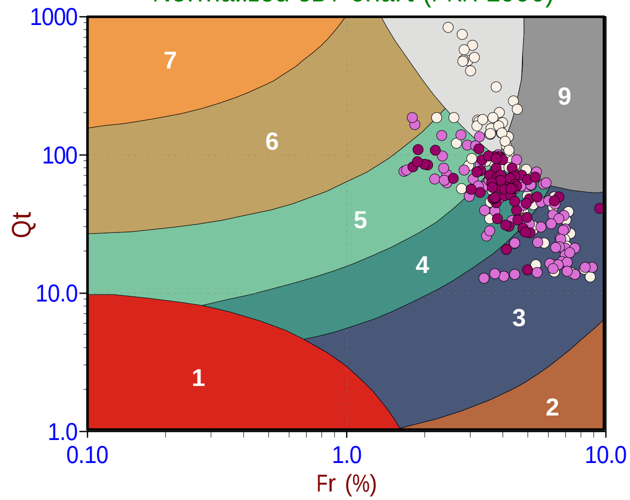
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Stantec Consulting Services Inc.	Job No: 19-54002	Sounding: CPT26
	Date: 2019-01-16 08:13	Cone: 367:T1500F15U500
	Site: CUF TDEC Order	

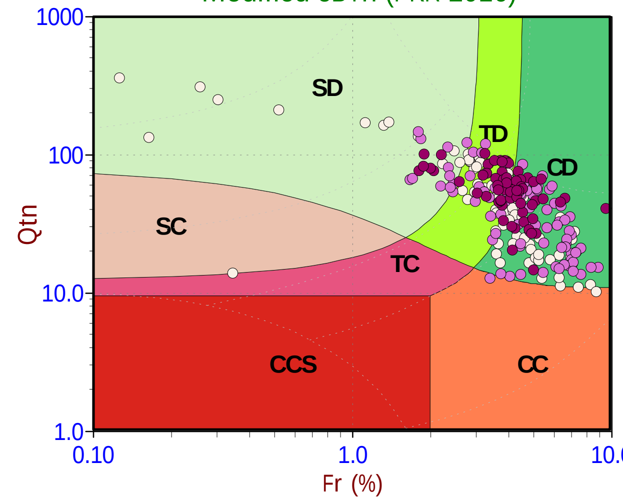
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

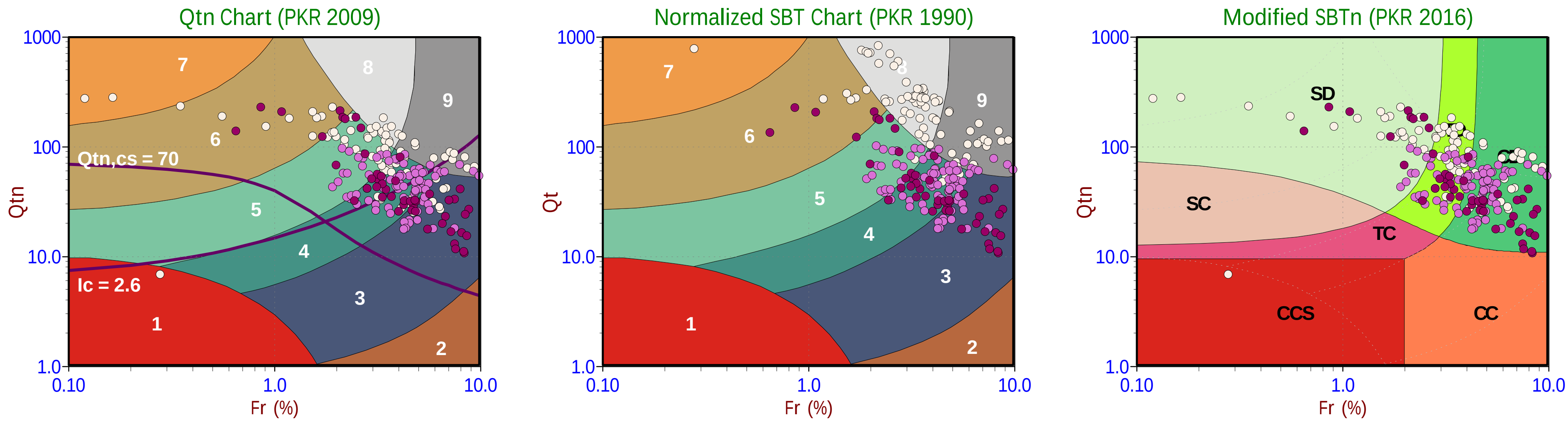
Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

CONETEC *Stantec Consulting Services Inc.*	Job No: 19-54002 Date: 2019-01-10 12:46 Site: CUF TDEC Order	Sounding: CPT27 Cone: 555:T1500F15U500



Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

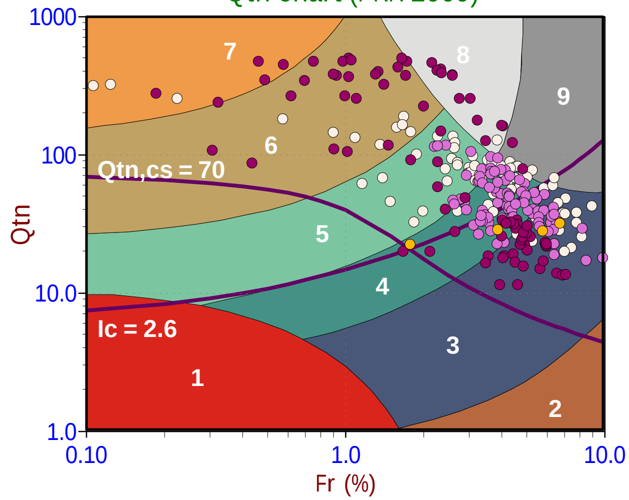
CONETEC

Stantec Consulting Services Inc.

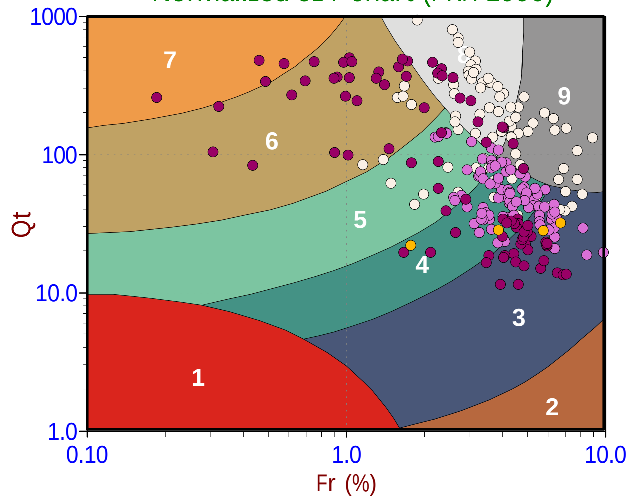
Job No: 19-54002
Date: 2019-01-11 08:47
Site: CUF TDEC Order

Sounding: CPT28
Cone: 555:T1500F15U500

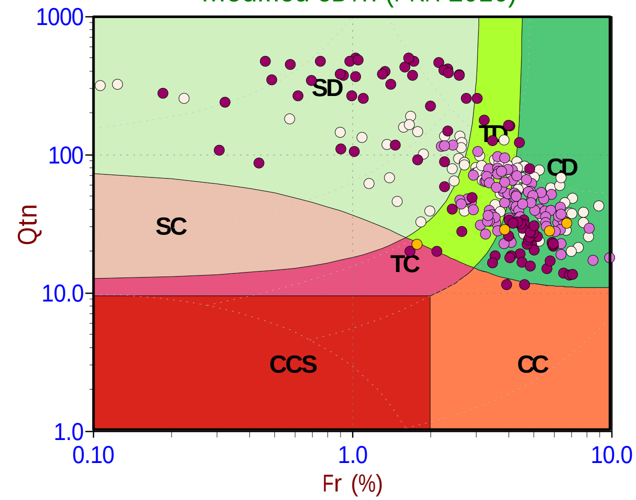
Qtn Chart (PKR 2009)



Normalized SBT Chart (PKR 1990)



Modified SBTn (PKR 2016)



Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

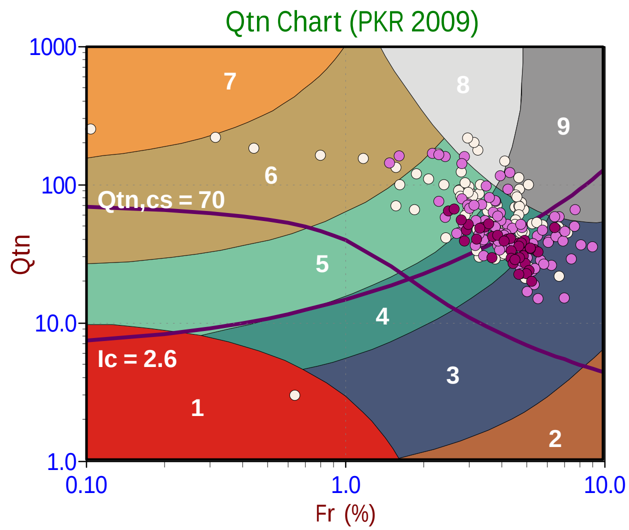
Legend

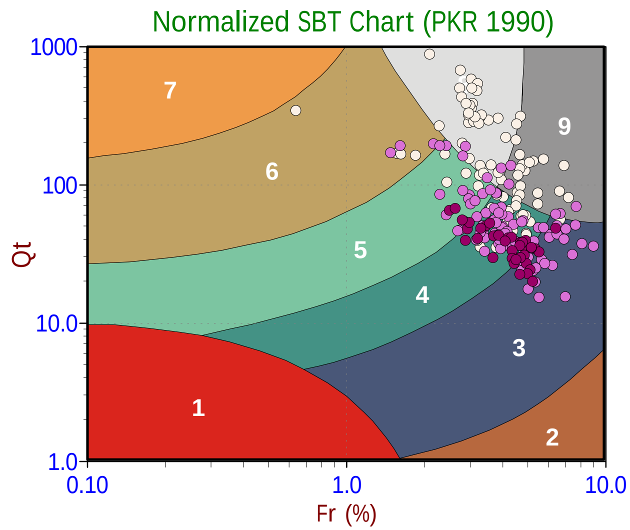
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

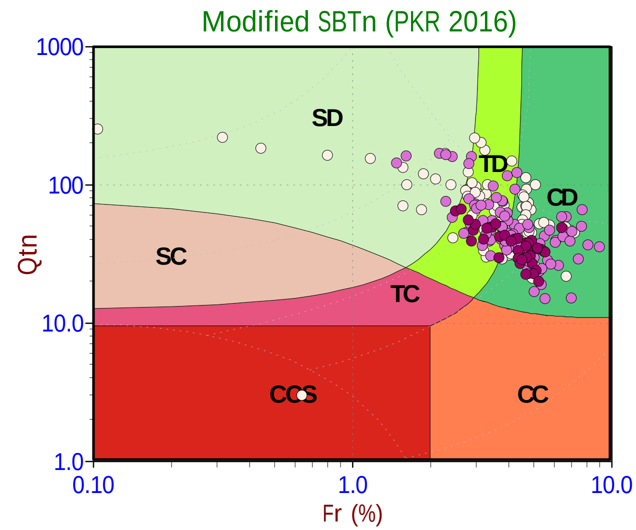
Stantec Consulting Services Inc.

Job No: 19-54002
Date: 2019-01-10 15:11
Site: CUF TDEC Order

Sounding: CPT29
Cone: 555:T1500F15U500







Depth Ranges
- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

Legend
- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

ConeTec

Job No:	19-54002
Client:	Stantec Consulting Services Inc.
Project:	CUF TDEC Order
Start Date:	08-Jan-2019
End Date:	23-Jan-2019

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)
CPT01	19-54002_CPT01.PPF	15	455	21.2		
CPT01	19-54002_CPT01.PPF	15	335	33.3	3.4	29.9
CPT01	19-54002_CPT01.PPF	15	195	33.5	3.8	29.7
CPT02	19-54002_CPT02.PPF	15	225	19.8		
CPT02	19-54002_CPT02.PPF	15	190	19.9		
CPT03	19-54002_CPT03.PPF	15	240	20.9		
CPT03	19-54002_CPT03.PPF	15	215	23.1		
CPT04	19-54002_CPT04.PPF	15	260	16.4		
CPT04	19-54002_CPT04.PPF	15	325	21.0		
CPT05	19-54002_CPT05.PPF	15	500	32.8	8.0	24.8
CPT06	19-54002_CPT06.PPF	15	375	26.2		
CPT06	19-54002_CPT06.PPF	15	360	31.0	1.9	29.1
CPT07	19-54002_CPT07.PPF	15	610	19.7		
CPT07	19-54002_CPT07.PPF	15	360	31.7	4.6	27.1
CPT07	19-54002_CPT07.PPF	15	255	33.8	6.8	27.0
CPT08	19-54002_CPT08.PPF	15	510	29.0	18.7	10.3
CPT09	19-54002_CPT09.PPF	15	1220	21.2		
CPT09	19-54002_CPT09.PPF	15	375	29.5	18.6	11.0
CPT10	19-54002_CPT10.PPF	15	1105	29.0	17.8	11.2
CPT11	19-54002_CPT11.PPF	15	900	29.1	18.4	10.7
CPT12	19-54002_CPT12.PPF	15	1265	23.6		
CPT13	19-54002_CPT13.PPF	15	795	19.7	8.6	11.1
CPT13	19-54002_CPT13.PPF	15	715	33.1	22.3	10.8
CPT14	19-54002_CPT14.PPF	15	1260	29.4	19.0	10.3
CPT14	19-54002_CPT14.PPF	15	270	57.2	21.5	35.7
CPT14	19-54002_CPT14.PPF	15	395	66.8	31.3	35.6
CPT14	19-54002_CPT14.PPF	15	530	74.0	37.2	36.8
CPT15	19-54002_CPT15.PPF	15	420	29.1	19.4	9.7
CPT16	19-54002_CPT16.PPF	15	275	27.7	17.8	9.9
CPT16	19-54002_CPT16.PPF	15	1285	42.3		
CPT17	19-54002_CPT17.PPF	15	1240	19.3		
CPT17	19-54002_CPT17.PPF	15	185	27.7	17.9	9.8
CPT17	19-54002_CPT17.PPF	15	425	42.8		
CPT17a	19-54002_CPT17a.PPF	15	210	23.0		
CPT17a	19-54002_CPT17a.PPF	15	255	29.0	19.7	9.3

CONETEC	Job No:	19-54002
	Client:	Stantec Consulting Services Inc.
	Project:	CUF TDEC Order
	Start Date:	08-Jan-2019
	End Date:	23-Jan-2019

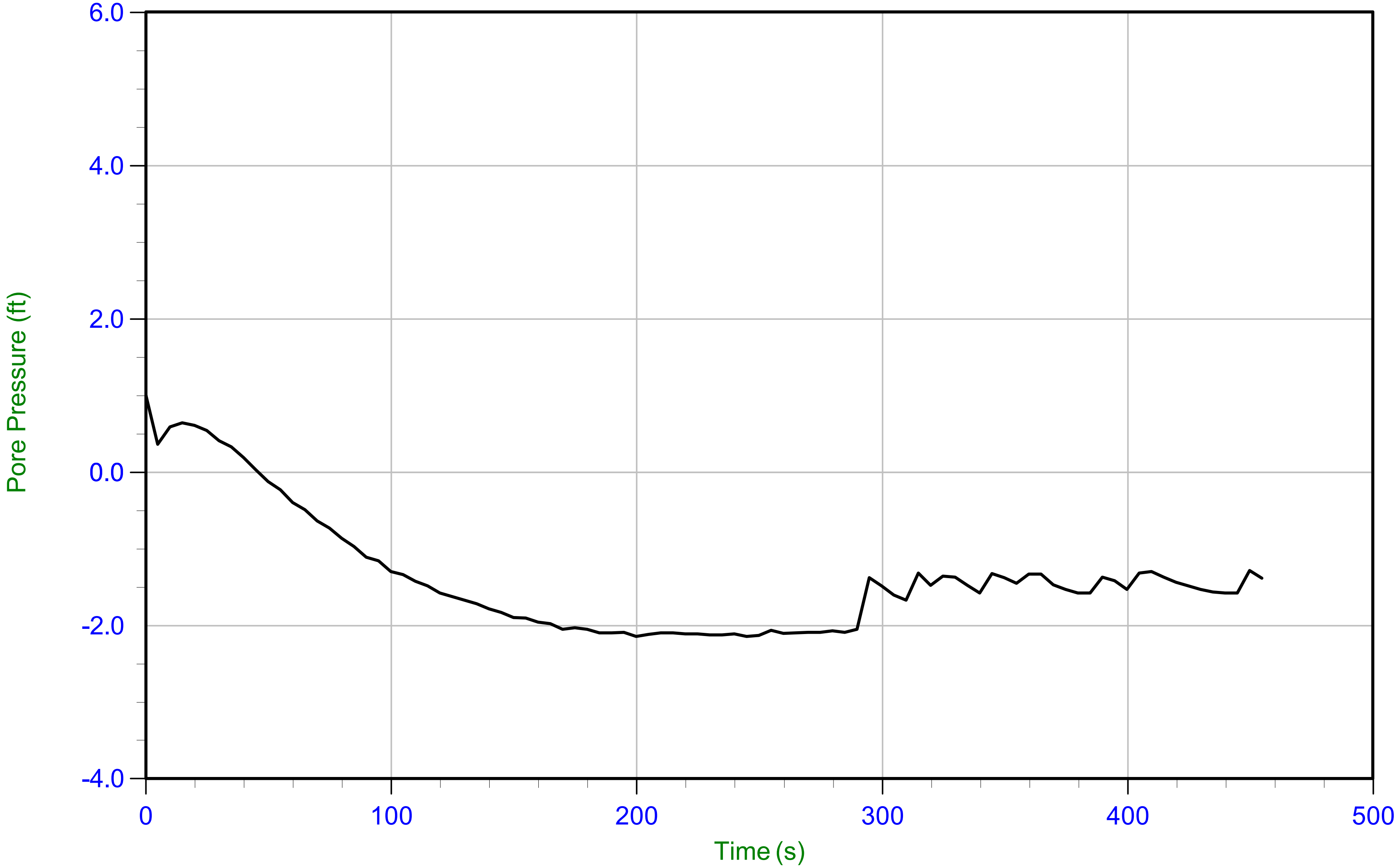
CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)
CPT17a	19-54002_CPT17a.PPF	15	970	41.4	31.9	9.5
CPT18	19-54002_CPT18.PPF	15	220	19.2		
CPT19	19-54002_CPT19.PPF	15	815	23.7	14.7	9.1
CPT19	19-54002_CPT19.PPF	15	240	41.5	32.0	9.5
CPT20	19-54002_CPT20.PPF	15	680	40.5	25.0	15.6
CPT21	19-54002_CPT21.PPF	15	1500	23.2		
CPT22	19-54002_CPT22.PPF	15	465	25.6	15.6	10.0
CPT22	19-54002_CPT22.PPF	15	1295	44.6		
CPT22a	19-54002_CPT22a.PPF	15	275	26.2	17.0	9.2
CPT22a	19-54002_CPT22a.PPF	15	1575	41.4		
CPT22a	19-54002_CPT22a.PPF	15	195	42.4	25.8	16.6
CPT23	19-54002_CPT23.PPF	15	205	26.2	16.1	10.0
CPT23	19-54002_CPT23.PPF	15	1205	42.3		
CPT24	19-54002_CPT24.PPF	15	1455	20.3		
CPT25	19-54002_CPT25.PPF	15	340	26.2	16.2	10.1
CPT25	19-54002_CPT25.PPF	15	330	42.4	16.8	25.6
CPT25	19-54002_CPT25.PPF	15	645	55.8	18.3	37.5
CPT25	19-54002_CPT25.PPF	15	535	77.5	46.0	31.5
CPT25a	19-54002_CPT25a.PPF	15	380	19.7		
CPT25a	19-54002_CPT25a.PPF	15	395	26.2	17.4	8.8
CPT28	19-54002_CPT28.PPF	15	355	20.3		
CPT28	19-54002_CPT28.PPF	15	210	23.1		
Totals			9.1 hrs			

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/10/2019 09:08
Site: CUF TDEC Order

Sounding: CPT01
Cone: 555:T1500F15U500
Cone Area: 15 sq cm

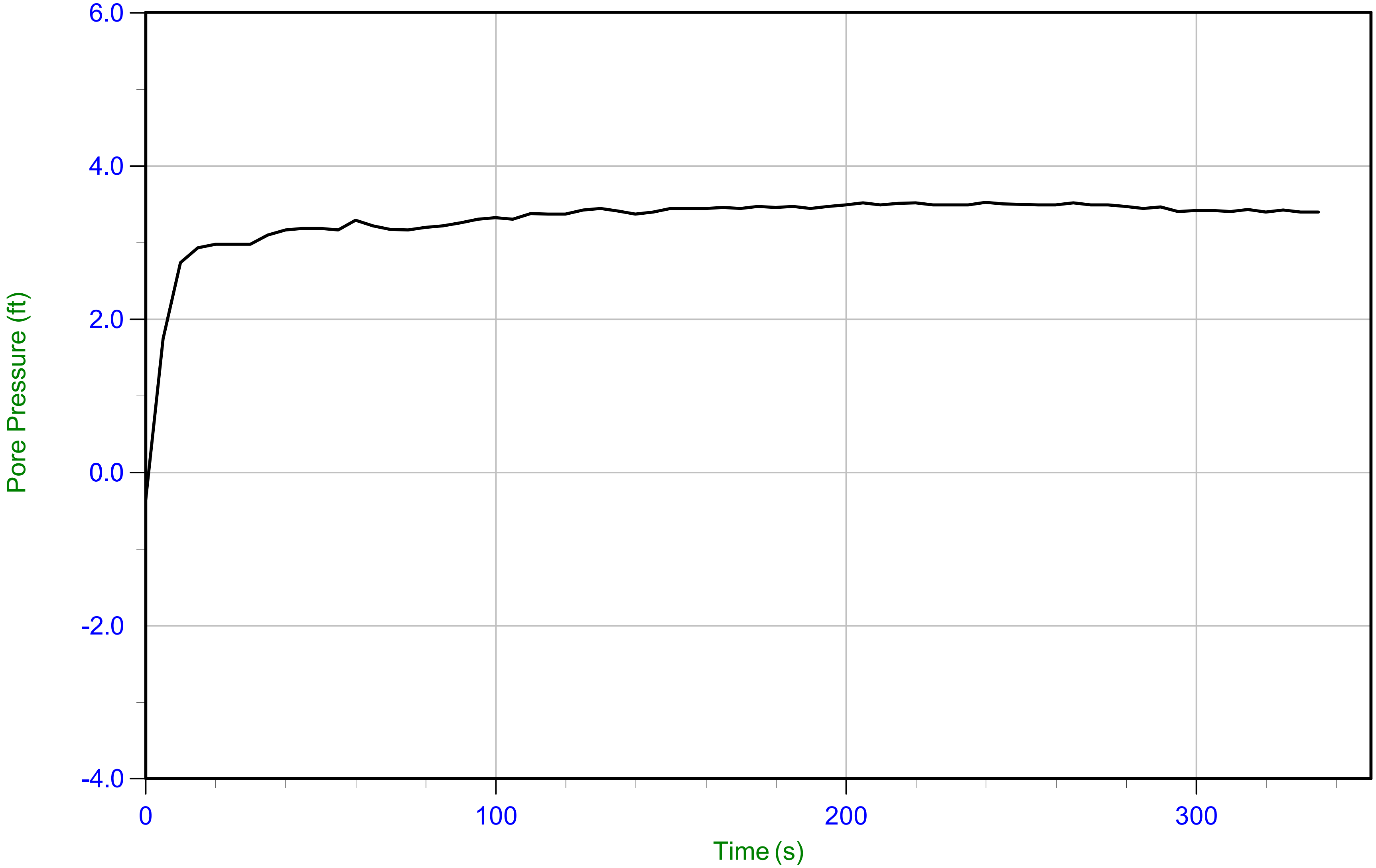


Trace Summary:

Filename: 19-54002_CPT01.PPF
Depth: 6.450 m / 21.161 ft
Duration: 455.0 s

U Min: -2.1 ft
U Max: 1.0 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/10/2019 09:08 Site: CUF TDEC Order	Sounding: CPT01 Cone: 555:T1500F15U500 Cone Area: 15 sq cm



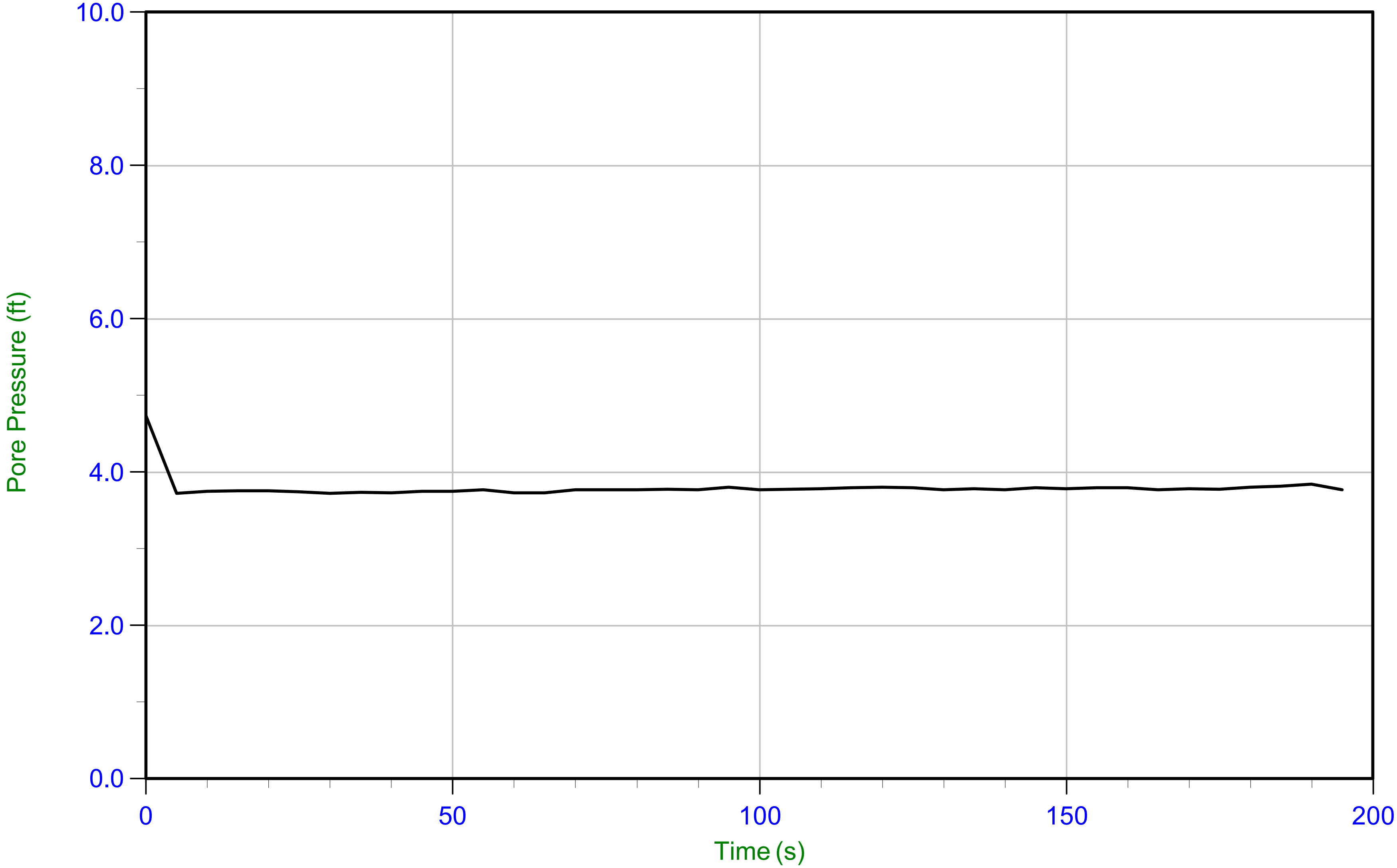
Trace Summary:

Filename: 19-54002_CPT01.PPF
Depth: 10.150 m / 33.300 ft
Duration: 335.0 s

U Min: -0.4 ft
U Max: 3.5 ft

WT: 9.104 m / 29.868 ft
Ueq: 3.4 ft

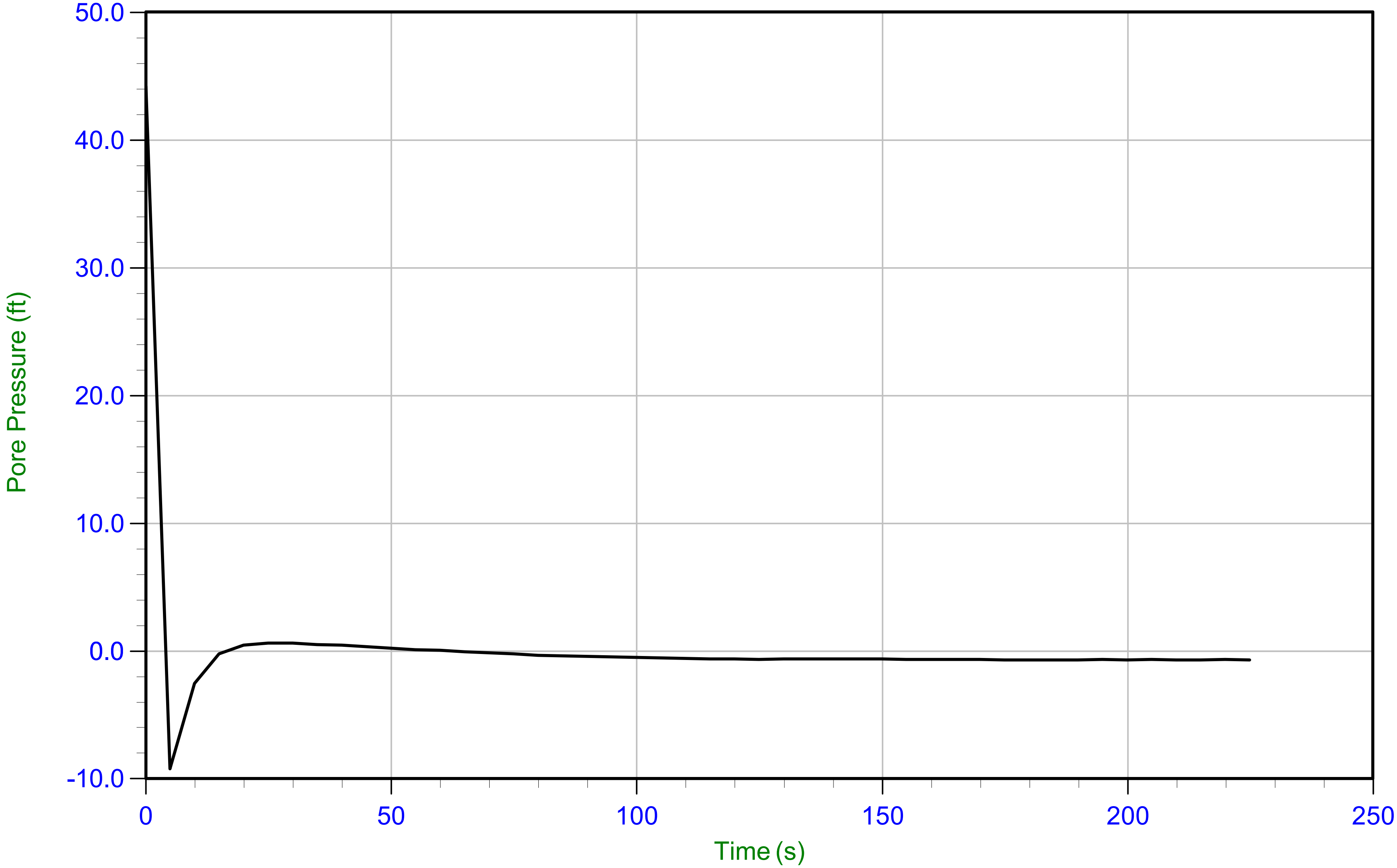
Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/10/2019 09:08 Site: CUF TDEC Order	Sounding: CPT01 Cone: 555:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT01.PPF	U Min: 3.7 ft	WT: 9.046 m / 29.678 ft
Depth: 10.200 m / 33.464 ft	U Max: 4.7 ft	Ueq: 3.8 ft
Duration: 195.0 s		

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/09/2019 15:43 Site: CUF TDEC Order	Sounding: CPT02 Cone: 555:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

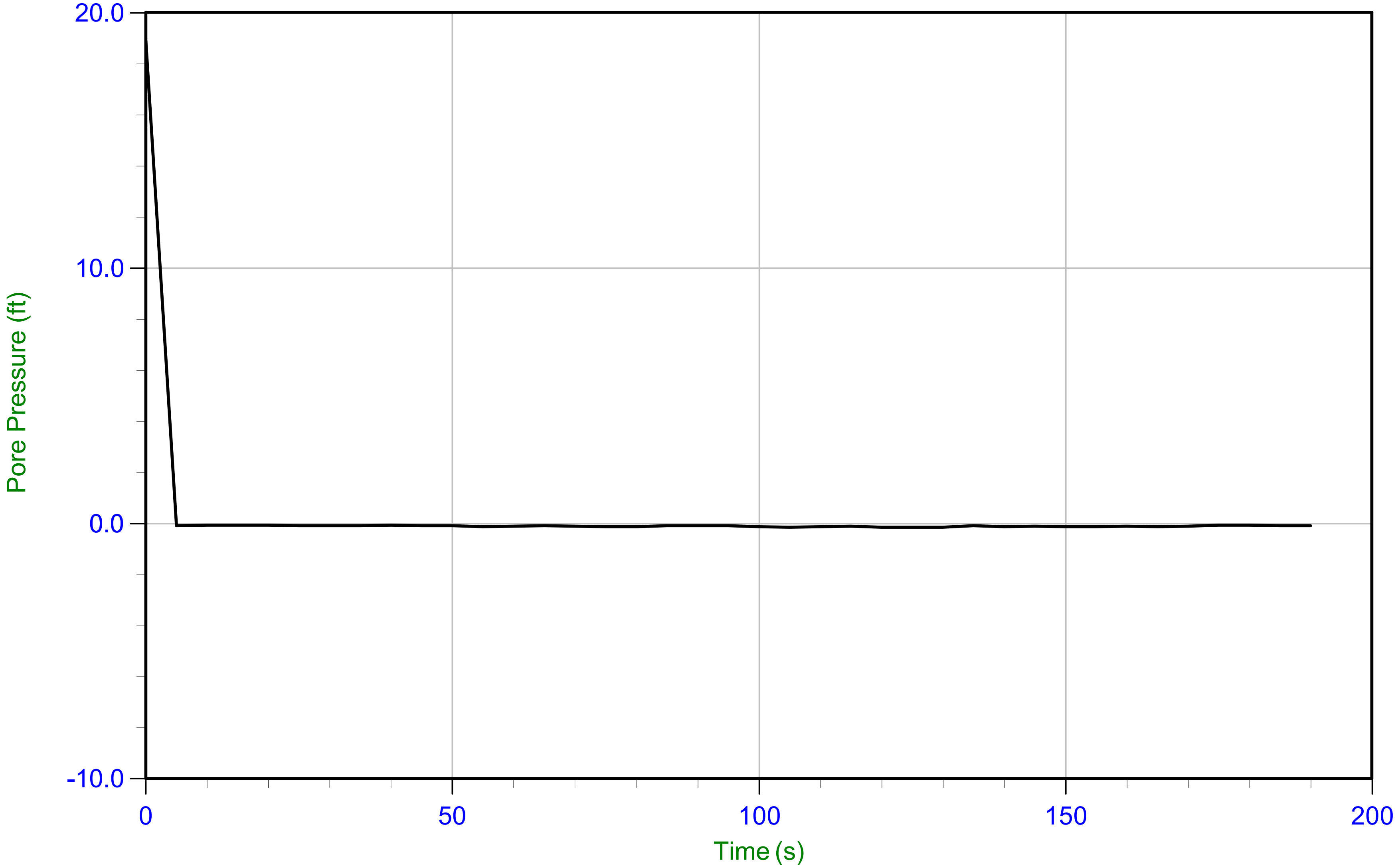
Filename: 19-54002_CPT02.PPF
Depth: 6.050 m / 19.849 ft
Duration: 225.0 s

U Min: -9.2 ft
U Max: 44.2 ft

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/09/2019 15:43
Site: CUF TDEC Order

Sounding: CPT02
Cone: 555:T1500F15U500
Cone Area: 15 sq cm

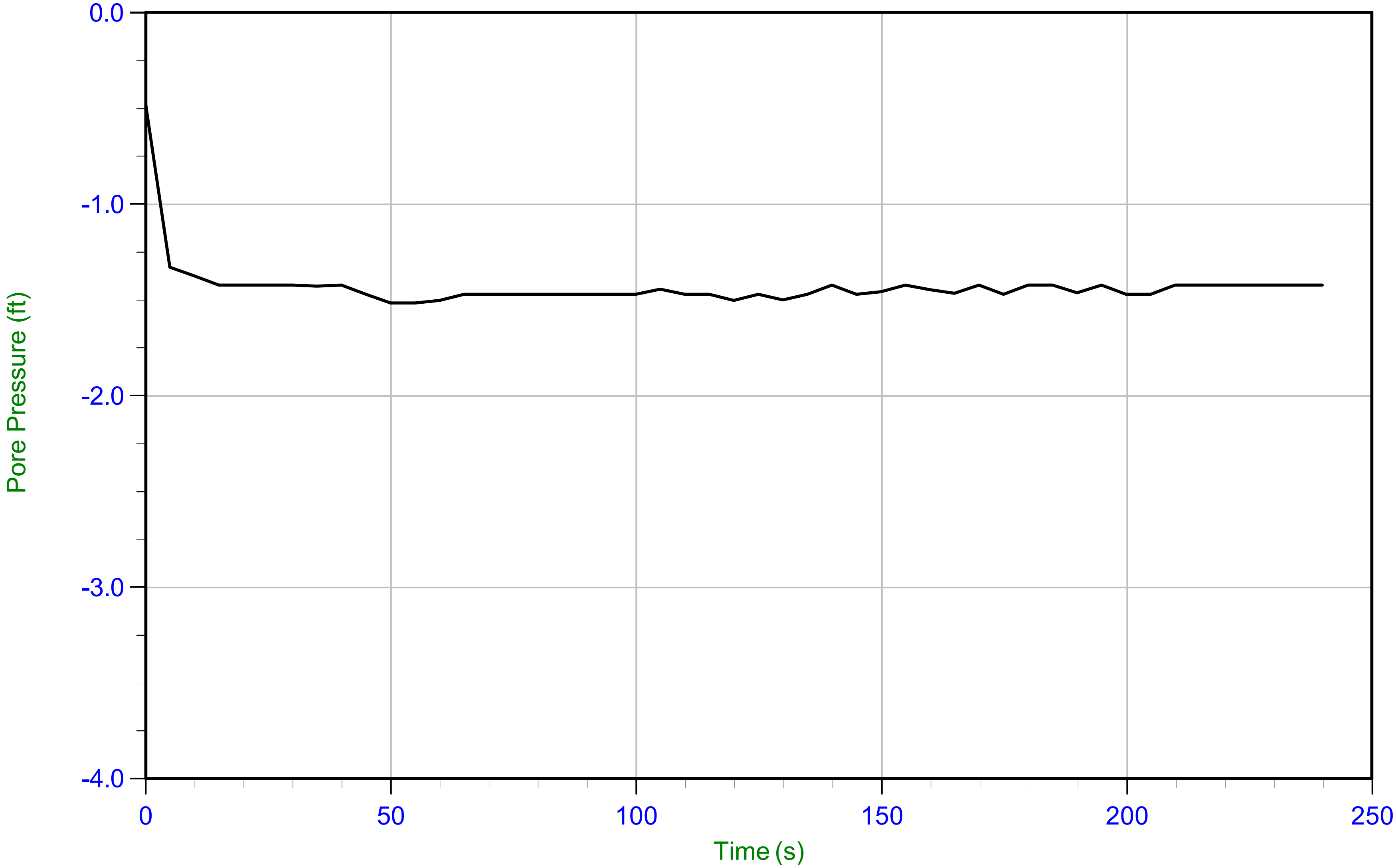


Trace Summary:

Filename: 19-54002_CPT02.PPF
Depth: 6.075 m / 19.931 ft
Duration: 190.0 s

U Min: -0.1 ft
U Max: 18.9 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/09/2019 14:37 Site: CUF TDEC Order	Sounding: CPT03 Cone: 555:T1500F15U500 Cone Area: 15 sq cm



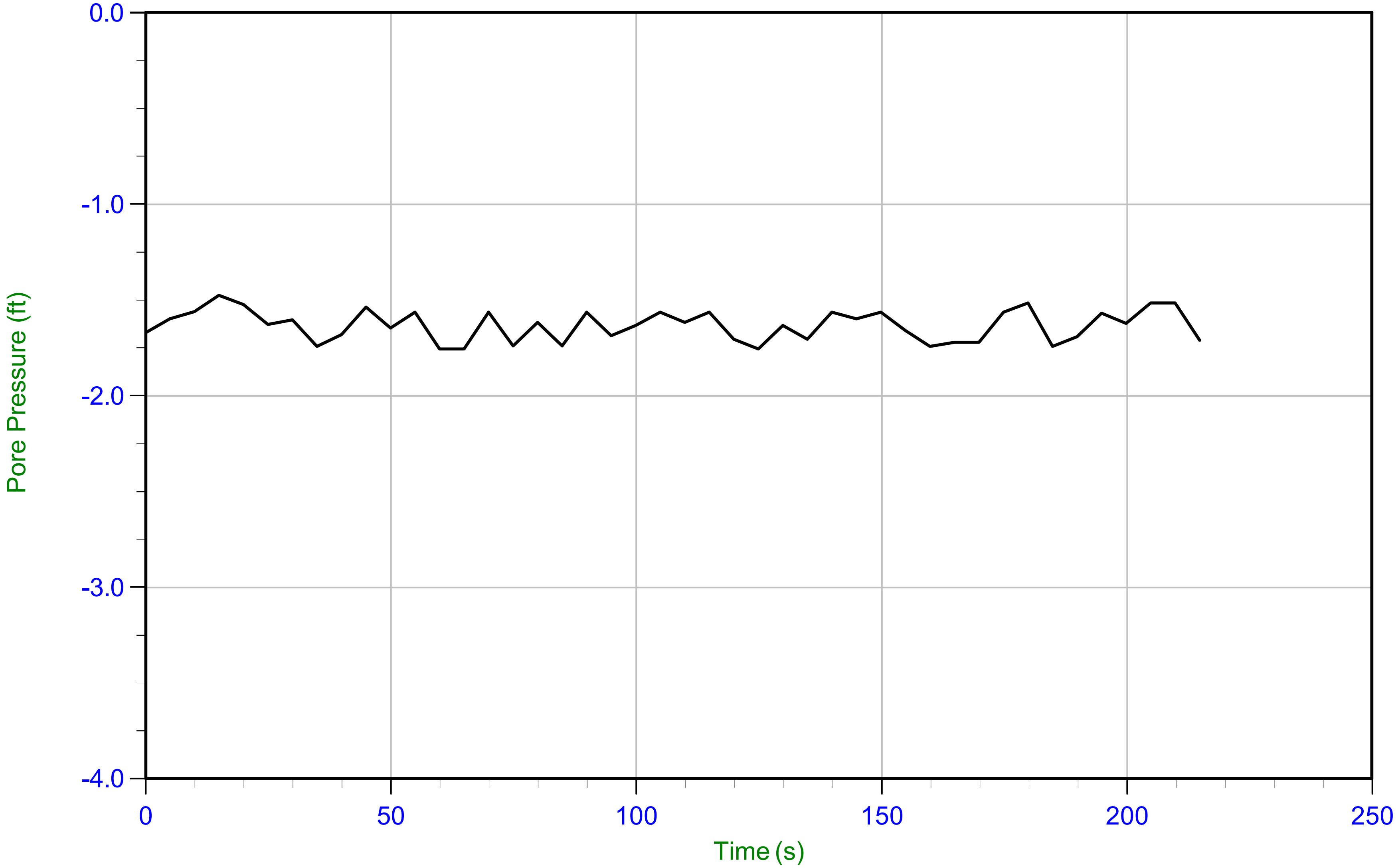
Trace Summary:

Filename: 19-54002_CPT03.PPF
Depth: 6.375 m / 20.915 ft
Duration: 240.0 s

U Min: -1.5 ft
U Max: -0.5 ft

Job No: 19-54002	Sounding: CPT03
Date: 01/09/2019 14:37	Cone: 555:T1500F15U500
Site: CUF TDEC Order	Cone Area: 15 sq cm

Stantec Consulting Services Inc.



Trace Summary:

Filename: 19-54002_CPT03.PPF
Depth: 7.050 m / 23.130 ft
Duration: 215.0 s

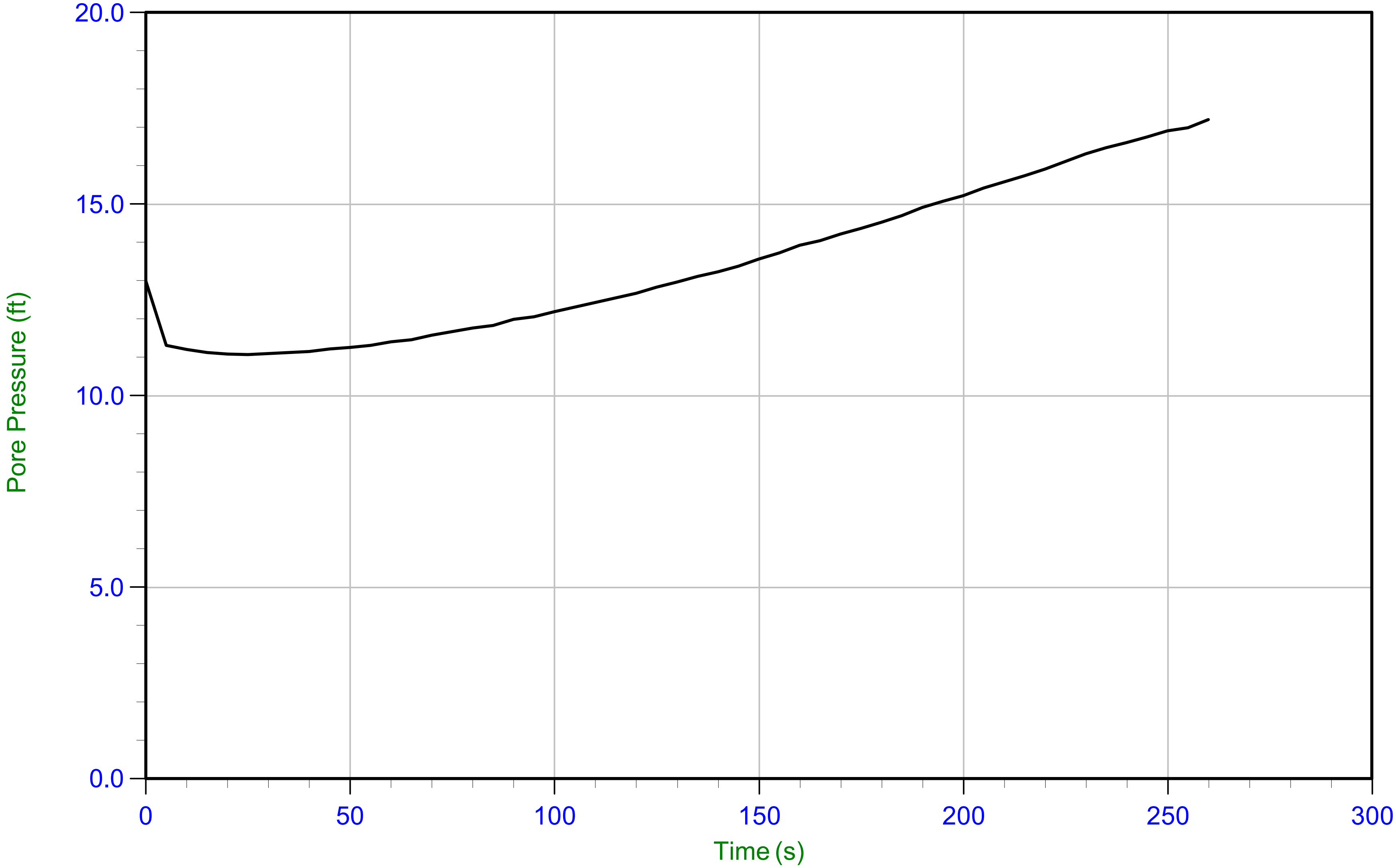
U Min: -1.8 ft
U Max: -1.5 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/08/2019 13:47
Site: CUF TDEC Order

Sounding: CPT04
Cone: 555:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT04.PPF
Depth: 5.000 m / 16.404 ft
Duration: 260.0 s

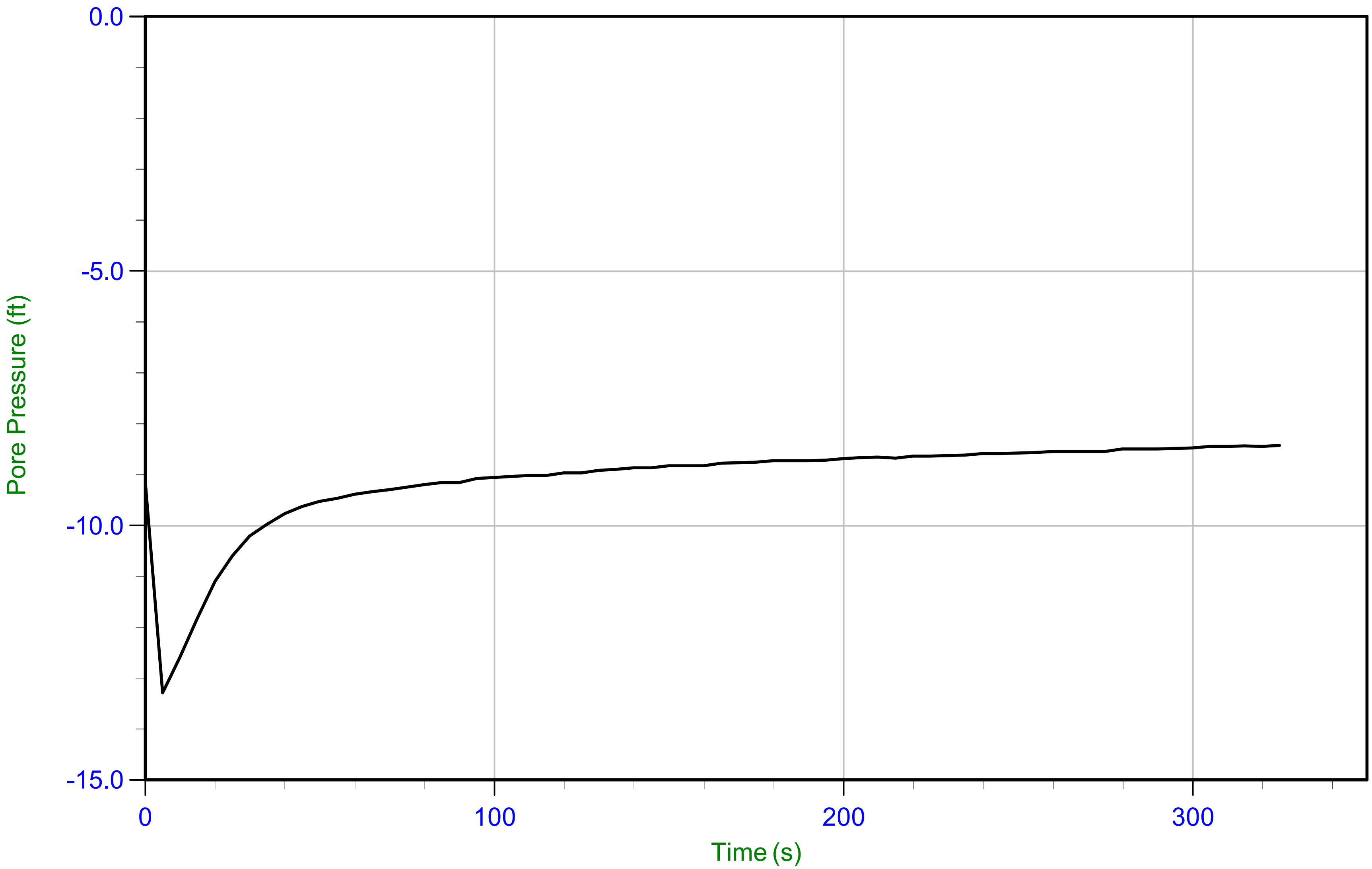
U Min: 11.1 ft
U Max: 17.2 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/08/2019 13:47
Site: CUF TDEC Order

Sounding: CPT04
Cone: 555:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT04.PPF
Depth: 6.400 m / 20.997 ft
Duration: 325.0 s

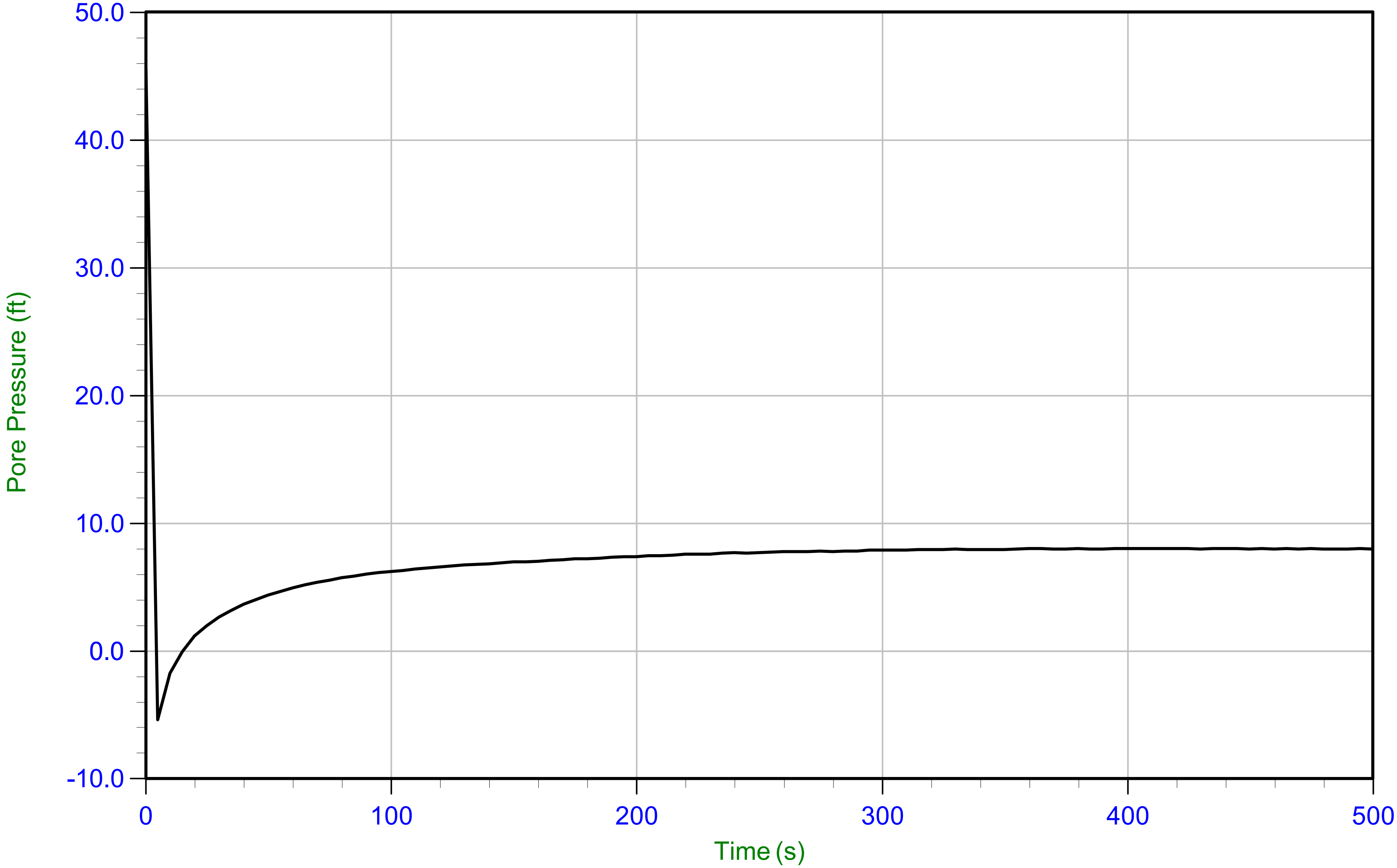
U Min: -13.3 ft
U Max: -8.4 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/08/2019 15:19
Site: CUF TDEC Order

Sounding: CPT05
Cone: 555:T1500F15U500
Cone Area: 15 sq cm



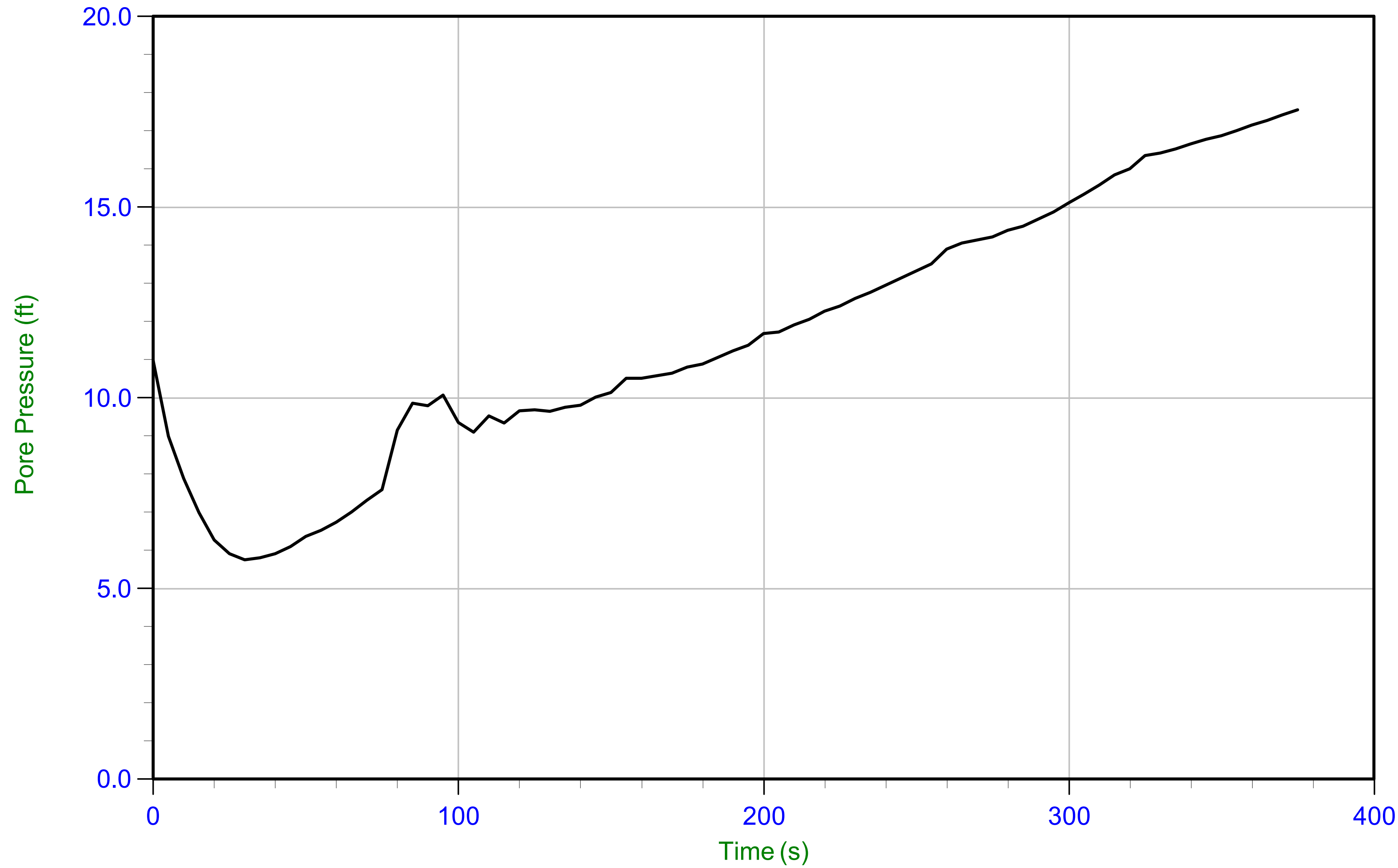
Trace Summary:

Filename: 19-54002_CPT05.PPF
Depth: 10.000 m / 32.808 ft
Duration: 500.0 s

U Min: -5.4 ft
U Max: 45.6 ft

WT: 7.566 m / 24.823 ft
Ueq: 8.0 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/09/2019 11:21 Site: CUF TDEC Order	Sounding: CPT06 Cone: 555:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT06.PPF
Depth: 8.000 m / 26.246 ft
Duration: 375.0 s

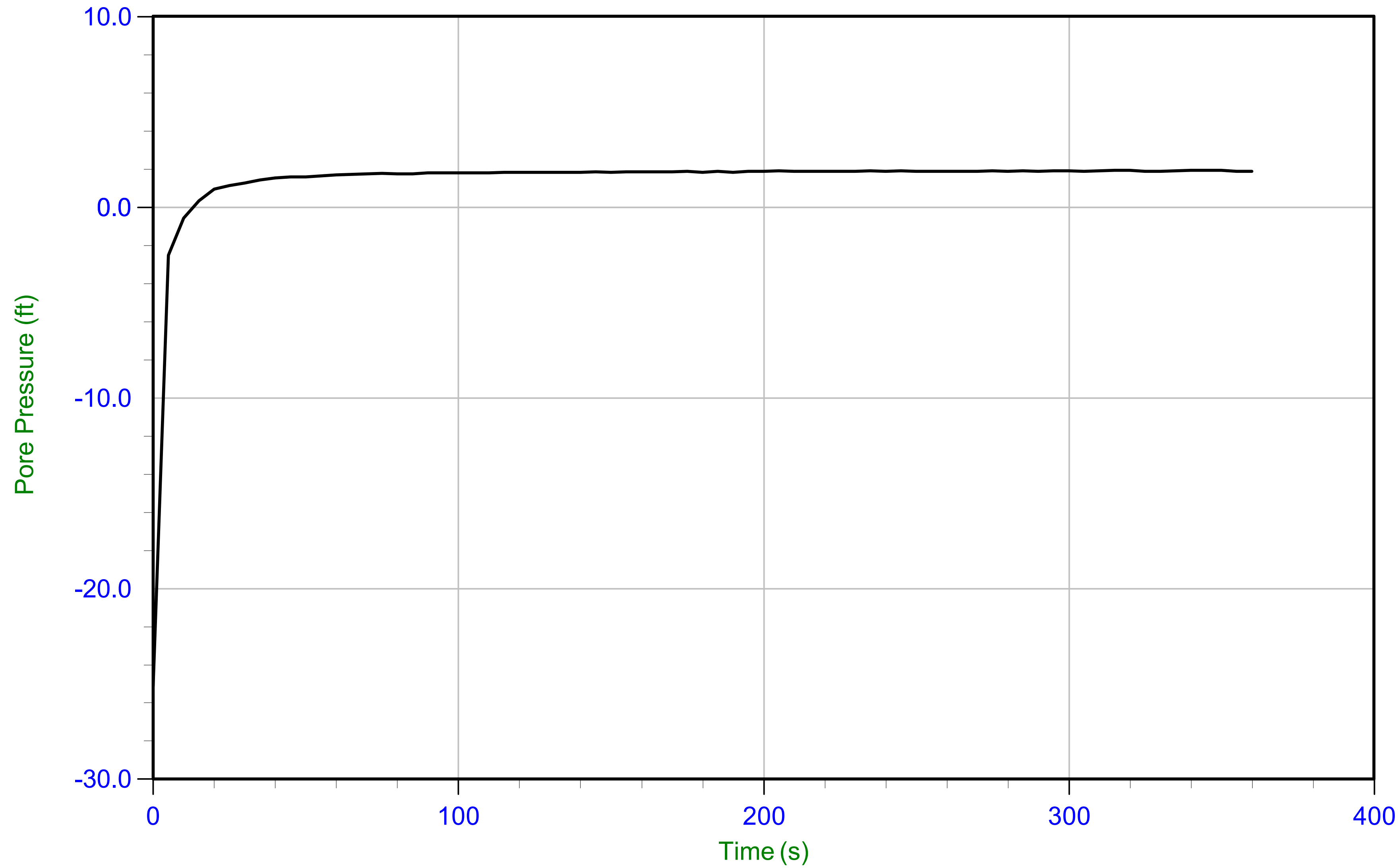
U Min: 5.8 ft
U Max: 17.5 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/09/2019 11:21
Site: CUF TDEC Order

Sounding: CPT06
Cone: 555:T1500F15U500
Cone Area: 15 sq cm



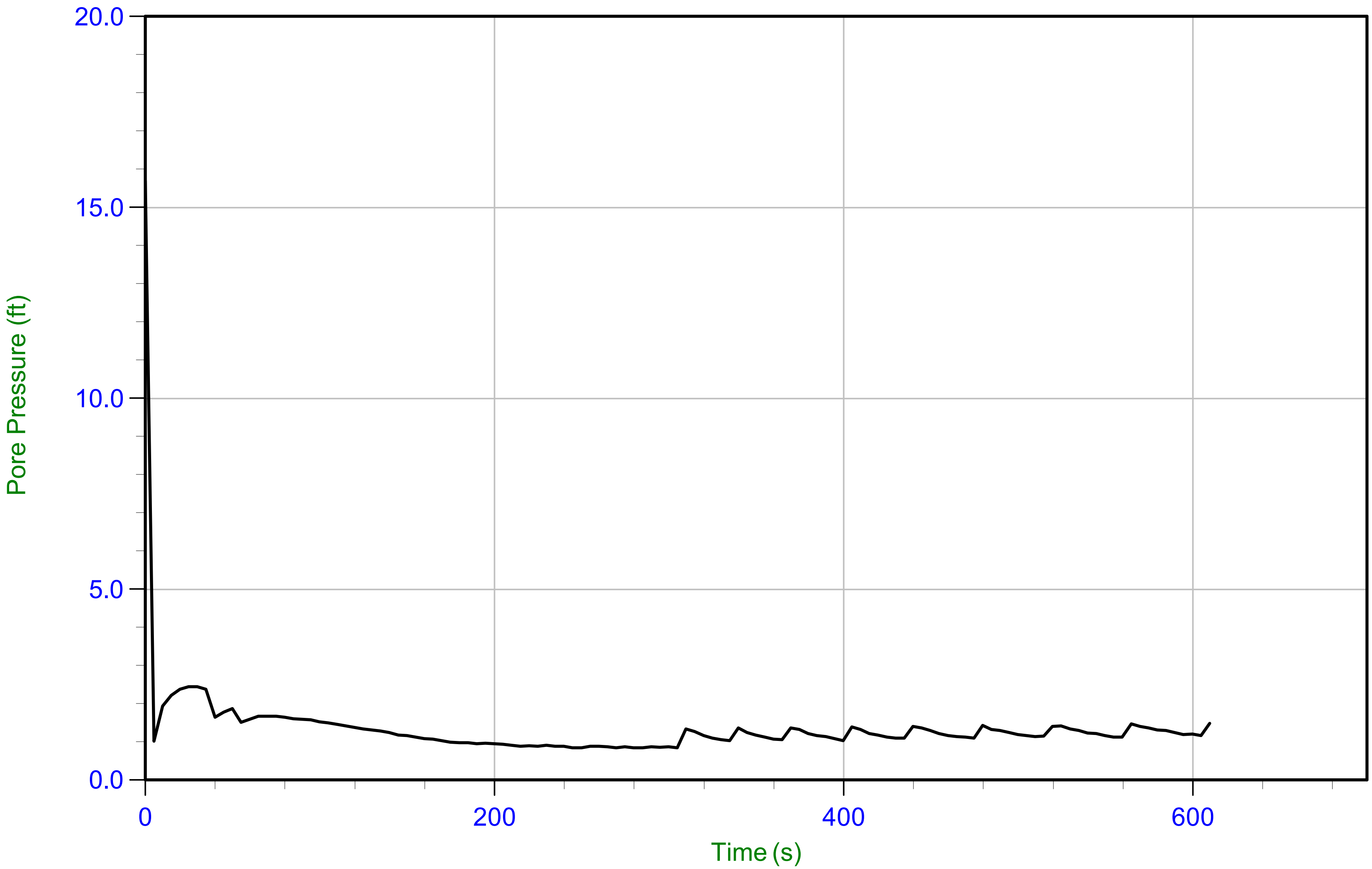
Trace Summary:

Filename: 19-54002_CPT06.PPF
Depth: 9.450 m / 31.004 ft
Duration: 360.0 s

U Min: -25.1 ft
U Max: 1.9 ft

WT: 8.868 m / 29.094 ft
Ueq: 1.9 ft

CONETEC	Job No: 19-54002	Sounding: CPT07
Stantec Consulting Services Inc.	Date: 01/09/2019 09:04	Cone: 555:T1500F15U500
	Site: CUF TDEC Order	Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT07.PPF

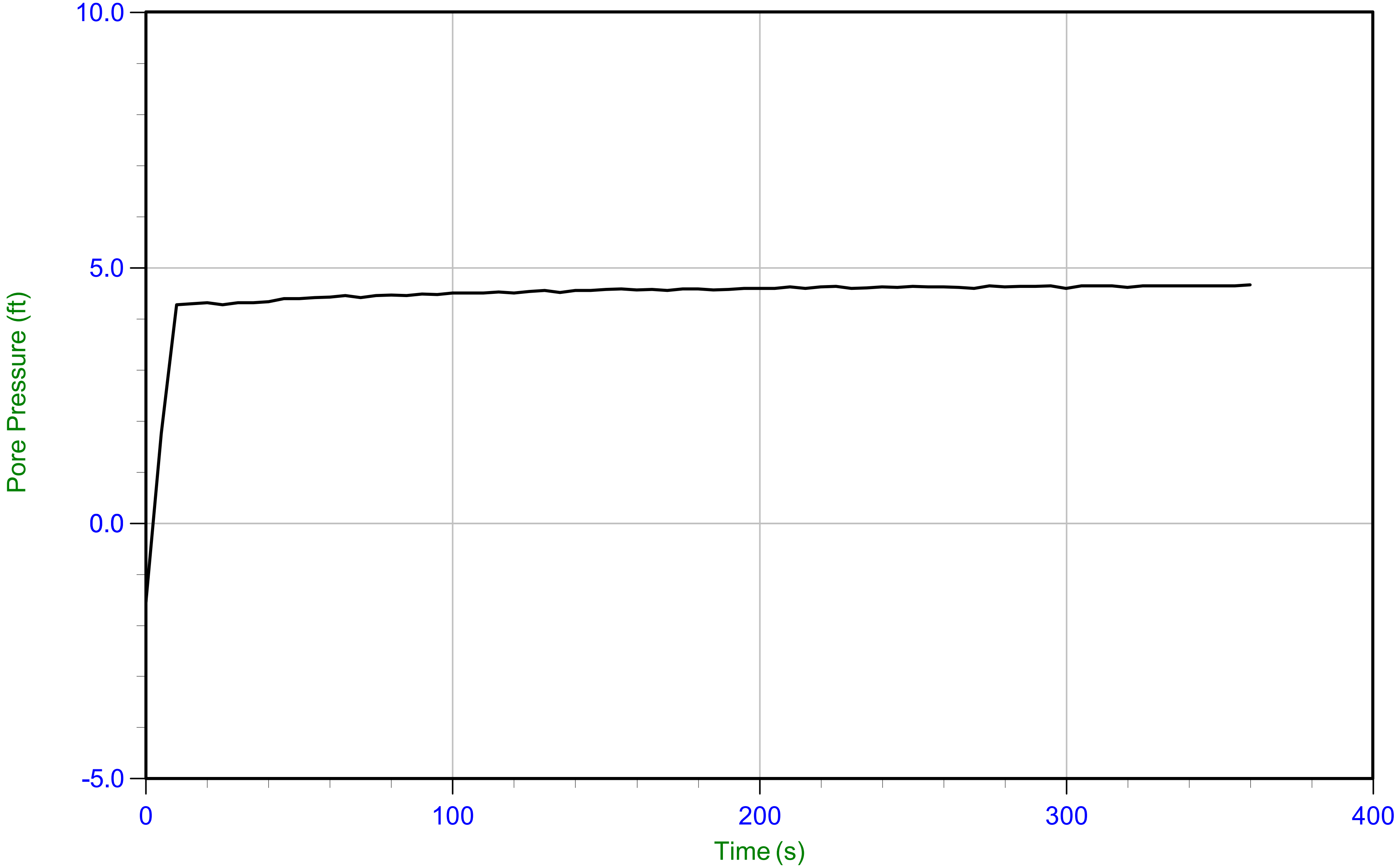
Depth: 6.000 m / 19.685 ft

Duration: 610.0 s

U Min: 0.8 ft

U Max: 15.7 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/09/2019 09:04 Site: CUF TDEC Order	Sounding: CPT07 Cone: 555:T1500F15U500 Cone Area: 15 sq cm



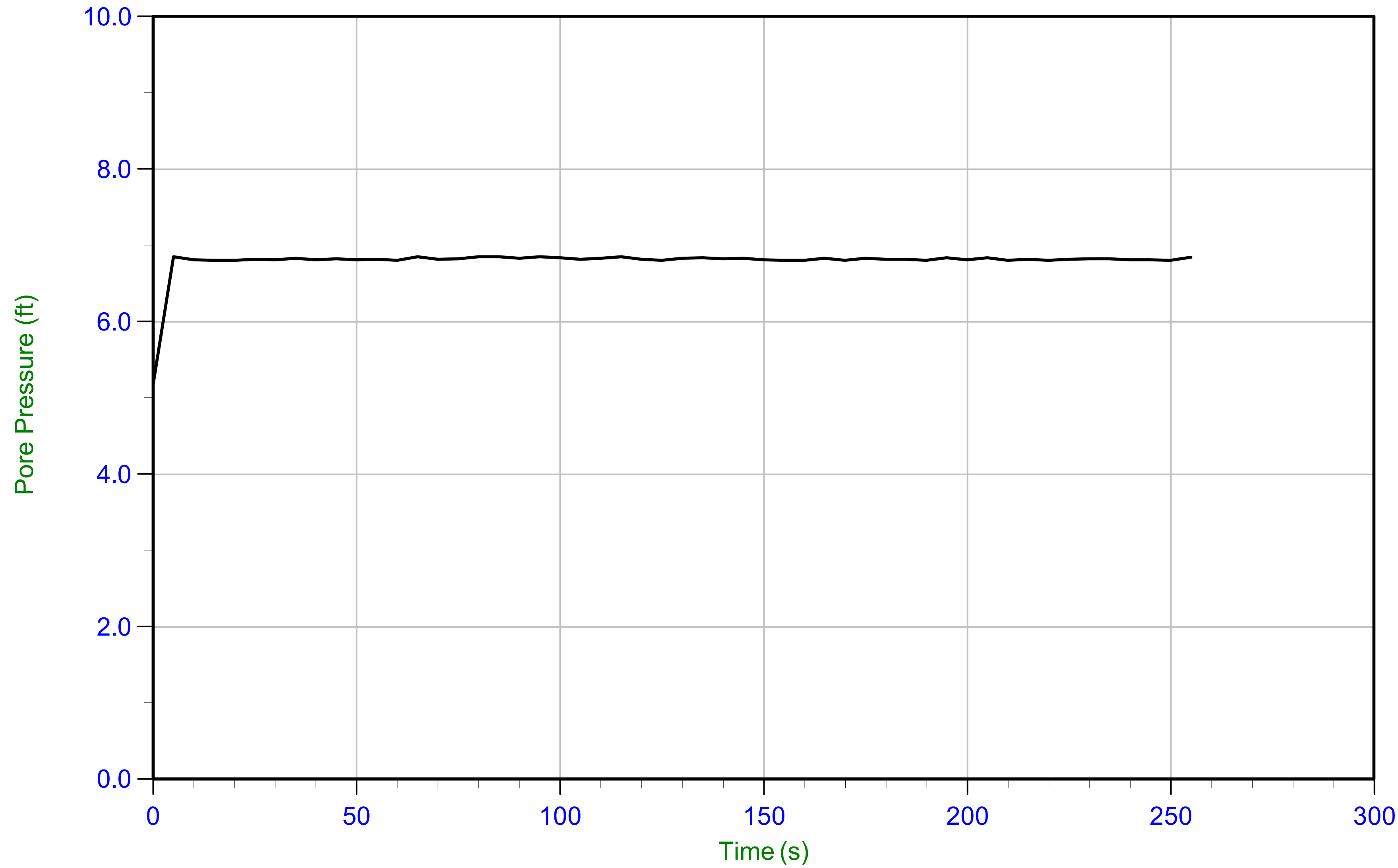
Trace Summary:

Filename: 19-54002_CPT07.PPF
Depth: 9.675 m / 31.742 ft
Duration: 360.0 s

U Min: -1.5 ft
U Max: 4.7 ft

WT: 8.267 m / 27.122 ft
Ueq: 4.6 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/09/2019 09:04 Site: CUF TDEC Order	Sounding: CPT07 Cone: 555:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

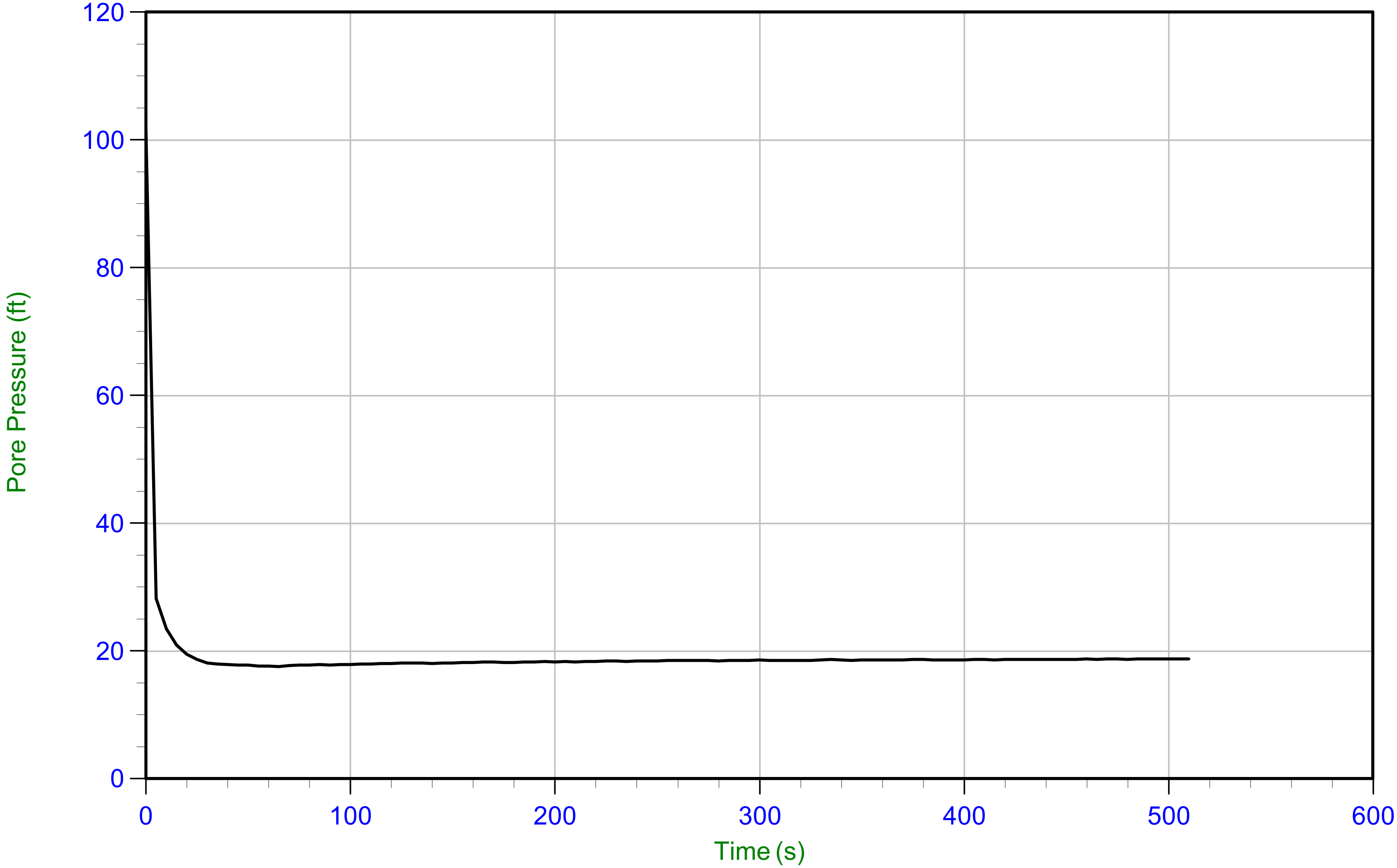
Filename: 19-54002_CPT07.PPF	U Min: 5.2 ft	WT: 8.226 m / 26.988 ft
Depth: 10.300 m / 33.792 ft	U Max: 6.9 ft	Ueq: 6.8 ft
Duration: 255.0 s		

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/22/2019 10:52
Site: CUF TDEC Order

Sounding: CPT08
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



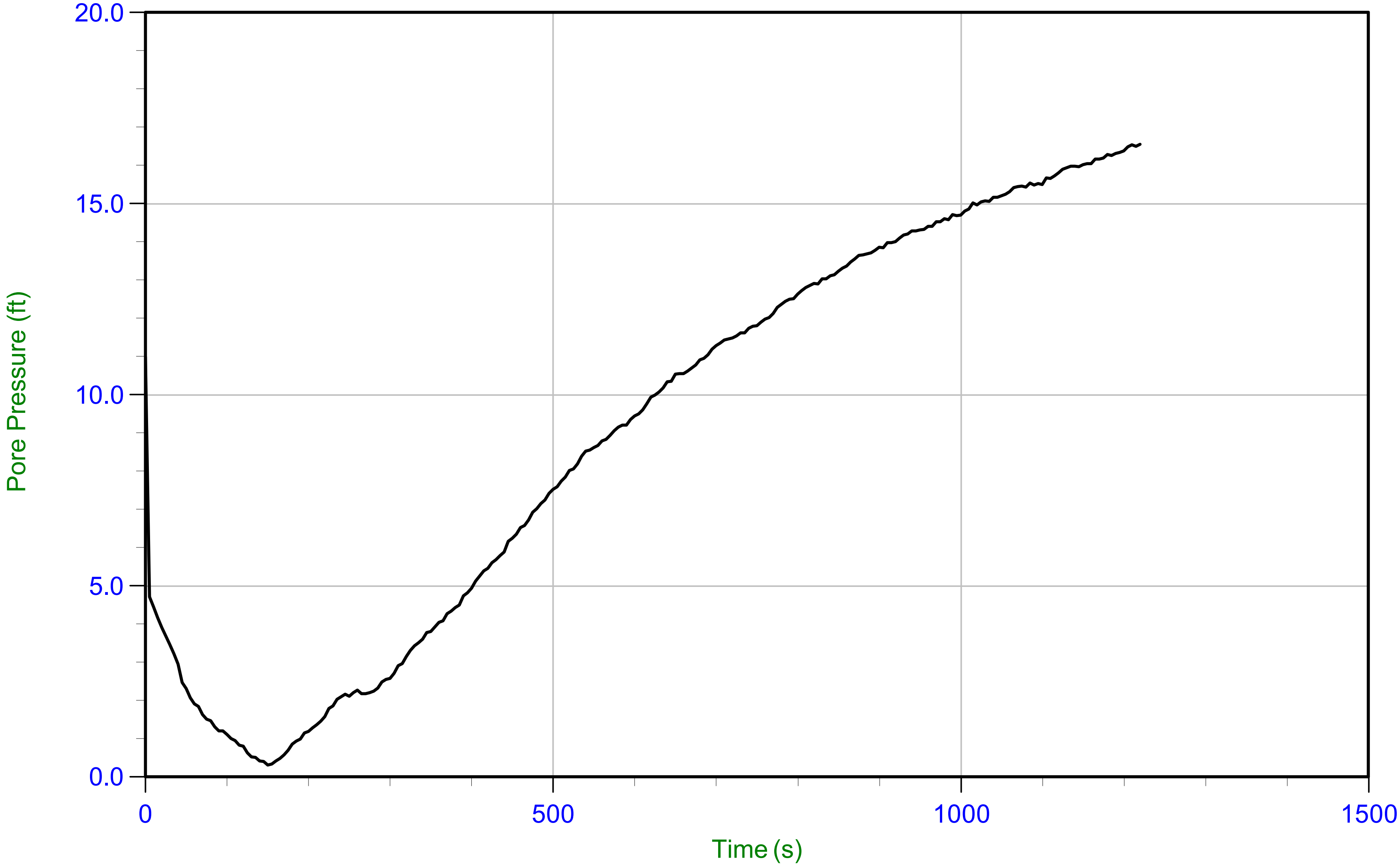
Trace Summary:

Filename: 19-54002_CPT08.PPF
Depth: 8.850 m / 29.035 ft
Duration: 510.0 s

U Min: 17.5 ft
U Max: 101.6 ft

WT: 3.135 m / 10.285 ft
Ueq: 18.7 ft

ConeTec	*Stantec Consulting Services Inc.*	Job No: 19-54002 Date: 01/22/2019 09:18 Site: CUF TDEC Order
		Sounding: CPT09 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT09.PPF
Depth: 6.475 m / 21.243 ft
Duration: 1220.0 s

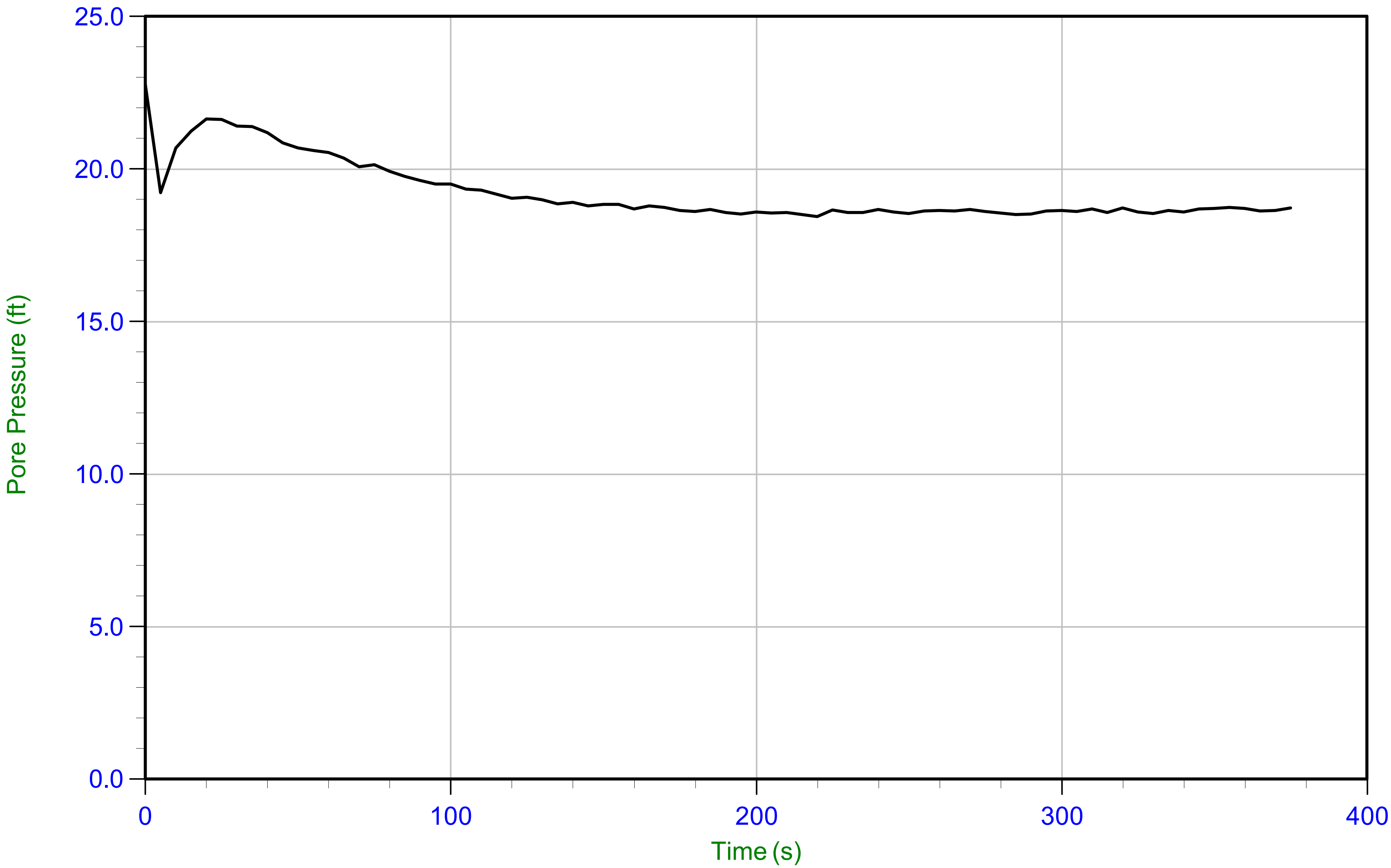
U Min: 0.3 ft
U Max: 16.6 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/22/2019 09:18
Site: CUF TDEC Order

Sounding: CPT09
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT09.PPF
Depth: 9.000 m / 29.527 ft
Duration: 375.0 s

U Min: 18.4 ft
U Max: 22.8 ft

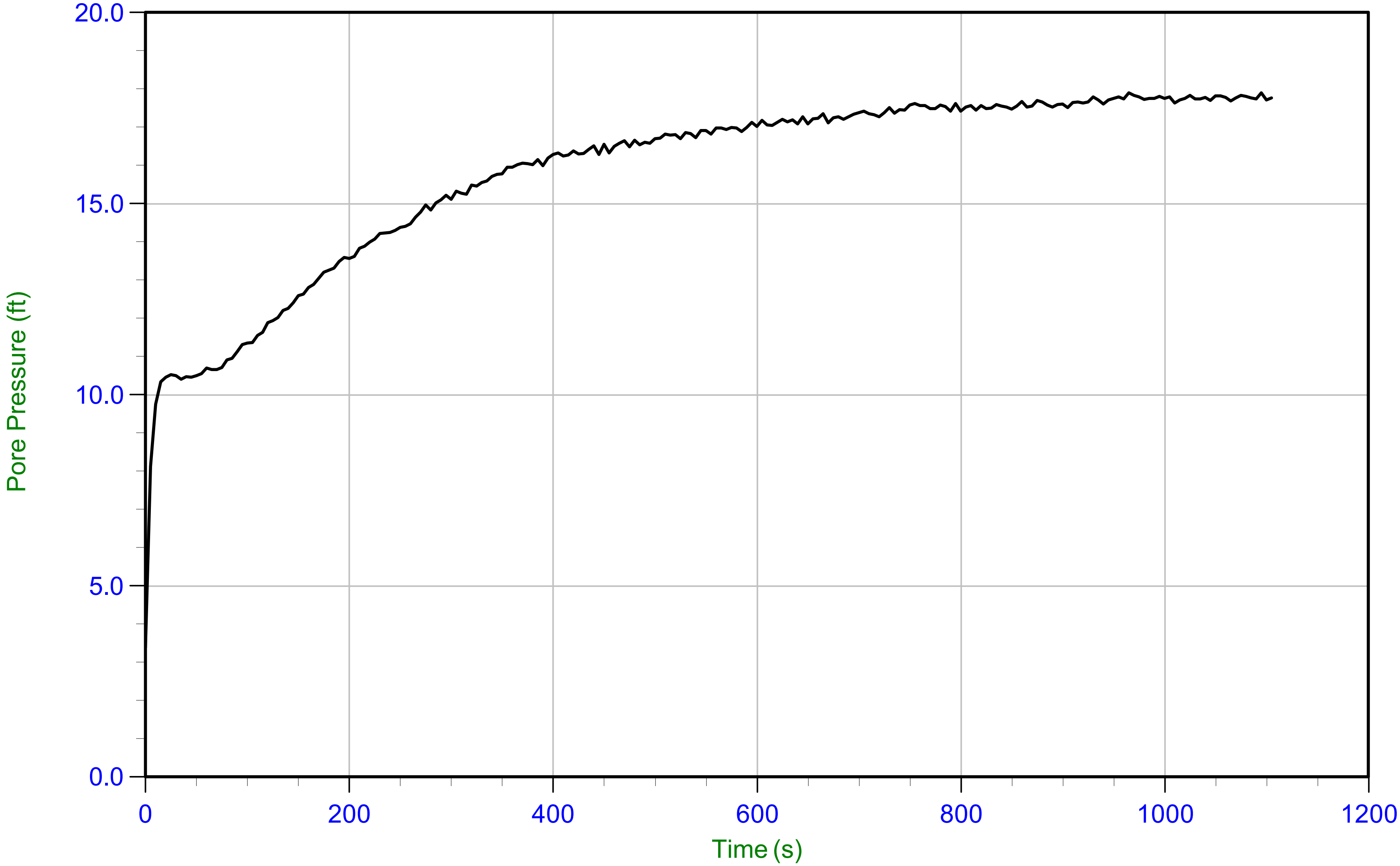
WT: 3.338 m / 10.951 ft
Ueq: 18.6 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/22/2019 07:47
Site: CUF TDEC Order

Sounding: CPT10
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



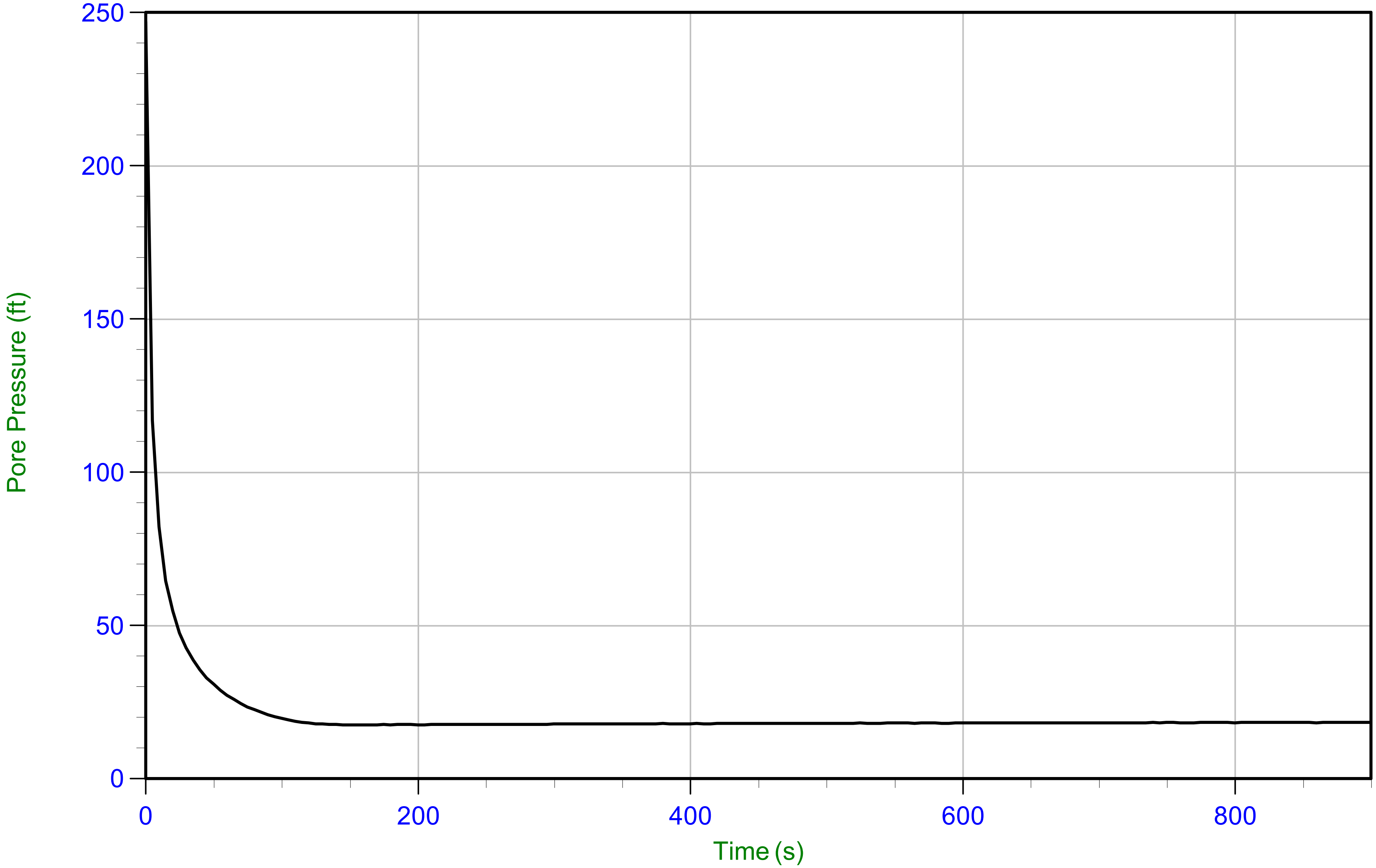
Trace Summary:

Filename: 19-54002_CPT10.PPF
Depth: 8.825 m / 28.953 ft
Duration: 1105.0 s

U Min: 3.4 ft
U Max: 17.9 ft

WT: 3.406 m / 11.174 ft
Ueq: 17.8 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/21/2019 15:19 Site: CUF TDEC Order	Sounding: CPT11 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT11.PPF
Depth: 8.875 m / 29.117 ft
Duration: 900.0 s

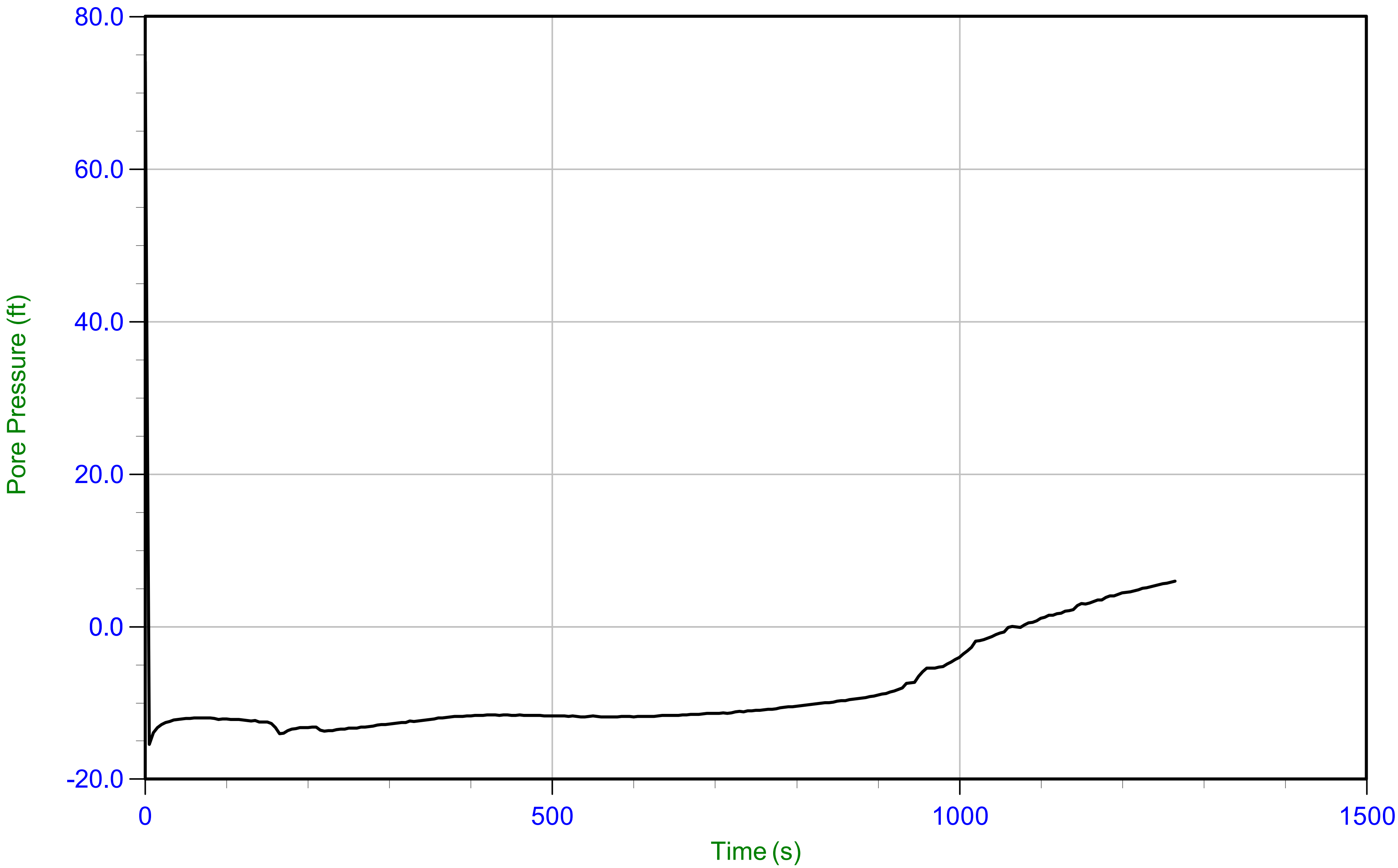
U Min: 17.6 ft
U Max: 247.0 ft

WT: 3.266 m / 10.715 ft
Ueq: 18.4 ft

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/21/2019 14:08
Site: CUF TDEC Order

Sounding: CPT12
Cone: 367:T1500F15U500
Cone Area: 15 sq cm

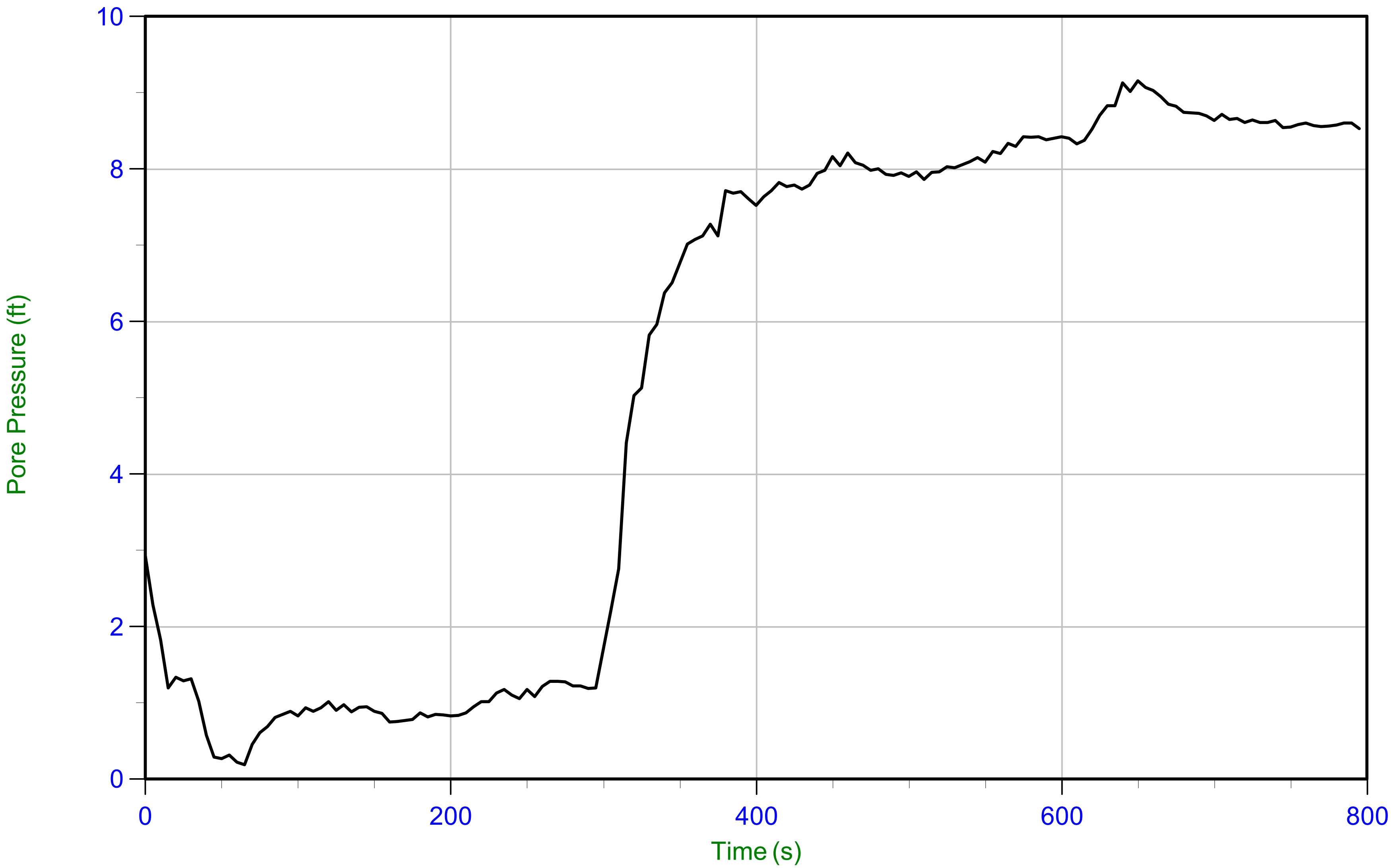


Trace Summary:

Filename: 19-54002_CPT12.PPF
Depth: 7.200 m / 23.622 ft
Duration: 1265.0 s

U Min: -15.4 ft
U Max: 74.1 ft

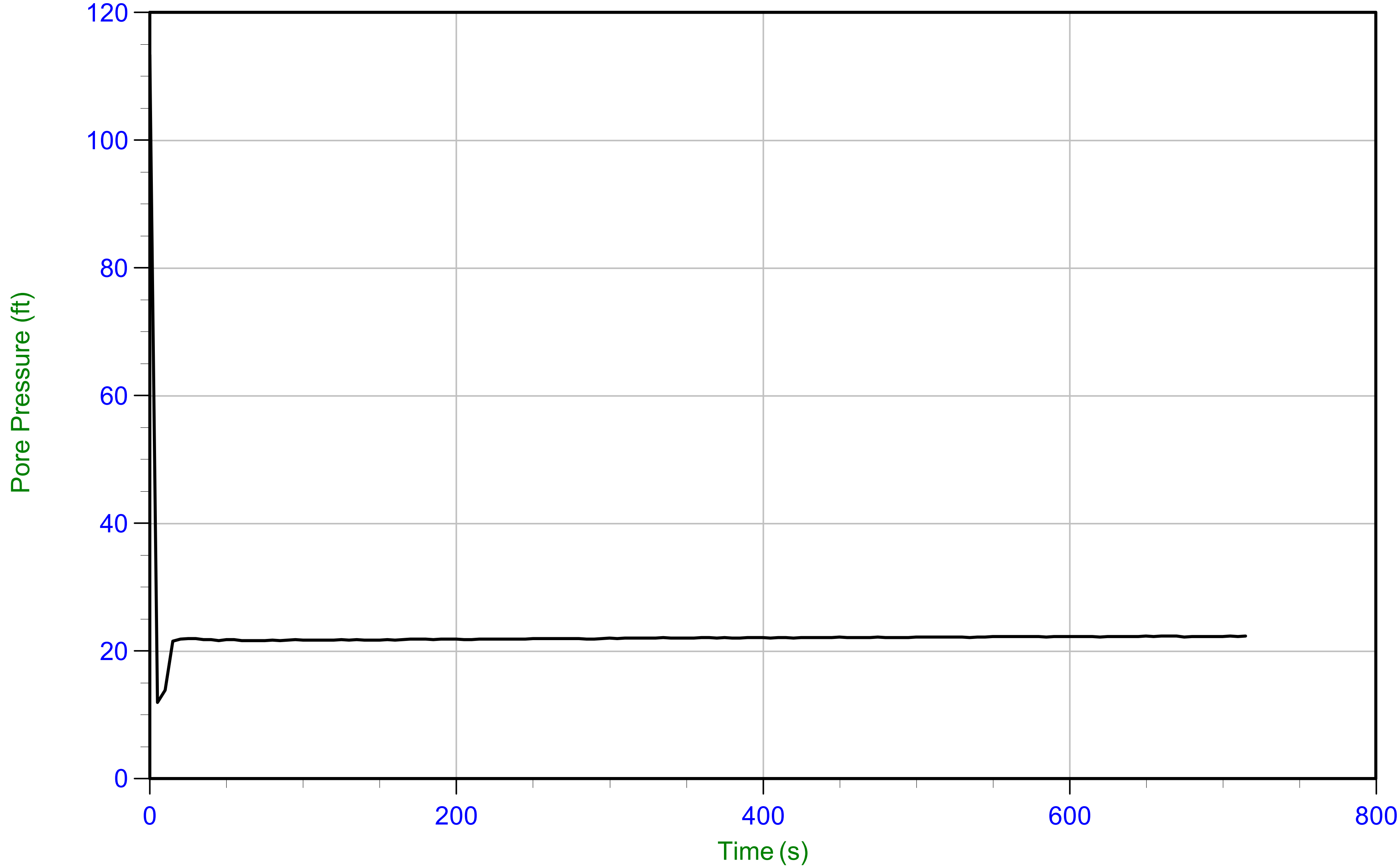
Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/21/2019 12:31 Site: CUF TDEC Order	Sounding: CPT13 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT13.PPF	U Min: 0.2 ft	WT: 3.386 m / 11.109 ft
Depth: 6.000 m / 19.685 ft	U Max: 9.2 ft	Ueq: 8.6 ft
Duration: 795.0 s		

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/21/2019 12:31 Site: CUF TDEC Order	Sounding: CPT13 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



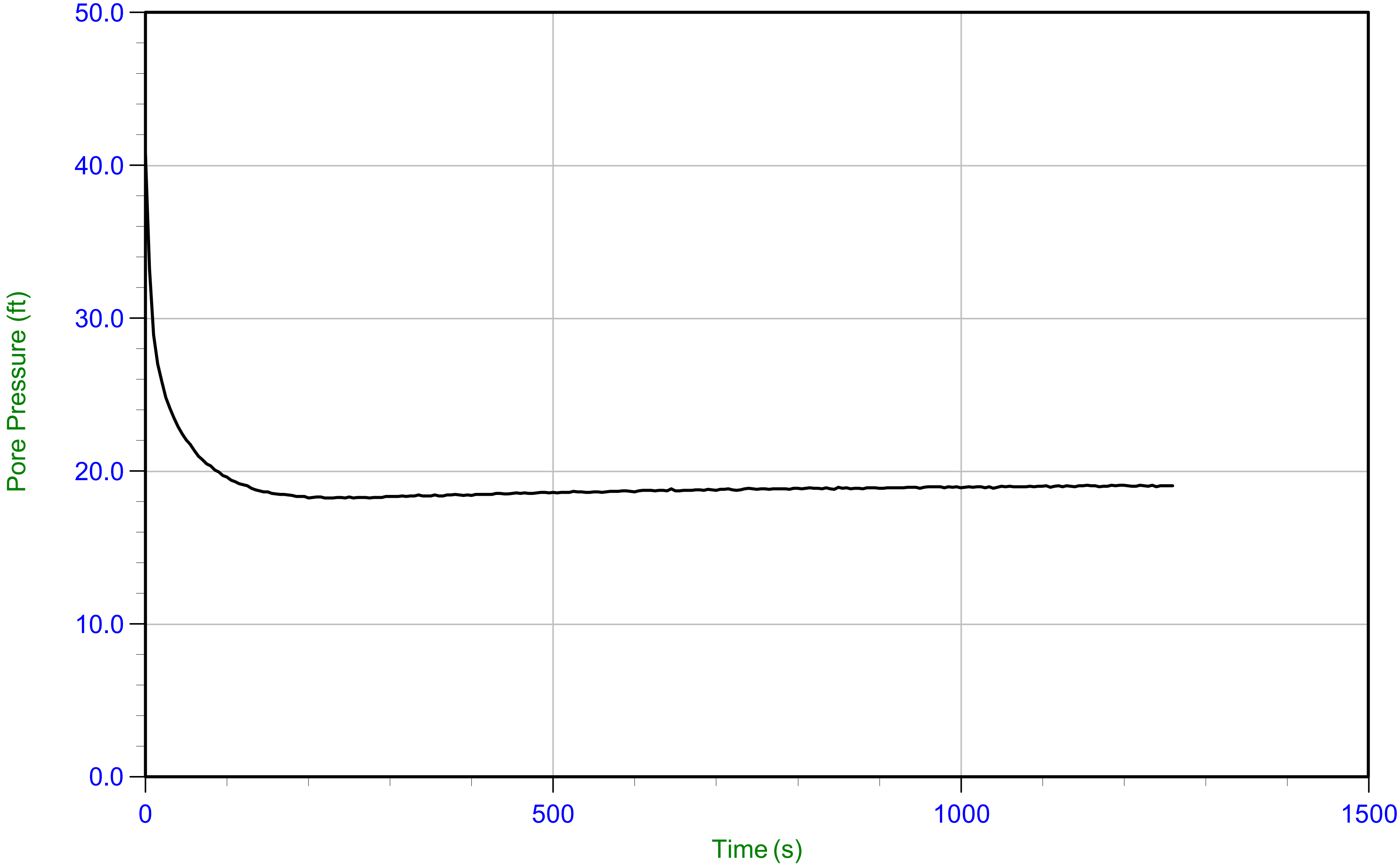
Trace Summary:

Filename: 19-54002_CPT13.PPF
Depth: 10.075 m / 33.054 ft
Duration: 715.0 s

U Min: 11.9 ft
U Max: 113.4 ft

WT: 3.280 m / 10.761 ft
Ueq: 22.3 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/18/2019 07:38 Site: CUF TDEC Order	Sounding: CPT14 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT14.PPF
Depth: 8.950 m / 29.363 ft
Duration: 1260.0 s

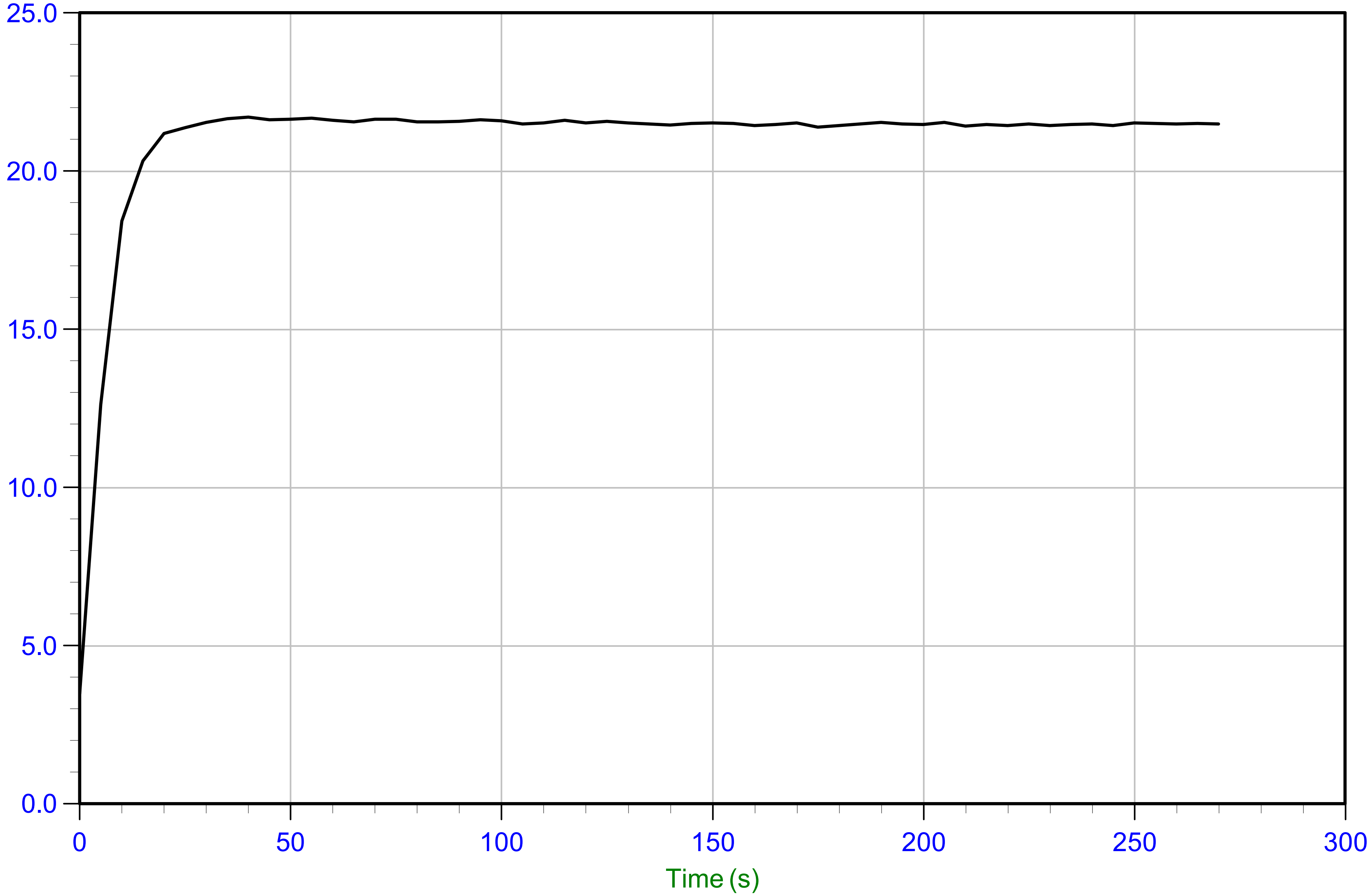
U Min: 18.2 ft
U Max: 40.8 ft

WT: 3.150 m / 10.335 ft
Ueq: 19.0 ft

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/18/2019 07:38
Site: CUF TDEC Order

Sounding: CPT14
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT14.PPF
Depth: 17.425 m / 57.168 ft
Duration: 270.0 s

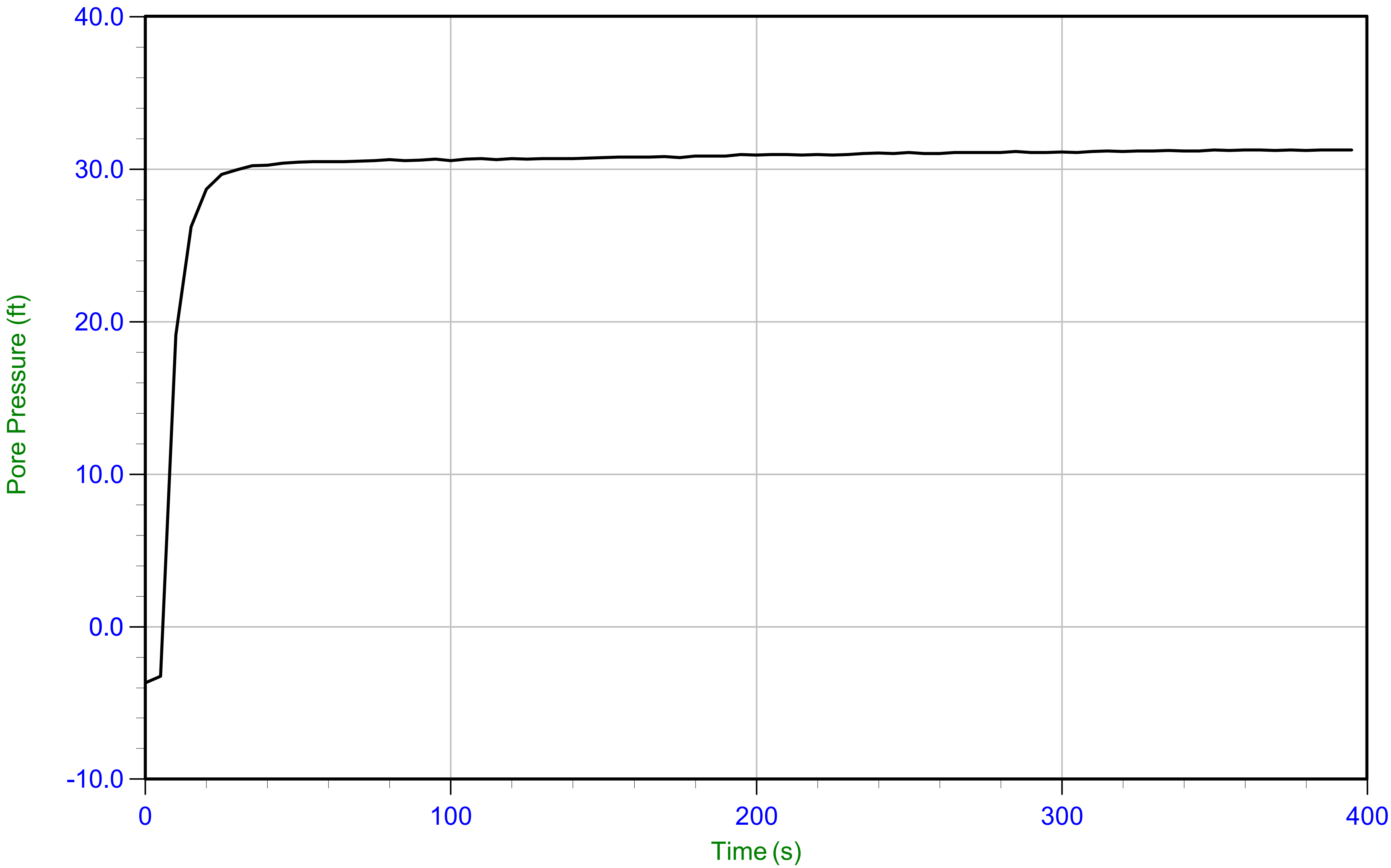
U Min: 3.5 ft
U Max: 21.7 ft

WT: 10.884 m / 35.708 ft
Ueq: 21.5 ft

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/18/2019 07:38
Site: CUF TDEC Order

Sounding: CPT14
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



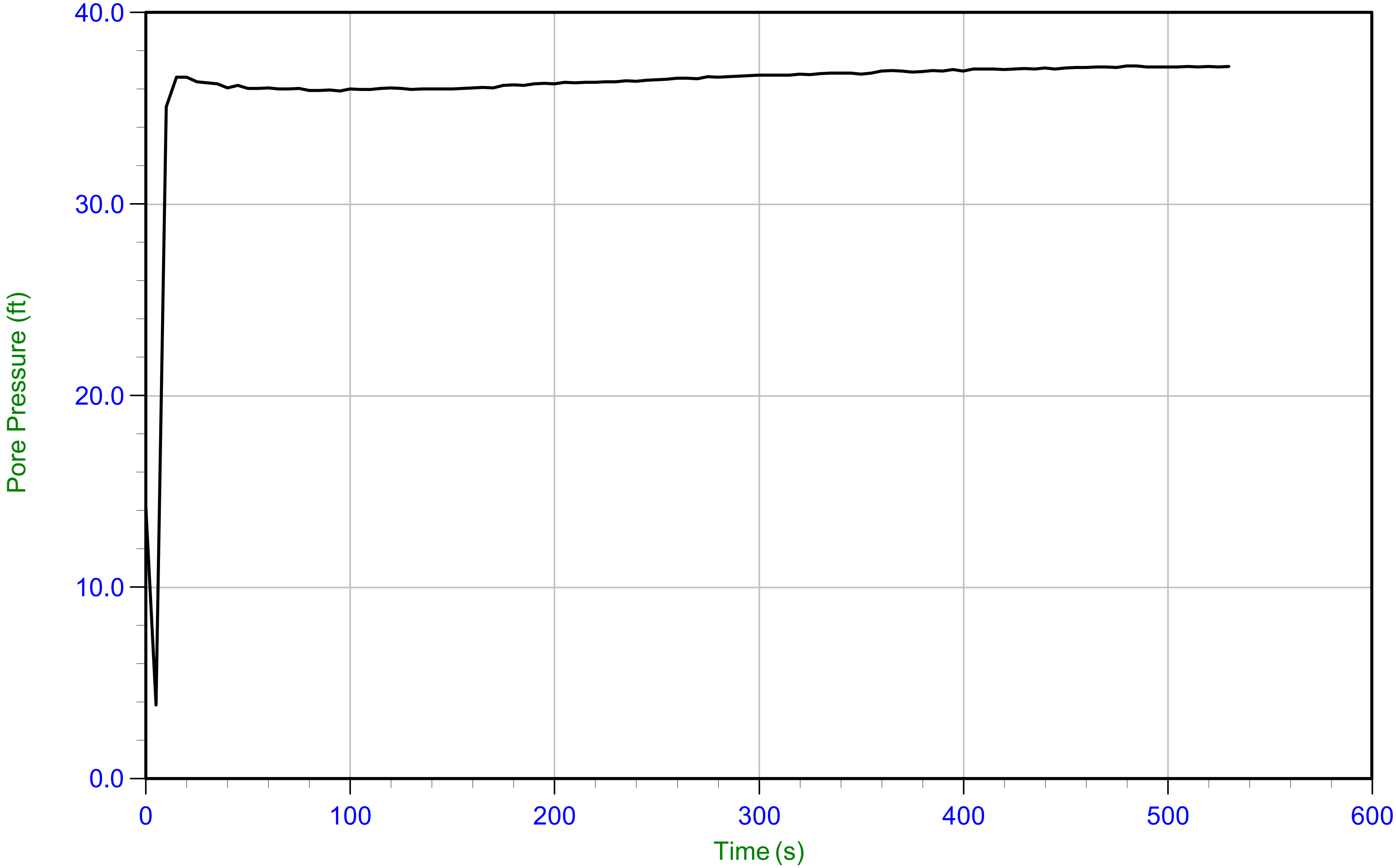
Trace Summary:

Filename: 19-54002_CPT14.PPF
Depth: 20.375 m / 66.846 ft
Duration: 395.0 s

U Min: -3.7 ft
U Max: 31.3 ft

WT: 10.839 m / 35.561 ft
Ueq: 31.3 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/18/2019 07:38 Site: CUF TDEC Order	Sounding: CPT14 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT14.PPF
Depth: 22.550 m / 73.982 ft
Duration: 530.0 s

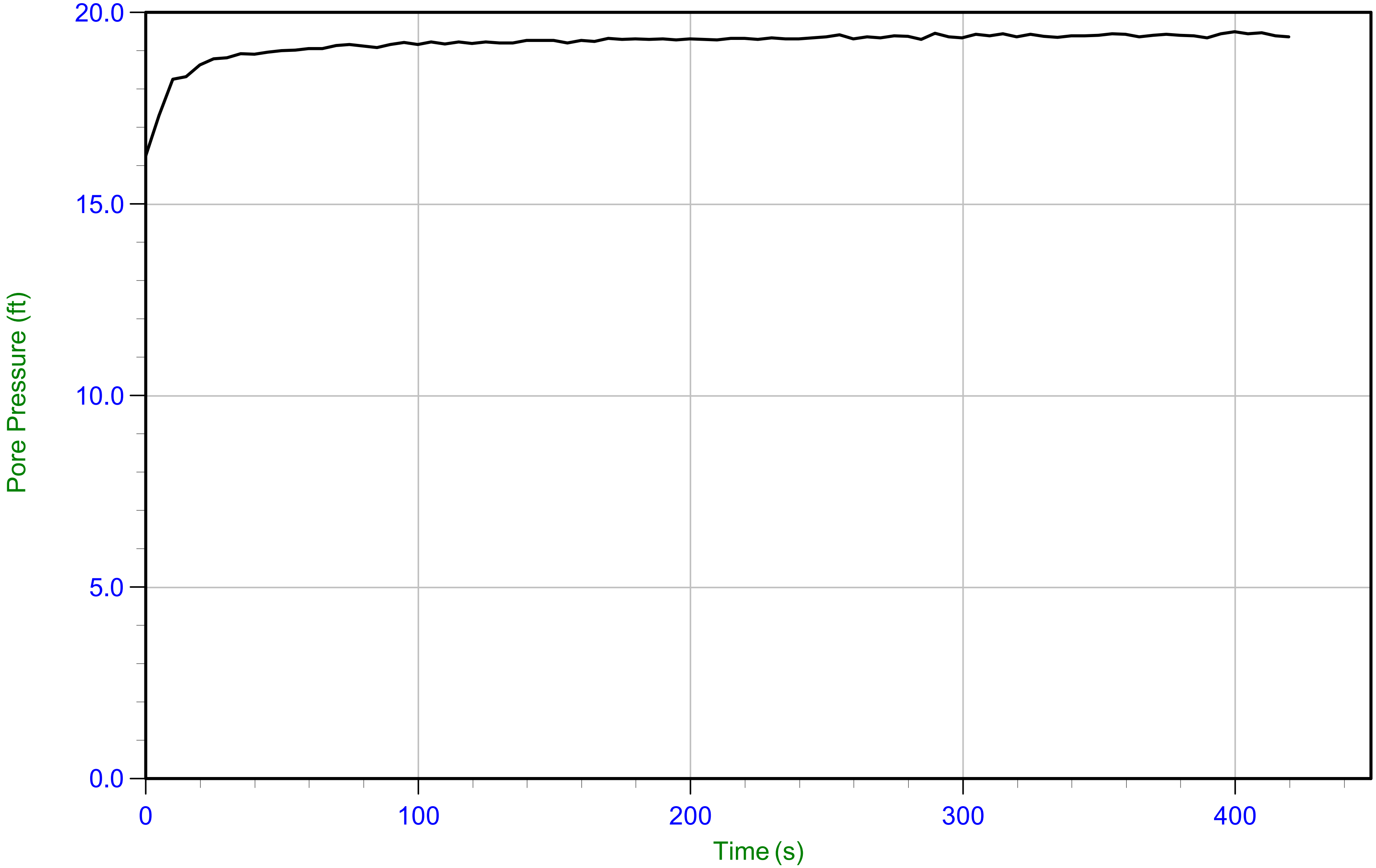
U Min: 3.9 ft
U Max: 37.2 ft

WT: 11.215 m / 36.794 ft
Ueq: 37.2 ft

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/17/2019 13:05
Site: CUF TDEC Order

Sounding: CPT15
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT15.PPF
Depth: 8.875 m / 29.117 ft
Duration: 420.0 s

U Min: 16.3 ft
U Max: 19.5 ft

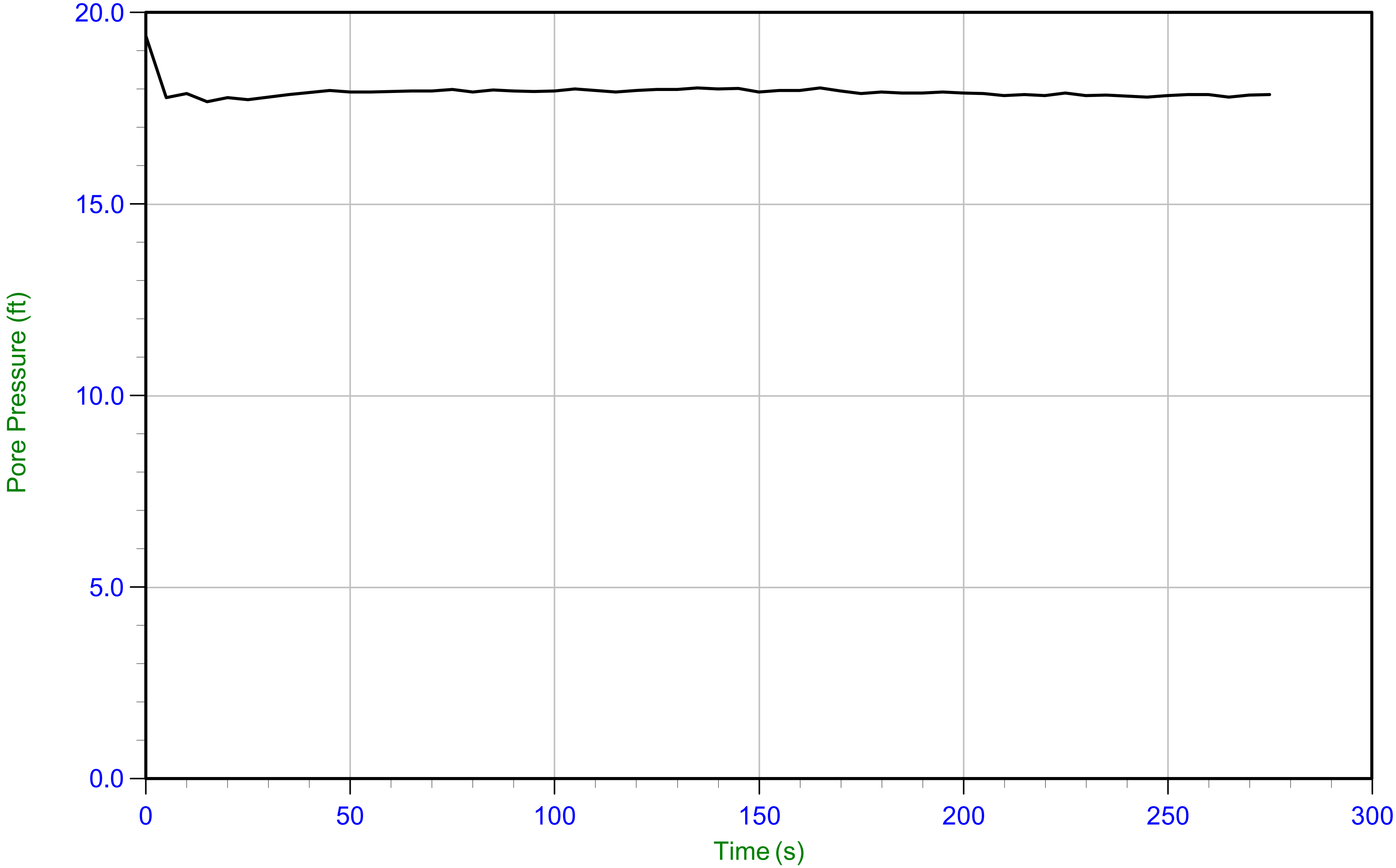
WT: 2.959 m / 9.708 ft
Ueq: 19.4 ft

ConeTec

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/17/2019 10:17
Site: CUF TDEC Order

Sounding: CPT16
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



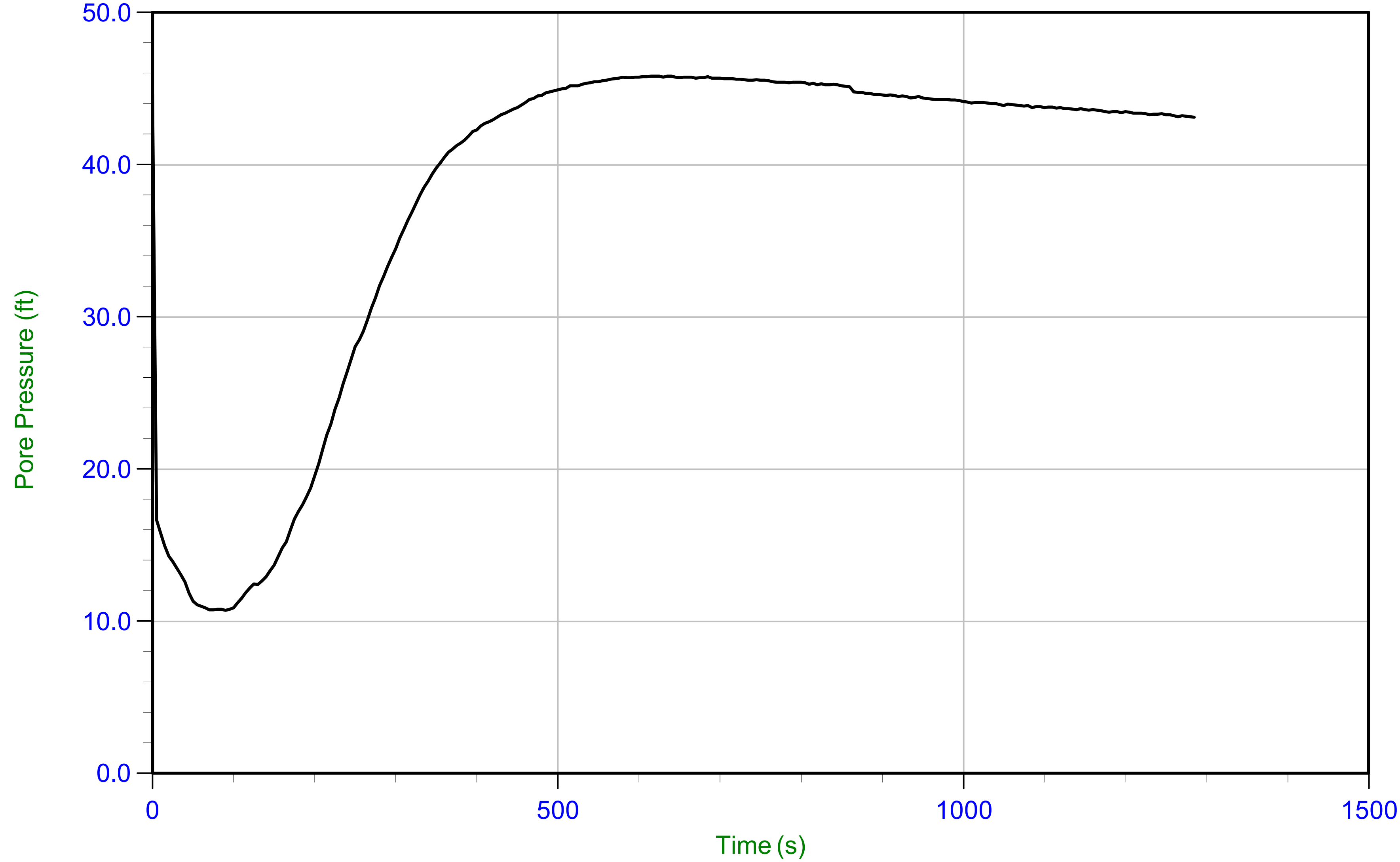
Trace Summary:

Filename: 19-54002_CPT16.PPF
Depth: 8.450 m / 27.723 ft
Duration: 275.0 s

U Min: 17.7 ft
U Max: 19.4 ft

WT: 3.010 m / 9.875 ft
Ueq: 17.8 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/17/2019 10:17 Site: CUF TDEC Order	Sounding: CPT16 Cone: 367:T1500F15U500 Cone Area: 15 sq cm

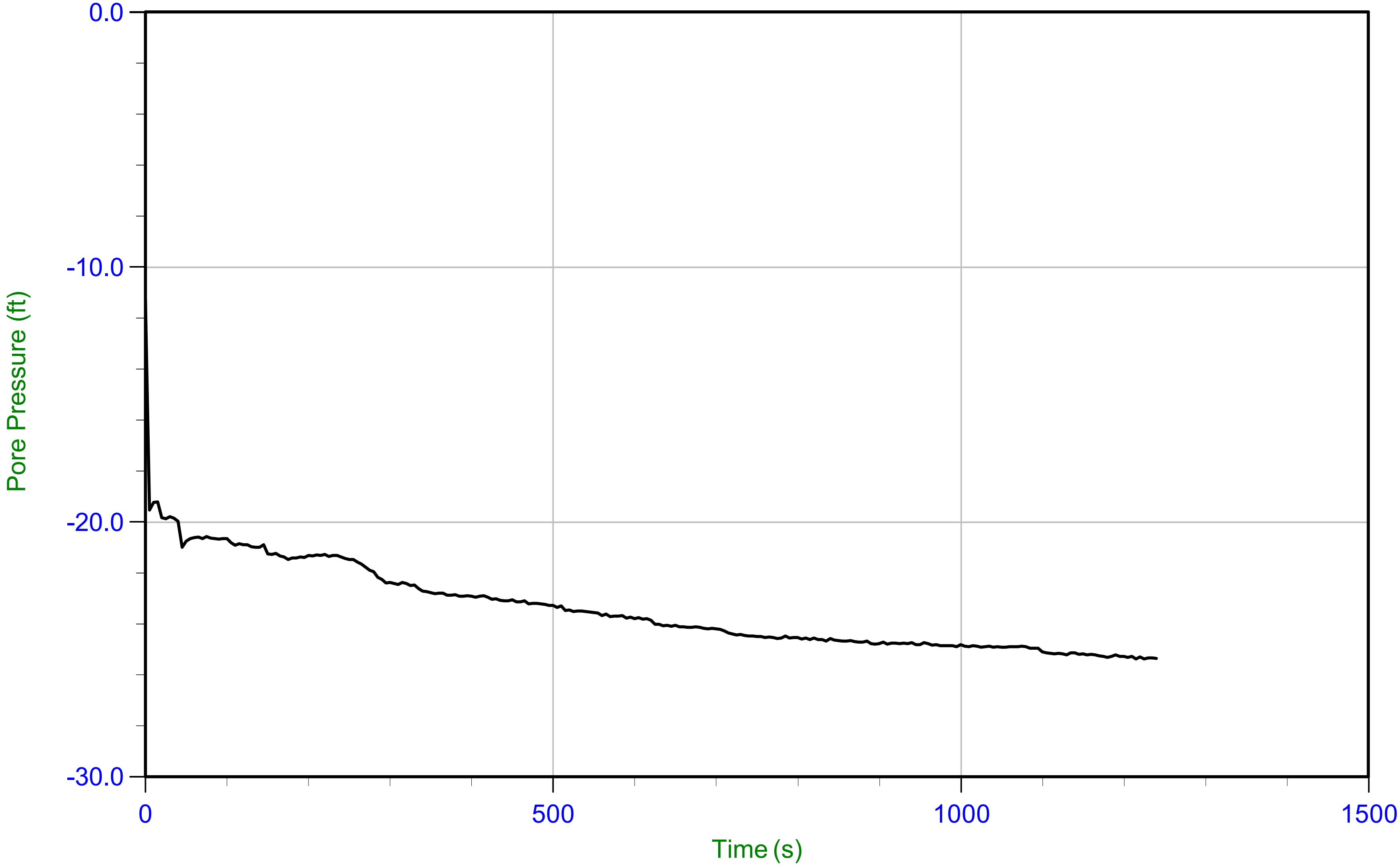


Trace Summary:

Filename: 19-54002_CPT16.PPF
Depth: 12.900 m / 42.322 ft
Duration: 1285.0 s

U Min: 10.7 ft
U Max: 45.8 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/17/2019 08:36 Site: CUF TDEC Order	Sounding: CPT17 Cone: 367:T1500F15U500 Cone Area: 15 sq cm

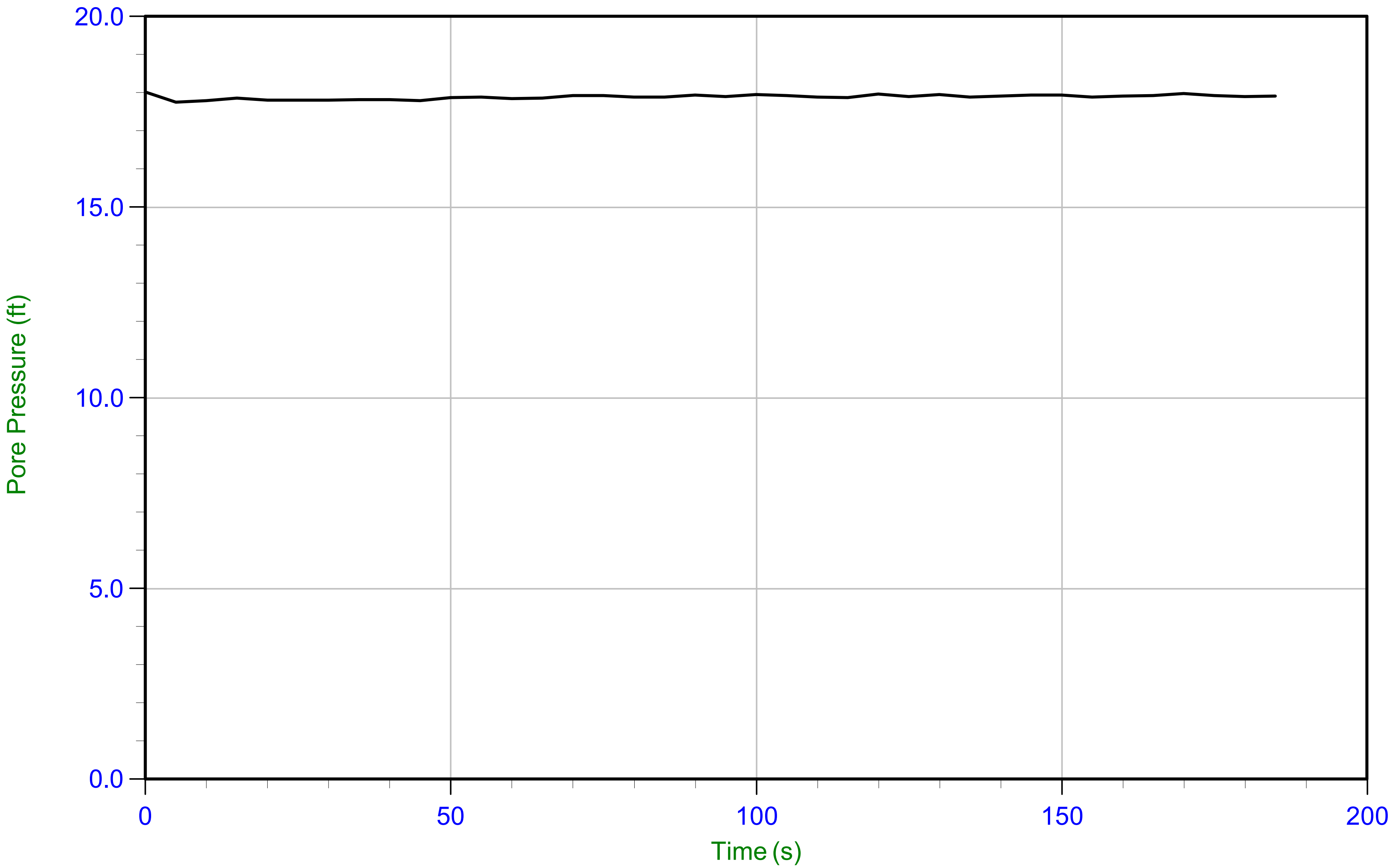


Trace Summary:

Filename: 19-54002_CPT17.PPF
Depth: 5.875 m / 19.275 ft
Duration: 1240.0 s

U Min: -25.4 ft
U Max: -11.3 ft

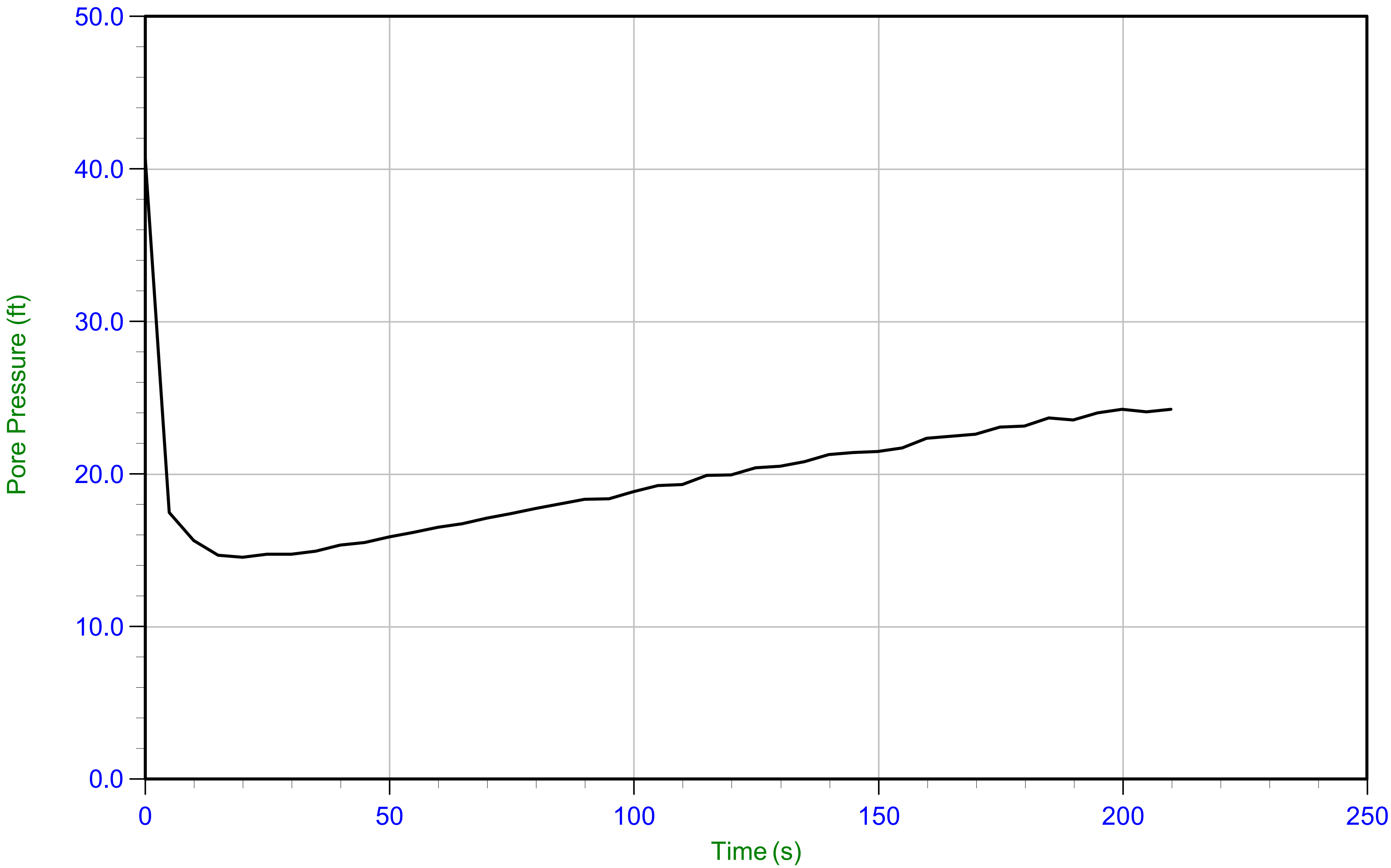
Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/17/2019 08:36 Site: CUF TDEC Order	Sounding: CPT17 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT17.PPF	U Min: 17.8 ft	WT: 2.989 m / 9.806 ft
Depth: 8.450 m / 27.723 ft	U Max: 18.0 ft	Ueq: 17.9 ft
Duration: 185.0 s		

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/22/2019 15:14 Site: CUF TDEC Order	Sounding: CPT17a Cone: 367:T1500F15U500 Cone Area: 15 sq cm

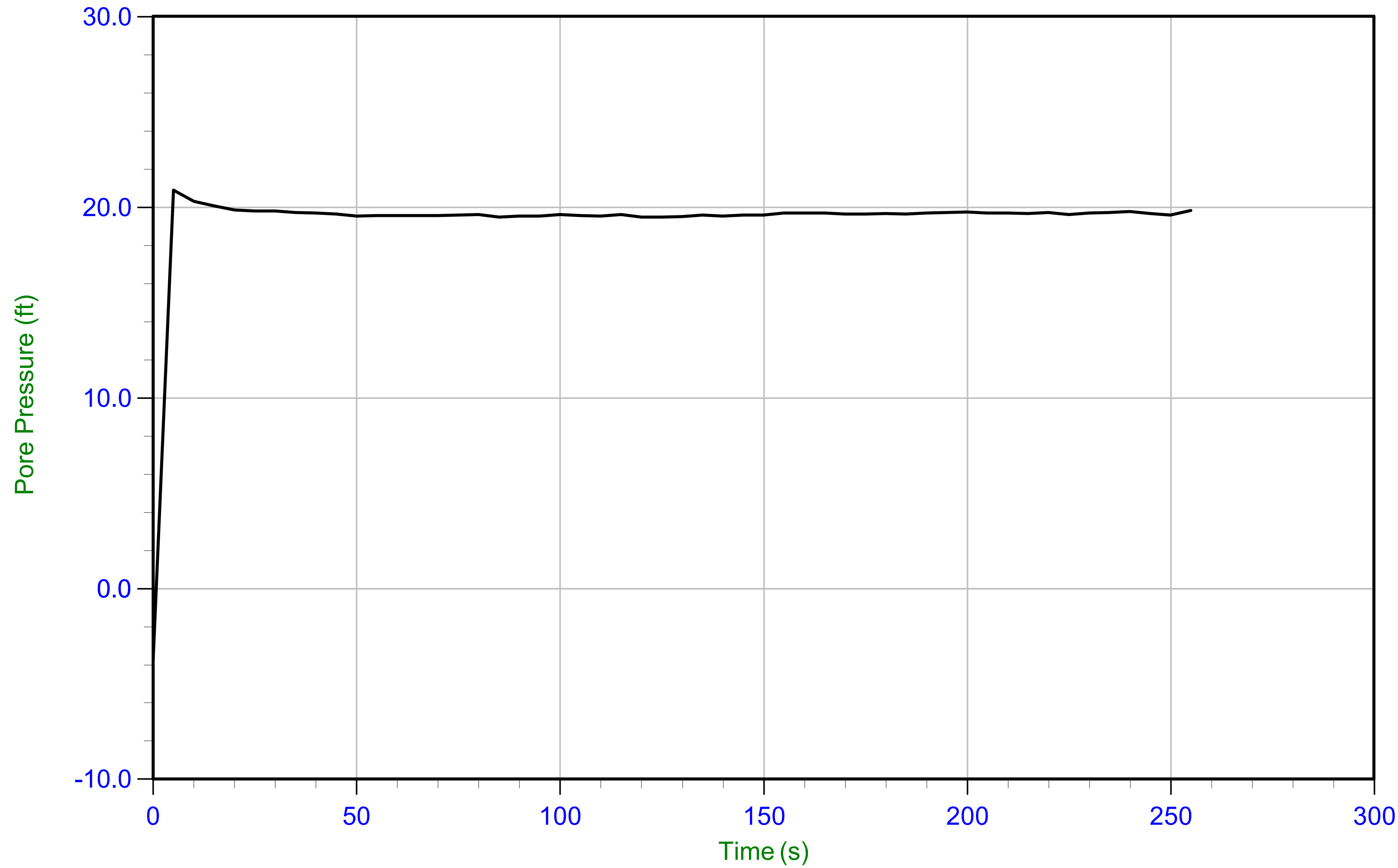


Trace Summary:

Filename: 19-54002_CPT17a.PPF
Depth: 7.000 m / 22.966 ft
Duration: 210.0 s

U Min: 14.6 ft
U Max: 40.7 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/22/2019 15:14 Site: CUF TDEC Order	Sounding: CPT17a Cone: 367:T1500F15U500 Cone Area: 15 sq cm



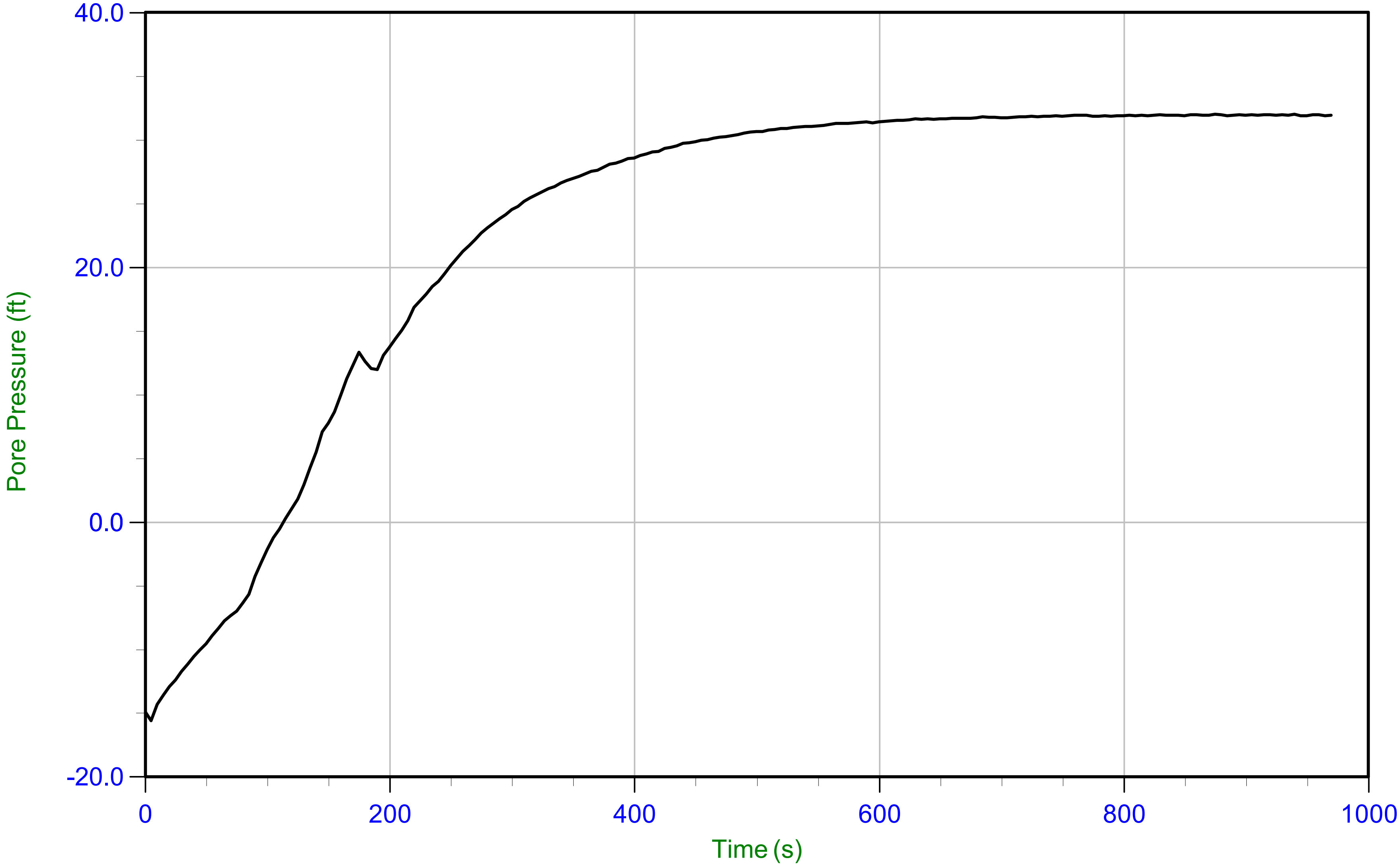
Trace Summary:

Filename: 19-54002_CPT17a.PPF	U Min: -3.8 ft	WT: 2.849 m / 9.347 ft
Depth: 8.850 m / 29.035 ft	U Max: 20.9 ft	Ueq: 19.7 ft
Duration: 255.0 s		

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/22/2019 15:14
Site: CUF TDEC Order

Sounding: CPT17a
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



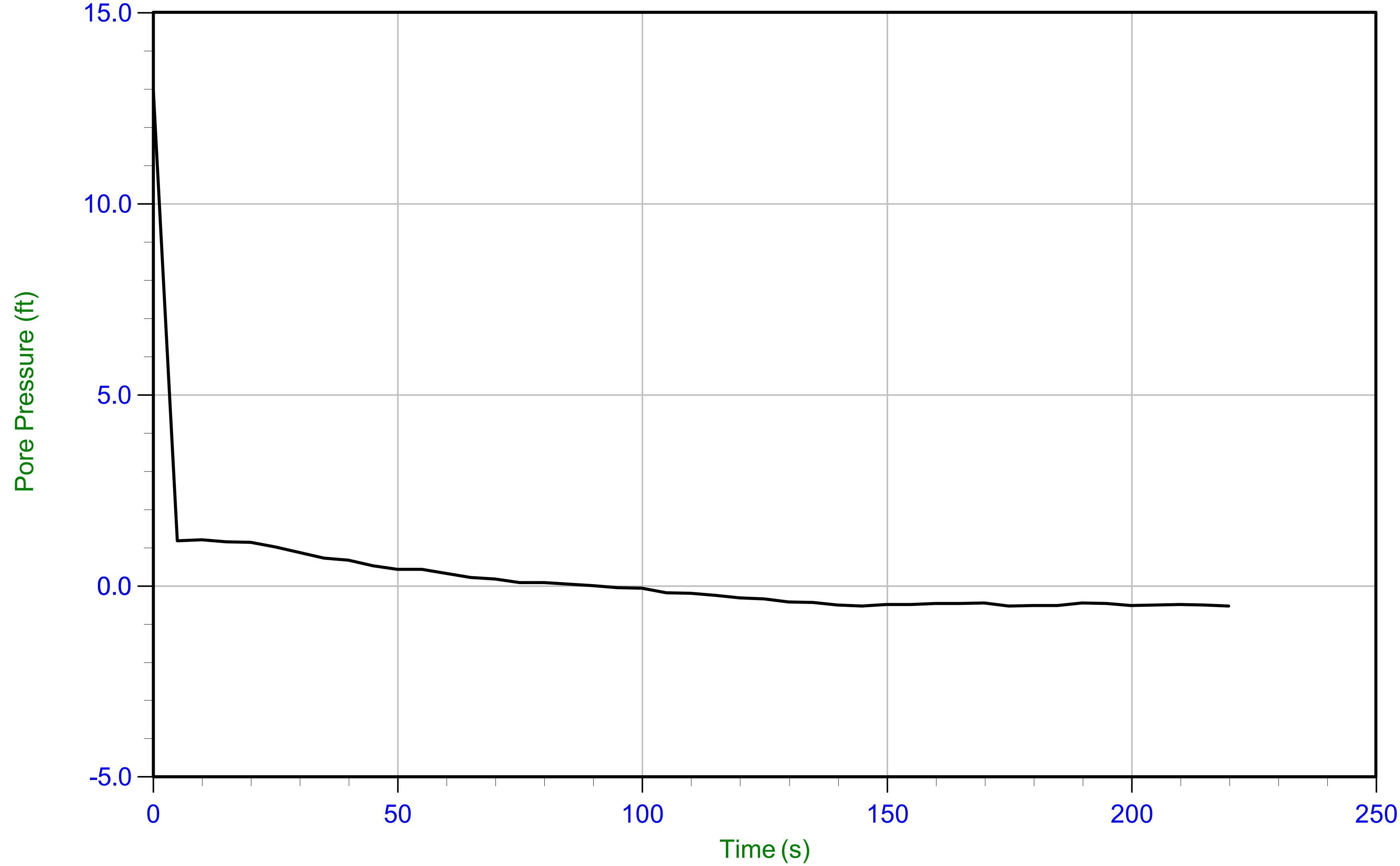
Trace Summary:

Filename: 19-54002_CPT17a.PPF
Depth: 12.625 m / 41.420 ft
Duration: 970.0 s

U Min: -15.6 ft
U Max: 32.0 ft

WT: 2.888 m / 9.475 ft
Ueq: 31.9 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/16/2019 14:48 Site: CUF TDEC Order	Sounding: CPT18 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT18.PPF
Depth: 5.850 m / 19.193 ft
Duration: 220.0 s

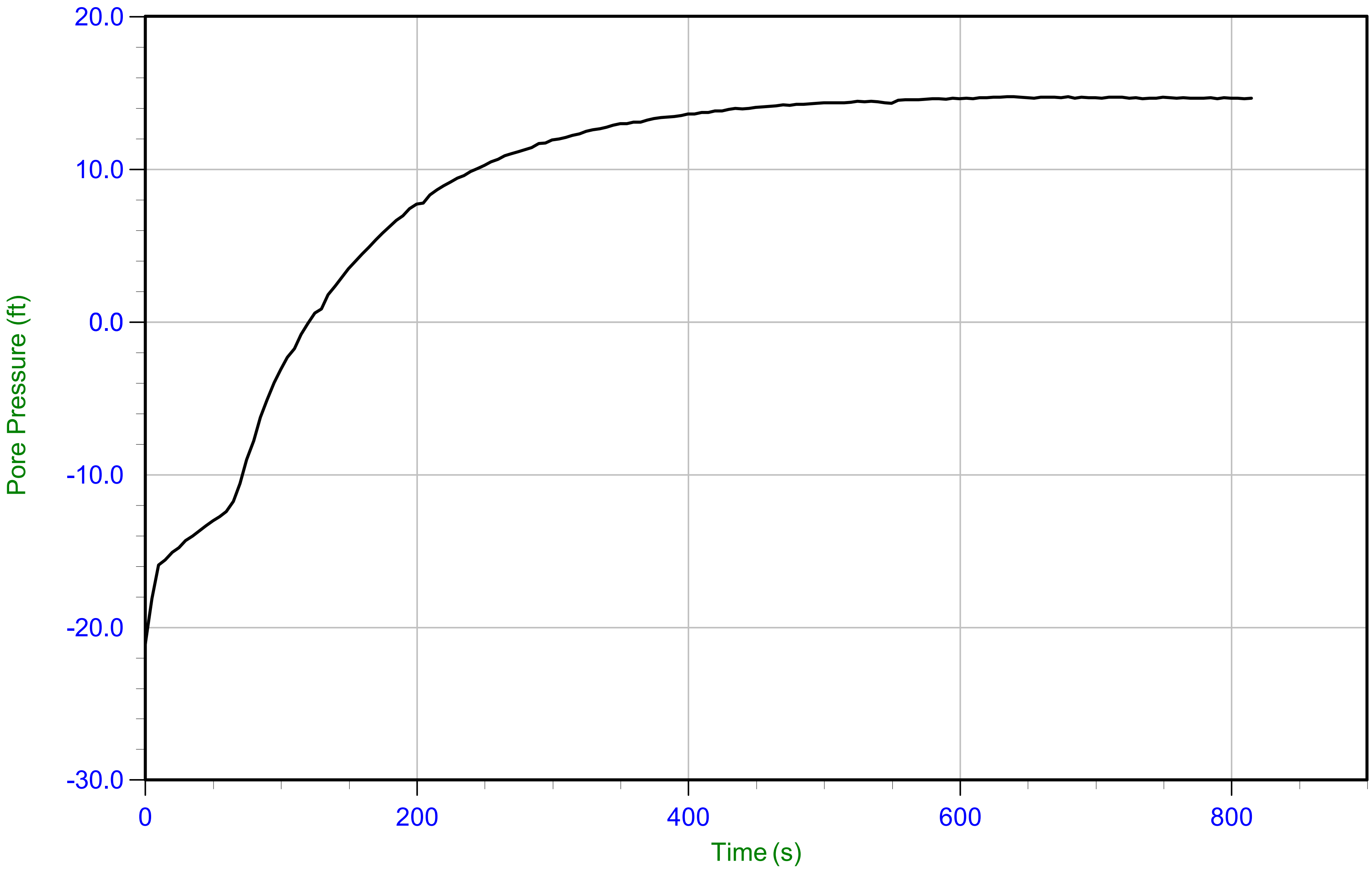
U Min: -0.5 ft
U Max: 12.9 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/16/2019 11:39
Site: CUF TDEC Order

Sounding: CPT19
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



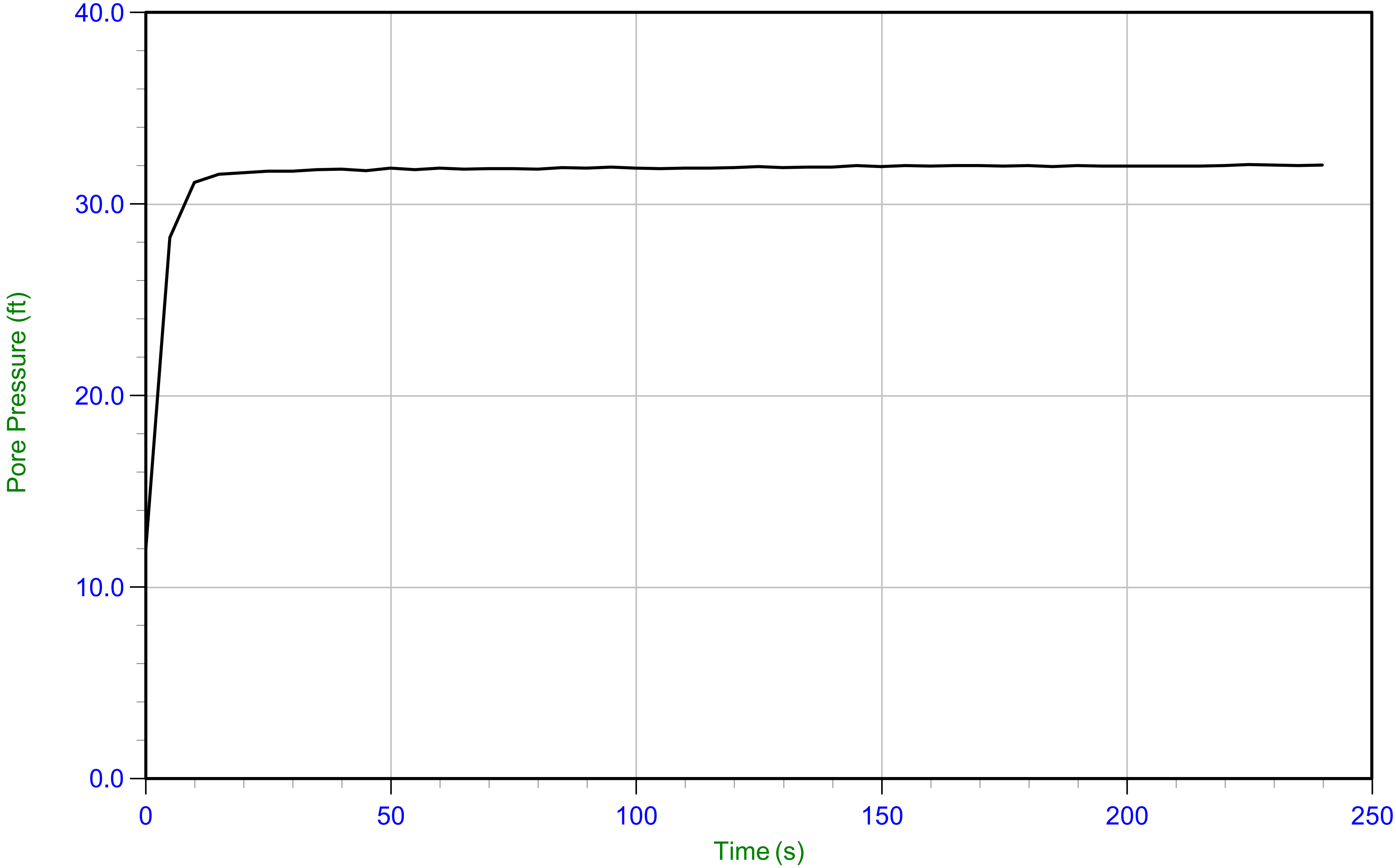
Trace Summary:

Filename: 19-54002_CPT19.PPF
Depth: 7.225 m / 23.704 ft
Duration: 815.0 s

U Min: -21.1 ft
U Max: 14.8 ft

WT: 2.759 m / 9.052 ft
Ueq: 14.7 ft

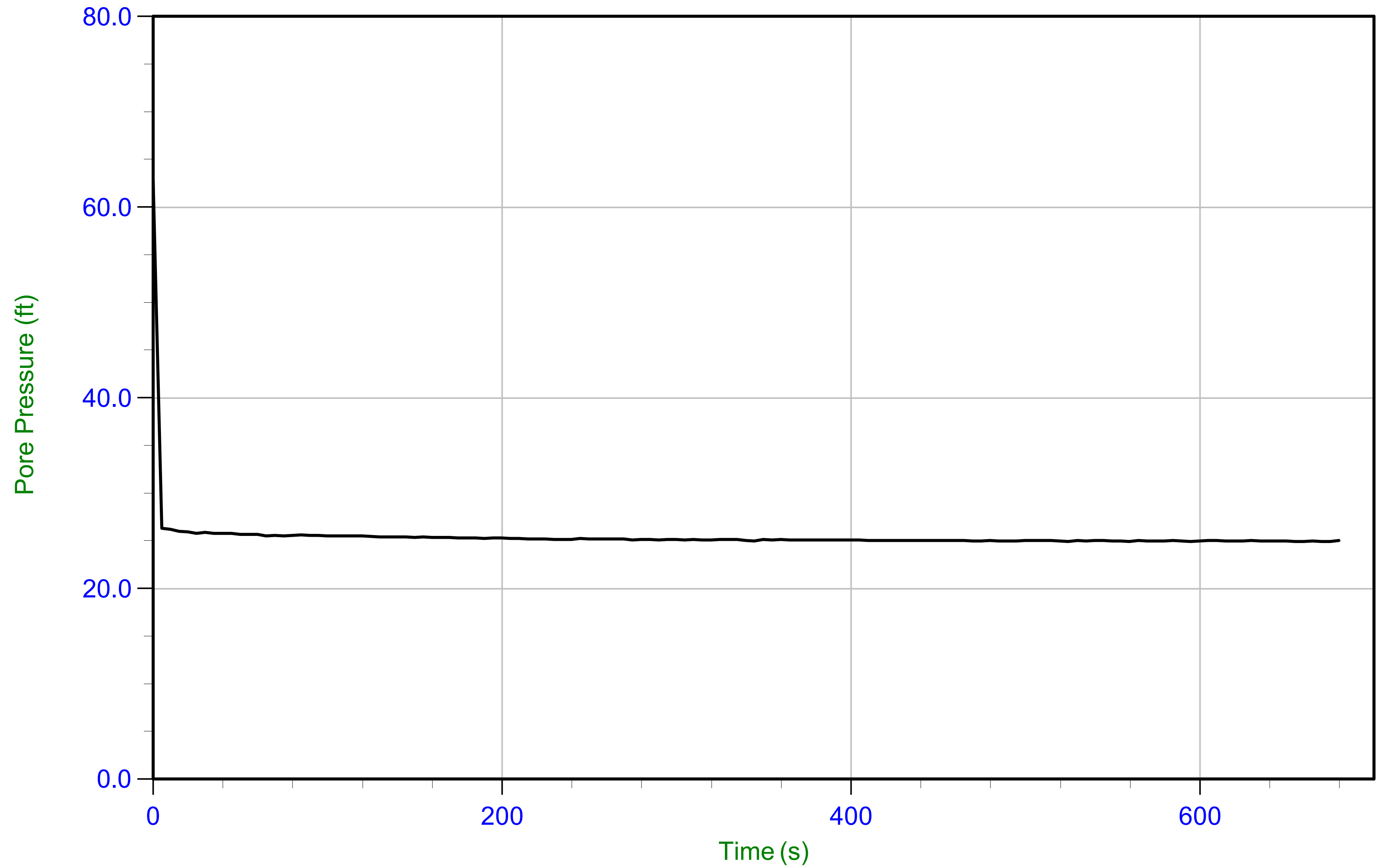
CONETEC	Stantec Consulting Services Inc.	Job No: 19-54002	Sounding: CPT19
		Date: 01/16/2019 11:39	Cone: 367:T1500F15U500
		Site: CUF TDEC Order	Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT19.PPF	U Min: 12.0 ft	WT: 2.892 m / 9.488 ft
Depth: 12.650 m / 41.502 ft	U Max: 32.1 ft	Ueq: 32.0 ft
Duration: 240.0 s		

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/16/2019 10:19 Site: CUF TDEC Order	Sounding: CPT20 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



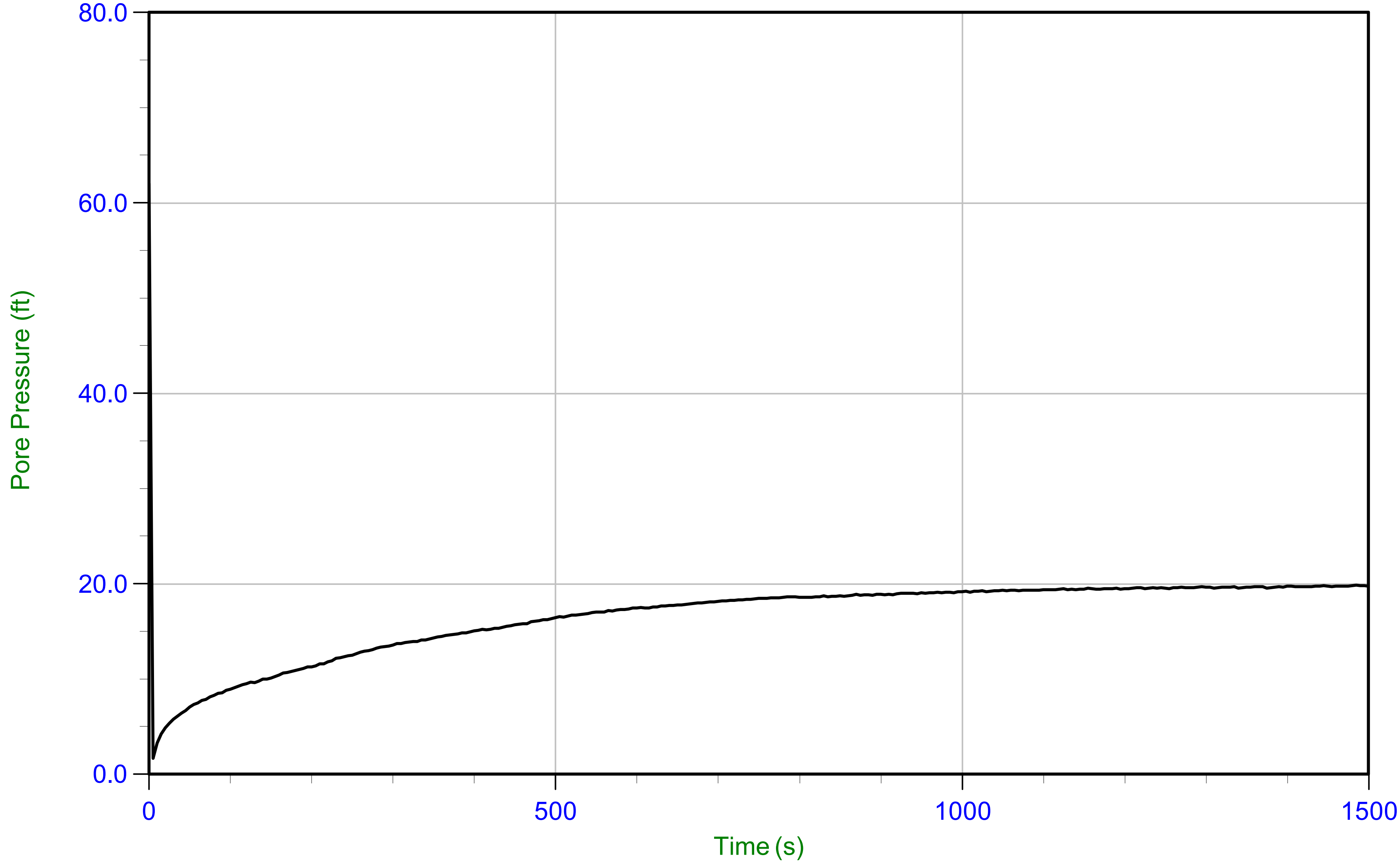
Trace Summary:

Filename: 19-54002_CPT20.PPF	U Min: 24.9 ft	WT: 4.741 m / 15.554 ft
Depth: 12.350 m / 40.518 ft	U Max: 62.8 ft	Ueq: 25.0 ft
Duration: 680.0 s		

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/16/2019 09:06
Site: CUF TDEC Order

Sounding: CPT21
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT21.PPF
Depth: 7.075 m / 23.212 ft
Duration: 1500.0 s

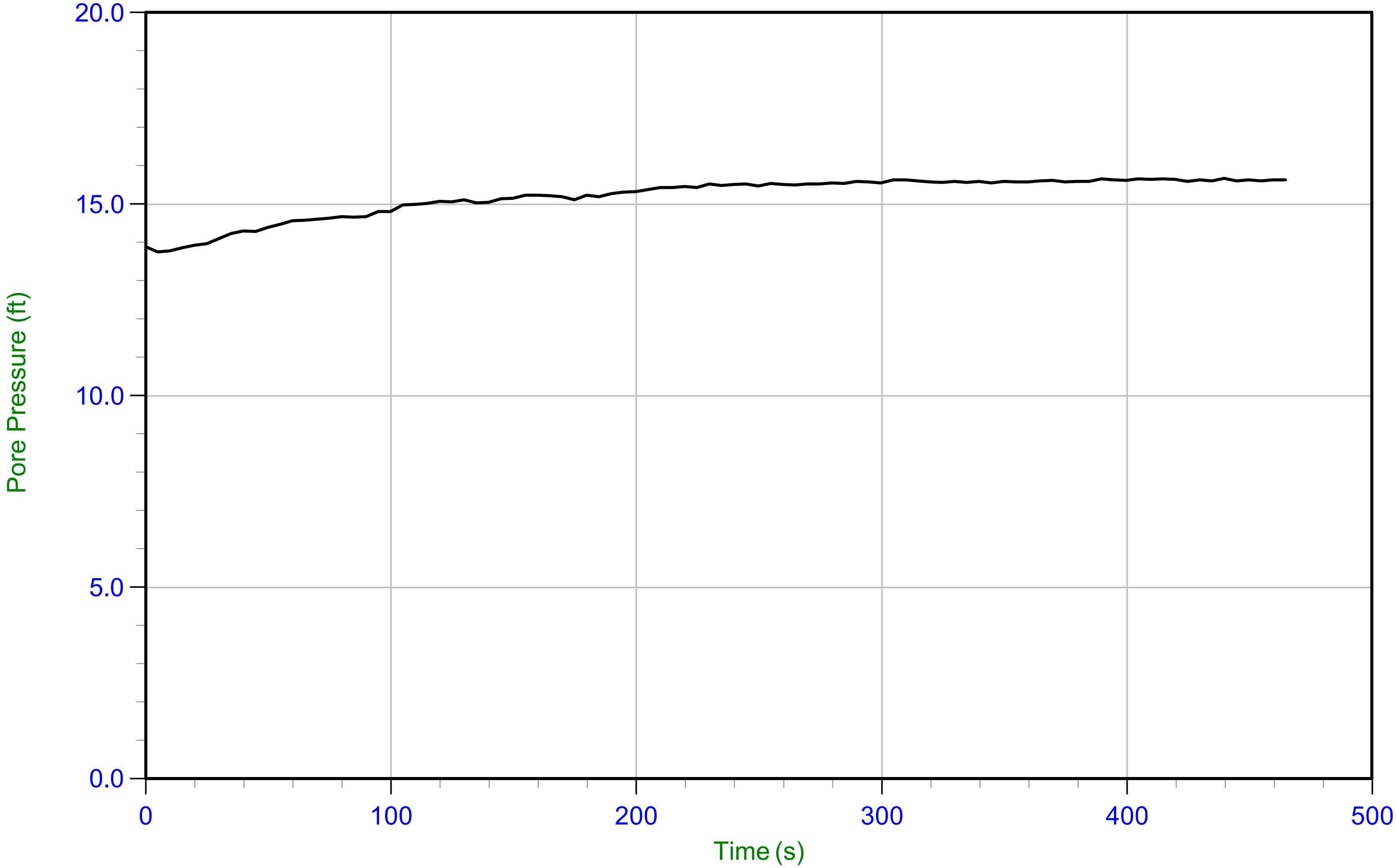
U Min: 1.7 ft
U Max: 62.1 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/15/2019 07:51
Site: CUF TDEC Order

Sounding: CPT22
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT22.PPF
Depth: 7.800 m / 25.590 ft
Duration: 465.0 s

U Min: 13.7 ft
U Max: 15.7 ft

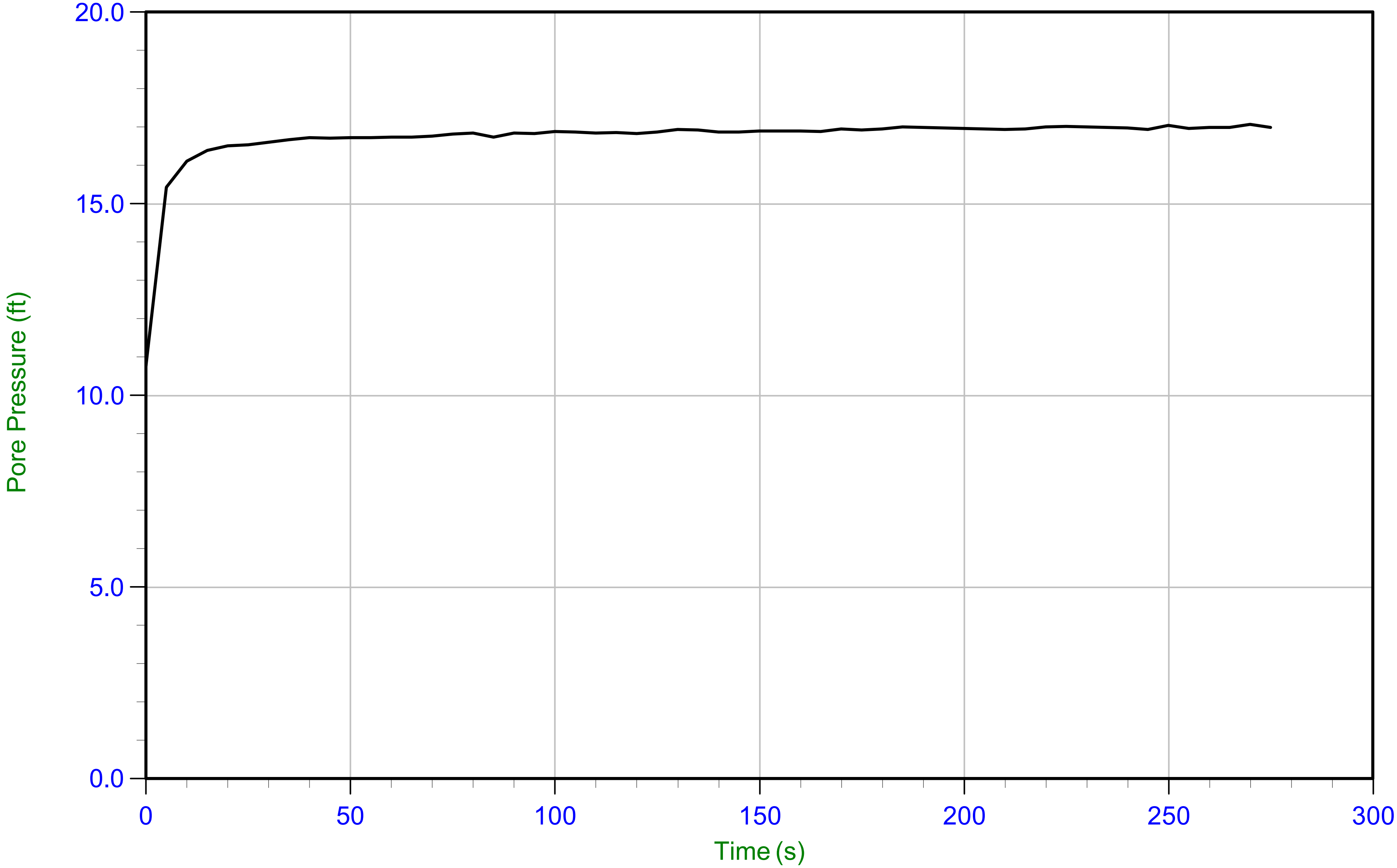
WT: 3.037 m / 9.964 ft
Ueq: 15.6 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/23/2019 07:33
Site: CUF TDEC Order

Sounding: CPT22a
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT22a.PPF
Depth: 8.000 m / 26.246 ft
Duration: 275.0 s

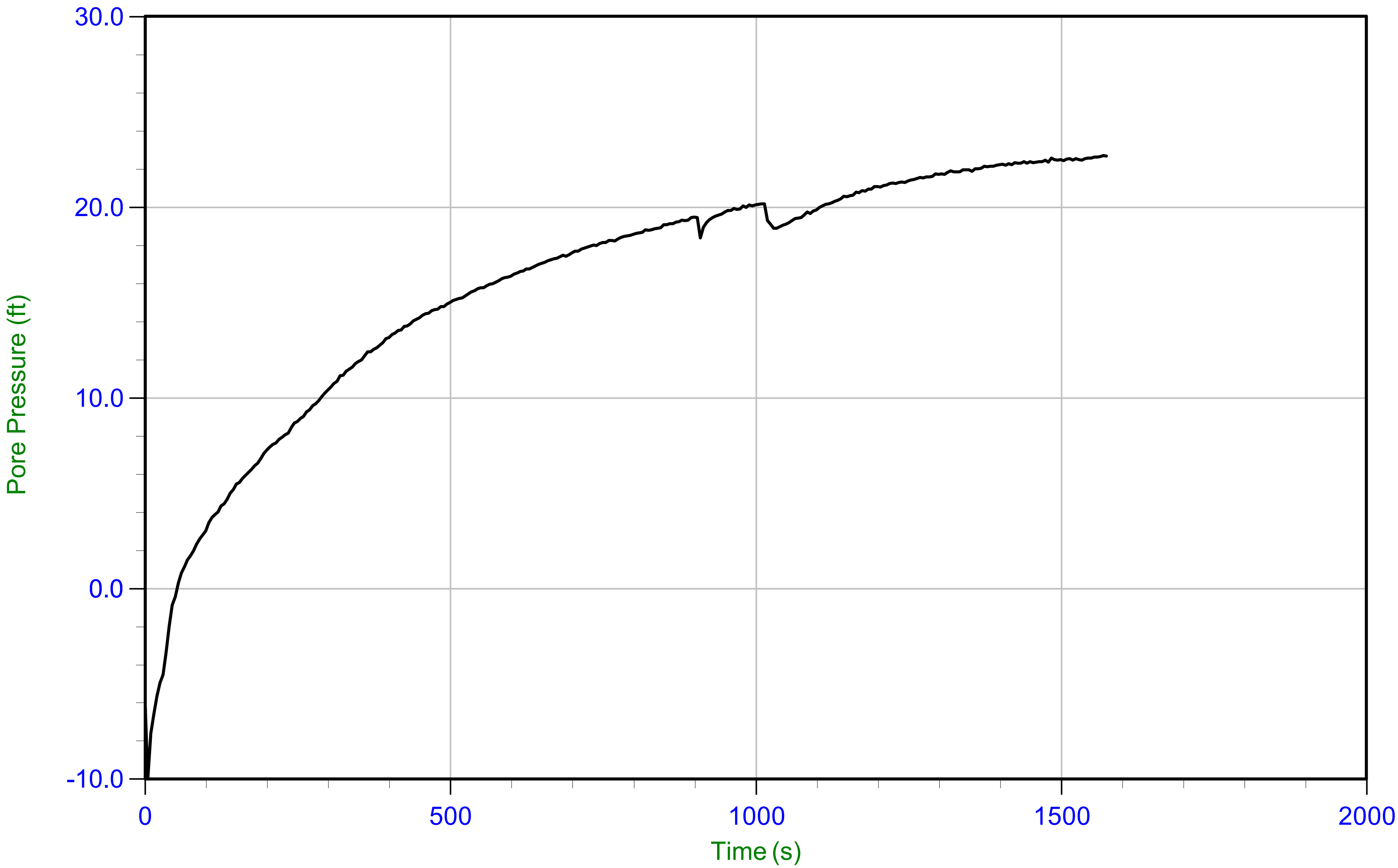
U Min: 10.8 ft
U Max: 17.1 ft

WT: 2.814 m / 9.232 ft
Ueq: 17.0 ft

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/23/2019 07:33
Site: CUF TDEC Order

Sounding: CPT22a
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

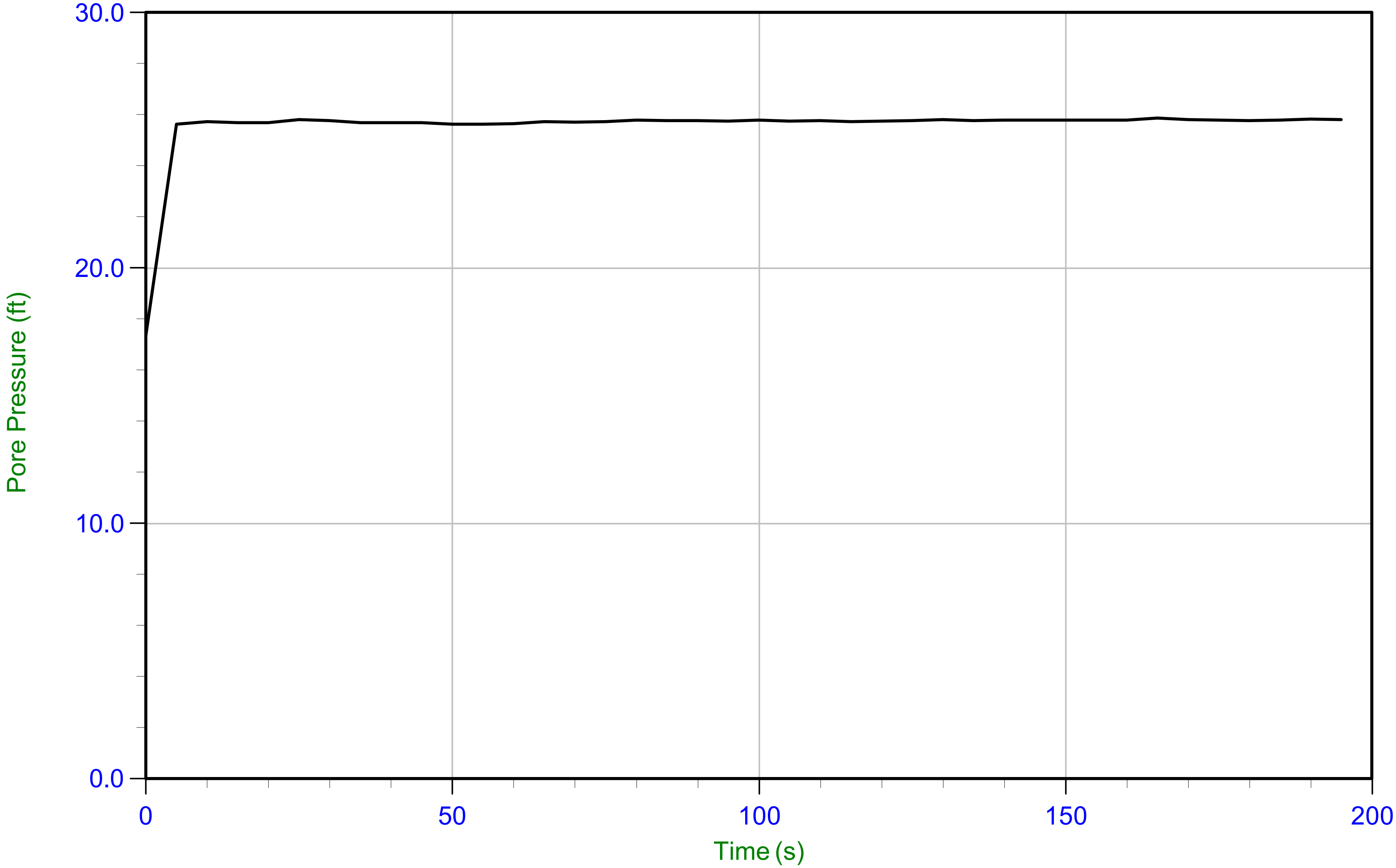
Filename: 19-54002_CPT22a.PPF
Depth: 12.625 m / 41.420 ft
Duration: 1575.0 s

U Min: -10.0 ft
U Max: 22.7 ft

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/23/2019 07:33
Site: CUF TDEC Order

Sounding: CPT22a
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT22a.PPF
Depth: 12.925 m / 42.404 ft
Duration: 195.0 s

U Min: 17.3 ft
U Max: 25.9 ft

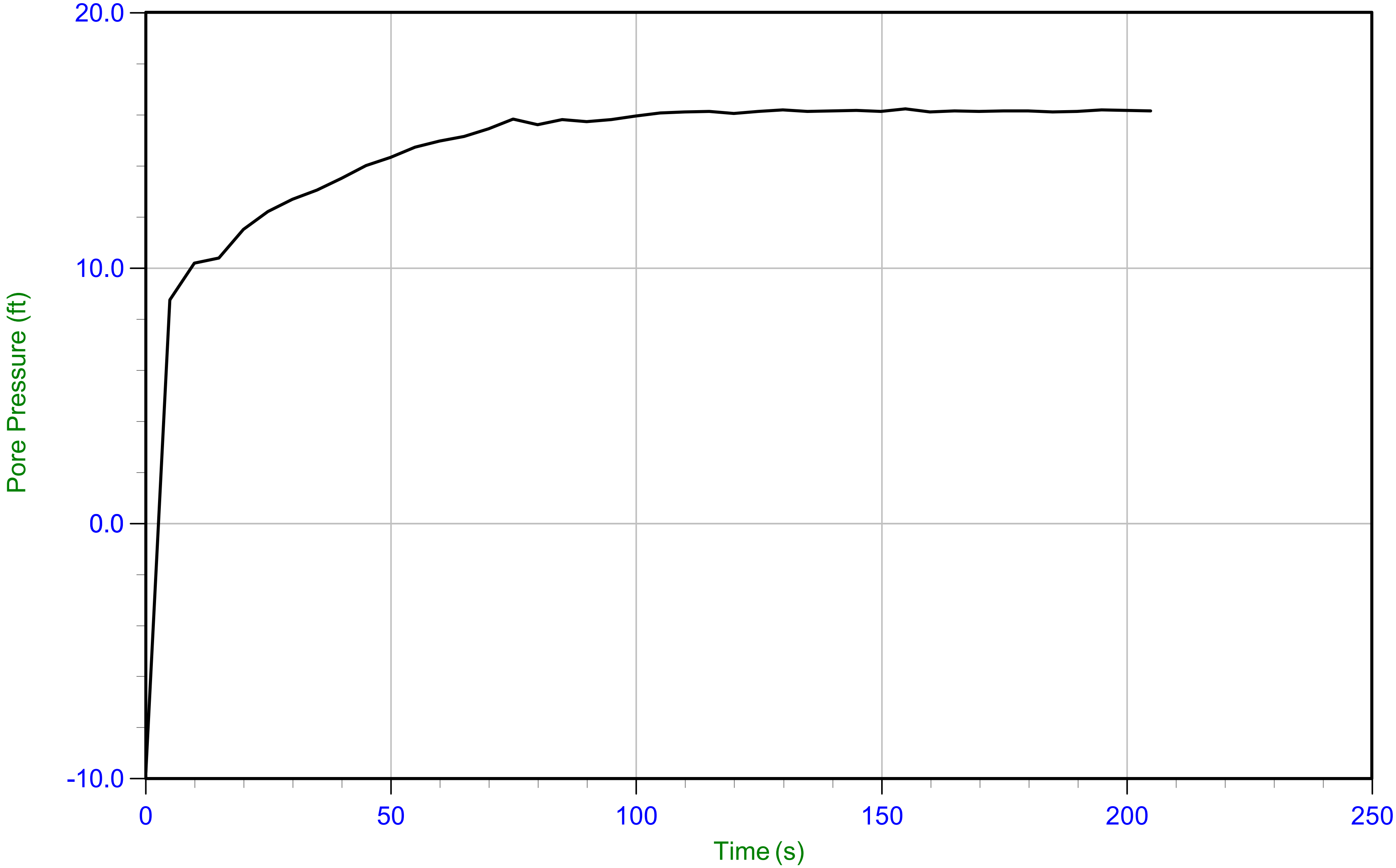
WT: 5.062 m / 16.607 ft
Ueq: 25.8 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/14/2019 13:17
Site: CUF TDEC Order

Sounding: CPT23
Cone: 367:T1500F15U500
Cone Area: 15 sq cm



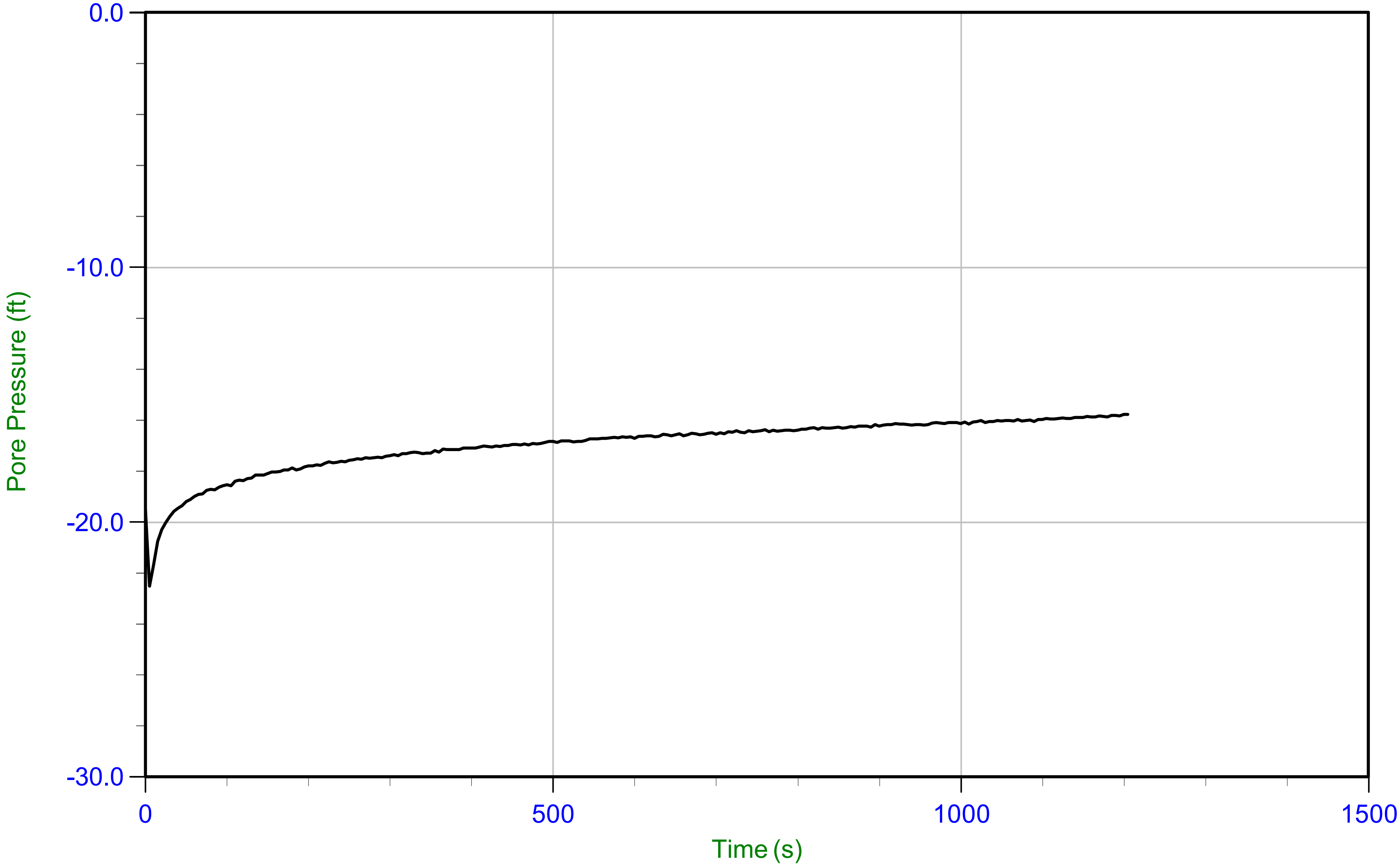
Trace Summary:

Filename: 19-54002_CPT23.PPF
Depth: 7.975 m / 26.164 ft
Duration: 205.0 s

U Min: -9.8 ft
U Max: 16.2 ft

WT: 3.054 m / 10.020 ft
Ueq: 16.1 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/14/2019 13:17 Site: CUF TDEC Order	Sounding: CPT23 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

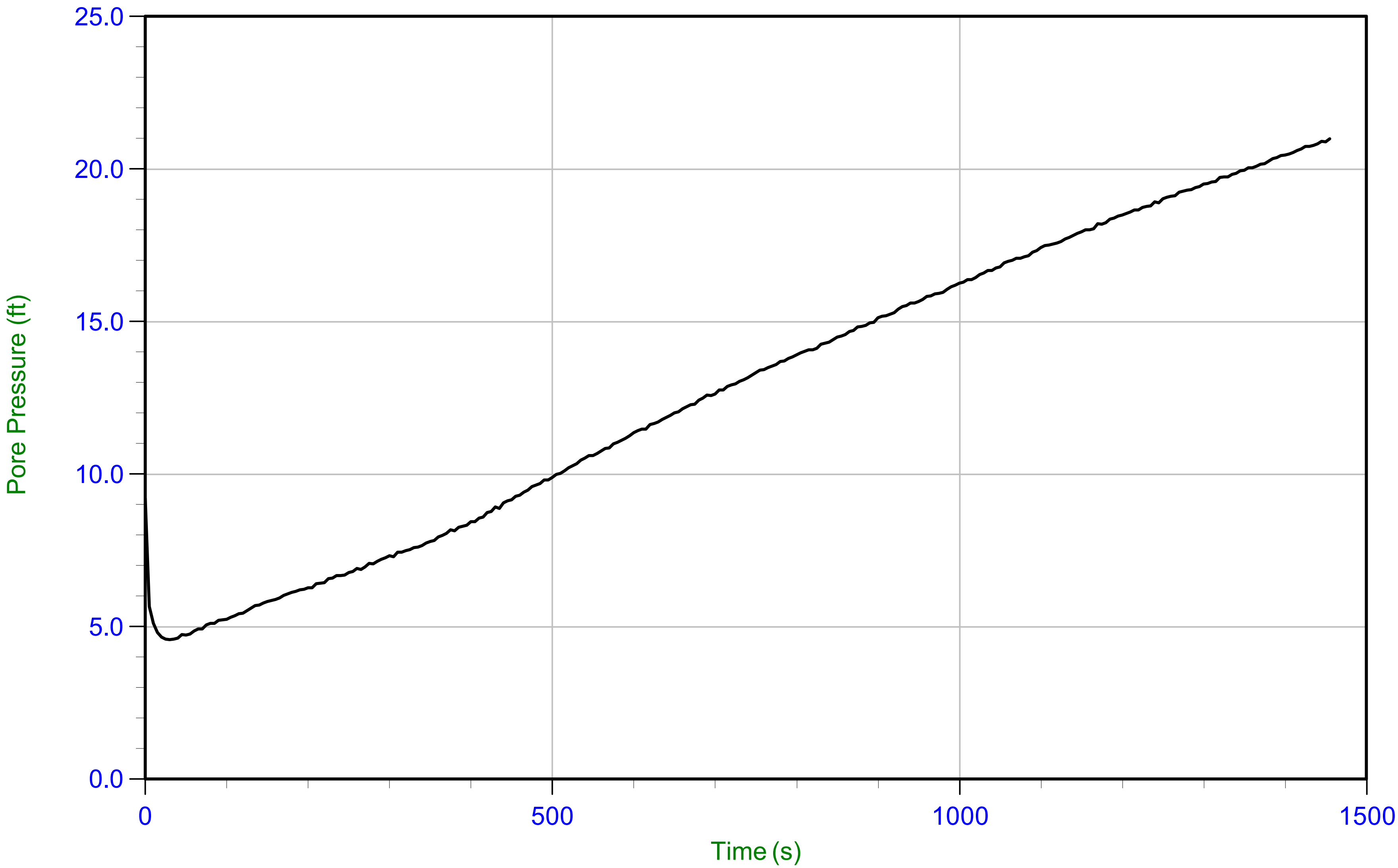
Filename: 19-54002_CPT23.PPF
Depth: 12.900 m / 42.322 ft
Duration: 1205.0 s

U Min: -22.5 ft
U Max: -15.8 ft

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/15/2019 09:47
Site: CUF TDEC Order

Sounding: CPT24
Cone: 367:T1500F15U500
Cone Area: 15 sq cm

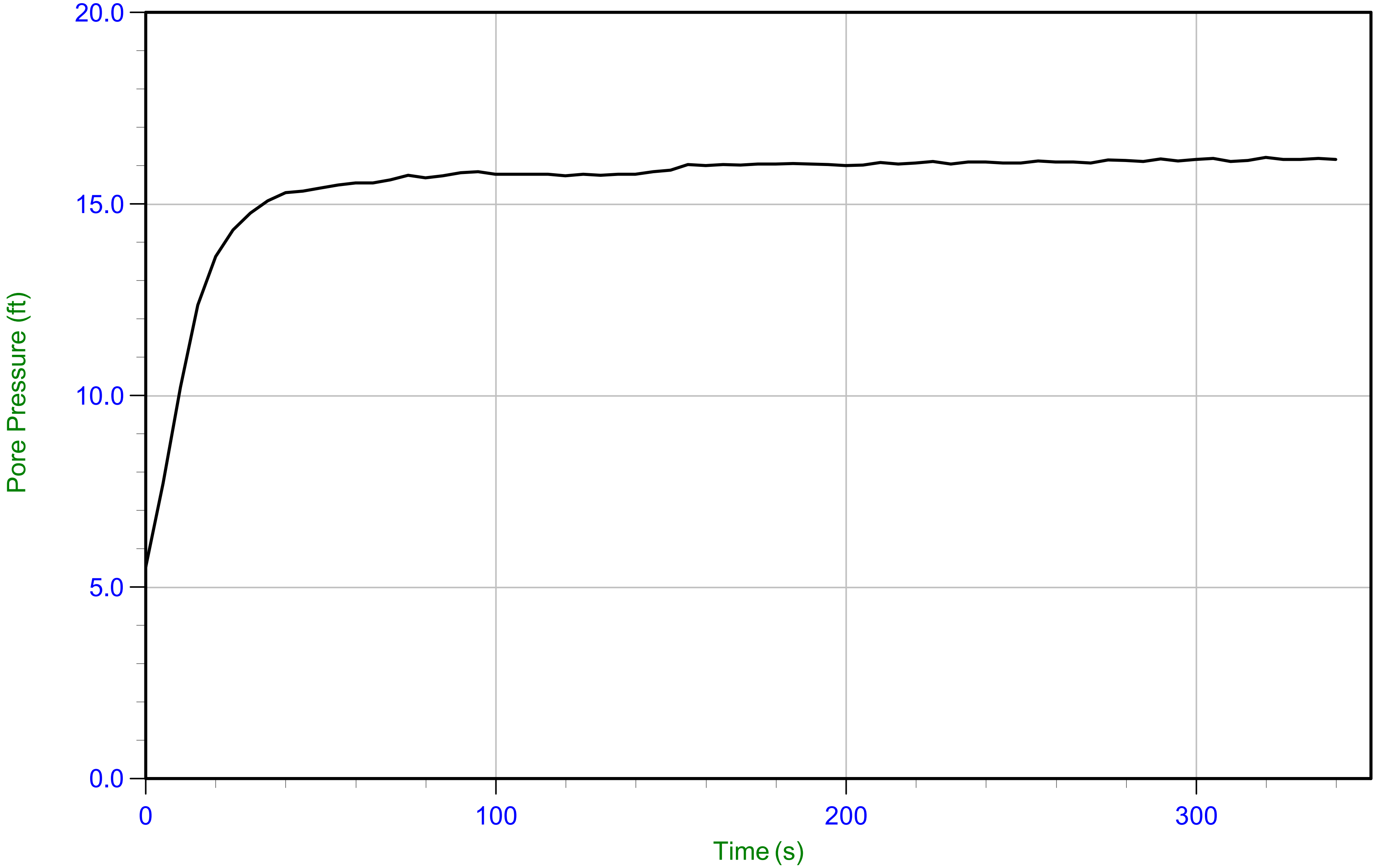


Trace Summary:

Filename: 19-54002_CPT24.PPF
Depth: 6.175 m / 20.259 ft
Duration: 1455.0 s

U Min: 4.6 ft
U Max: 21.0 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/15/2019 11:13 Site: CUF TDEC Order	Sounding: CPT25 Cone: 367:T1500F15U500 Cone Area: 15 sq cm

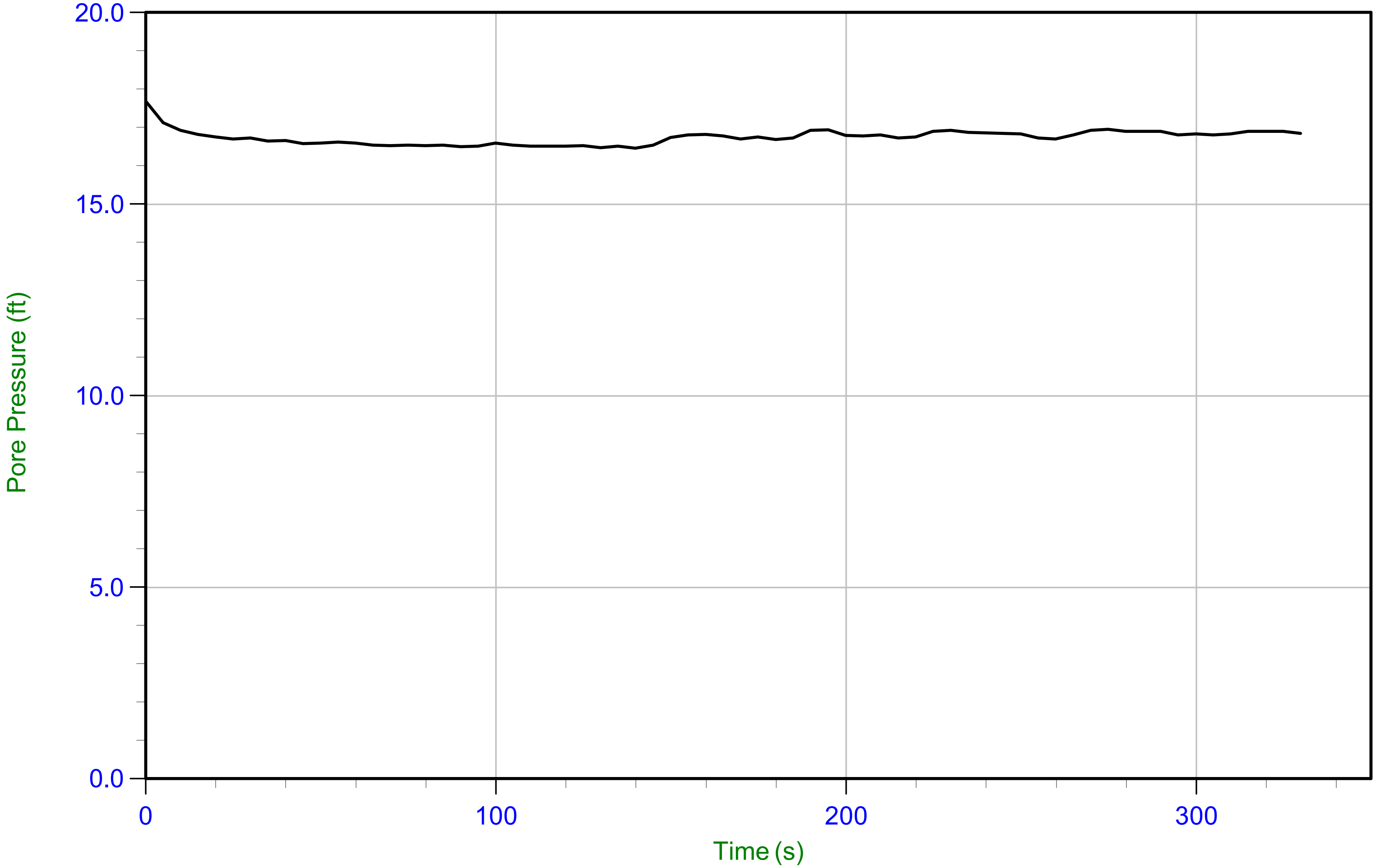


Trace Summary:

Filename: 19-54002_CPT25.PPF	U Min: 5.5 ft	WT: 3.068 m / 10.065 ft
Depth: 8.000 m / 26.246 ft	U Max: 16.2 ft	Ueq: 16.2 ft
Duration: 340.0 s		

CONETEC	Job No: 19-54002 Date: 01/15/2019 11:13 Site: CUF TDEC Order	Sounding: CPT25 Cone: 367:T1500F15U500 Cone Area: 15 sq cm

Stantec Consulting Services Inc.



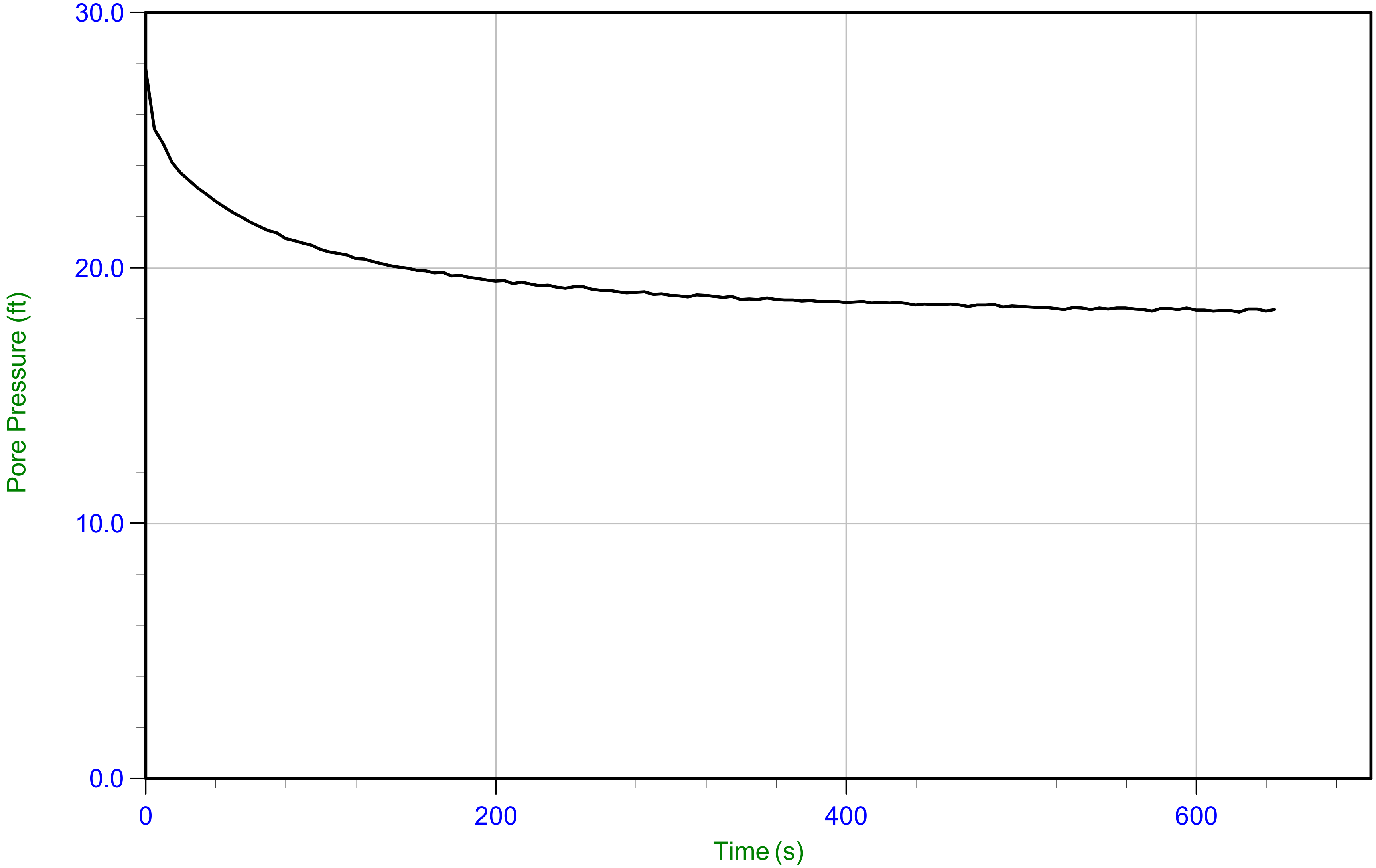
Trace Summary:

Filename: 19-54002_CPT25.PPF
Depth: 12.925 m / 42.404 ft
Duration: 330.0 s

U Min: 16.5 ft
U Max: 17.7 ft

WT: 7.797 m / 25.580 ft
Ueq: 16.8 ft

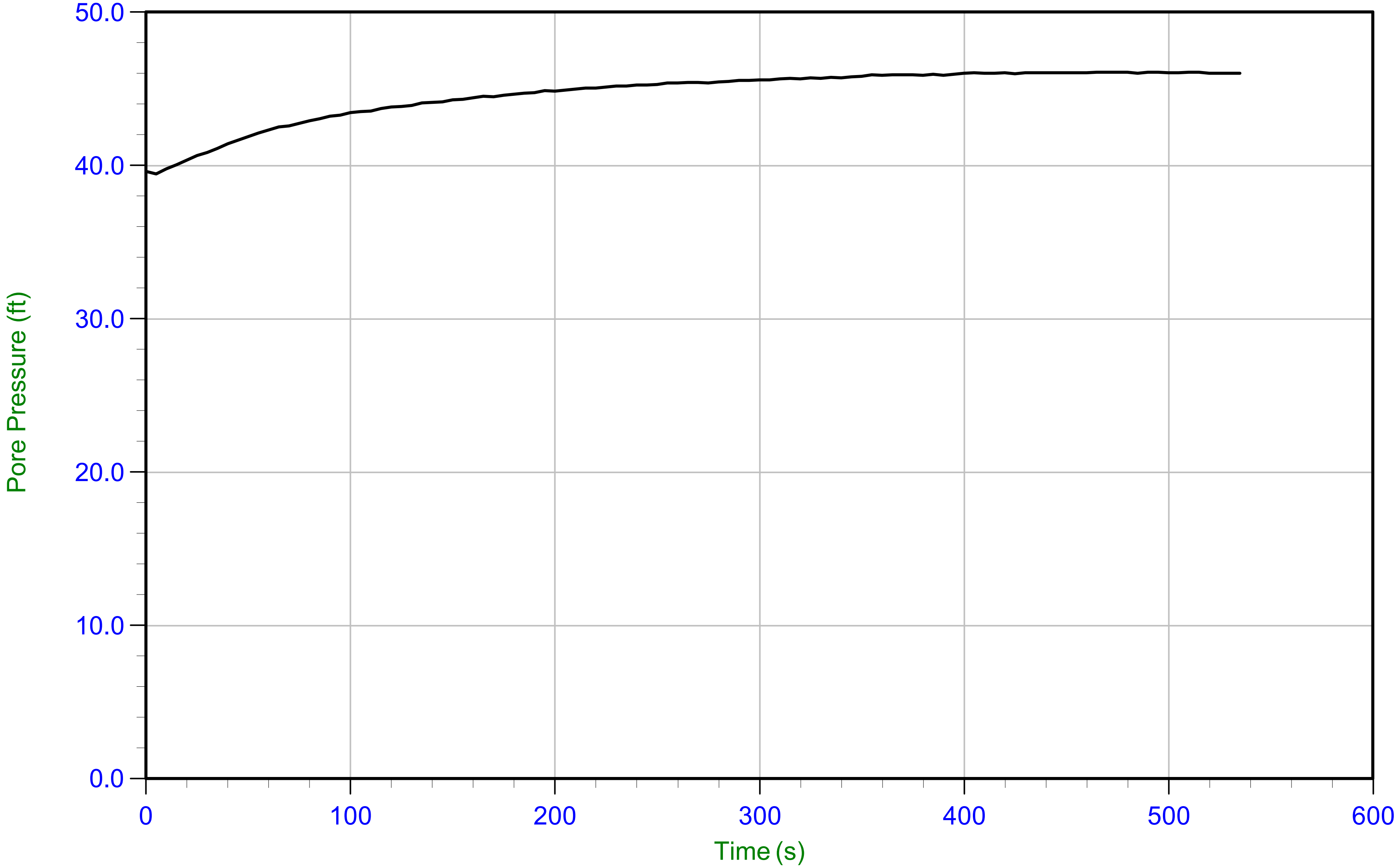
Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/15/2019 11:13 Site: CUF TDEC Order	Sounding: CPT25 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT25.PPF	U Min: 18.3 ft	WT: 11.423 m / 37.477 ft
Depth: 17.000 m / 55.774 ft	U Max: 27.8 ft	Ueq: 18.3 ft
Duration: 645.0 s		

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/15/2019 11:13 Site: CUF TDEC Order	Sounding: CPT25 Cone: 367:T1500F15U500 Cone Area: 15 sq cm



Trace Summary:

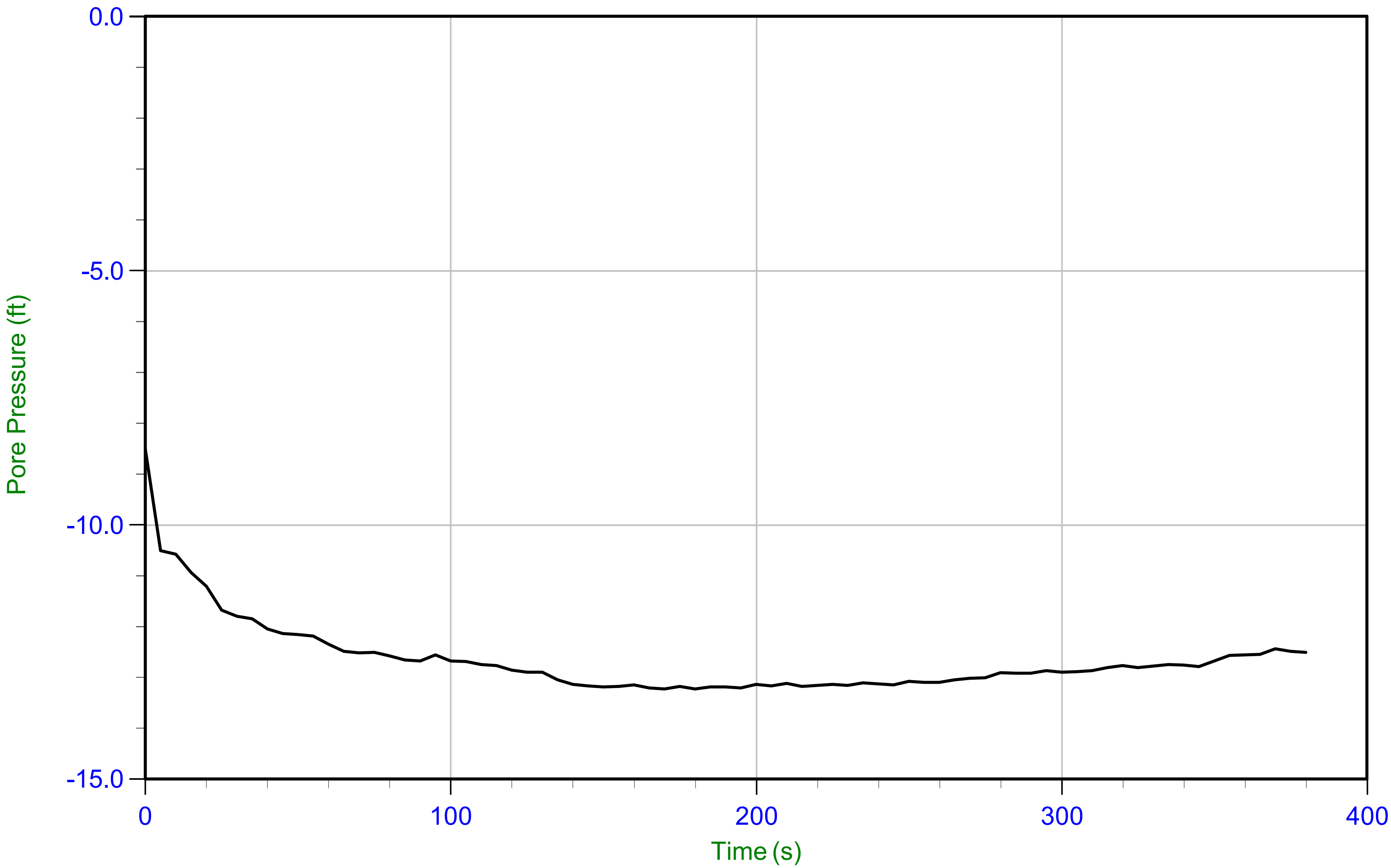
Filename: 19-54002_CPT25.PPF	U Min: 39.4 ft	WT: 9.591 m / 31.466 ft
Depth: 23.625 m / 77.509 ft	U Max: 46.1 ft	Ueq: 46.0 ft
Duration: 535.0 s		

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/23/2019 10:04
Site: CUF TDEC Order

Sounding: CPT25a
Cone: 367:T1500F15U500
Cone Area: 15 sq cm

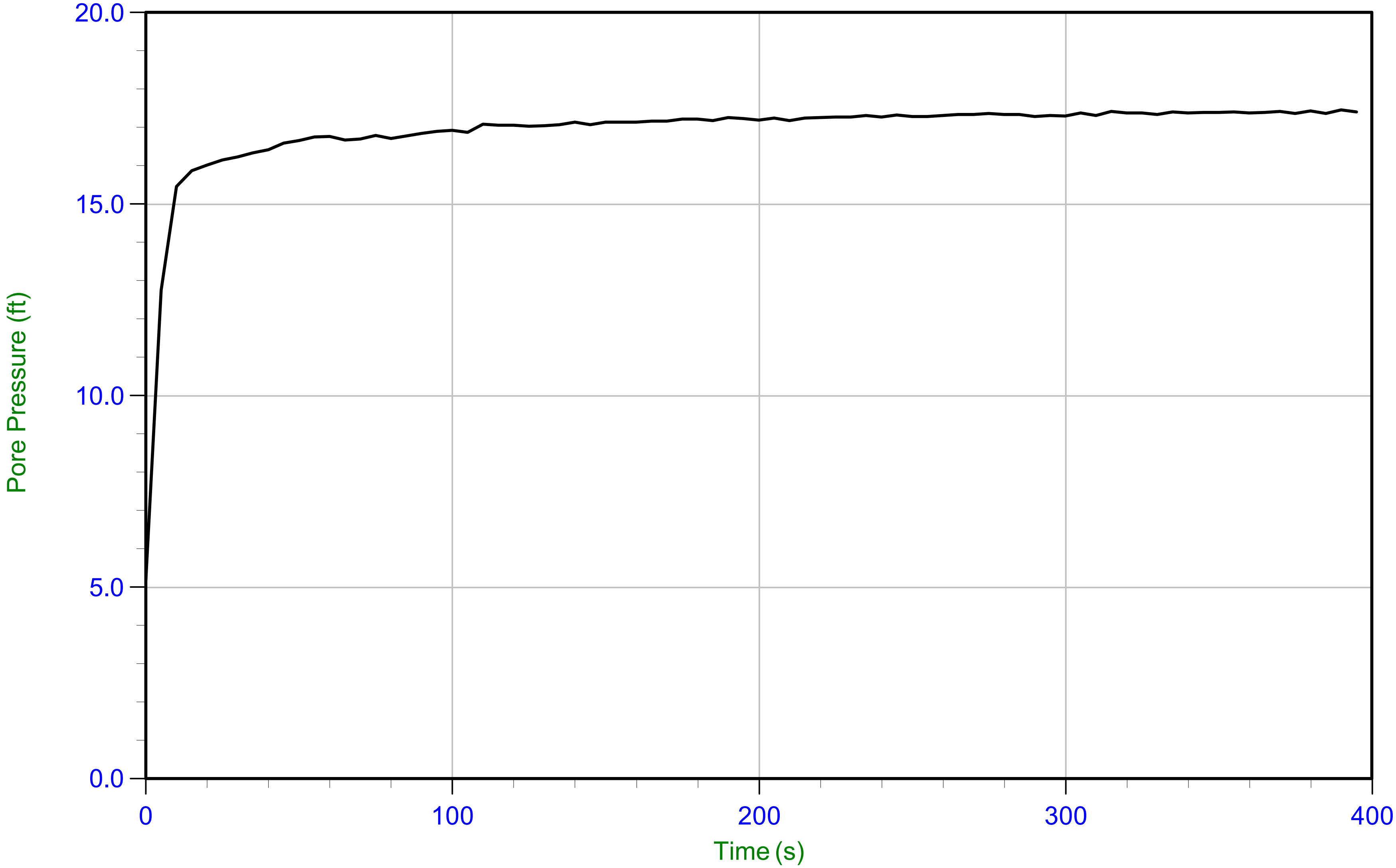


Trace Summary:

Filename: 19-54002_CPT25a.PPF
Depth: 6.000 m / 19.685 ft
Duration: 380.0 s

U Min: -13.2 ft
U Max: -8.5 ft

Stantec Consulting Services Inc.	Job No: 19-54002 Date: 01/23/2019 10:04 Site: CUF TDEC Order	Sounding: CPT25a Cone: 367:T1500F15U500 Cone Area: 15 sq cm



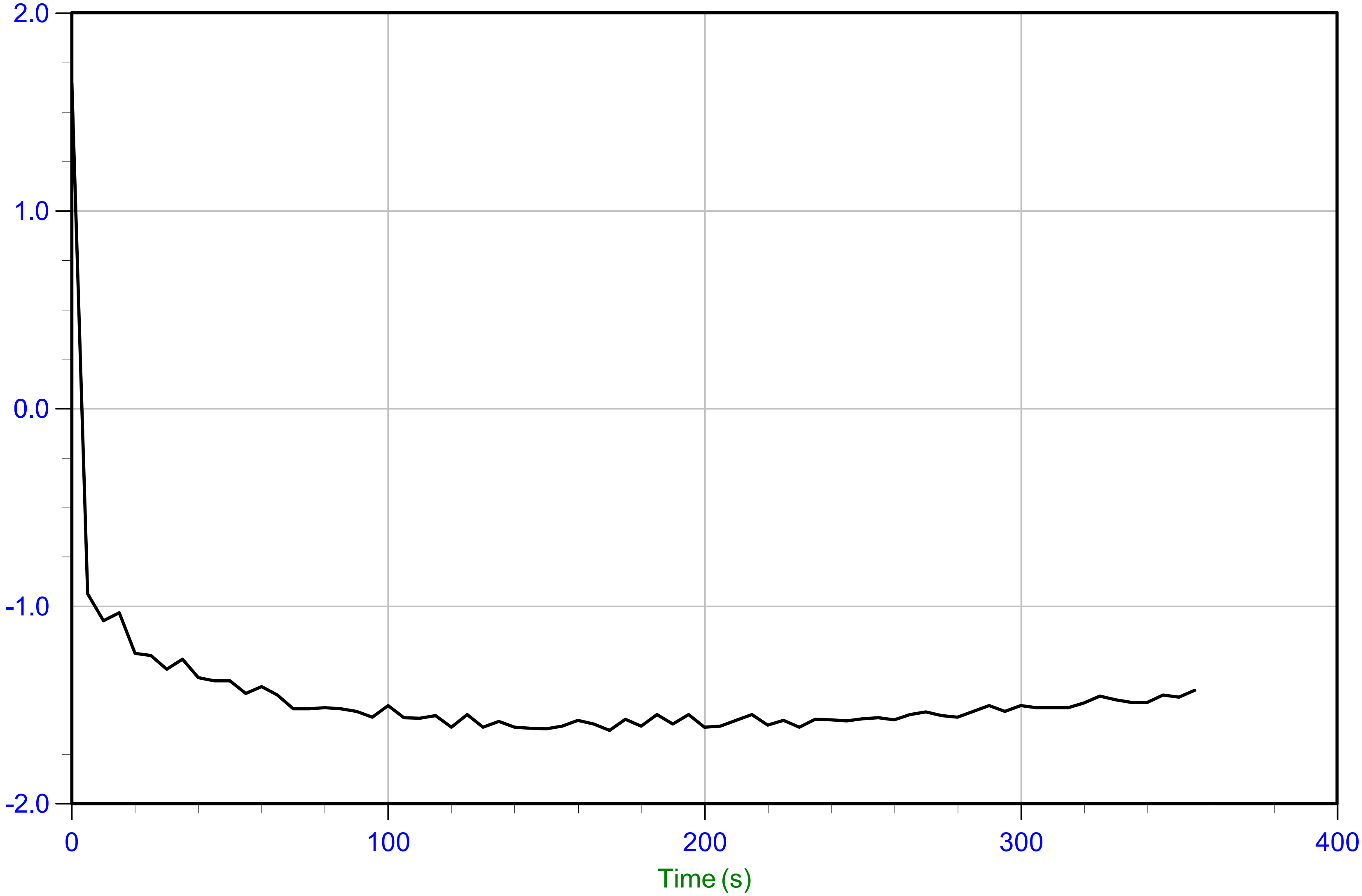
Trace Summary:

Filename: 19-54002_CPT25a.PPF	U Min: 5.2 ft	WT: 2.692 m / 8.832 ft
Depth: 8.000 m / 26.246 ft	U Max: 17.5 ft	Ueq: 17.4 ft
Duration: 395.0 s		

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/11/2019 08:47
Site: CUF TDEC Order

Sounding: CPT28
Cone: 555:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT28.PPF
Depth: 6.175 m / 20.259 ft
Duration: 355.0 s

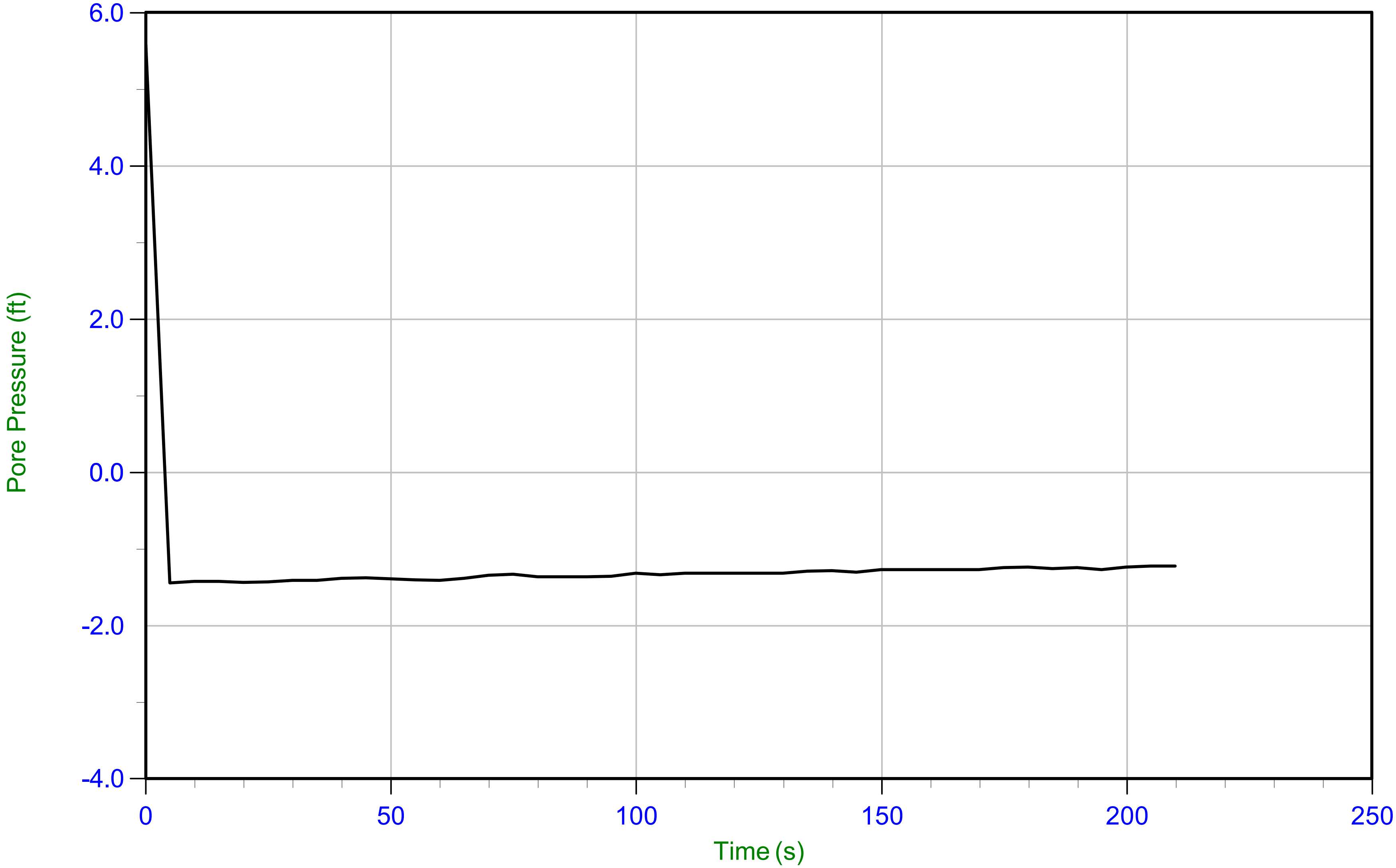
U Min: -1.6 ft
U Max: 1.6 ft

CONETEC

Stantec Consulting Services Inc.

Job No: 19-54002
Date: 01/11/2019 08:47
Site: CUF TDEC Order

Sounding: CPT28
Cone: 555:T1500F15U500
Cone Area: 15 sq cm



Trace Summary:

Filename: 19-54002_CPT28.PPF
Depth: 7.050 m / 23.130 ft
Duration: 210.0 s

U Min: -1.4 ft
U Max: 5.6 ft

ATTACHMENT E.2

Downhole Geophysics Results

September 14, 2019

Mr. Benjamin Halada
Stantec
3052 Beaumont Centre Circle
Lexington, KY 40513-1703

Subject: Results of Geophysical Borehole Logging
Fifteen Boreholes (93-1D, B11, B12, B13, B14, B16, B17, B18, B19, TW01, TW03, TW05, TW07, TW08, and TW09)
TVA Cumberland Fossil Plant (CUF)
Cumberland City, TN
ARM Project: 190734

Dear Mr. Halada,

ARM Geophysics (ARM) is pleased to present this letter report that summarizes the results of geophysical borehole logging performed at the above referenced site on January 8 and 9, February 5 and 6, April 2 through 4, and April 30 through May 3, 2019. The objective of the logging was to identify water-bearing zones and to measure the depth and orientation of fractures and bedding planes in the above mentioned boreholes. To achieve these objectives, ARM acquired standard borehole logs and images.

LOGGING METHODS

The logs that ARM completed for this investigation include:

- Natural Gamma
- Fluid Temperature
- Fluid Resistivity
- 3-Arm Caliper
- Optical Televiewer (OTV) – 93-1D only
- Acoustic Televiewer (ATV)
- Heat Pulse Flowmeter – Ambient & Pumping
- Idronaut – O2%, Redox, pH, fluid temp/resistivity, and pressure

ARM has provided a summary of these logging methods in Attachment A. ARM acquired the image and standard logs using a Matrix acquisition system manufactured by Mount Sopris Instrument Company.

INTERPRETATION

BASIC LOG DESCRIPTIONS

The geophysical borehole logs acquired during this investigation are presented in Attachment B. All log depths are referenced to ground surface as indicated in the header of each log. The majority of the acquired data are presented as standard curves that represent the change in measured parameter with depth. The format of the heat pulse flowmeter and televiewer logs are discussed in the following paragraphs.

The Vertical Flow track in the Hydro Log provides a record of the rate of vertical fluid movement derived from the heat pulse flowmeter tool. The X-axis represents the magnitude of flow in gallons/min that was recorded at depths indicated by the posted value. It is calculated during acquisition by dividing the distance between the grid and thermistors by the travel time. Negative and positive values indicate downward and upward flow, respectively.

The televiewer logs contain borehole images and structural information obtained from the OTV tool. The *Optical View* track is an "unwrapped" photographic image of the borehole wall (Figure 1). In this case, the cylindrical borehole surface is unzipped along the north azimuth and unrolled to a flat strip. The compass orientation (with respect to true north) is presented at the top of the log. The unwrapped format is distorted like any projection of a curved surface on a flat one. Horizontal and vertical planes will be undistorted. However, dipping planes will be represented as a sine wave: the greater the dip, the greater the wave amplitude.

The Plane Projection track presents the fracture signatures that are digitized from the unwrapped *Optical View* track. The *Dip & Dip Direction* log is a presentation in which the vertical axis is depth and the horizontal is dip angle from 0° to 90°. As shown in Figure 2, the dip direction is indicated by the orientation of the tadpole tail, measured in a clockwise direction from north.

INTERPRETATION OF STRUCTURAL DIAGRAMS

The structural data are presented on polar and rose diagrams for statistical analysis and pattern visualization. Polar diagrams are used in this report to plot the dip and dip direction of planar features. Zero degree dip is represented at the center of the diagram and 90° at the circumference. The dip direction is indicated by the compass azimuth, measured clockwise from north (0°), as shown in Figure 3. This format is sometimes referred to as a dip vector plot but it is essentially the same as a stereonet with an upper hemisphere projection

.

The rose diagram graphically illustrates the strike distribution of a set of planes. Radiating rays are drawn with lengths proportional to number of strike measurements within each 10° sector. It is important to recognize that in this report, the polar diagram represents dip and dip direction, whereas the rose diagram represents strike. Using the right-hand-rule convention, strike equals the dip direction minus 90°.

RESULTS AND DISCUSSION

SITE GEOLOGY

Ordovician Formations, including Mannie, Shale, Fernvale Limestone, Hermitage Formation, and Carters, Lebanon, Ridley, Pierce, and Murfreesboro Limestones (Ordovician): https://mrdata.usgs.gov/geology/state/state.php?state=TN

ORIENTATION ANALYSIS OF PLANAR FEATURES

An optical televiewers (93-1D only) and acoustic image were used to measure the depth and orientations of bedding and fracture planes. The digitized planar features were corrected for borehole deviation and magnetic declination. The measured plane projections and orientations are shown in the plane projection log. A tabulated listing of the fracture and bedding orientations is presented in Attachment C. Stereographic analysis was performed on the planar orientation data acquired from the image log. A listing of the calculated mean orientations of all bedding and fracture planes are presented in Table 1. The results from the borehole is presented in the polar and rose diagrams, and charts shown in Figures 4 through 9. Predominant groups or “sets” are indicated by the clustering of data points in the polar diagrams.

Figure 4 present polar diagrams showing the dip and dip direction of all planes measured during this investigation. ARM has classified the planes by symbols corresponding to bedding and fracture plane sets. Figures 5A and 5B present the same data, with the data set(s) categorized by borehole.

ARM used statistical contouring to identify windows in which to calculate the mean orientation of all bedding and fracture planes. Figures 6A and 6B presents a polar diagram with statistical contouring of bedding plane orientations. The mean bedding dip/dip directions are shown to the right of the diagram. The rose diagrams in Figures 8A and 8B show a predominant WNW/ESE strike direction.

Figures 7A through 7P present polar diagrams with statistical contouring of all fracture plane orientations. The mean fracture plane dip/dip directions are shown to the right of the diagram. Similarity in the Sitewide Bedding Set 2 and Sitewide Fracture Set 2 orientations suggest the latter may be bedding partings. The rose diagram in Figure 9A shows a predominant ENE/WSW strike direction. Figures 9B through 9P

The mean orientations for all bedding planes and fracture sets are shown in Table 1.

Table 1: Statistical mean of dip and dip direction of bedding and fracture planes.

Planes	Dip	Dip Direction	Strike/Dip
Sitewide Bedding Set 1	64	10	N80W/64NE
Sitewide Bedding Set 2	63	202	N68W/63SW
Sitewide Fracture Set 1	3	141	N51E/3SE
Sitewide Fracture Set 2	68	172	N82E/68SE
Sitewide Fracture Set 3	49	319	N49E/49NW
93-1D Bedding Set 1	67	12	N78W/67NE
93-1D Bedding Set 2	63	202	N68W/63SW
93-1D Fracture Set 1	65	8	N82W/65NE
93-1D Fracture Set 2	50	122	N32E/50SE
B11 Fracture Set 1	7	47	N43W/7NE
B11 Fracture Set 2	48	347	N77E/48NW
B12 Fracture Set 1	32	86	N4W/32NE
B12 Fracture Set 2	84	183	N87W/84SW
B13 Fracture Set 1	24	171	N81E/24SE
B13 Fracture Set 2	69	1	N89W/69NE
B14 Fracture Set 1	6	88	N2W/6NE
B14 Fracture Set 2	64	95	N5E/64SE
B16 Fracture Set	8	194	N76W/8SW
B17 Fracture Set	30	179	N89E/30SE
B18 Fracture Set	49	169	N79E/49SE
B19 Fracture Set 1	73	41	N49W/73NE
B19 Fracture Set 2	70	179	N89E/70SE
TW01 Fracture Set	7	124	N34E/7SE
TW03 Fracture Set 1	10	146	N56E/10SE
TW03 Fracture Set 2	79	30	N60W/79NE
TW05 Fracture Set 1	6	172	N82E/6SE
TW05 Fracture Set 2	53	310	N40E/53NW
TW07 Fracture Set 1	1	209	N61W/1SW
TW07 Fracture Set 2	49	324	N54E/49NW
TW08 Fracture Set	8	73	N17W/8NE
TW09 Fracture Set 1	15	133	N43E/15SE
TW09 Fracture Set 2	66	170	N80E/66SE

INTERPRETATION OF WATER PRODUCING OR RECEIVING ZONES

Table 2 presents the directional flow detected in each borehole. Flow direction and associated symbols in the Hydro Log represent heat pulse flowmeter under ambient conditions, unless flow was only observed under pumping conditions.

Water producing or receiving zones are typically identified in the acquired logs by a combination of the following parameters:

A. Start or increase in upward or downward fluid flow identified by heat pulse flowmeter data suggests water-producing zone.
B. End or decrease in upward or downward fluid flow identified by heat pulse flowmeter data suggests water-receiving zone.
C. Open fractures observed in televiewer data.
D. Deflections in caliper curve (suggests fractures).
E. Deflections or change in slope in fluid temperature or fluid resistivity curve.

Table 3 presents the interpreted flow zones (under pumping conditions) based on the indicators above. The most convincing evidence of water producing or receiving zones are heat pulse flowmeter, fluid temperature, and fluid resistivity deflections since they can indicate flow in the borehole. Fractures observed in televiewer images or caliper curves can indicate water-bearing zones although the evidence is more indirect. A fracture may be observed in the borehole wall that may have been opened or enlarged during the drilling process but may be tight and contain little or no water a short distance into the formation. A combination of the above indicators provides the highest level of confidence for identifying water-bearing zones.

Table 2: Directional flow detected by borehole.

Borehole	Downward Ambient	Upward Ambient	Downward Pumping	Upward Pumping
93-1D				
B11				
B12			X	
B13				
B14				X
B16	X			
B17	X			
B18	X			X
B19				X
TW01				X
TW03	X	X		X
TW05		X		X
TW07				X
TW08				X
TW09				X

Table 3: Interpreted water producing or receiving zones and indicators under pumping conditions. Letters in Indicators column correspond to the selection parameters shown above.

Borehole	Depth (Feet)	Indicators	Type
B12	57-59	A, C, D, E	Producing zone
B12	60-62	B, C	Receiving zone
B14	134-135	A, C, D, E	Producing zone
B16	129-131	A, C, E	Producing zone
B16	135-137	A, C	Producing zone
B16	143-145	B, C, E	Receiving zone
B17	114-116	A, C, E	Producing zone
B17	123-125	B, C, E	Receiving zone
B18	48-50	B, C, D, E	Receiving zone
B19	51-53	B, C, D, E	Receiving zone
B19	63-65	A, C	Producing zone
TW01	70-72	B, C, E	Receiving zone
TW01	73-75	A, C, D, E	Producing zone
TW03	86-87	A, C, E	Producing zone
TW03	94-96	B, C, E	Receiving zone
TW05	79-81	B, C, E	Receiving zone
TW05	89-91	A, C, E	Producing zone
TW07	128-130	A, C, D, E	Producing zone
TW08	140-142	A, C, D, E	Producing zone
TW09	141-143	A, C, D, E	Producing zone

CLOSING

The data collection and interpretation methodologies used in this investigation are consistent with standard practices applied to similar geophysical investigations. The correlation of geophysical responses with probable subsurface features is based on the past results of similar surveys although it is possible that some variation could exist at this site.
Please contact us if you have any questions regarding this survey. We appreciate your business and look forward to working with you again.

Kind regards,
ARM Geophysics

Duro Rajkovic
Senior Geophysicist

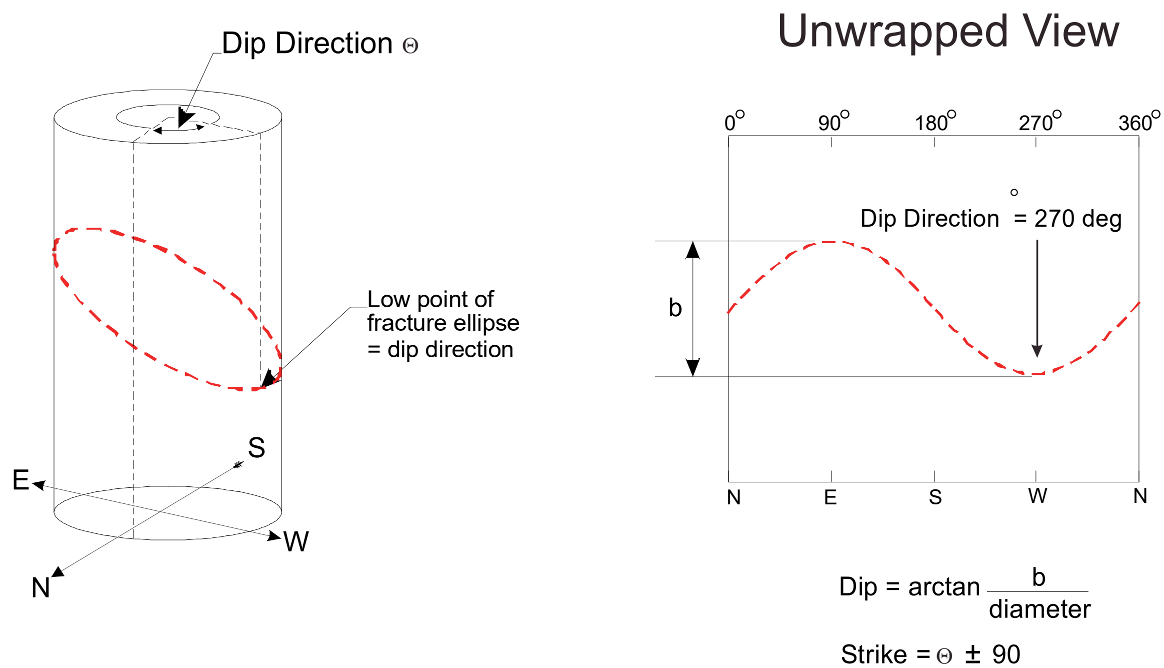


Figure 1: Diagram illustrating unwrapped view of fracture signature.

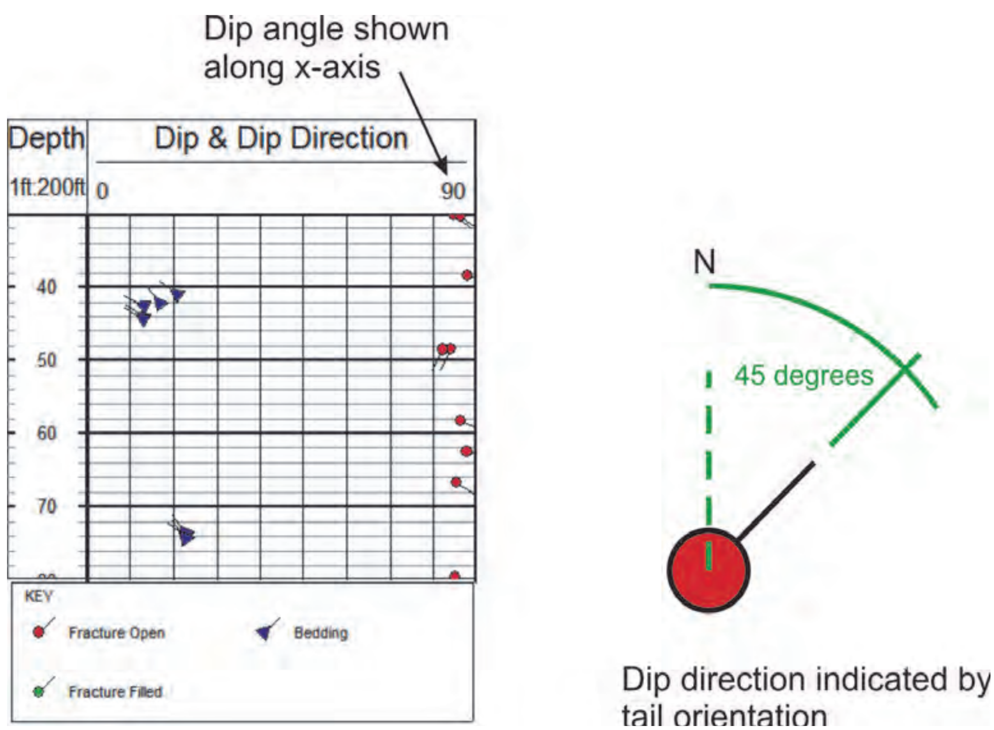
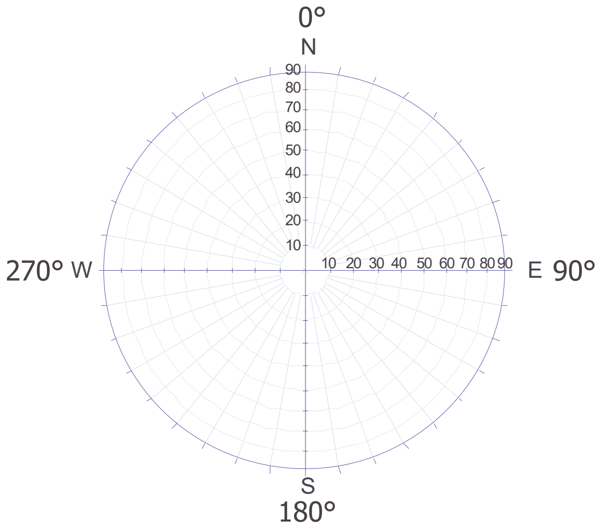
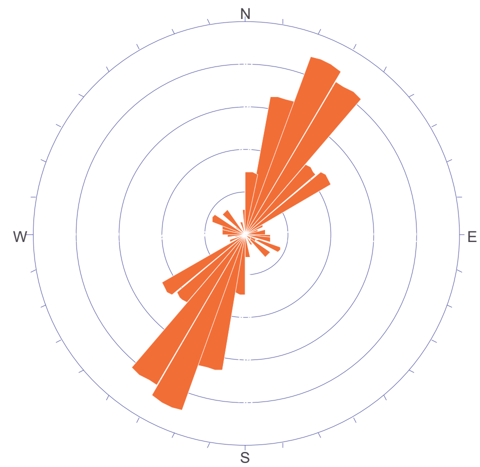


Figure 2: Dip & dip direction determination from the tadpole plot.



Polar Diagram



Rose Diagram

Figure 3: Example polar and rose diagrams. Polar diagram is used in this report for plotting dip and dip direction. Rose diagrams are used for plotting the frequency or number of strike measurements per sector.

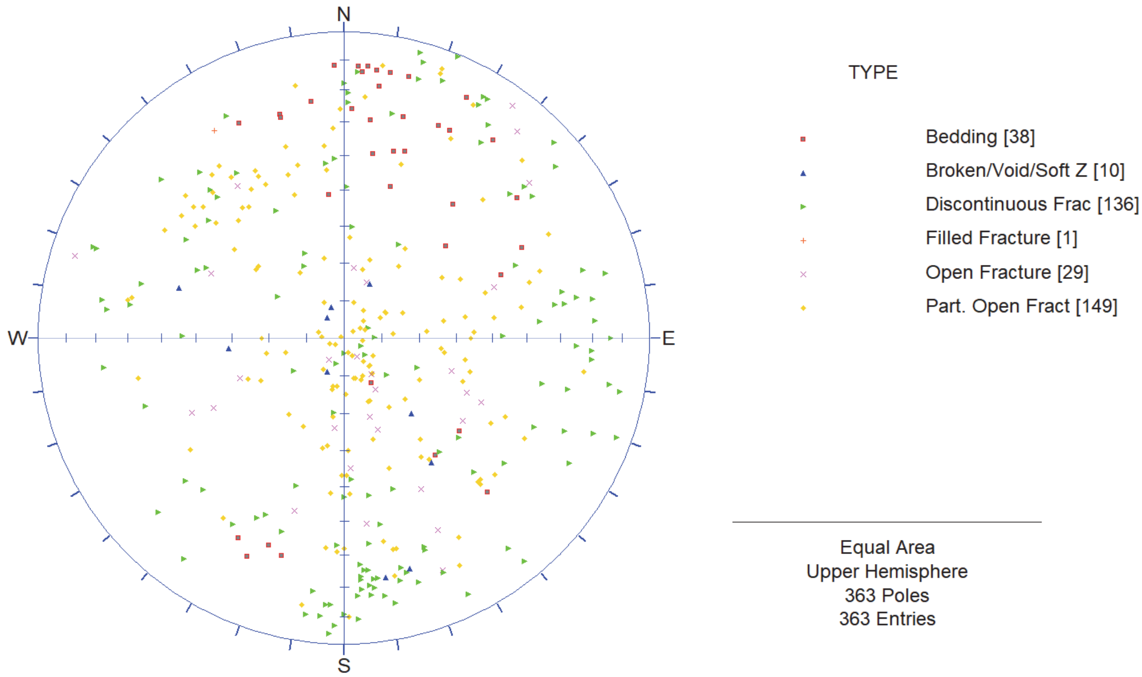


Figure 4: A polar diagram plotting dip and dip direction of all planes categorized by plane type.

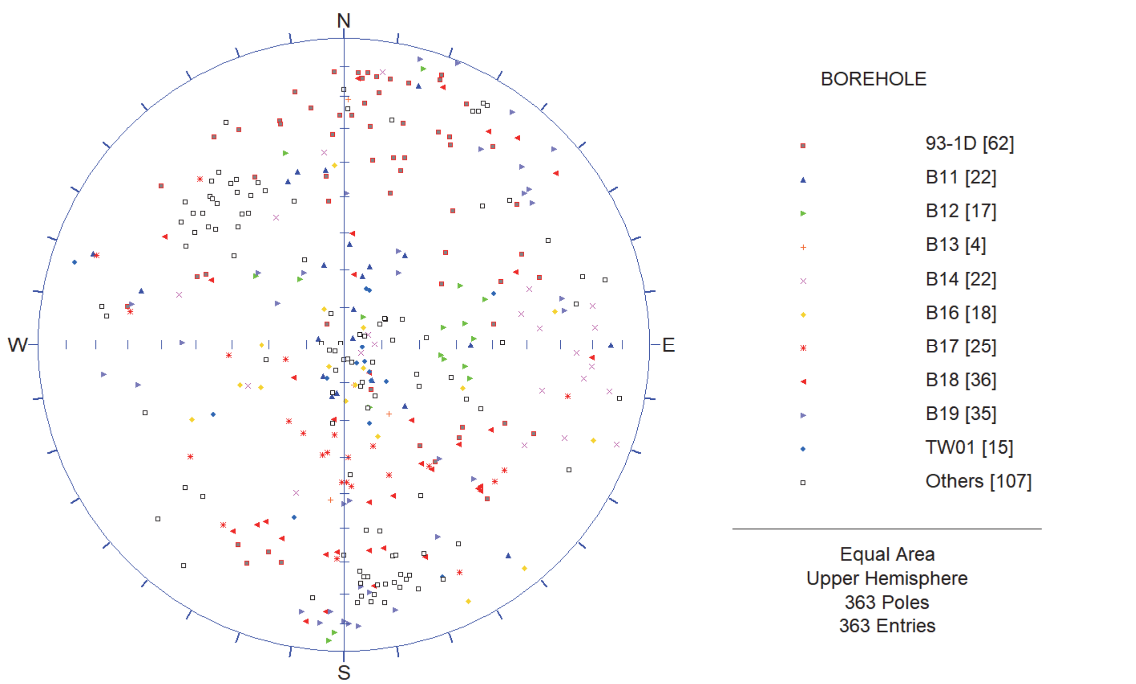


Figure 5A: A polar diagram plotting dip and dip direction of all planes categorized by borehole.

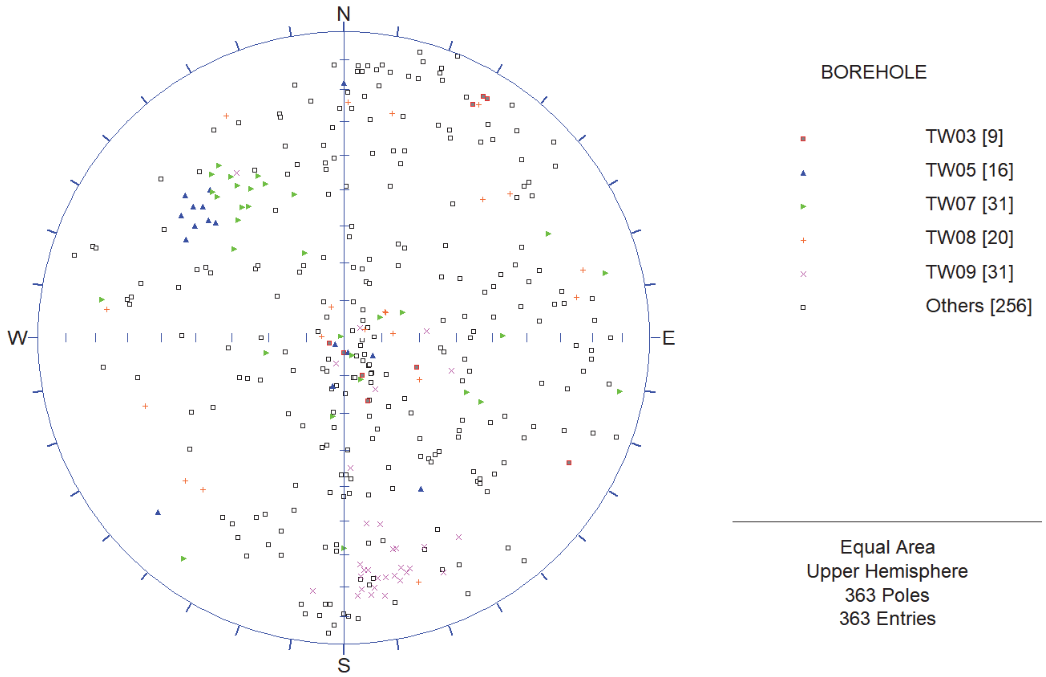


Figure 5B: A polar diagram plotting dip and dip direction of all planes categorized by borehole.

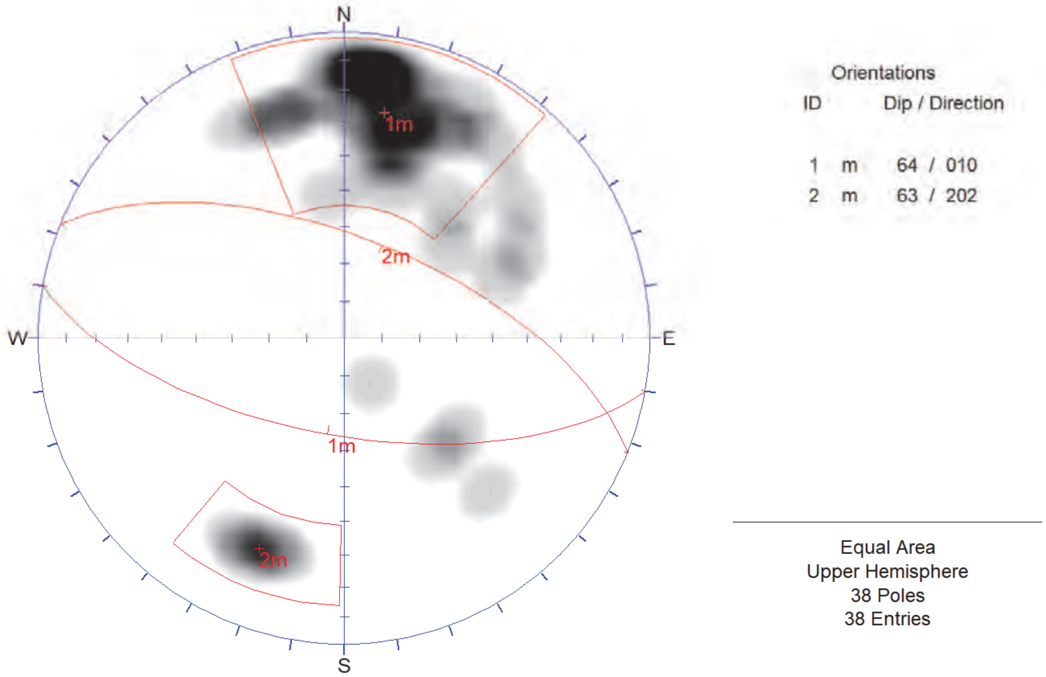


Figure 6A: A polar diagram with statistical contouring of all bedding planes. The calculated mean dip angle and direction is shown at the right of the diagram.

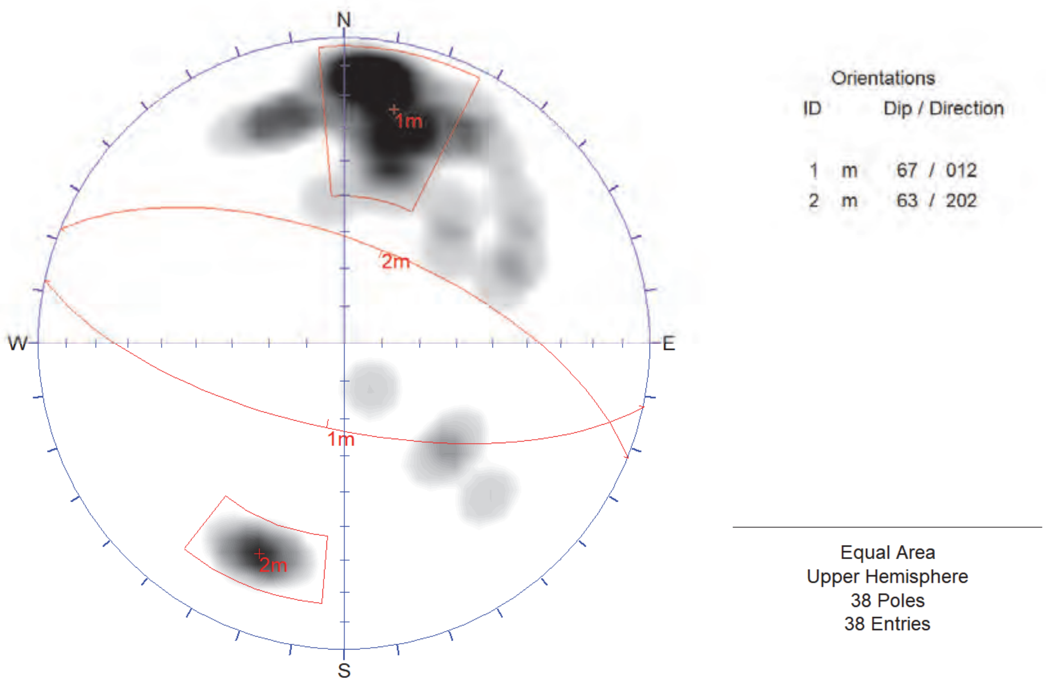


Figure 6B: A polar diagram with statistical contouring of bedding planes for 93-1D. The calculated mean dip angle and direction is shown at the right of the diagram.

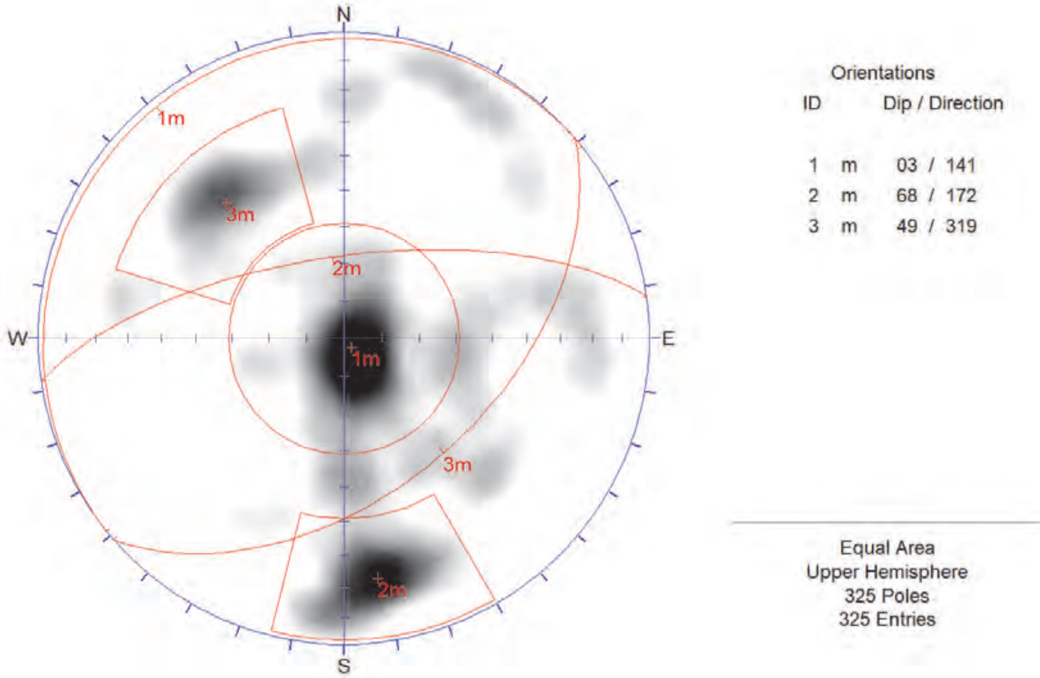


Figure 7A: A polar diagram with statistical contouring of all fracture planes. The calculated mean dip angle and direction is shown at the right of the diagram.

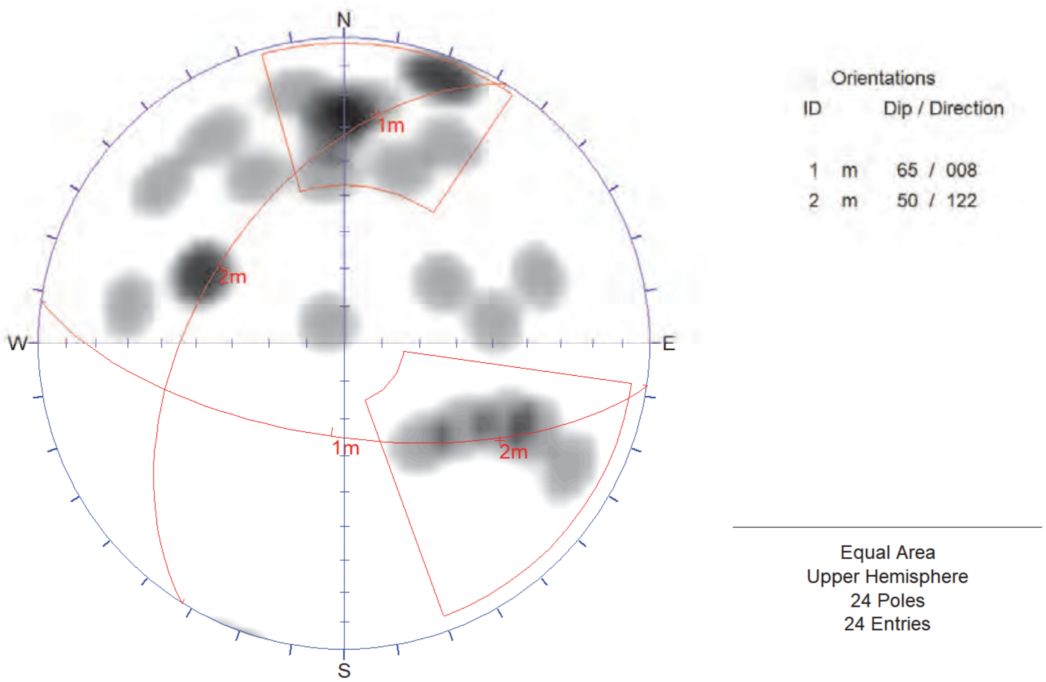


Figure 7B: A polar diagram with statistical contouring of fracture planes for 93-1D. The calculated mean dip angle and direction is shown at the right of the diagram.

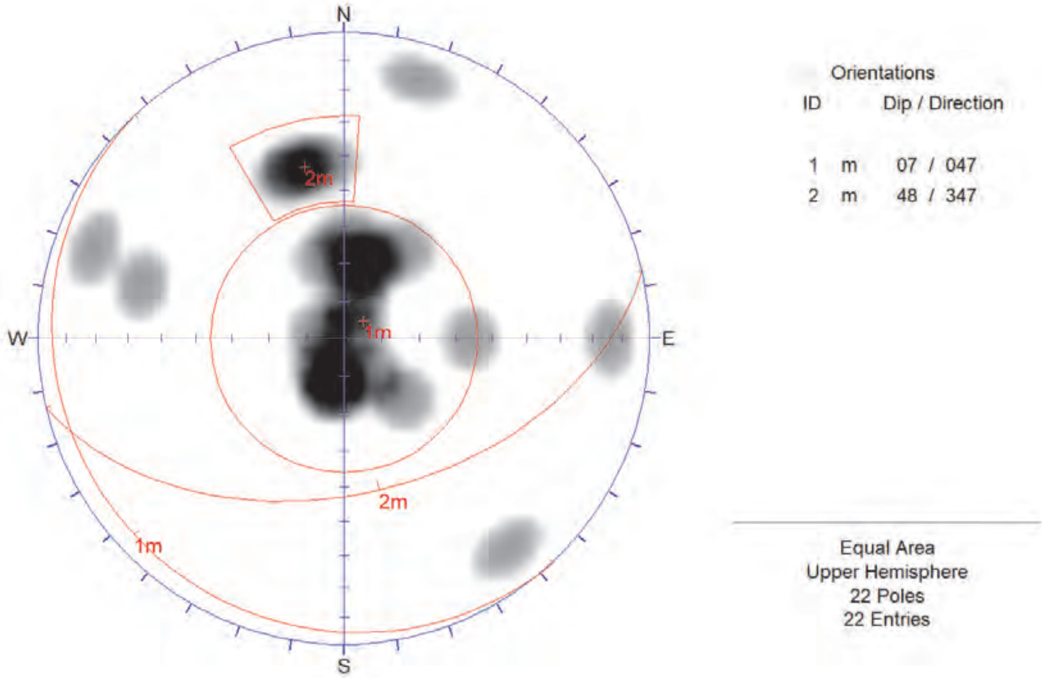


Figure 7C: A polar diagram with statistical contouring of fracture planes for B11. The calculated mean dip angle and direction is shown at the right of the diagram.

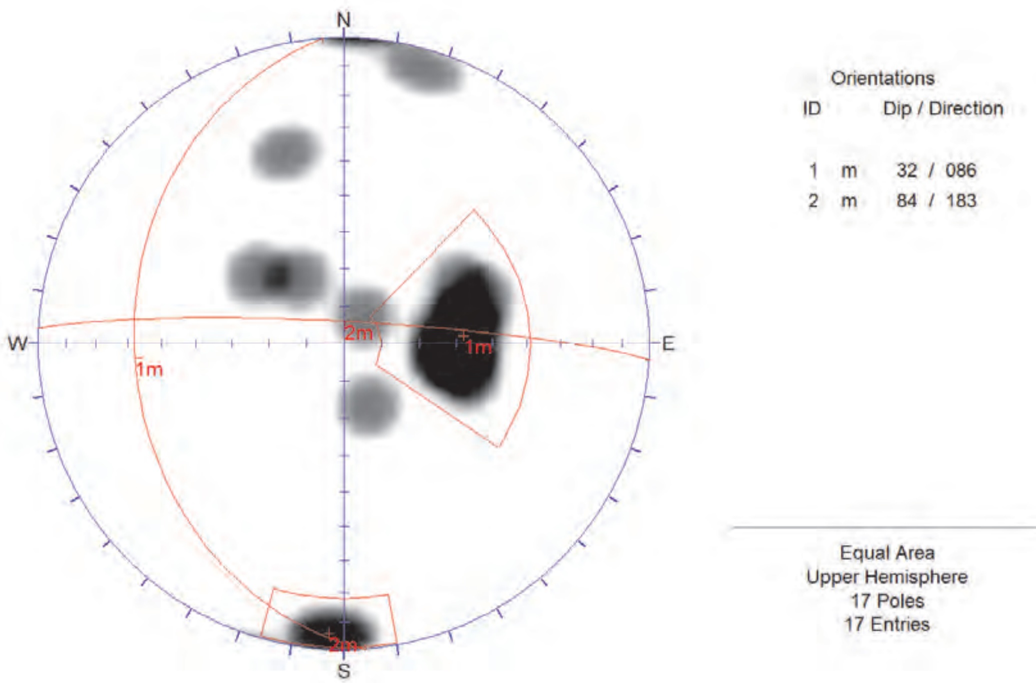


Figure 7D: A polar diagram with statistical contouring of fracture planes for B12. The calculated mean dip angle and direction is shown at the right of the diagram.

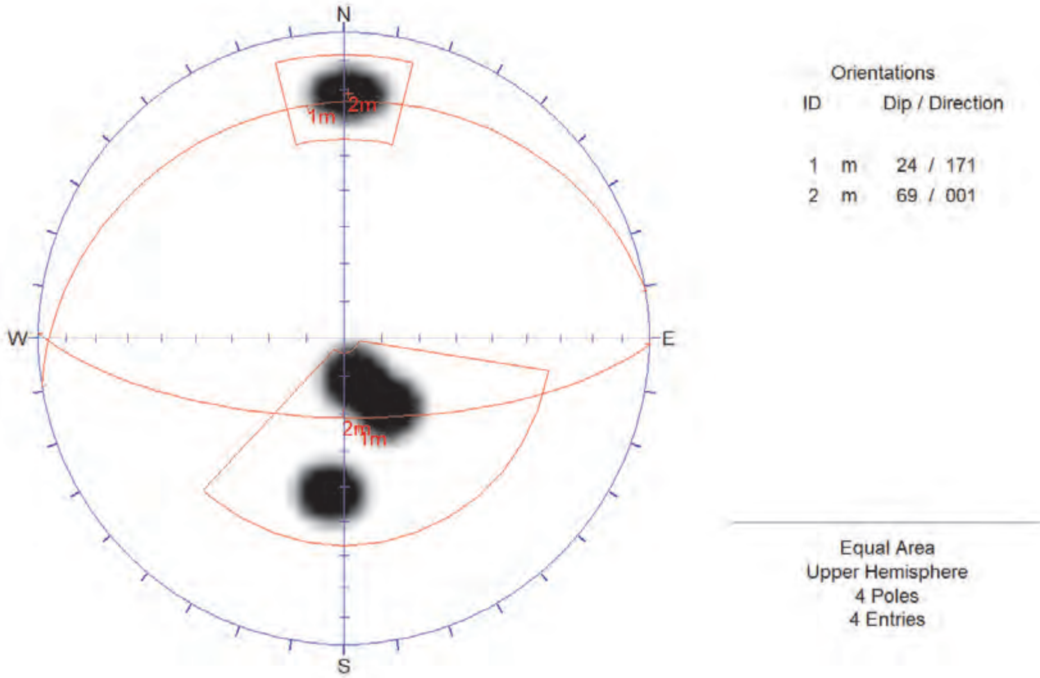


Figure 7E: A polar diagram with statistical contouring of fracture planes for B13. The calculated mean dip angle and direction is shown at the right of the diagram.

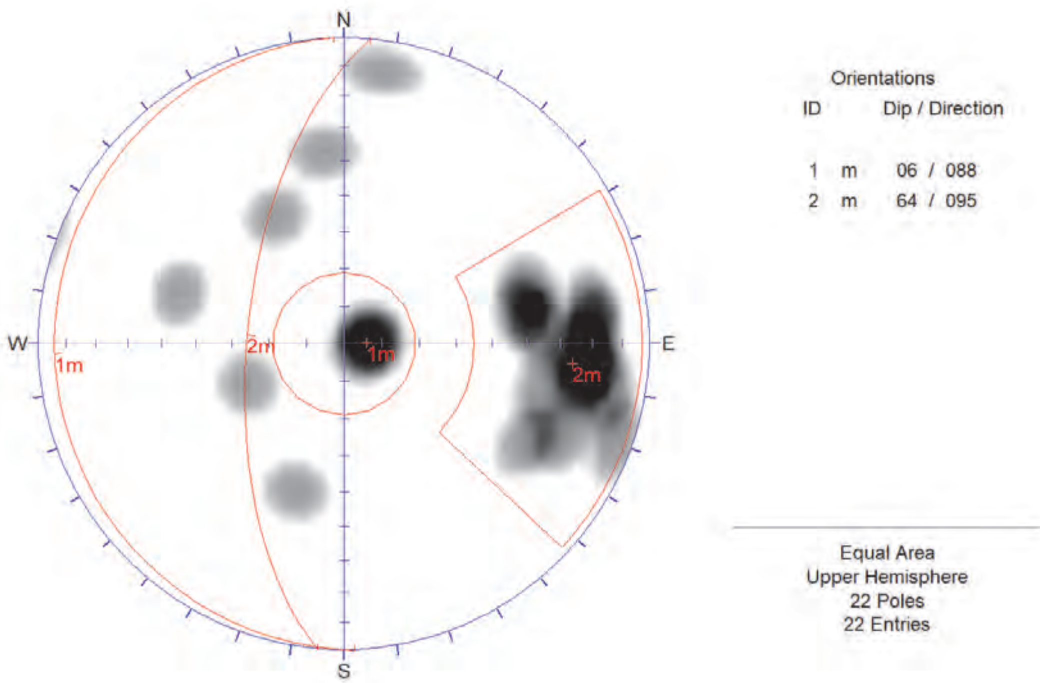


Figure 7F: A polar diagram with statistical contouring of fracture planes for B14. The calculated mean dip angle and direction is shown at the right of the diagram.

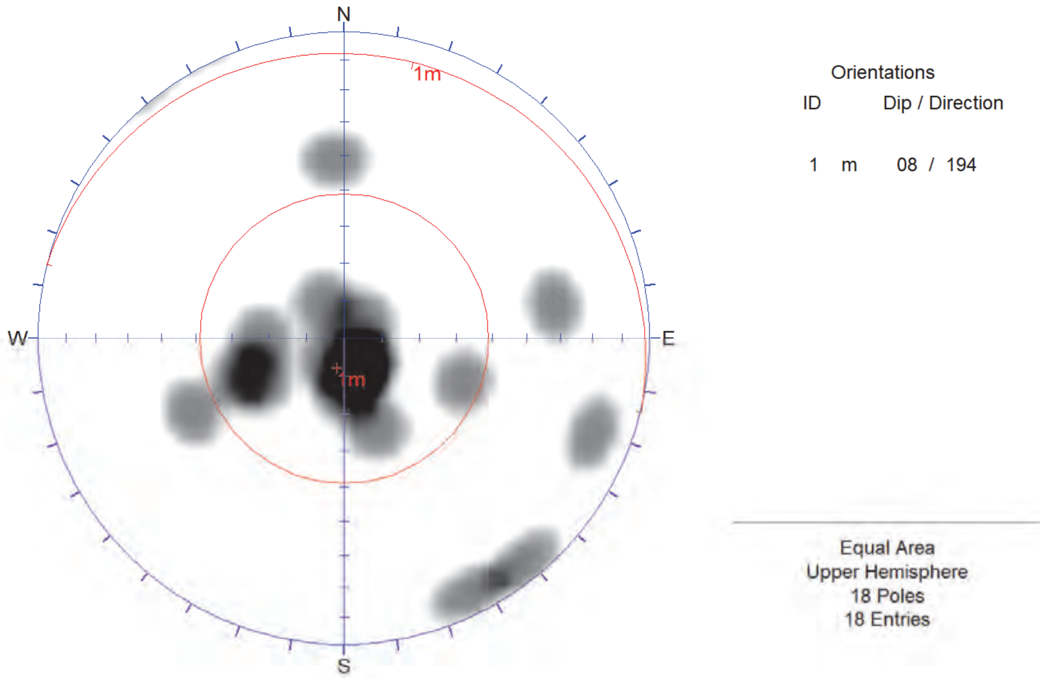


Figure 7G: A polar diagram with statistical contouring of fracture planes for B16. The calculated mean dip angle and direction is shown at the right of the diagram.

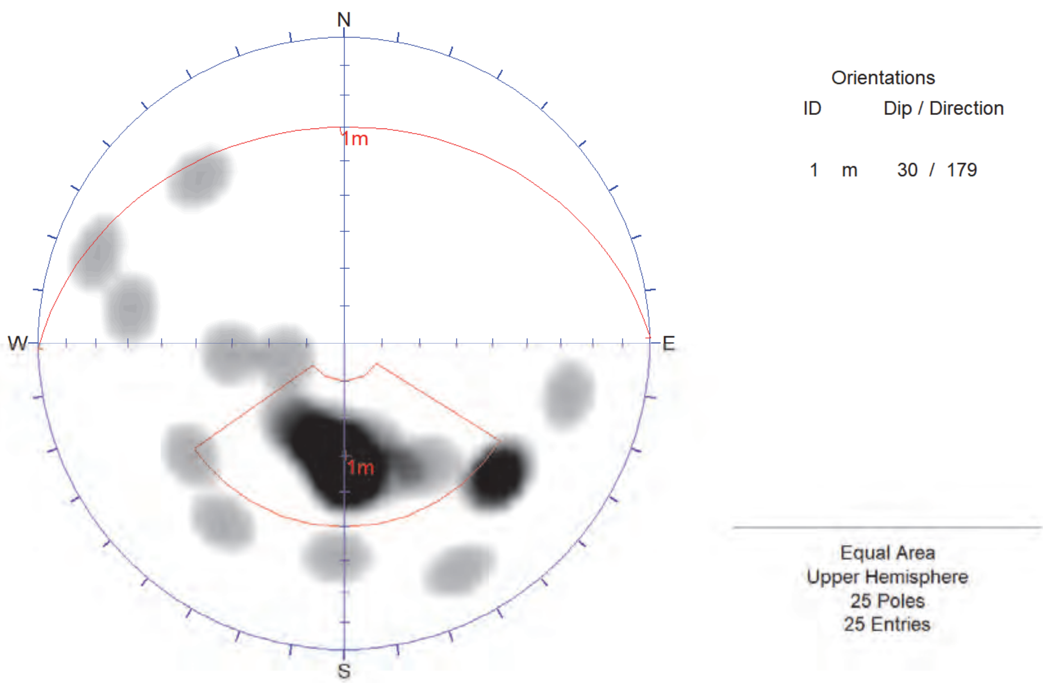


Figure 7H: A polar diagram with statistical contouring of fracture planes for B17. The calculated mean dip angle and direction is shown at the right of the diagram.

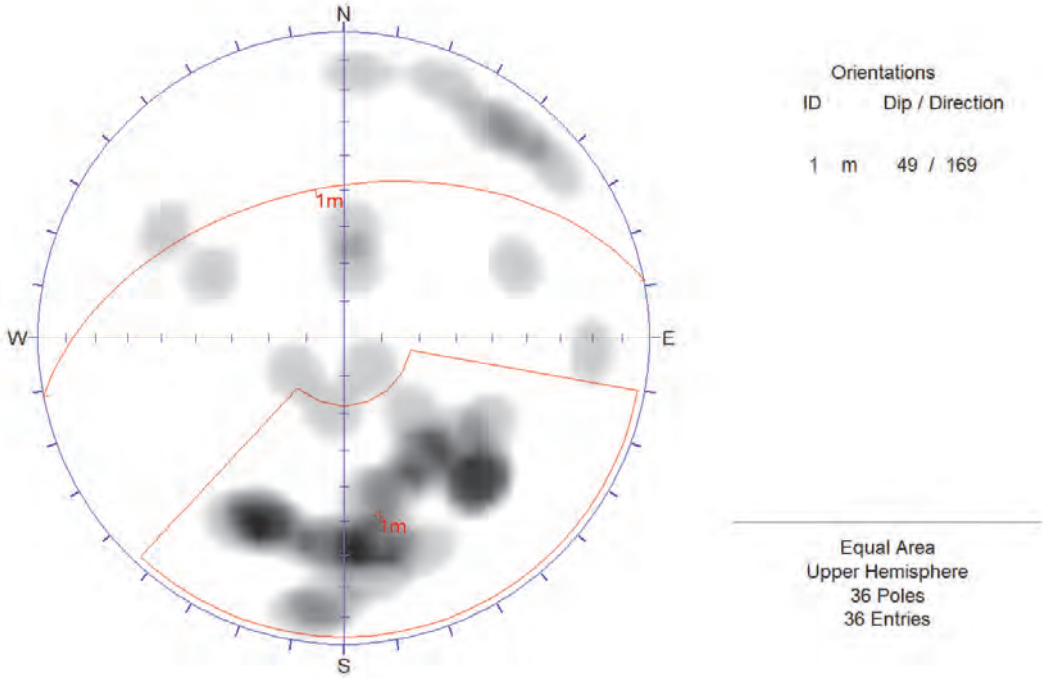


Figure 7I: A polar diagram with statistical contouring of fracture planes for B18. The calculated mean dip angle and direction is shown at the right of the diagram.

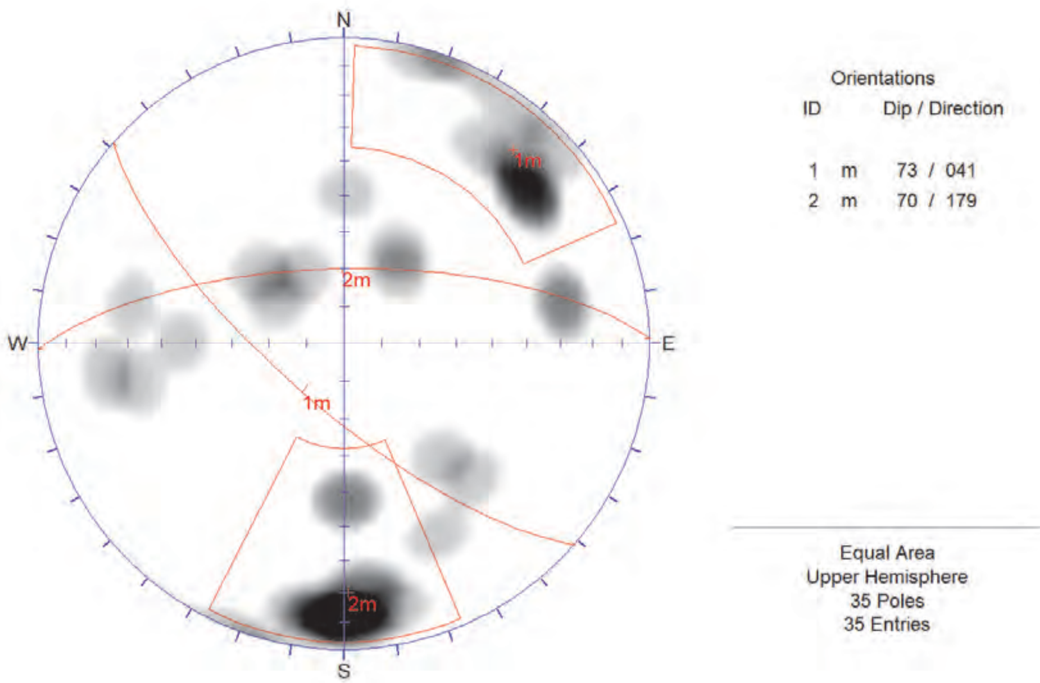


Figure 7J: A polar diagram with statistical contouring of fracture planes for B19. The calculated mean dip angle and direction is shown at the right of the diagram.

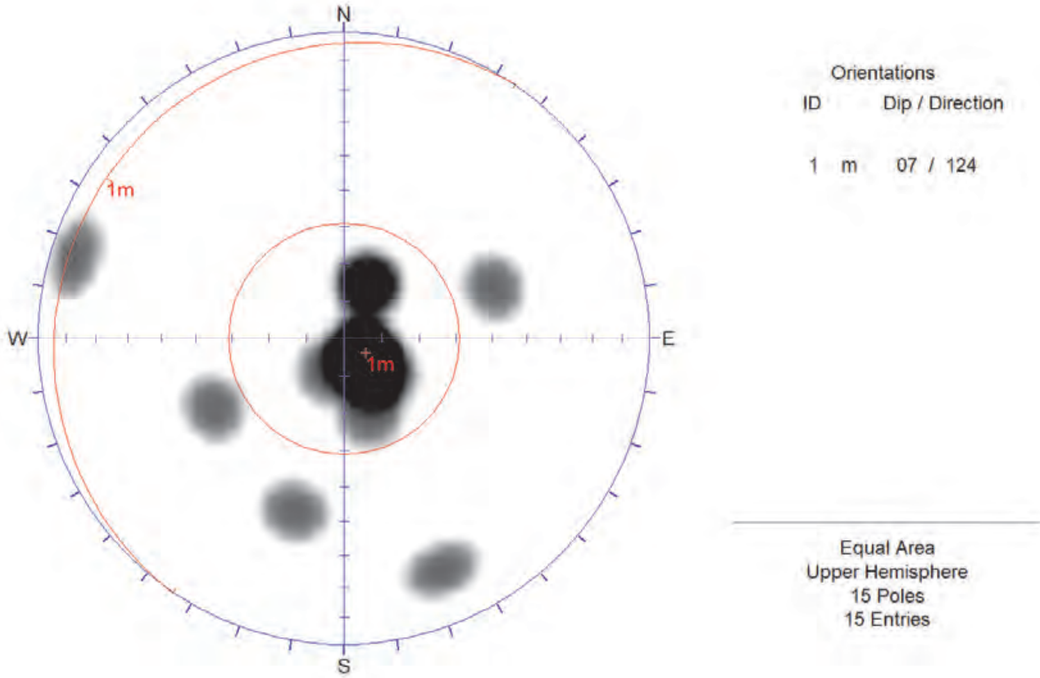


Figure 7K: A polar diagram with statistical contouring of fracture planes for TW01. The calculated mean dip angle and direction is shown at the right of the diagram.

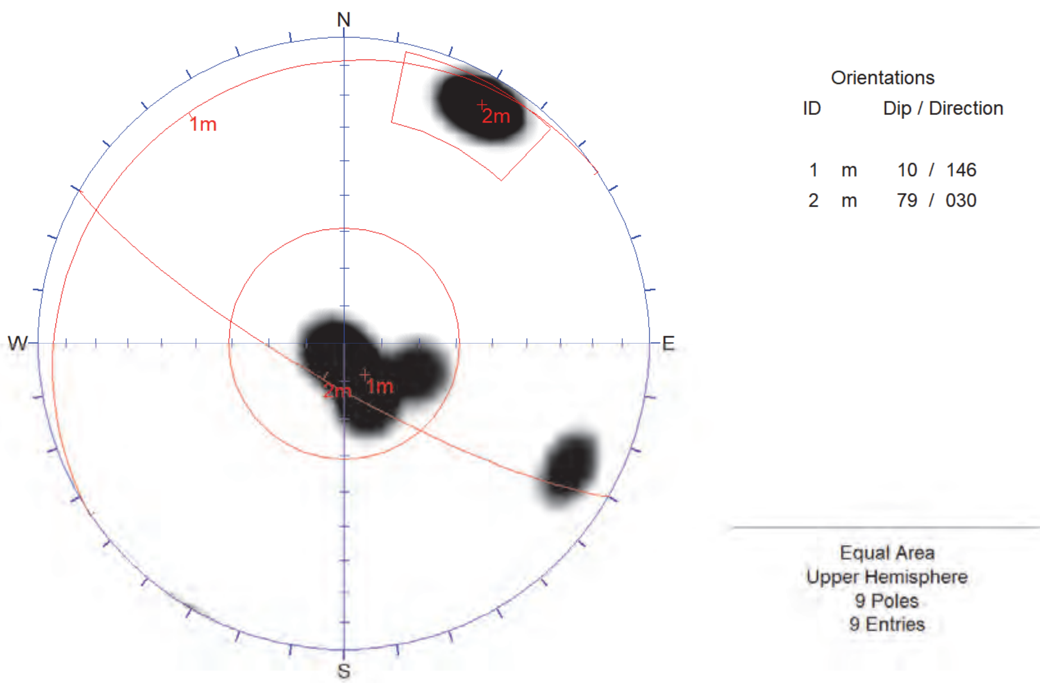


Figure 7L: A polar diagram with statistical contouring of fracture planes for TW03. The calculated mean dip angle and direction is shown at the right of the diagram.

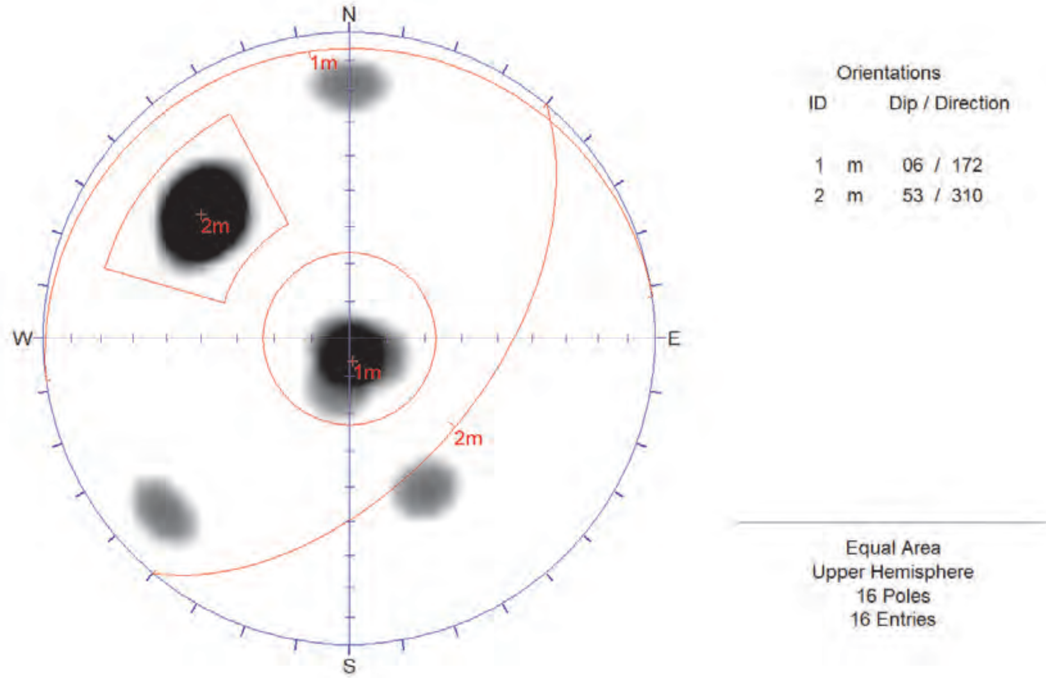


Figure 7M: A polar diagram with statistical contouring of fracture planes for TW05. The calculated mean dip angle and direction is shown at the right of the diagram.

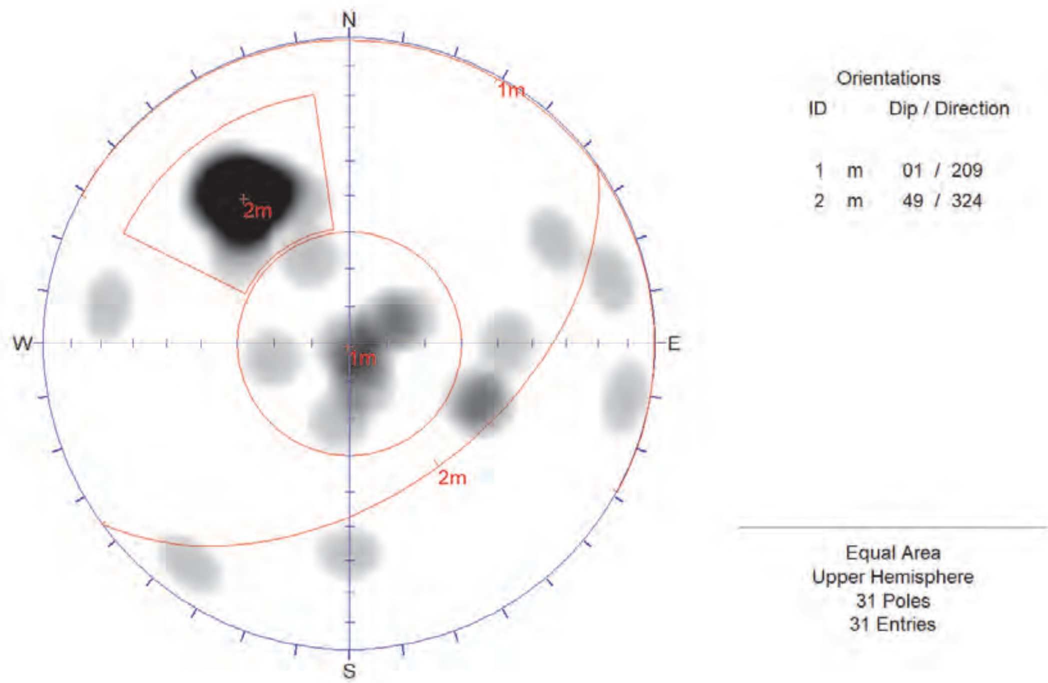


Figure 7N: A polar diagram with statistical contouring of fracture planes for TW07. The calculated mean dip angle and direction is shown at the right of the diagram.

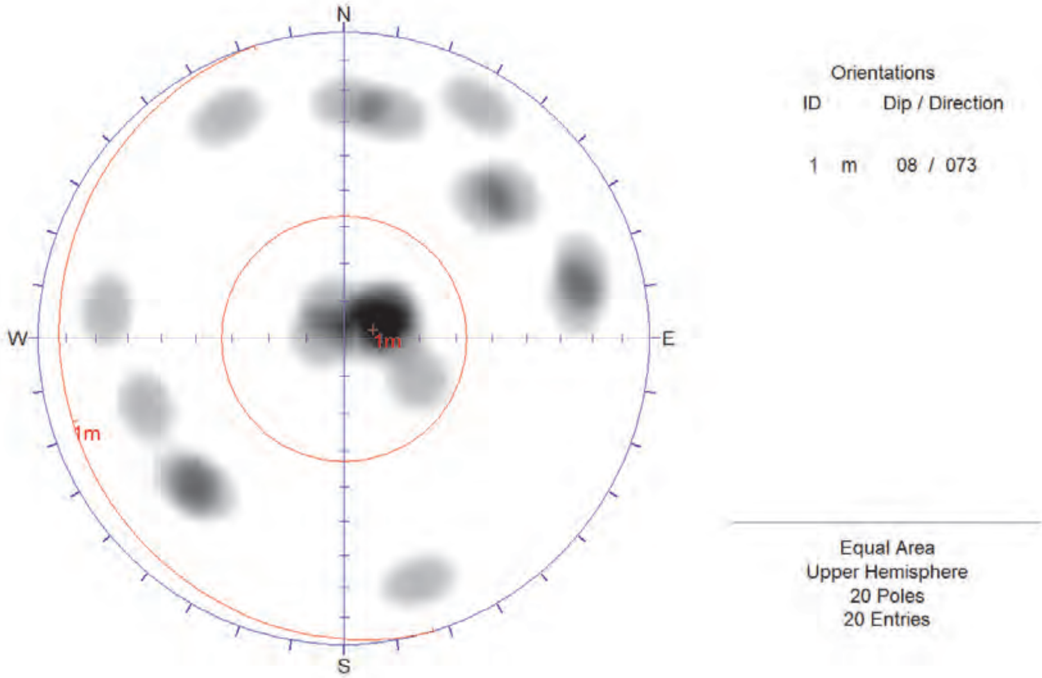


Figure 7O: A polar diagram with statistical contouring of fracture planes for TW08. The calculated mean dip angle and direction is shown at the right of the diagram.

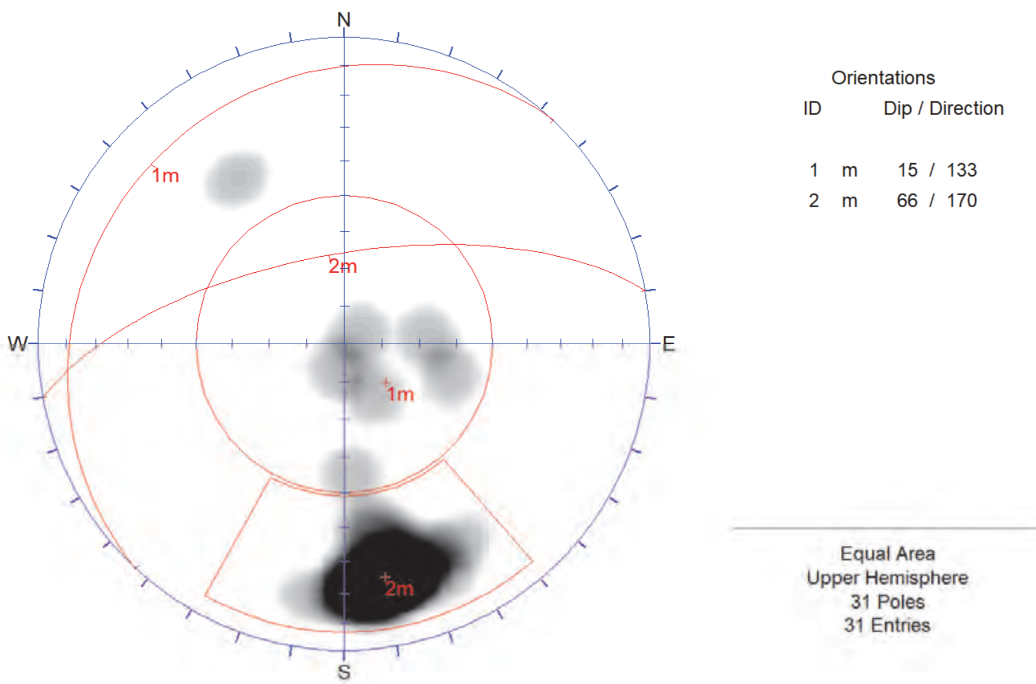


Figure 7P: A polar diagram with statistical contouring of fracture planes for TW09. The calculated mean dip angle and direction is shown at the right of the diagram.

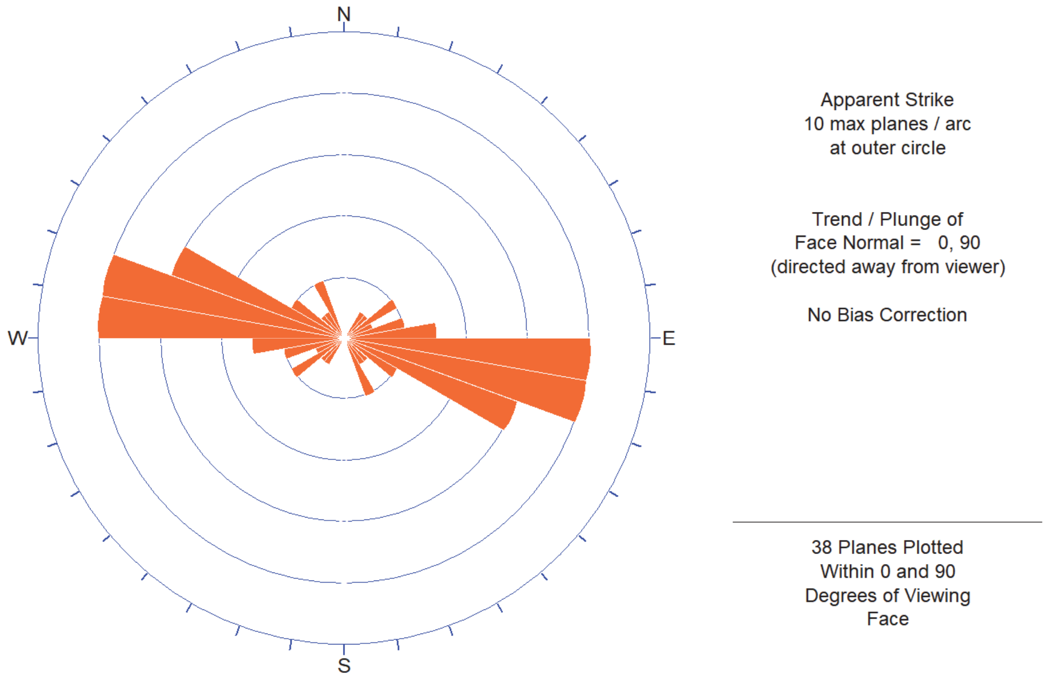


Figure 8A: A rose diagram illustrating strike distribution of all bedding planes.

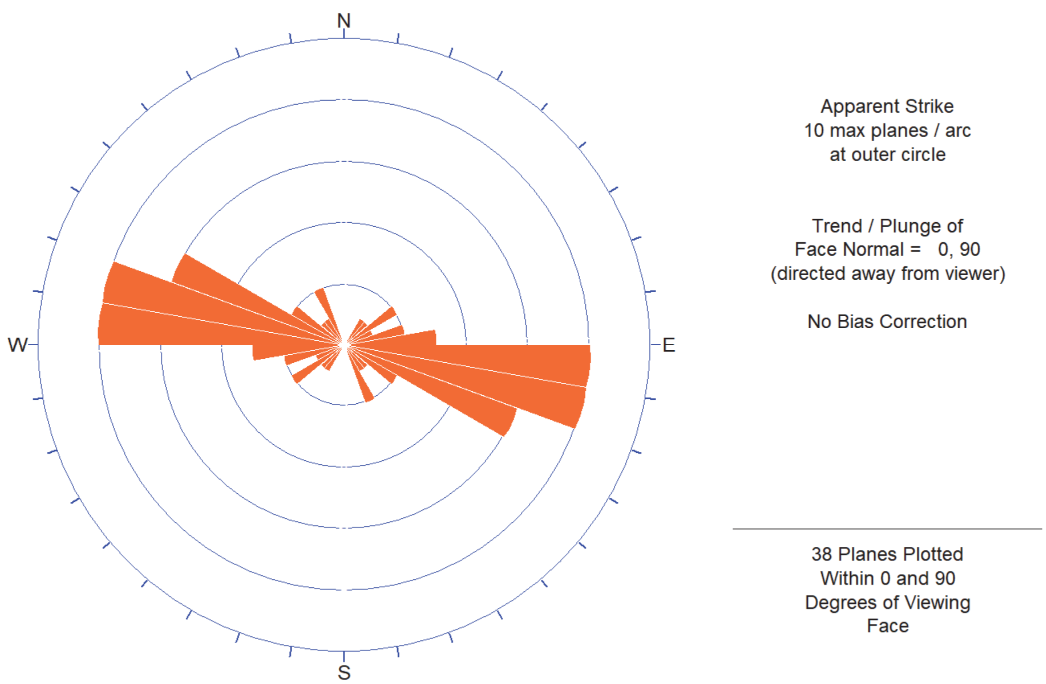


Figure 8B: A rose diagram illustrating strike distribution of bedding planes for 93-1D.

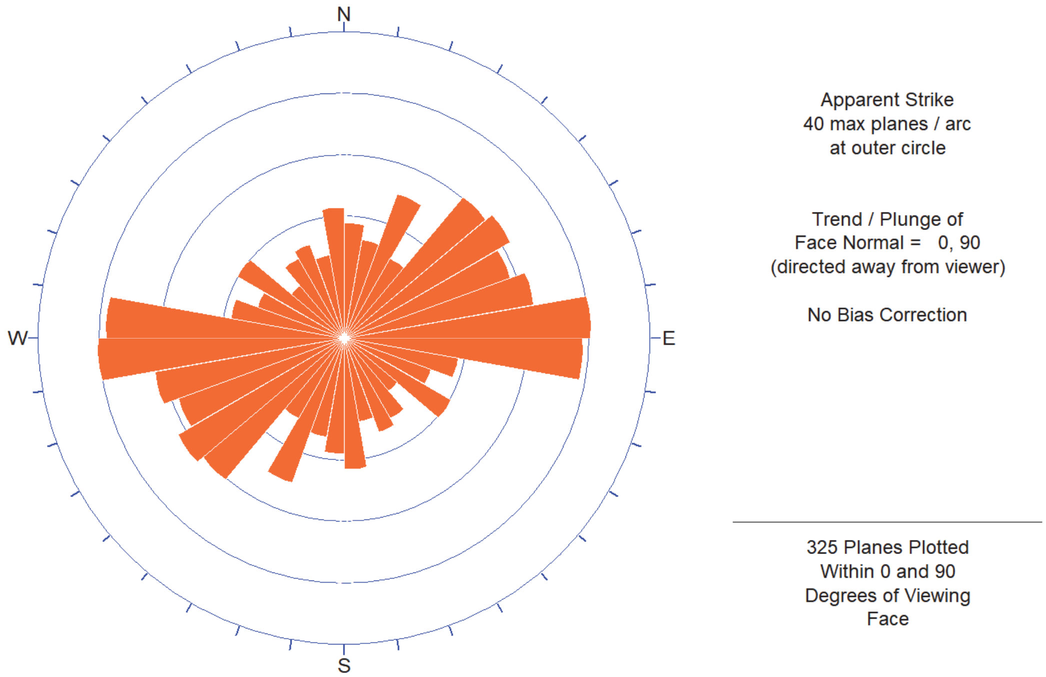


Figure 9A: A rose diagram illustrating strike distribution of all fractures.

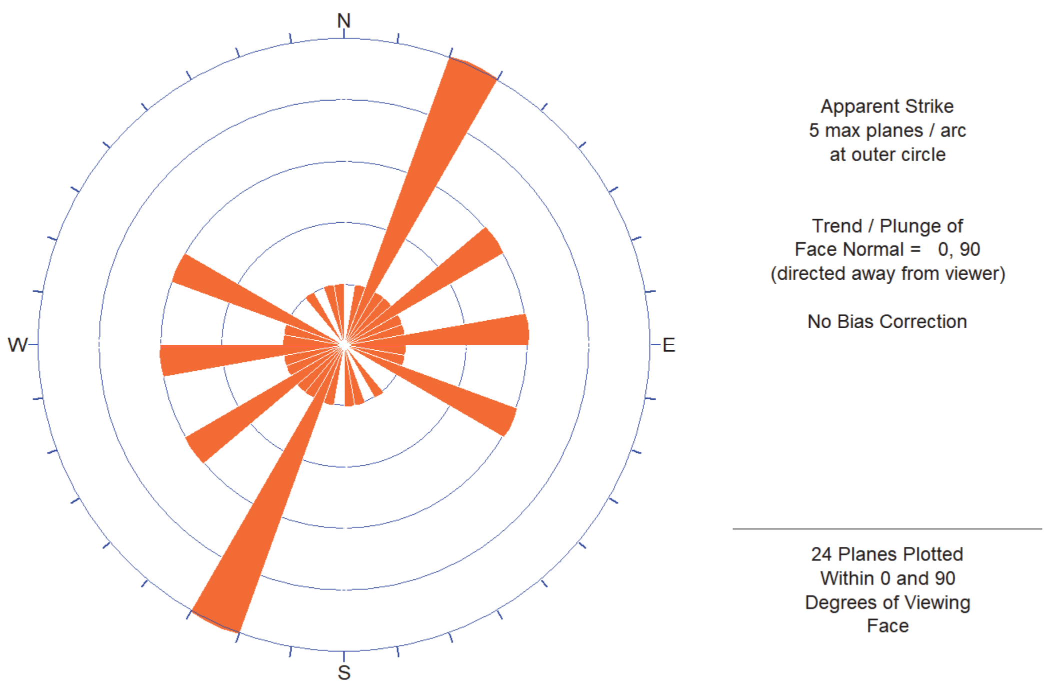


Figure 9B: A rose diagram illustrating strike distribution of fractures for 93-1D.

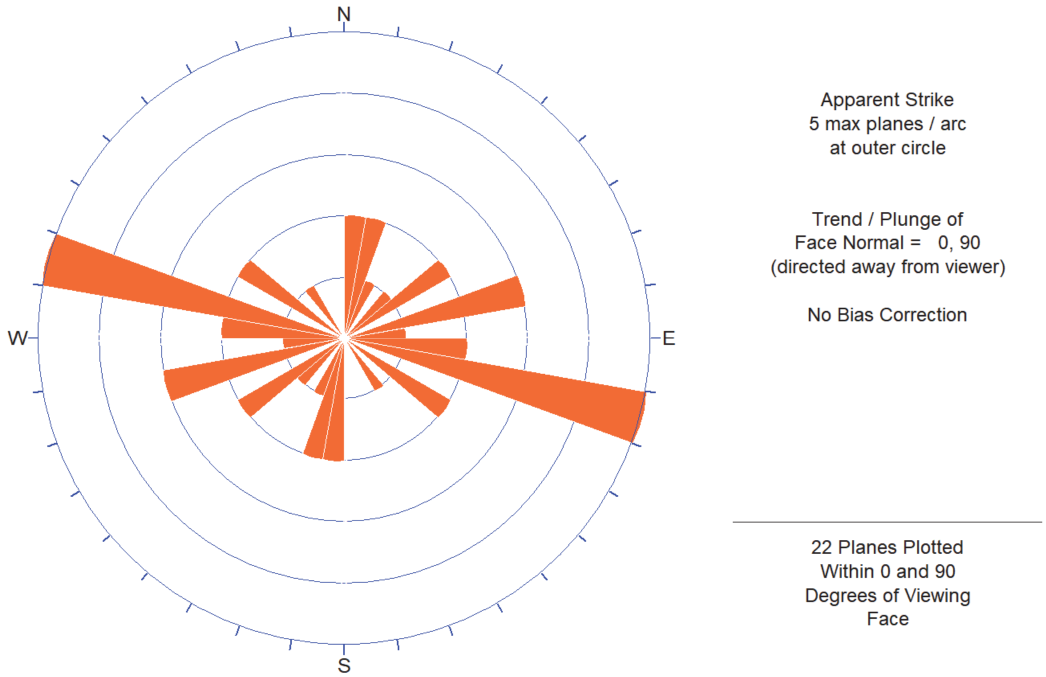


Figure 9C: A rose diagram illustrating strike distribution of fractures for B11.

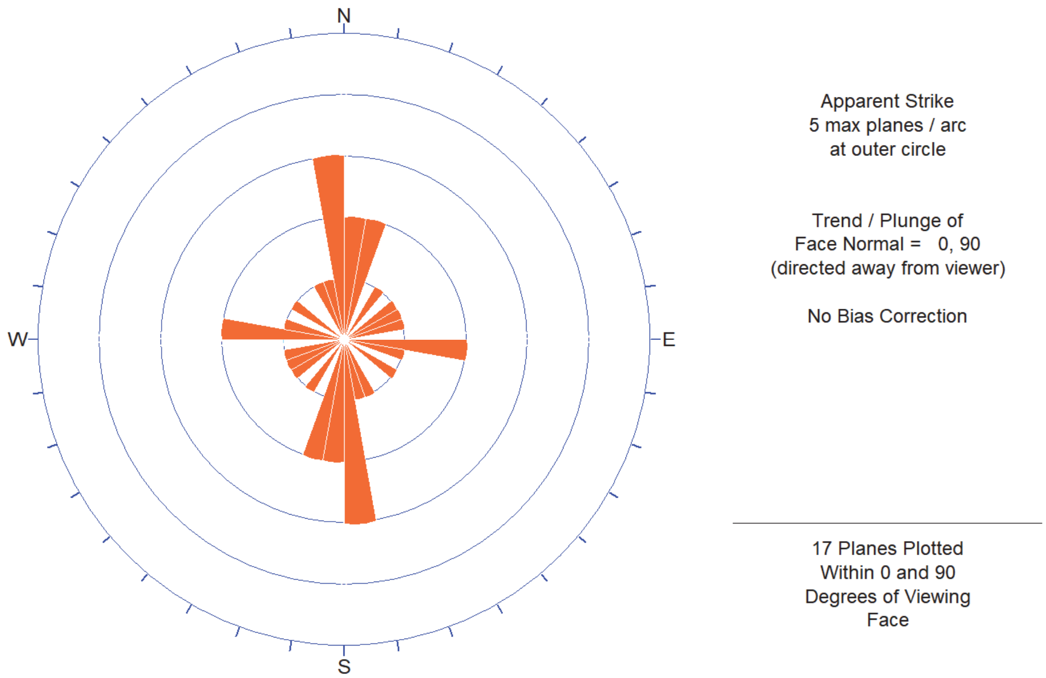


Figure 9D: A rose diagram illustrating strike distribution of fractures for B12.

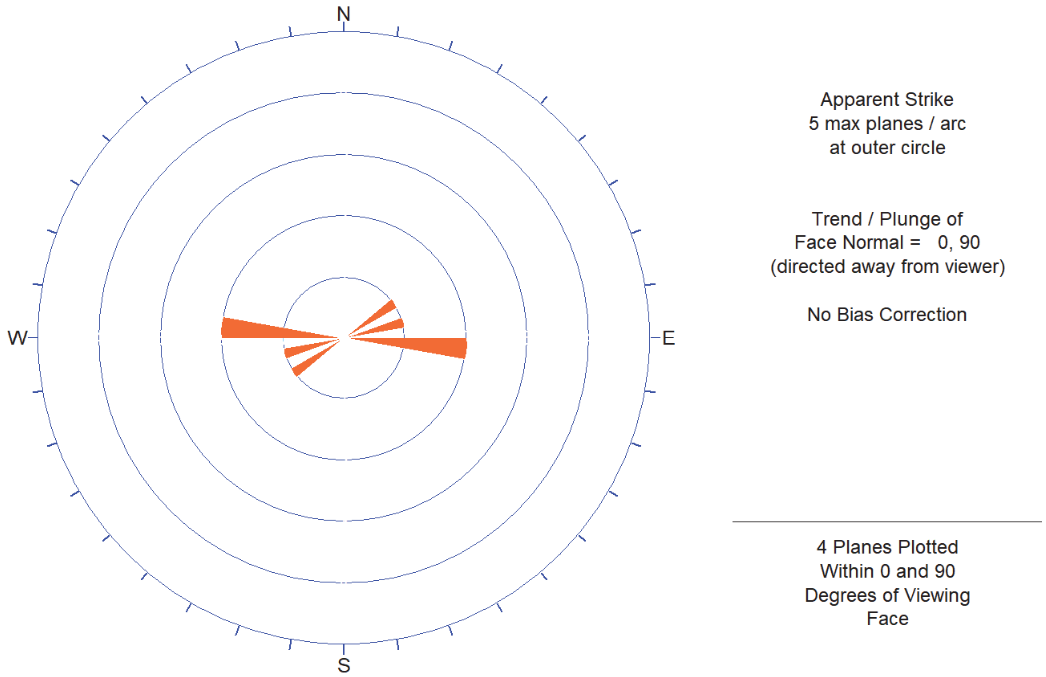


Figure 9E: A rose diagram illustrating strike distribution of fractures for B13.

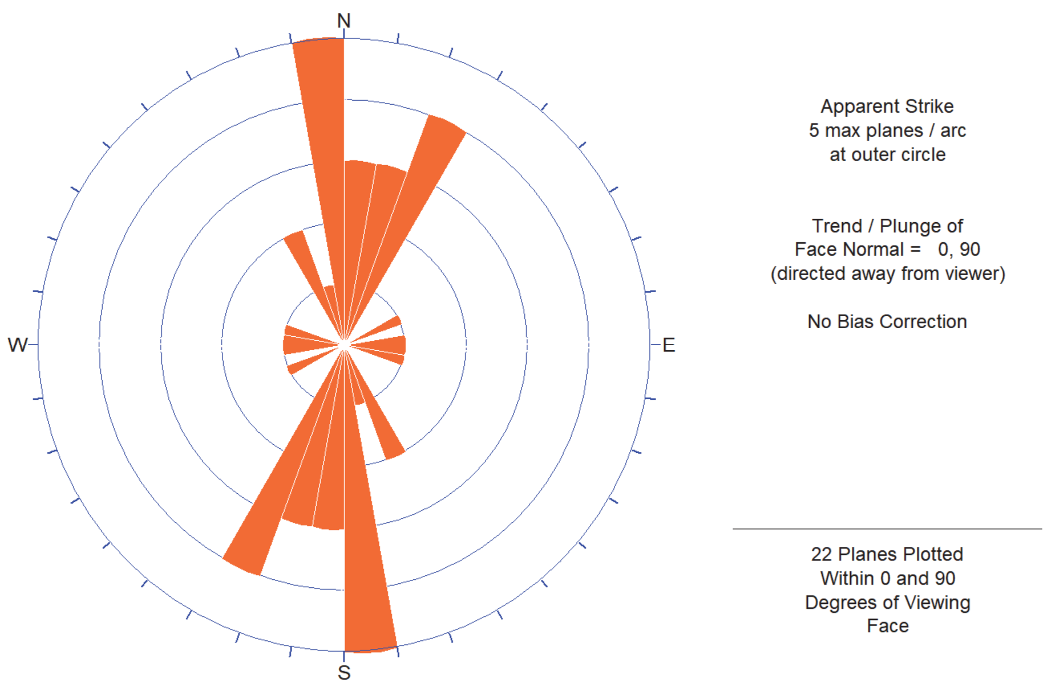


Figure 9F: A rose diagram illustrating strike distribution of fractures for B14.

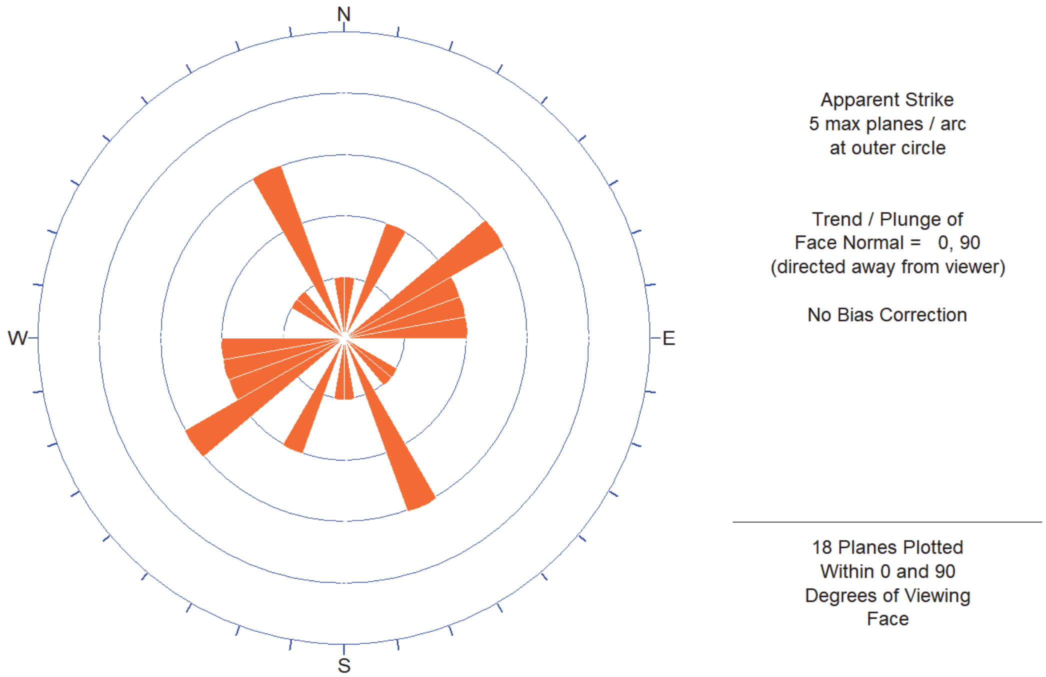


Figure 9G: A rose diagram illustrating strike distribution of fractures for B16.

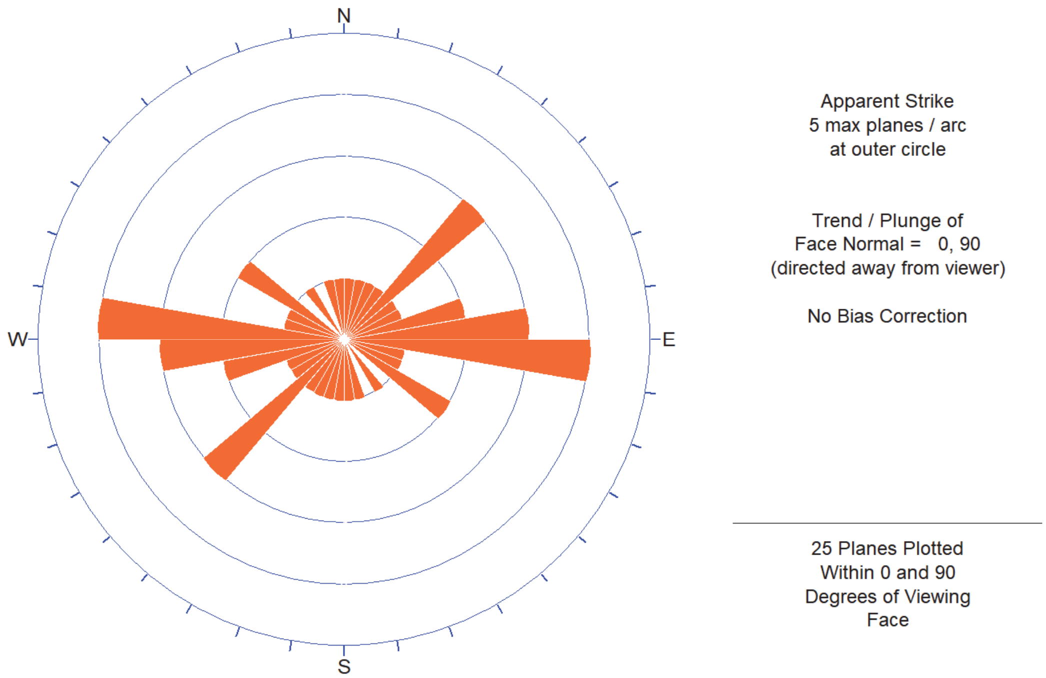


Figure 9H: A rose diagram illustrating strike distribution of fractures for B17.

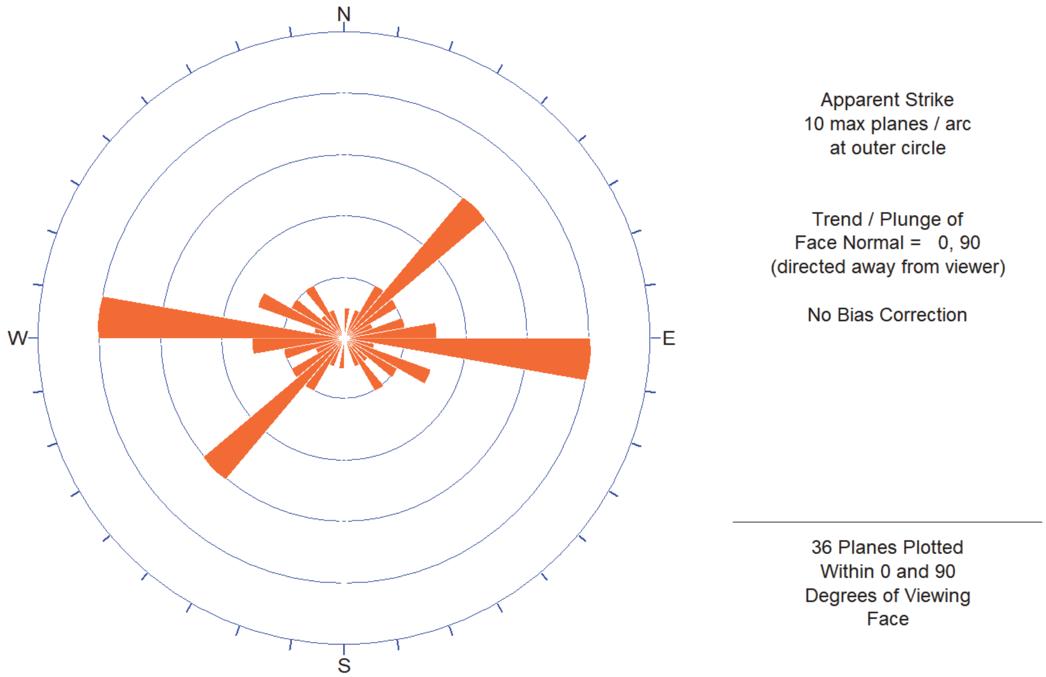


Figure 9I: A rose diagram illustrating strike distribution of fractures for B18.

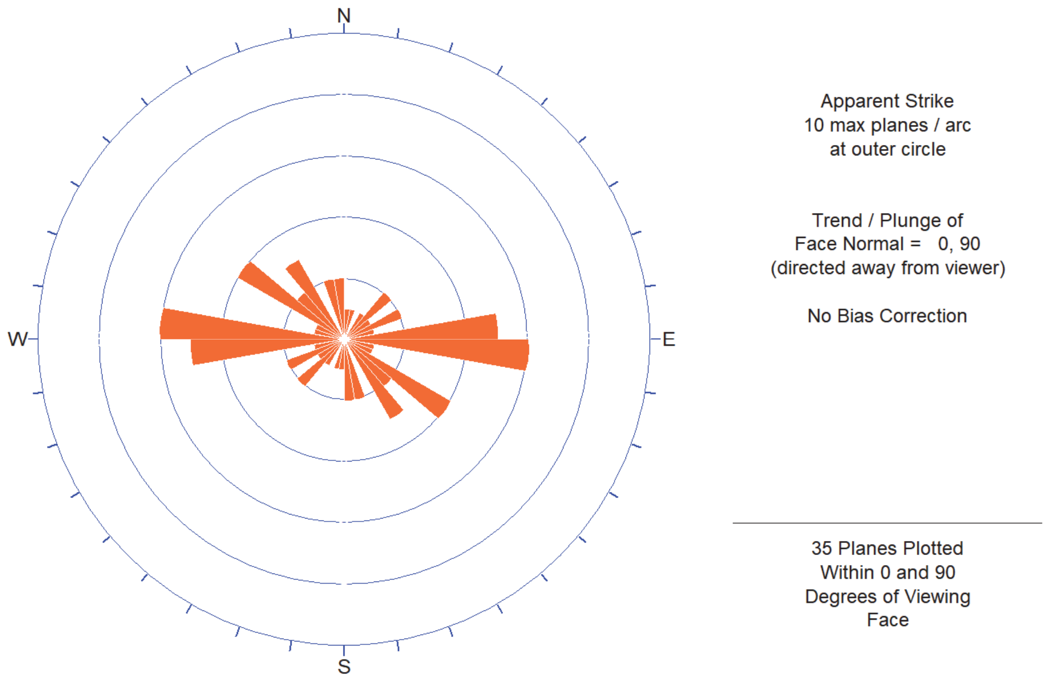


Figure 9J: A rose diagram illustrating strike distribution of fractures for B19.

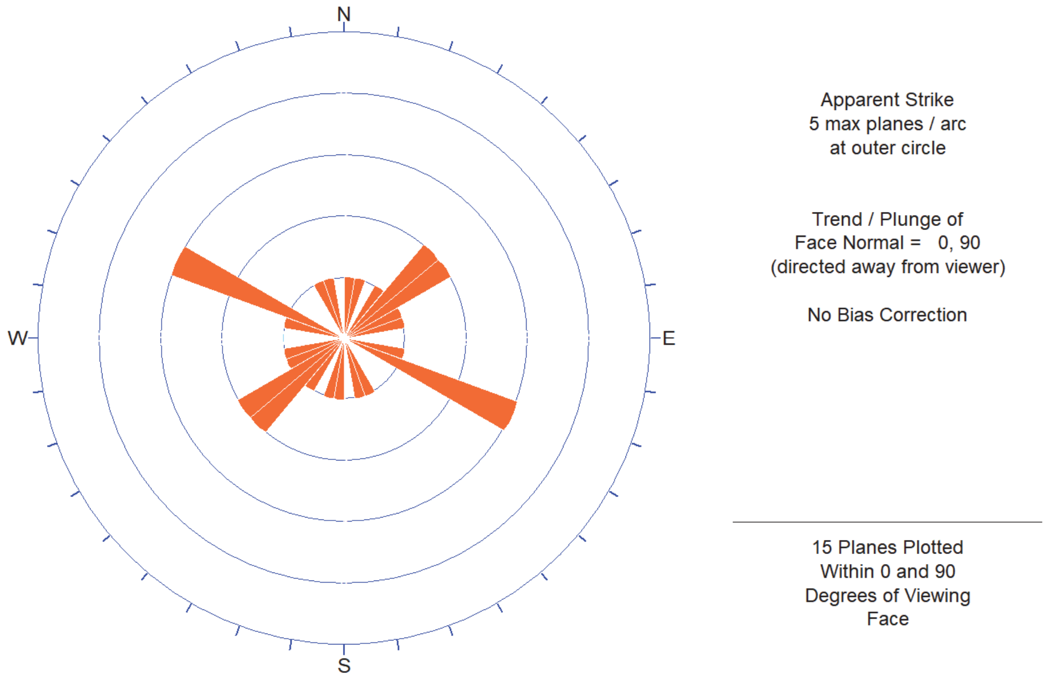


Figure 9K: A rose diagram illustrating strike distribution of fractures for TW01.

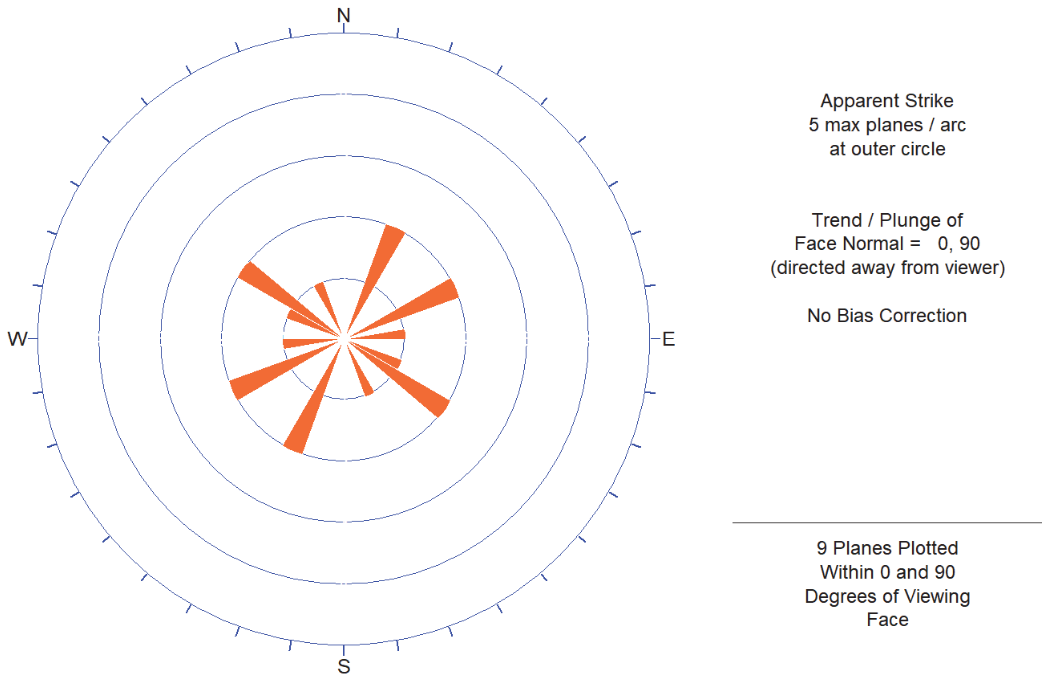


Figure 9L: A rose diagram illustrating strike distribution of fractures for TW03.

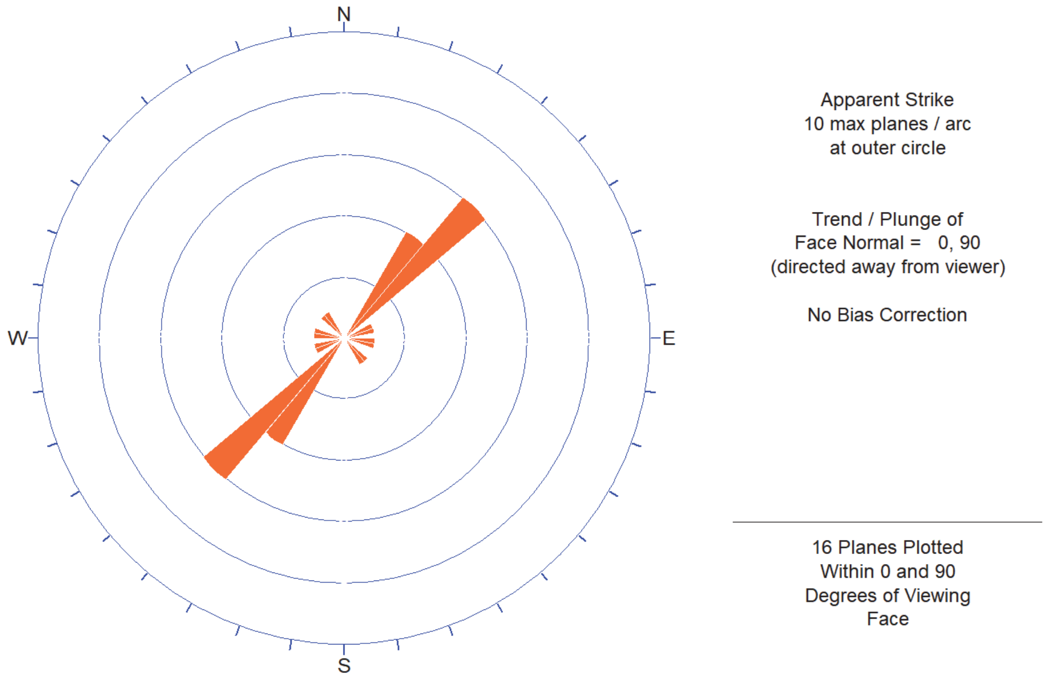


Figure 9M: A rose diagram illustrating strike distribution of fractures for TW05.

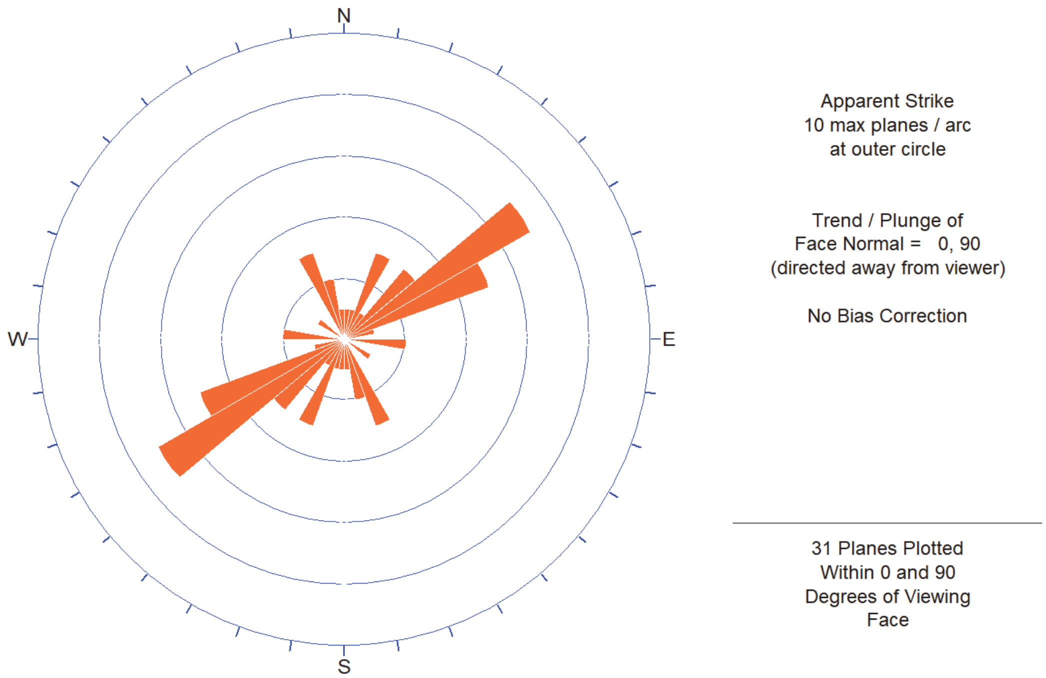


Figure 9N: A rose diagram illustrating strike distribution of fractures for TW07.

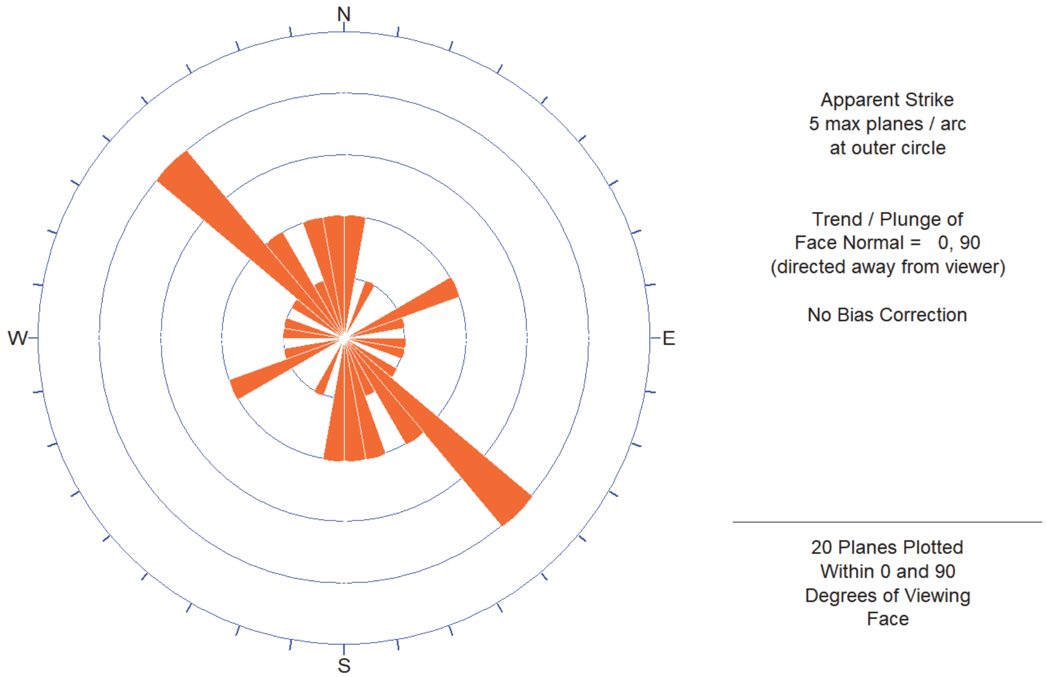


Figure 9O: A rose diagram illustrating strike distribution of fractures for TW08.

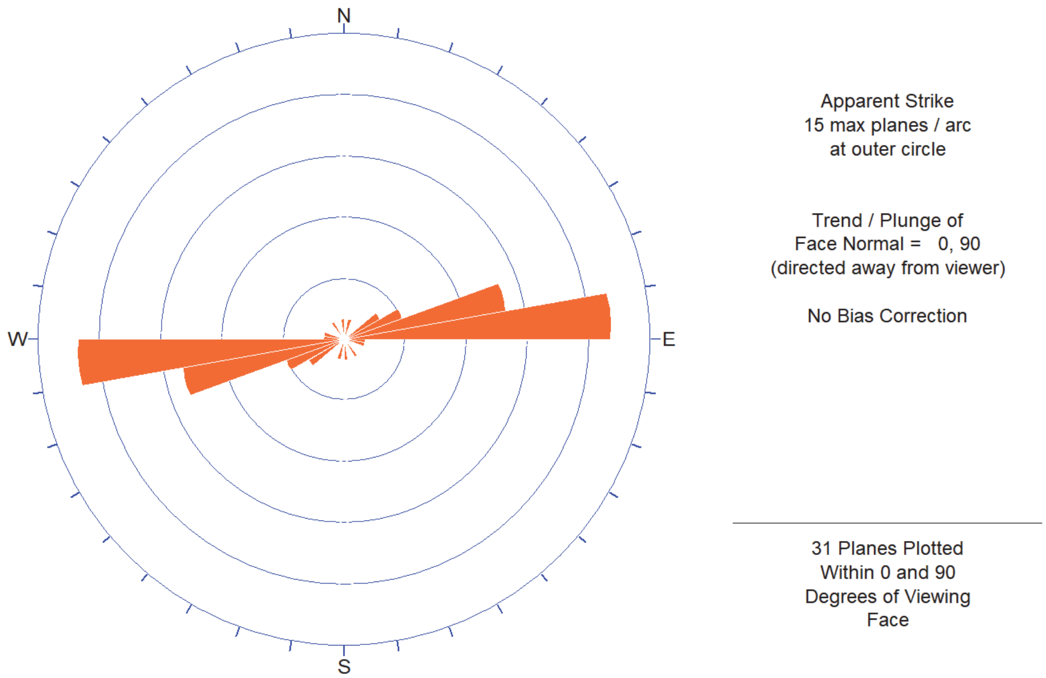


Figure 9P: A rose diagram illustrating strike distribution of fractures for TW09.

ATTACHMENT A
LOGGING METHODS

1129 West Governor Road, PO Box 797
Hershey, PA 17033-0797
Voice: (717) 533 - 8600
Fax: (717) 533 - 8605

APPENDIX A: OVERVIEW OF LOGGING METHODS

CALIPER LOGS

The caliper log measures variations in borehole size as a function of depth in a well. Some example responses of in a caliper log is shown in Figure A- 1 (Rider, 2002[1.]) The log data enables (a) the detection of competent or fractured geologic units, (b) the location of washouts or tight zones, (c) the optimal placement of well screen, sand, and bentonite, and (d) the establishment of appropriate borehole correction factors to be applied to other well log curves. Further, when run in combination with other logs, the caliper log may be an indicator of lithologic makeup and degree of consolidation. The typical caliper response in a fractured, weathered, or karstic unit is a relatively abrupt increase in borehole size.

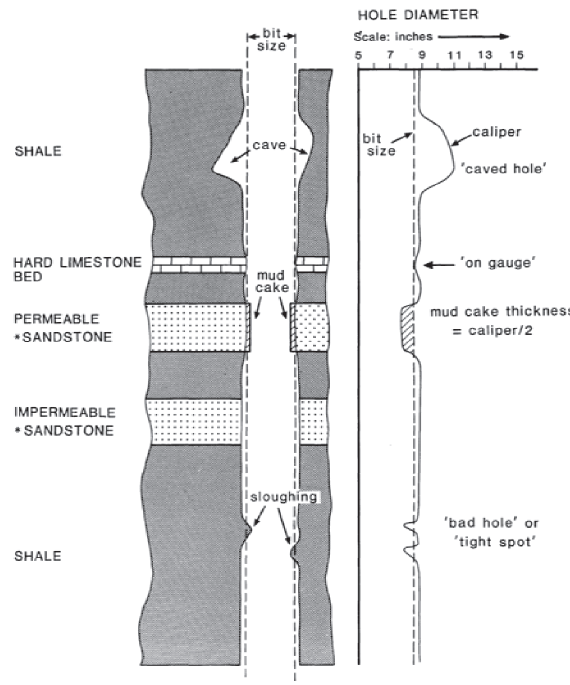


Figure A- 1: The caliper log showing some typical responses. (From Rider, 2002).

SPONTANEOUS POTENTIAL (SP) LOGS

The SP log measures the natural voltages that are created within the borehole due to the presence of borehole fluids, formation fluids, and formation matrix materials. It is recorded by measuring the difference in electrical potential in millivolts between an electrode in the borehole and a grounded electrode at the surface. The SP log is commonly used to 1) detect permeable beds, 2) detect boundaries of permeable beds, 3) determine formation water resistivity, and 4) determine the volume of shale in permeable beds. The constant SP readings observed in thicker shale units define the shale base line, a reference line from which further formation matrix and formation fluid property calculations may be completed. Although this log is consistently used in oil and gas applications, its effectiveness in water wells is limited since the method requires a contrast in salinity between borehole and formation fluids (Figure A- 2). This condition is often not met in ground water wells.

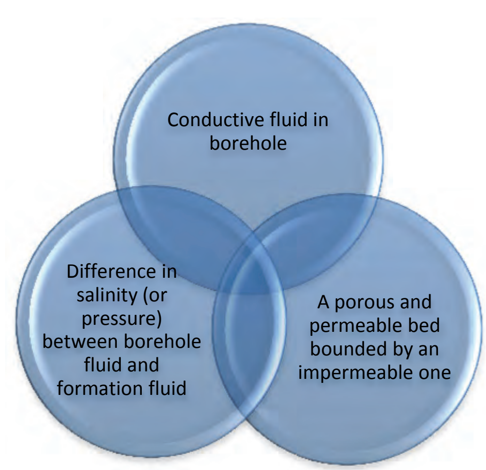


Figure A- 2: Conditions required to produce an SP response.

1 Rider, M. (2006) The Geological Interpretation of Well Logs, *Rider-French Consulting, Ltd*., 280pp.

The SP log can be qualitatively used for permeability recognition. SP deflections from the shale base line commonly indicate the presence of a permeable bed. The magnitude and direction of the deflection is dependent upon the relative resistivity (or salinity) values of the borehole fluid and the formation fluid. If the formation fluid resistivity is less than the borehole fluid resistivity, then the relative SP values will decrease in a porous, coarse-grained unit. Alternately, if the formation fluid resistivity is greater than the borehole fluid resistivity, the relative SP values will increase in the same body, and the curve shape is referred to as a "reversed SP". If both fluid resistivities are equal, no SP deflection will occur.

GAMMA RAY LOGS

The gamma ray log is a passive instrument that measures the amount of naturally occurring radioactivity from geologic units within the borehole. Commonly occurring radioelements include potassium, thorium, and uranium; the two former elements are predominant within a common fine-grained rock sequence. The gamma ray log is also an excellent lithologic indicator because fine-grained clays and shales contain a higher radioelement concentration than limestones or sands. Gamma ray values are often used to assess the percentage of clay materials (indurated or non-indurated) that are present within a formation by utilizing empirically derived equations and sand-shale base line information.

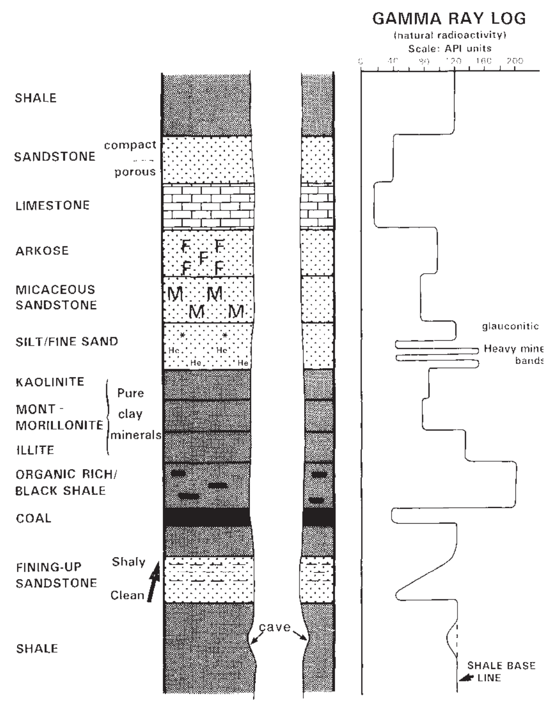


Figure A- 3: Characteristic gamma ray responses. (From Rider, 2002).

NORMAL RESISTIVITY LOGS

Resistivity is a measure of how well an electric current passes through a material. Formation resistivity is an intrinsic property of rocks and depends on the porosity and resistivity of the interstitial fluid and rock matrix. The spacing between the transmitter and receiver on the tool determines the depth of investigation into the surrounding formation; the greater the spacing, the deeper the penetration of electrical current into the formation.

In sedimentary rocks, the resistivity values of shales (5 - 30 ohm-m) is generally lower than the resistivity of sandstone (30 – 100 ohm-m), which is lower than the resistivity limestone (75 – 300 ohm-m). The resistivity log often shows a picture of the overall depositional sequence in sedimentary environment. Resistivity of igneous and metamorphic rocks is extremely high when compared to resistivity in sedimentary rocks, with values that are commonly thousands of ohm-meters. Example resistivity log responses are shown in Figure A- 4.

FLUID RESISTIVITY LOGS

Fluid resistivity, which is the reciprocal of fluid conductivity, provides data related to the concentration of dissolved solids in the fluid column. Although the quality of the fluid column may not reflect the quality of adjacent interstitial fluids, information can be quite useful when combined with other logs. For example, change in fluid resistivity associated with a water-producing zone that is corroborated by other logs may indicate the inflow of ground water.

SINGLE-POINT RESISTANCE LOGS

Single point resistance measurements are made by passing a constant current between two electrodes and recording the voltage fluctuations as the probe is moved up the borehole. The resistance variations measured in the borehole is primarily due to variations in the immediate vicinity of the downhole electrode.

The resistance log is strongly affected by the resistance of the drilling fluid and variations in borehole diameter. It is extremely useful for detecting fractures in boreholes with relatively constant diameter. In sedimentary environments, the resistance log generally follows the variations in resistivity of the formation. Shales in clay generally exhibit low values, sandstones have intermediate values, while coal and limestone beds have high resistance values.

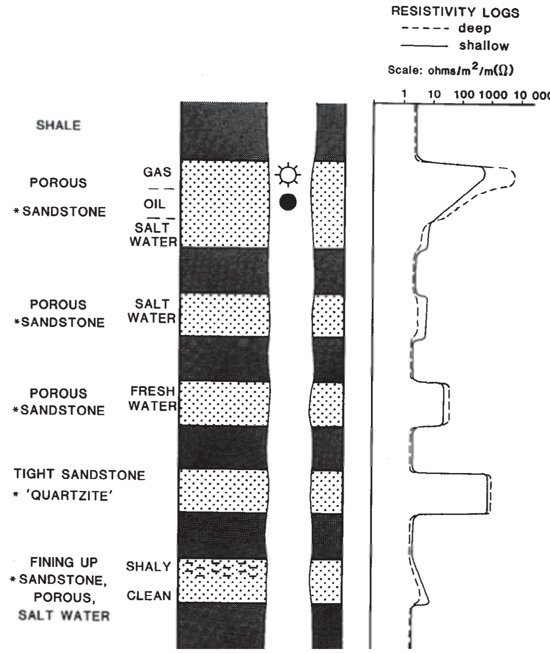


Figure A- 4: Characteristic resistivity responses. (From Rider, 2002)

TEMPERATURE LOGS

Temperature logs measure the change in fluid temperature within the borehole as a function of depth. This log can indicate the location of water- producing strata or fracture zones within the well. The inherent assumption of this technique is that the fluids entering the borehole from water producing zones are either cooler or warmer than the fluid in the borehole. In this case, it is possible to relate a temperature anomaly to a depth range in which waters of different temperature are emanating from a water-producing/receiving or fractured lithologic unit.

HEAT PULSE FLOWMETER (HPFM) LOGS

The heat pulse flowmeter measures the vertical flow rates within a borehole. The log may be used to identify contributing fracture zones under natural and pumping conditions. The system operates by heating a wire grid that is located between two thermistors. The heated body of water moves toward one of the thermistors under the effect of the vertical component of flow within the well. Positive and negative values on the log represent upward and downward flow, respectively. Measurements are recorded while the tool is stationary and the logs are presented as a bar graph (mud log) as shown in Figure A- 5.

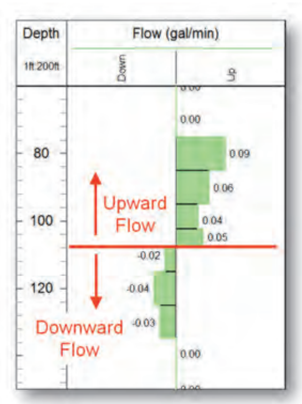


Figure A- 5: Example heat pulse flowmeter log.

A number of techniques have been attempted for measuring horizontal flow in wells without much success. The techniques may not represent the true hydrogeologic conditions due to variations in flow caused by the well.

OPTICAL TELEVIEWER (OTV) LOGS

The optical televiewer probe combines the axial view of a downward looking digital imaging system with a precision ground hyperbolic mirror to obtain an undistorted 360° view of the borehole wall. The probe records one 360° line of pixels at 0.003-ft depth intervals. The sample circle can be divided into 720 or 360 radial samples to give 0.5° or 1° radial resolution. For this investigation, the highest radial resolution (0.5°) was used. The line of pixels is aligned with respect to True North and digitally stacked to construct a complete, undistorted, and oriented image of the borehole walls. The data are 24 -bit true color and may be used for lithologic determination as part of the interpretation. Since the acquired image is digitized and properly oriented with respect to borehole deviation and tool rotation, it allows data processing to provide accurate strike and dip information of structural features. The borehole image is often shown as an “unwrapped” 360° image in which the cylindrical borehole image is sliced down the northern axis and flattened out as shown in Figure A- 6.

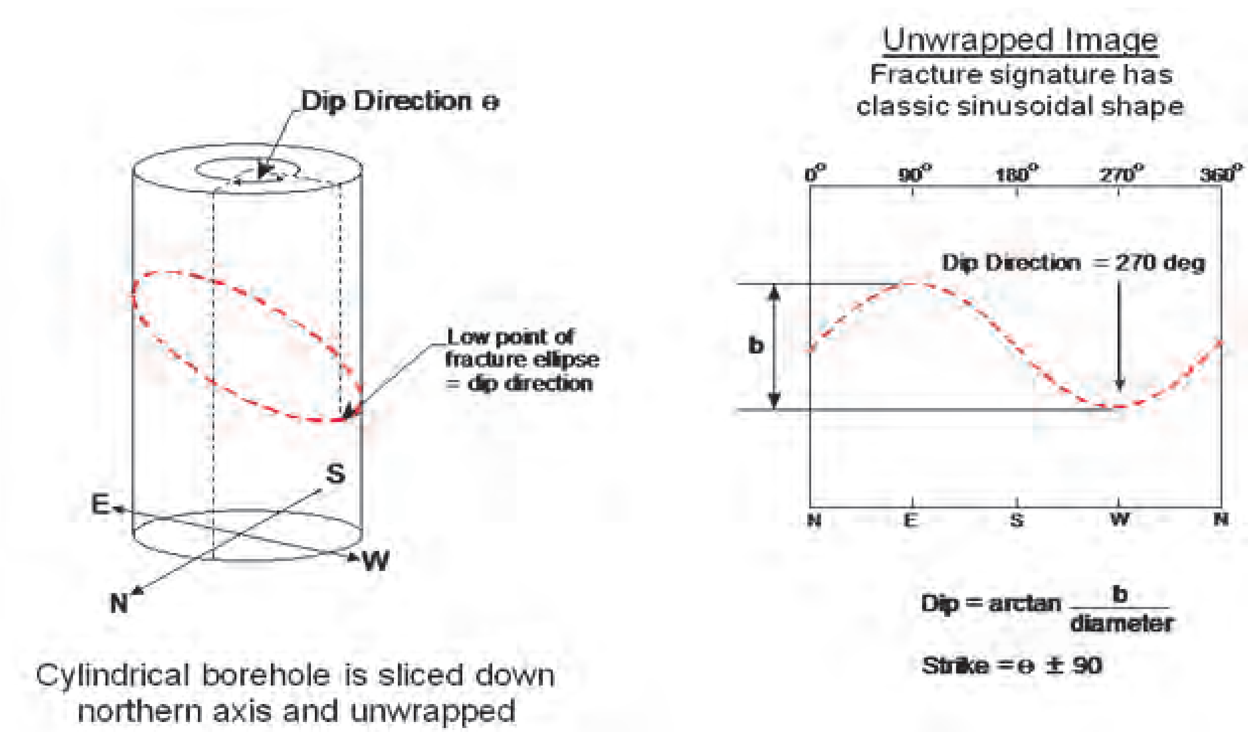


Figure A- 6: Schematic showing the sinusoidal fracture signature in the unwrapped borehole view.

ACOUSTIC TELEVIEWER (ATV) LOGS

Acoustic televiewer provides a 360° acoustic image of the borehole walls that can be used to identify and determine the orientation of planar features such as bedding and fractures. The data can also indicate the relative degree of hardness of formation materials. As shown in Figure A-7, Ultrasonic pulses are transmitted from a rotating transducer inside the tool. The transmitted pulses reflect off the borehole wall and return to the tool where the travel time and amplitude of the acoustic signal are measured. In order for the acoustic waves to travel to and from the borehole wall, the well must be fluid filled. Greater travel time can indicate openings in the rock. Strong amplitude suggests smooth, competent rock. Weaker amplitudes suggest rough or less competent rock.

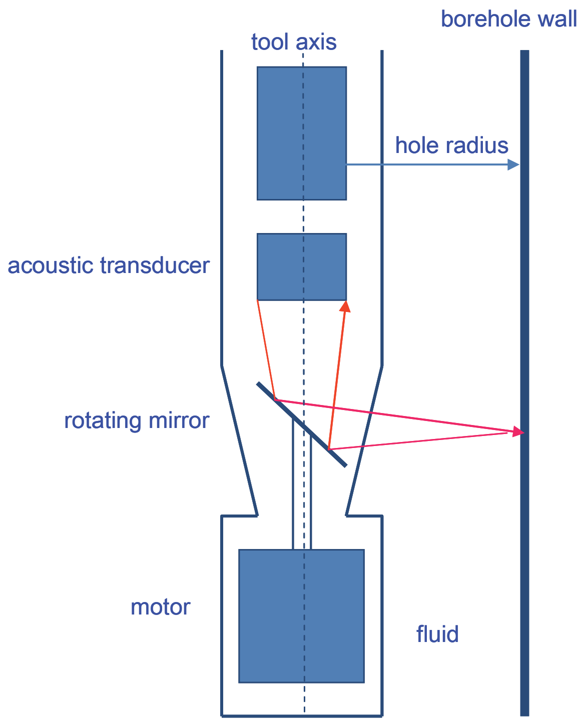


Figure A- 7: Schematic of the acoustic televiewer tool.

ATTACHMENT B
BOREHOLE LOGS

93-1D

Televiewer Logs

COMP	Stantec
WELL	93-1D
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec STATE: TN
WELL ID: 93-1D ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD
SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 0.68 G.L. N/A

LOGGING DATE	02.06.2019	02.06.2019	No Test Run	No Test Run	No Test Run
RUN NO	2	4			
TYPE LOG	OTV.GR	ATV.GR			
DRILLER DEPTH (FT)	146.4	146.4			
ARM DEPTH (FT)	146.3	146.4			
BTM LOGGED INTERVAL (FT)	146.38	147.02			
TOP LOGGED INTERVAL (FT)	73	80			
CASING SIZE (IN)/DEPTH (FT)	4/76	4/76			
CASING ARM (FT)	82.04	82.04			
BIT SIZE (IN)	3.0	3.0			
FLUID LEVEL IN HOLE (FT)	34.8	34.8			
MAG. DECLINATION (DEG)	3.2 W	3.2 W			
RECORDED BY	D. Rajkovic	D. Rajkovic			
WITNESSED BY	N/A	N/A			

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

Symbols

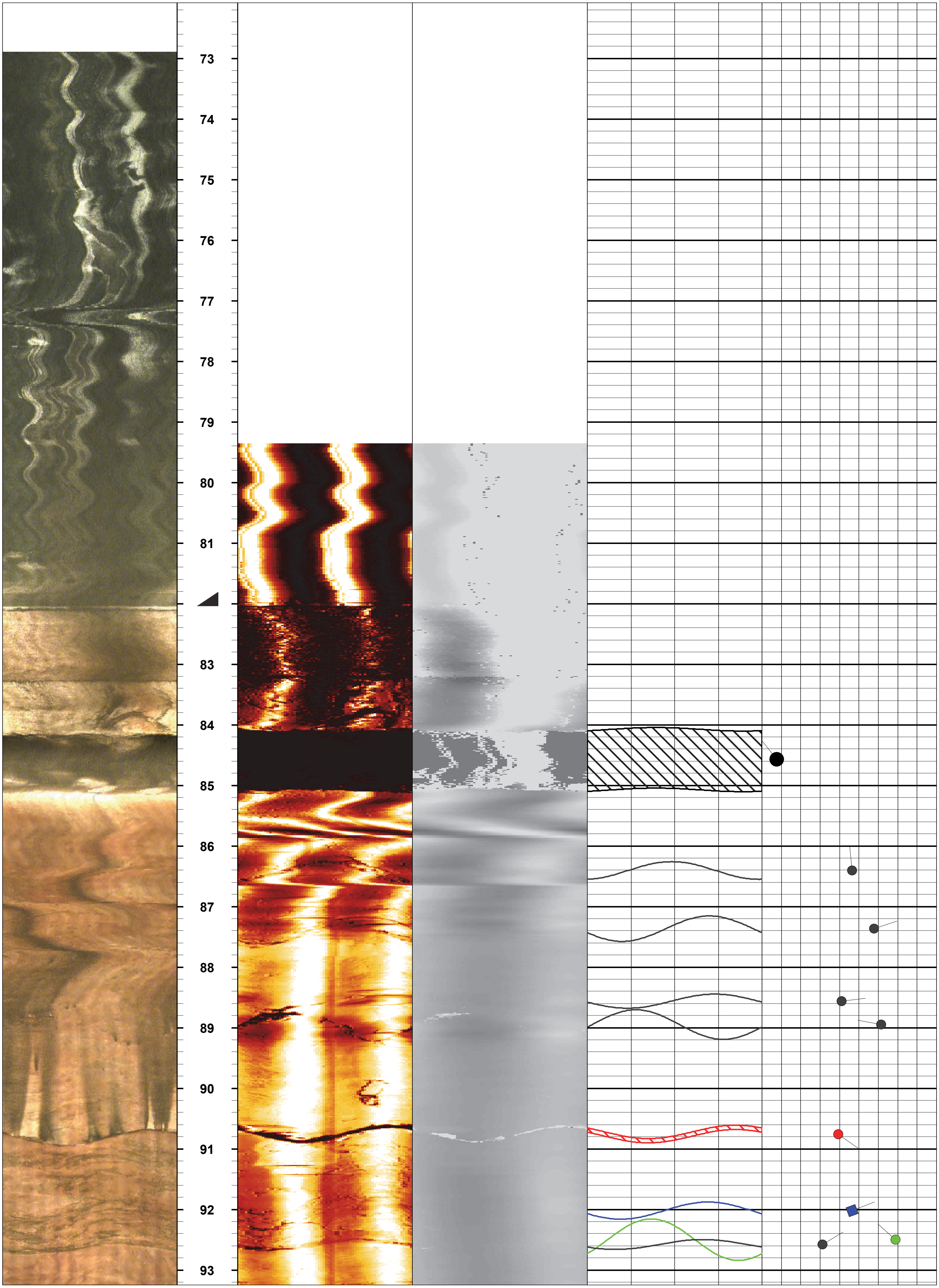
Bottom of Casing

Structure

Open Fracture
Bedding
Discontinuous Fract
Part. Open Fract
Filled Fracture
Broken/Void/Soft Zone

Optical Image	Depth	Acoustic Amplitude	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols				

69
70
71
72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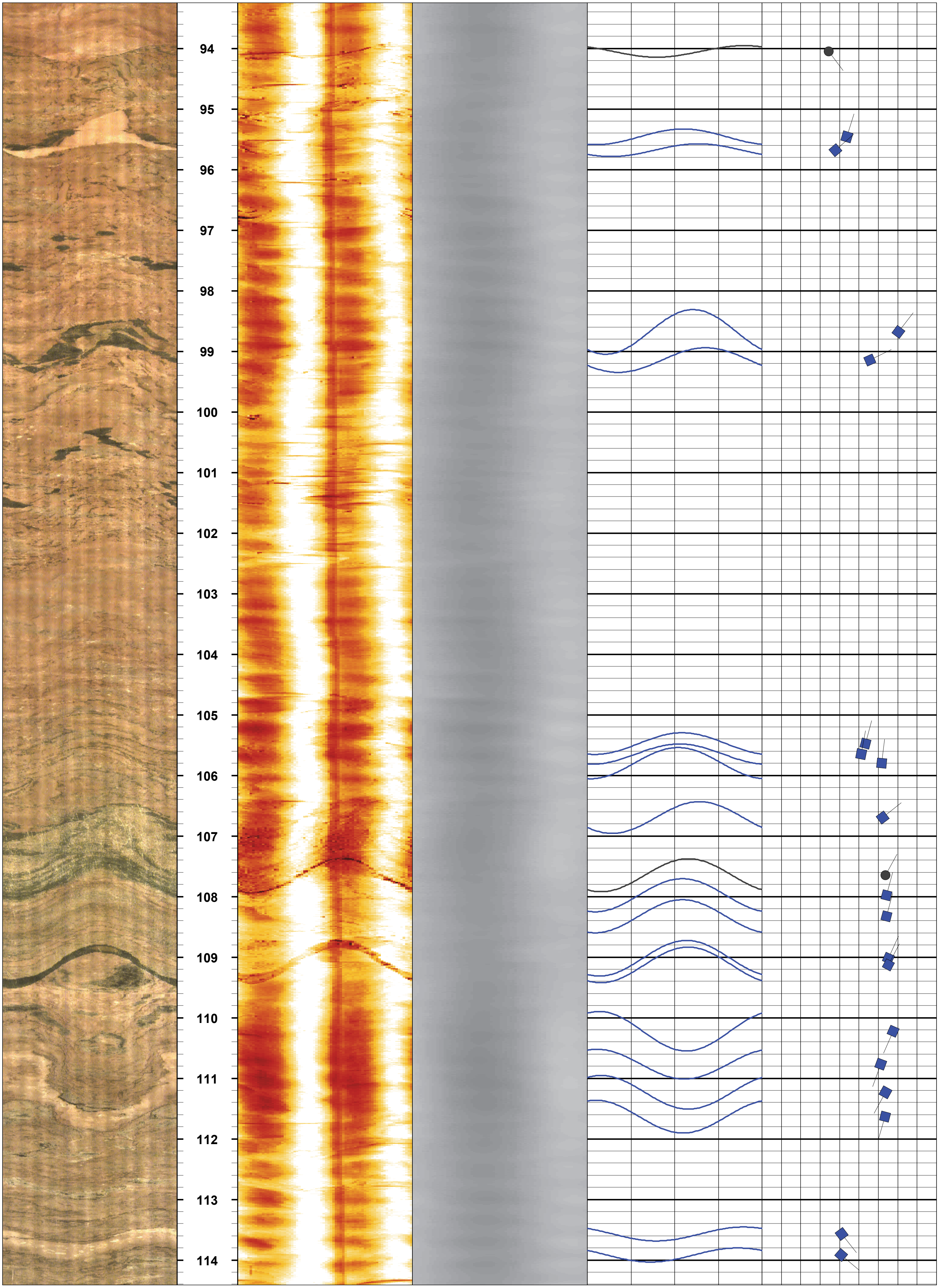
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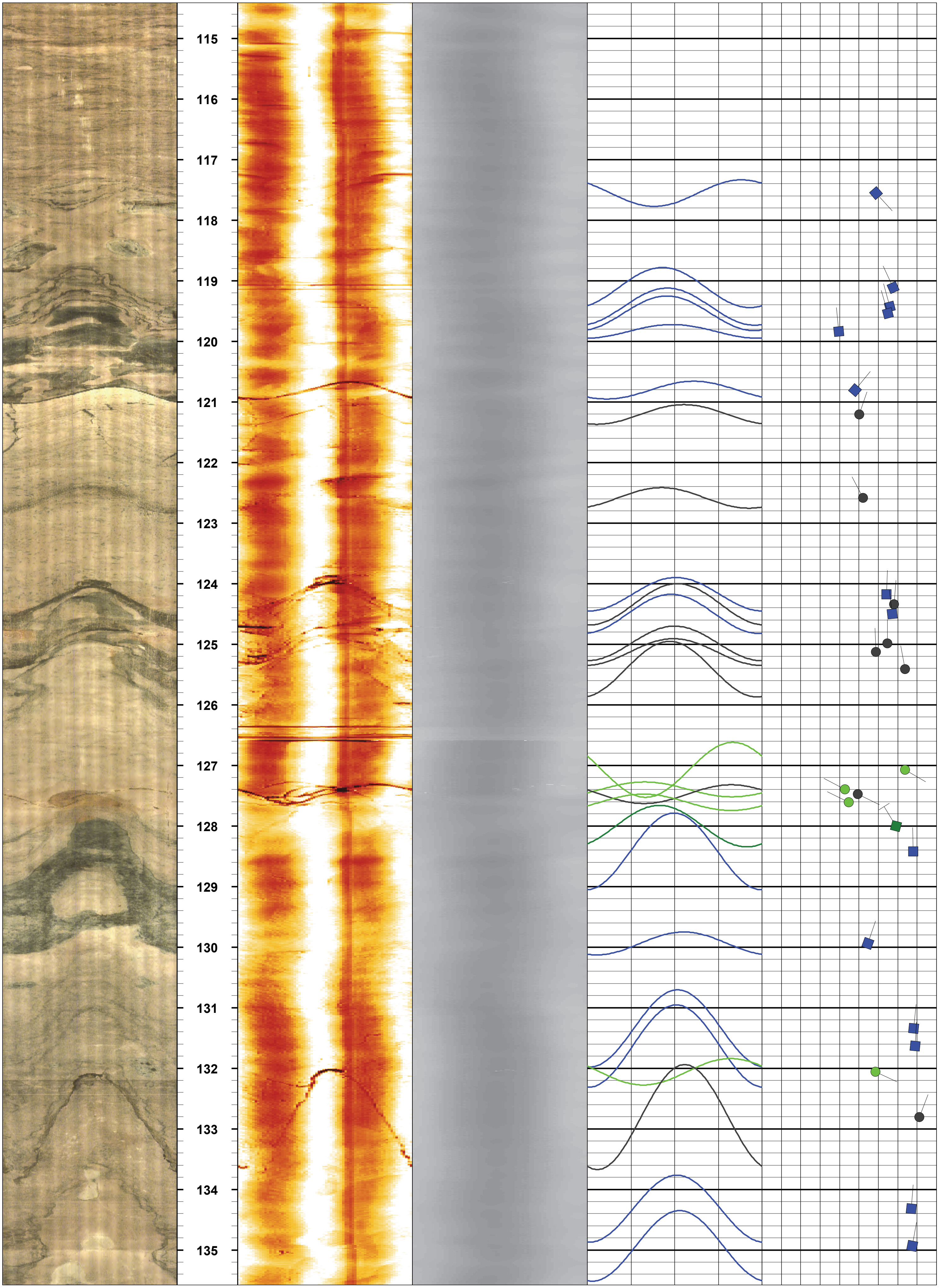
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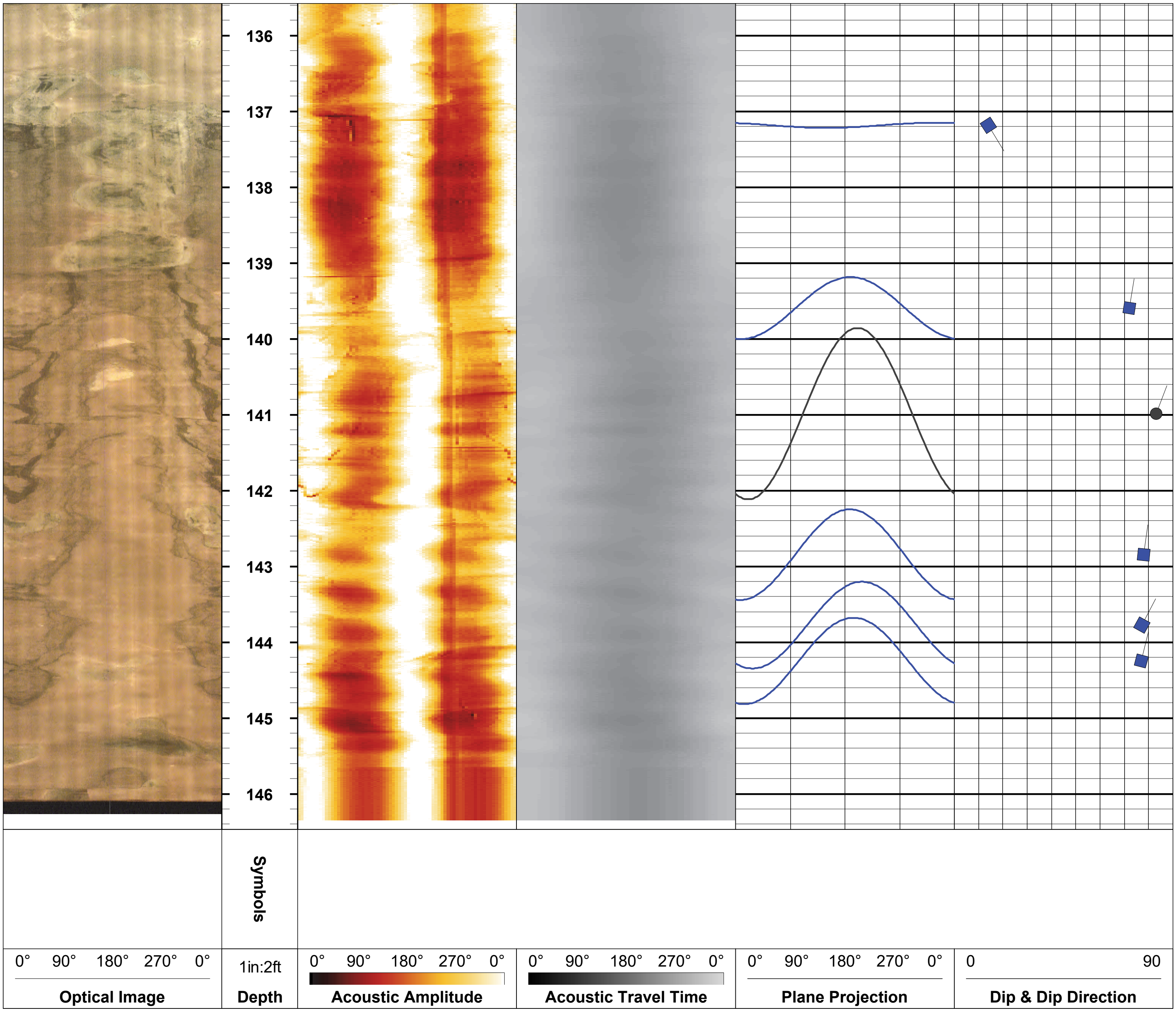
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142
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144
145
146
Symbols
0° 90° 180° 270° 0°
Optical Image
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Amplitude
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

ARM GEOPHYSICS — Surface & Borehole Services

COMP	**Stantec**
WELL	**93-1D**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec — STATE: TN
WELL ID: 93-1D — ARM NO.: 180734
FIELD/SITE: Cumberland City — API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD
SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface — ELEVATION: — K.B. N/A
LOG MEASURED FROM: Ground Surface — ABOVE PERM. DATUM: — D.F. N/A
DRILLING MEAS. FROM: Ground Surface — STICK UP: 0.68 — G.L. N/A

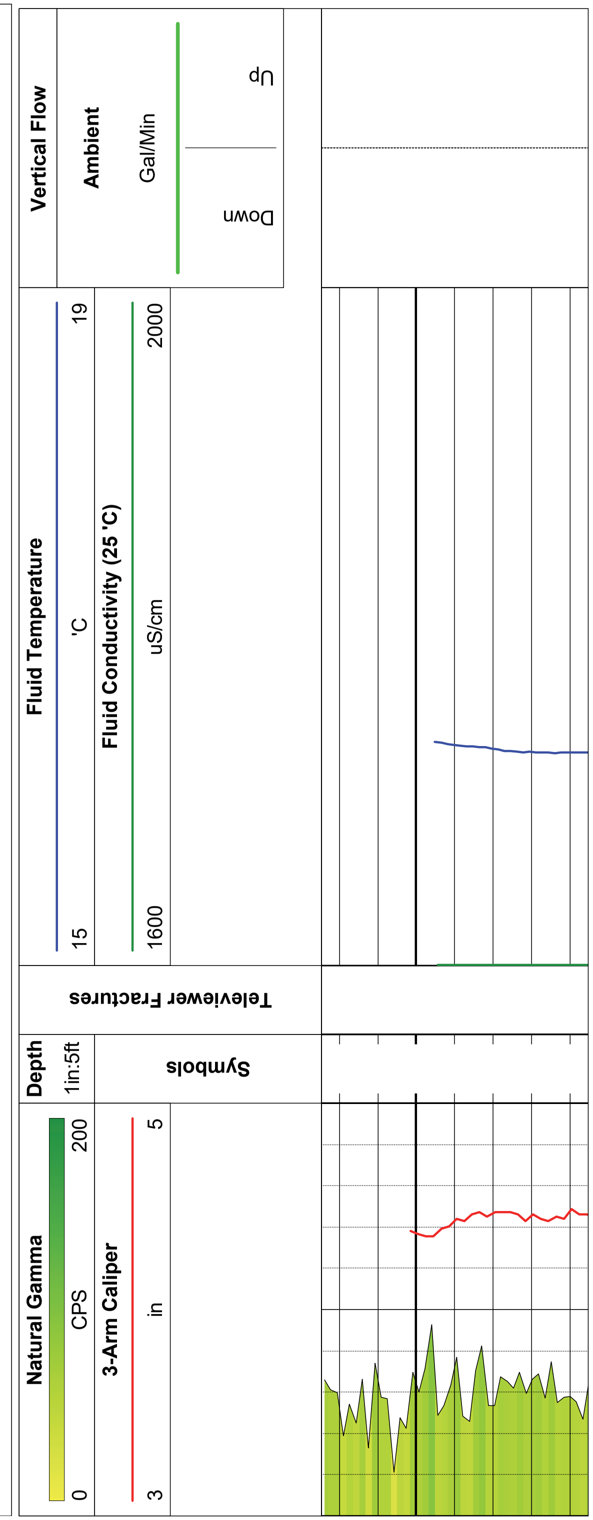
LOGGING DATE	02.06.2019	02.06.2019	02.06.2019	No Test Run	No Test Run
RUN NO	1	3	5		
TYPE LOG	FTC.GR	CAL	HPFM A		
DRILLER DEPTH (FT)	146.4	146.4	146.4		
ARM DEPTH (FT)	146.3	146.44	N/A		
BTM LOGGED INTERVAL (FT)	146.39	146.44	87		
TOP LOGGED INTERVAL (FT)	5.45	6	84		
CASING SIZE (IN)/DEPTH (FT)	4/76	4/76	4/76		
CASING ARM (FT)	82.04	82.04	82.04		
BIT SIZE (IN)	3.0	3.0	3.0		
FLUID LEVEL IN HOLE (FT)	34.85	34.85	34.85		
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W		
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic		
WITNESSED BY	N/A	N/A	N/A		

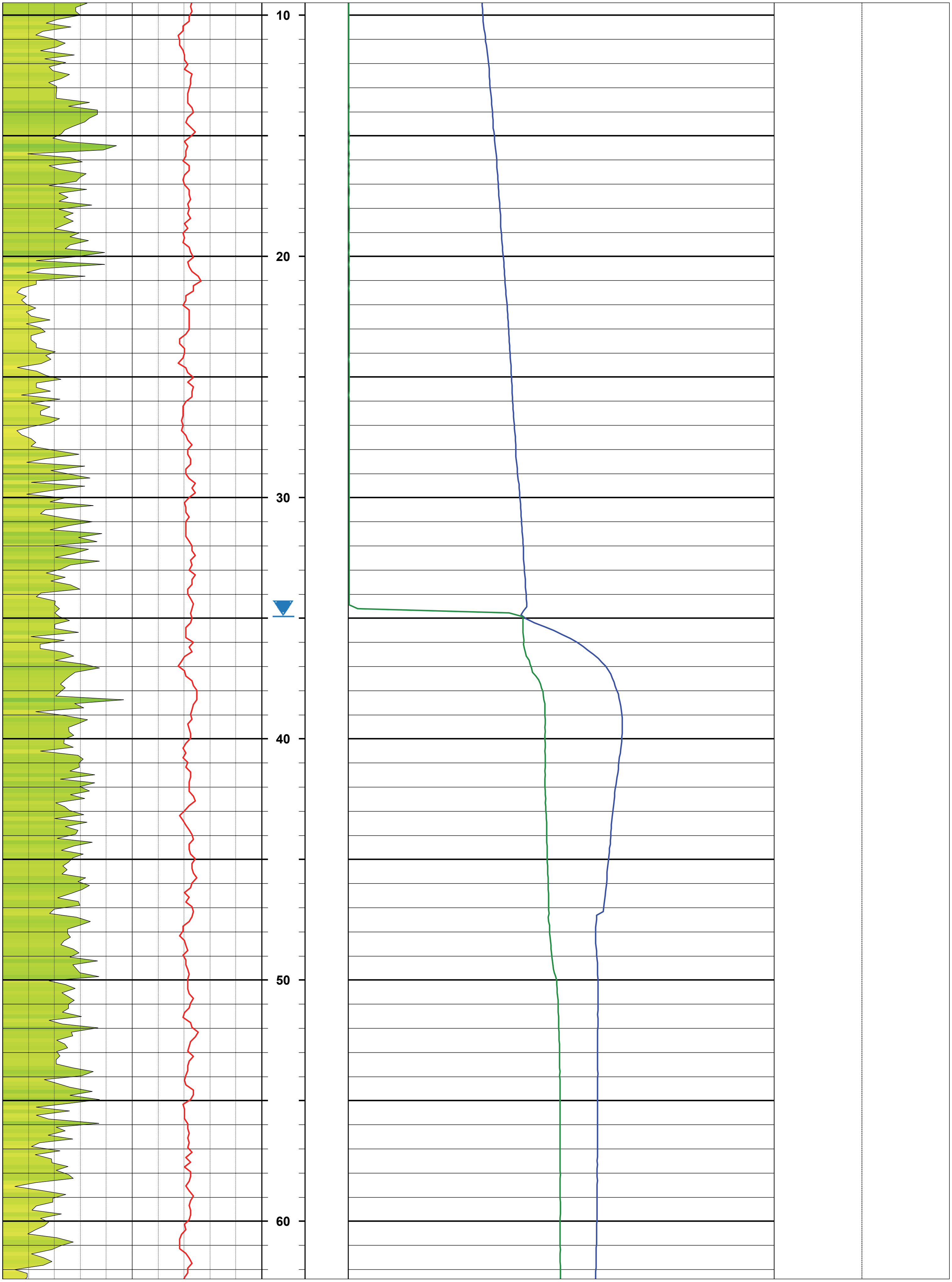
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

Symbols

Bottom of Casing

Fluid Level

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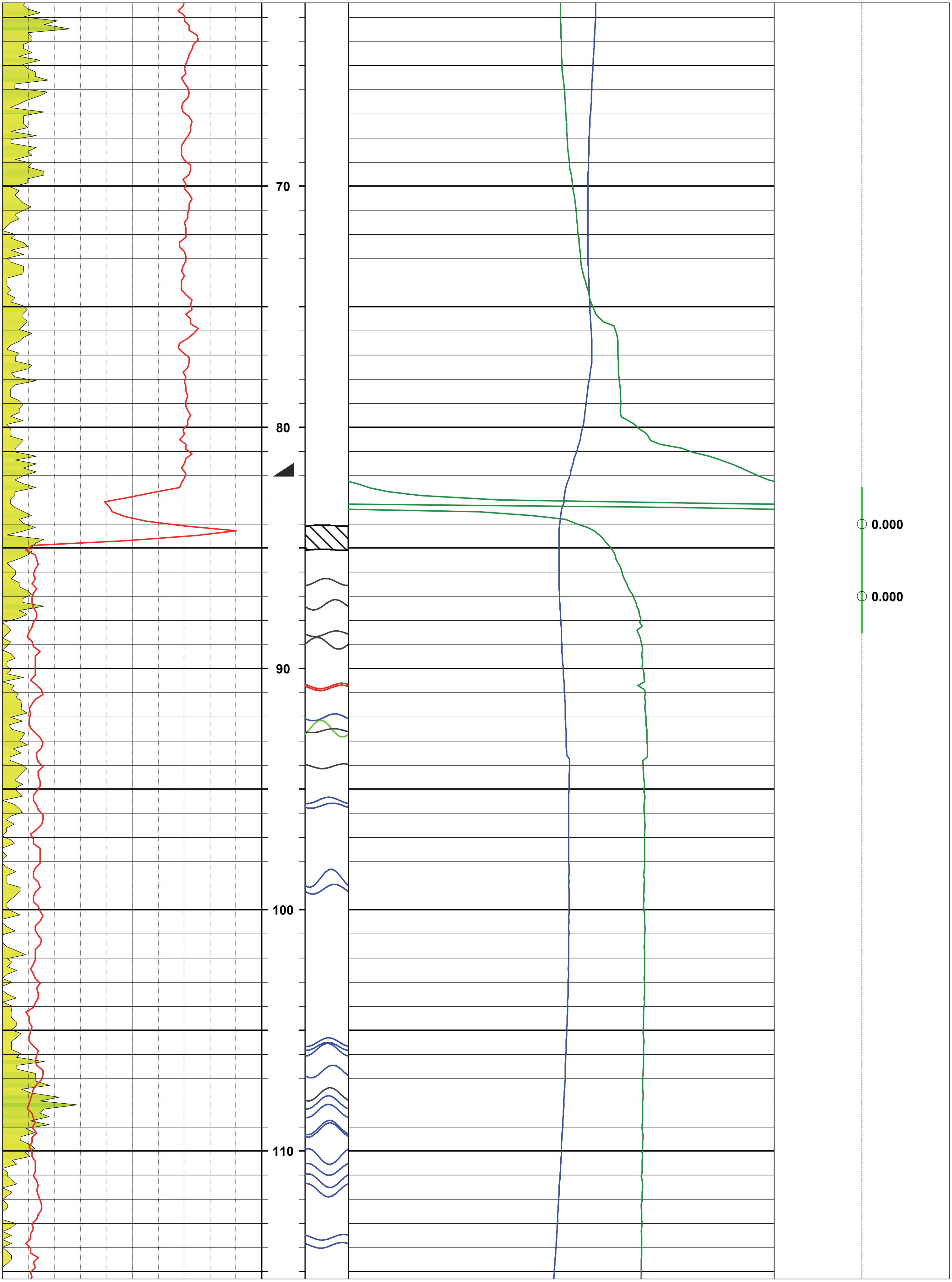
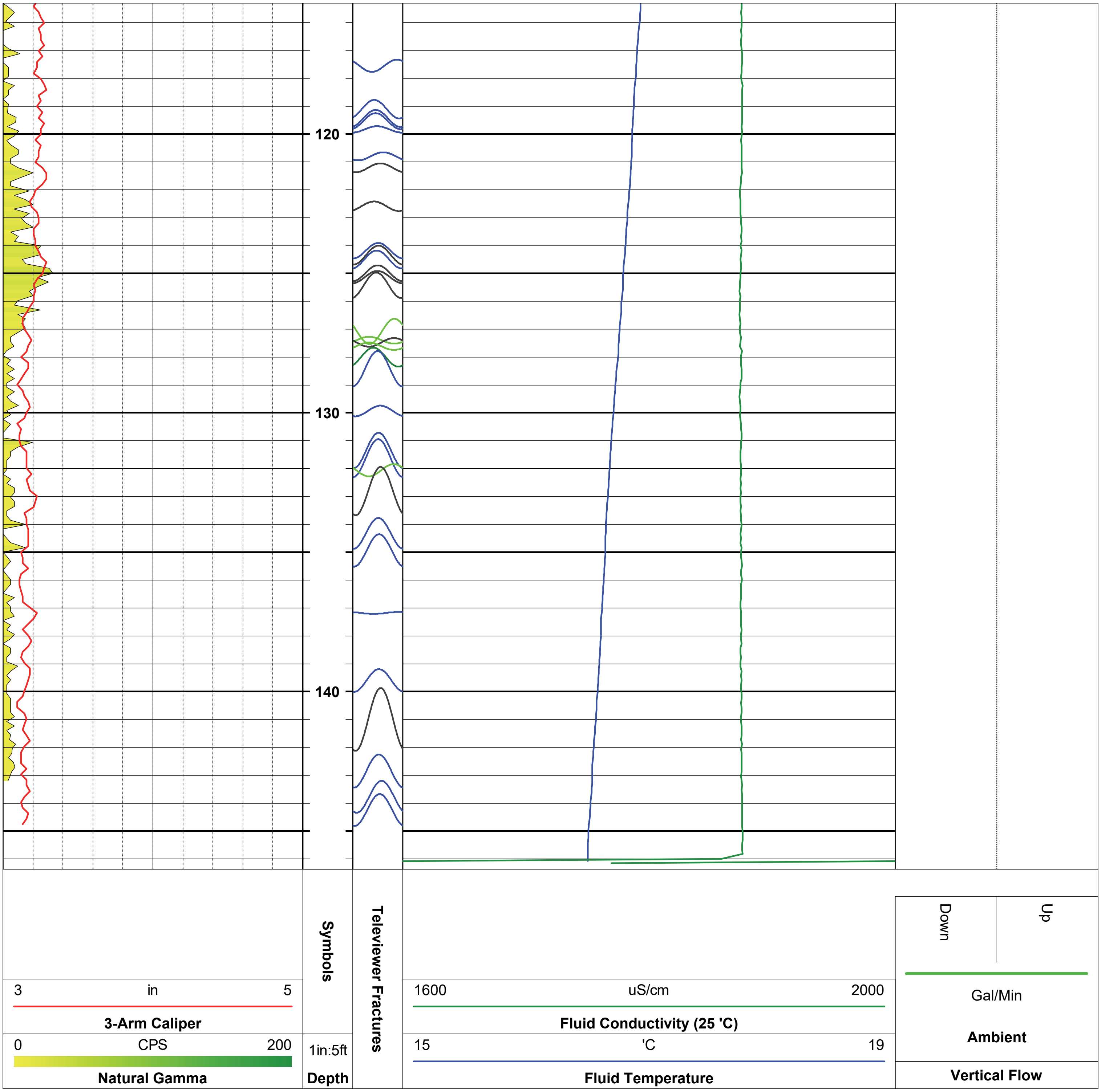
60


70
80
90
100
110
0.000
0.000



120
130
140
Symbols
Televiewer Fractures
Down
Up
3 in 5
3-Arm Caliper
0 CPS 200
Natural Gamma
1in:5ft
Depth
1600 uS/cm 2000
Fluid Conductivity (25 'C)
15 'C 19
Fluid Temperature
Gal/Min
Ambient
Vertical Flow

B11

Acoustic Televiewer

COMP	**Stantec**
WELL	**B11**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec STATE: TN
WELL ID: B11 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD
SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 0.9 G.L. N/A

LOGGING DATE	04.02.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	3				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	104				
ARM DEPTH (FT)	104.3				
BTM LOGGED INTERVAL (FT)	104.59				
TOP LOGGED INTERVAL (FT)	80				
CASING SIZE (IN)/DEPTH (FT)	4/84				
CASING ARM (FT)	83.68				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	26.68				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

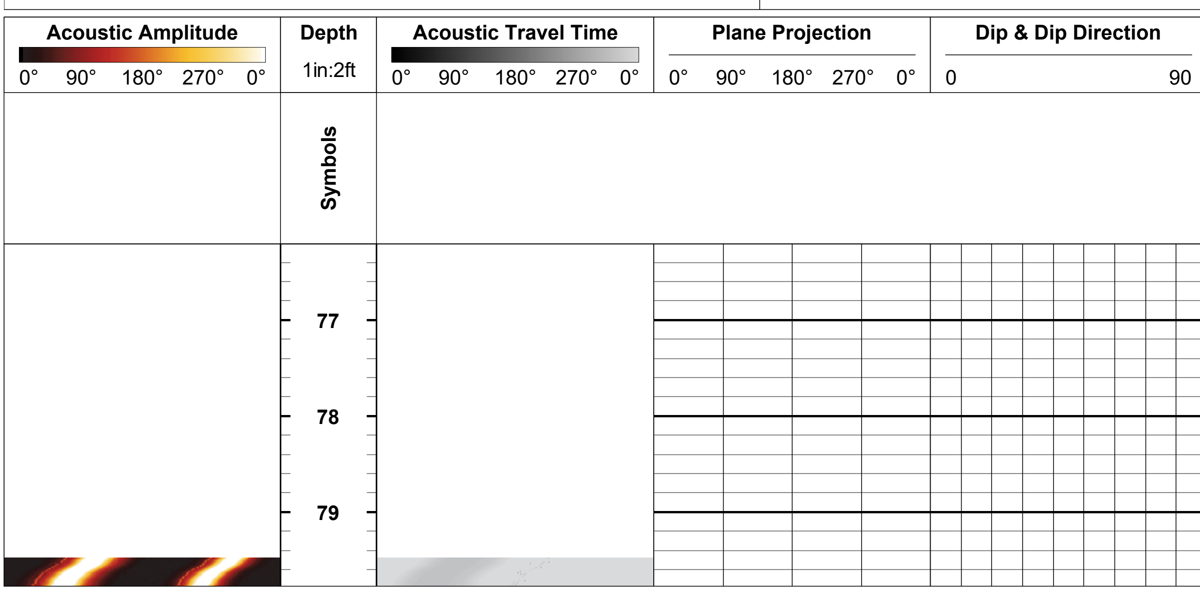
Symbols

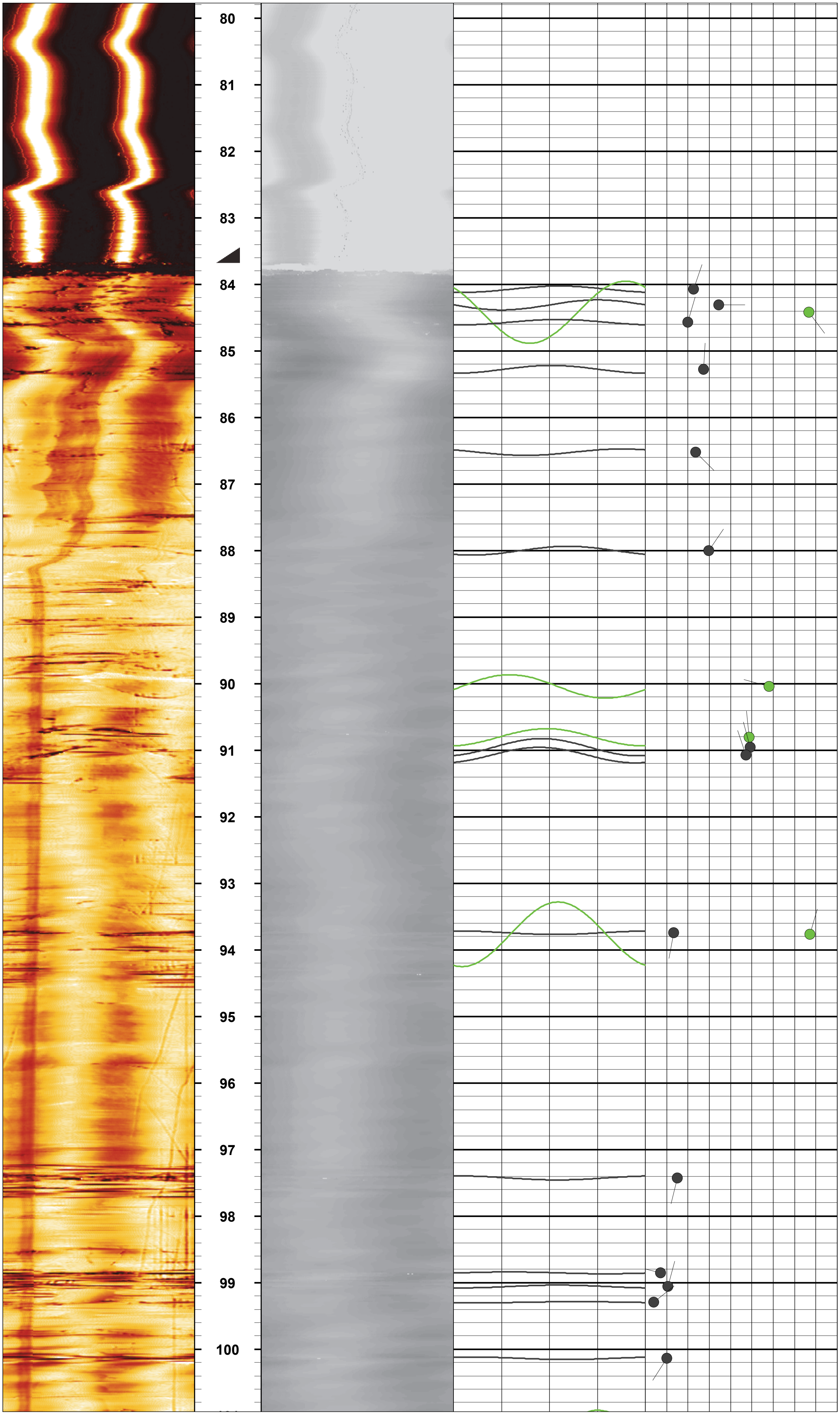
Bottom of Casing

Structure

Discontinuous Fract

Part. Open Fract

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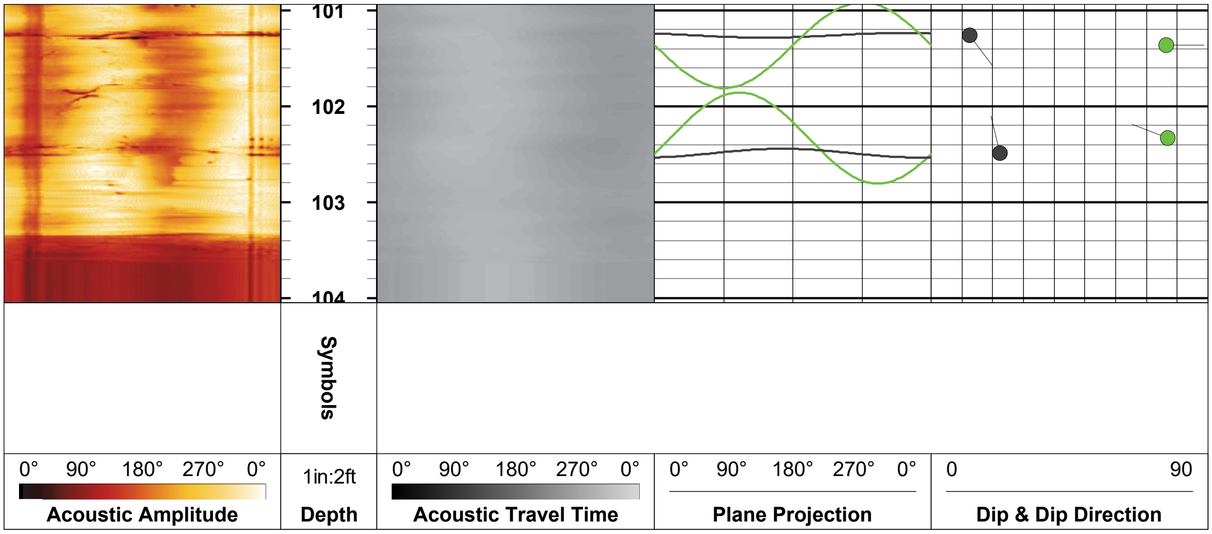

101
102
103
104
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0
90
Dip & Dip Direction

Hydro Log

ARM GEOPHYSICS
Surface & Borehole Services

COMP	**Stantec**
WELL	**B11**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec STATE: TN
WELL ID: B11 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 0.9 G.L. N/A

LOGGING DATE	04.02.2019	04.02.2019	04.02.2019	04.02.2019	No Test Run
RUN NO	1	2	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	104	104	104	104	
ARM DEPTH (FT)	104	104.22	N/A	N/A	
BTM LOGGED INTERVAL (FT)	104.36	104.22	102.01	102.01	
TOP LOGGED INTERVAL (FT)	5.23	5.78	84	84	
CASING SIZE (IN)/DEPTH (FT)	4/84	4/84	4/84	4/84	
CASING ARM (FT)	83.68	83.68	83.68	83.68	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	26.78	26.78	26.78	26.78	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

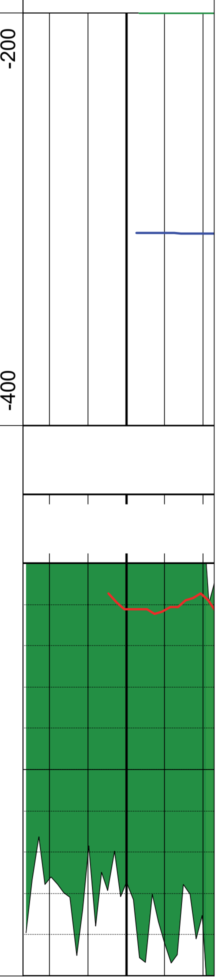
pH, O2%, and Redox data provided by Stantec.

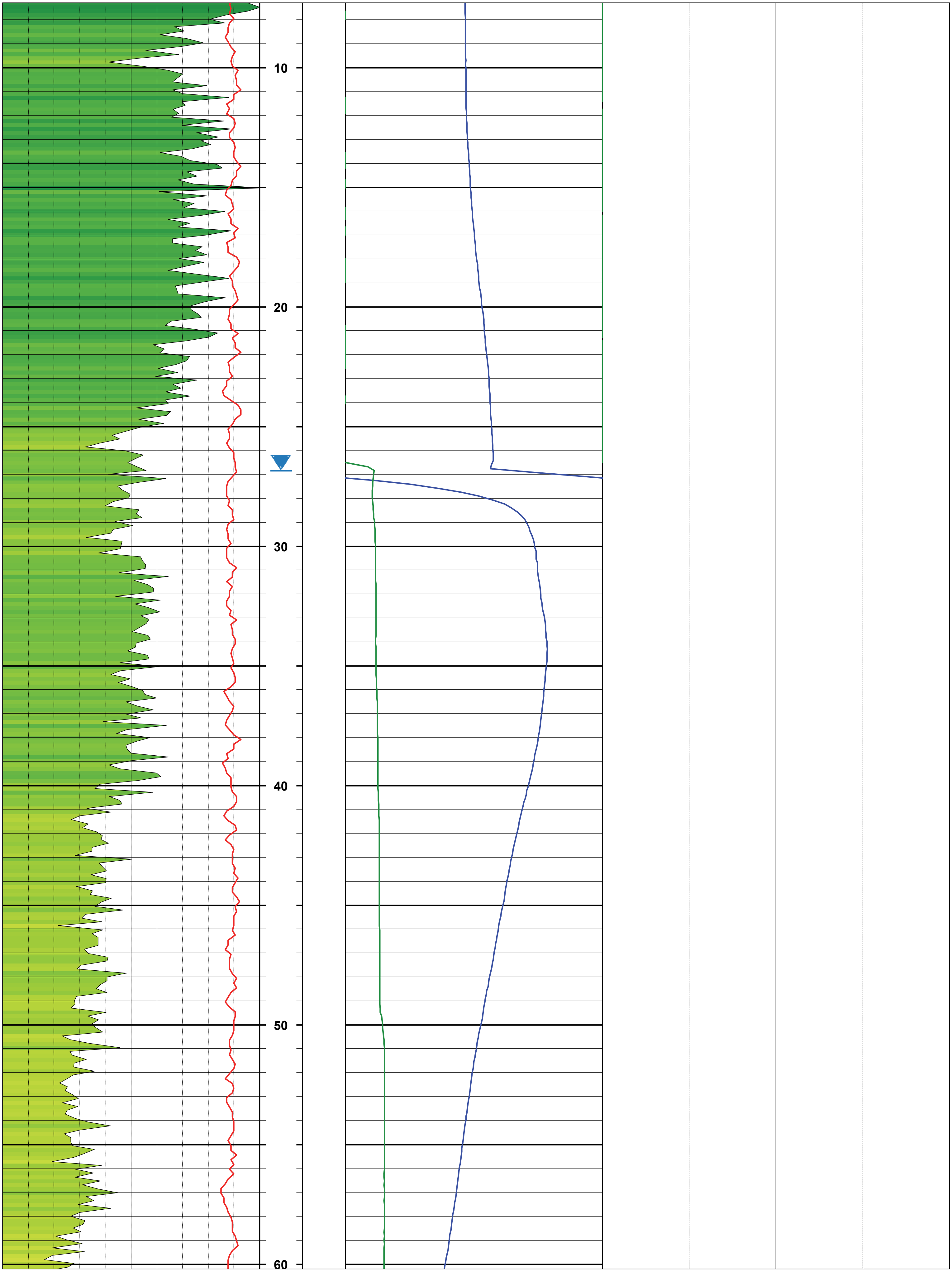
Symbols

Bottom of Casing

Fluid Level

Natural Gamma 0 CPS 200
3-Arm Caliper 2 in 4
Depth 1in:5ft
Symbols
Televiewer Fractures
Fluid Temperature 16 'C 20
Fluid Conductivity (25 'C) 0 uS/cm 2000
pH 7 9
O2% 0.4 0.8
Redox -400 -200
Vertical Flow
Ambient Gal/Min Down Up
Pumping Gal/Min Down Up





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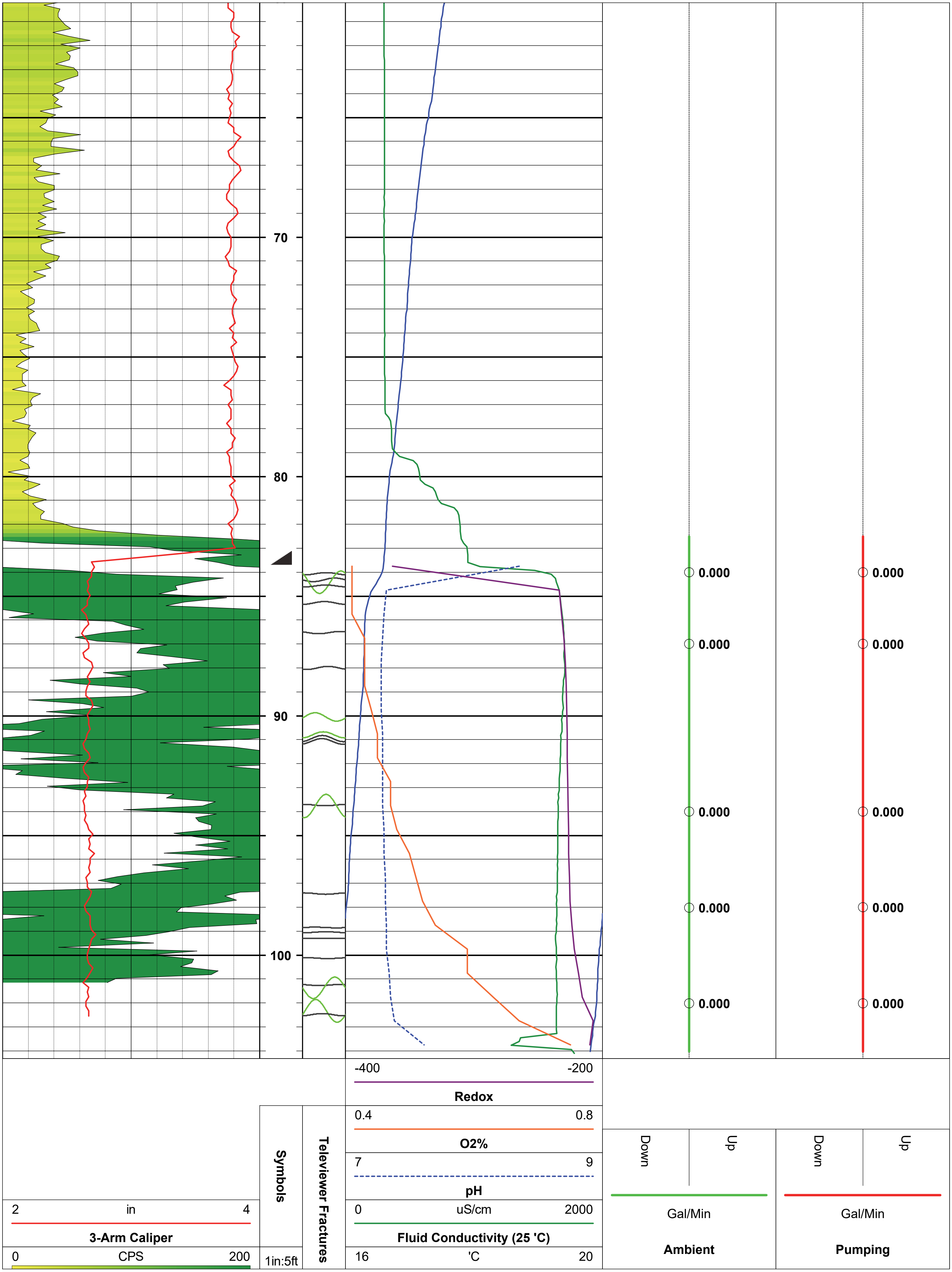


70
80
90
100
0.000
-400
-200
Redox
0.4
0.8
O2%
7
9
pH
0
uS/cm
2000
Fluid Conductivity (25 'C)
16
'C
20
2
in
4
3-Arm Caliper
0
CPS
200
Symbols
1in:5ft
Televiewer Fractures
Down
Up
Gal/Min
Ambient
Pumping

Natural Gamma	Depth		Fluid Temperature	Vertical Flow

B12

Acoustic Televiewer

COMP	**Stantec**
WELL	**B12**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec STATE: TN
WELL ID: B12 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 2.41 G.L. N/A

LOGGING DATE	04.02.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	3				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	70				
ARM DEPTH (FT)	69.85				
BTM LOGGED INTERVAL (FT)	69.85				
TOP LOGGED INTERVAL (FT)	47				
CASING SIZE (IN)/DEPTH (FT)	4/50				
CASING ARM (FT)	50.03				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	23.28				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

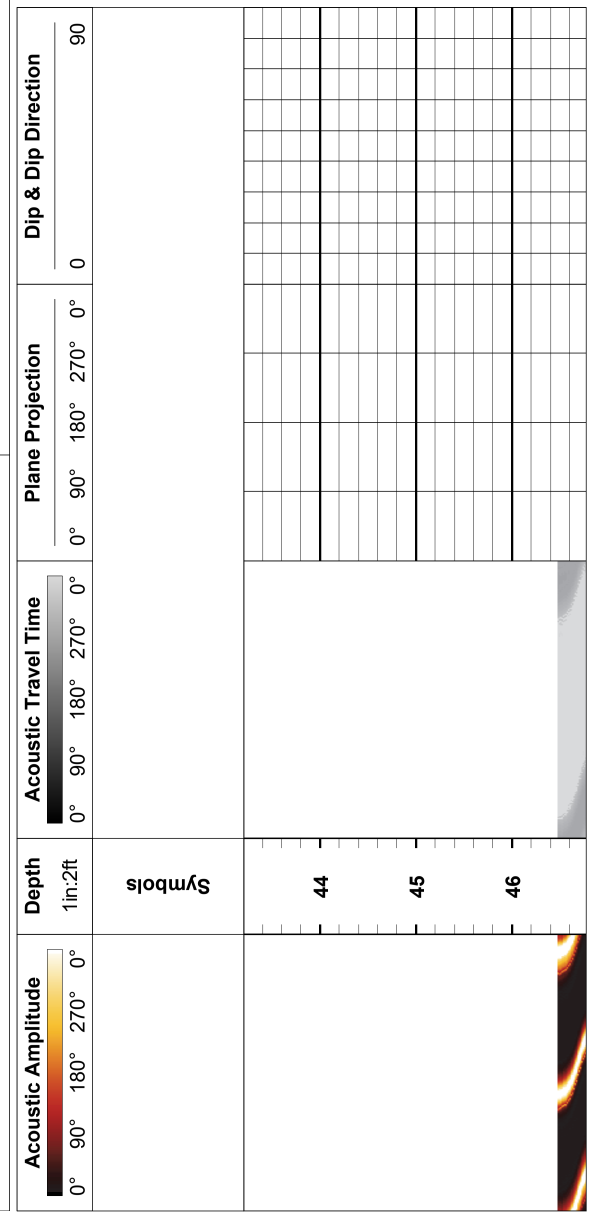
Symbols

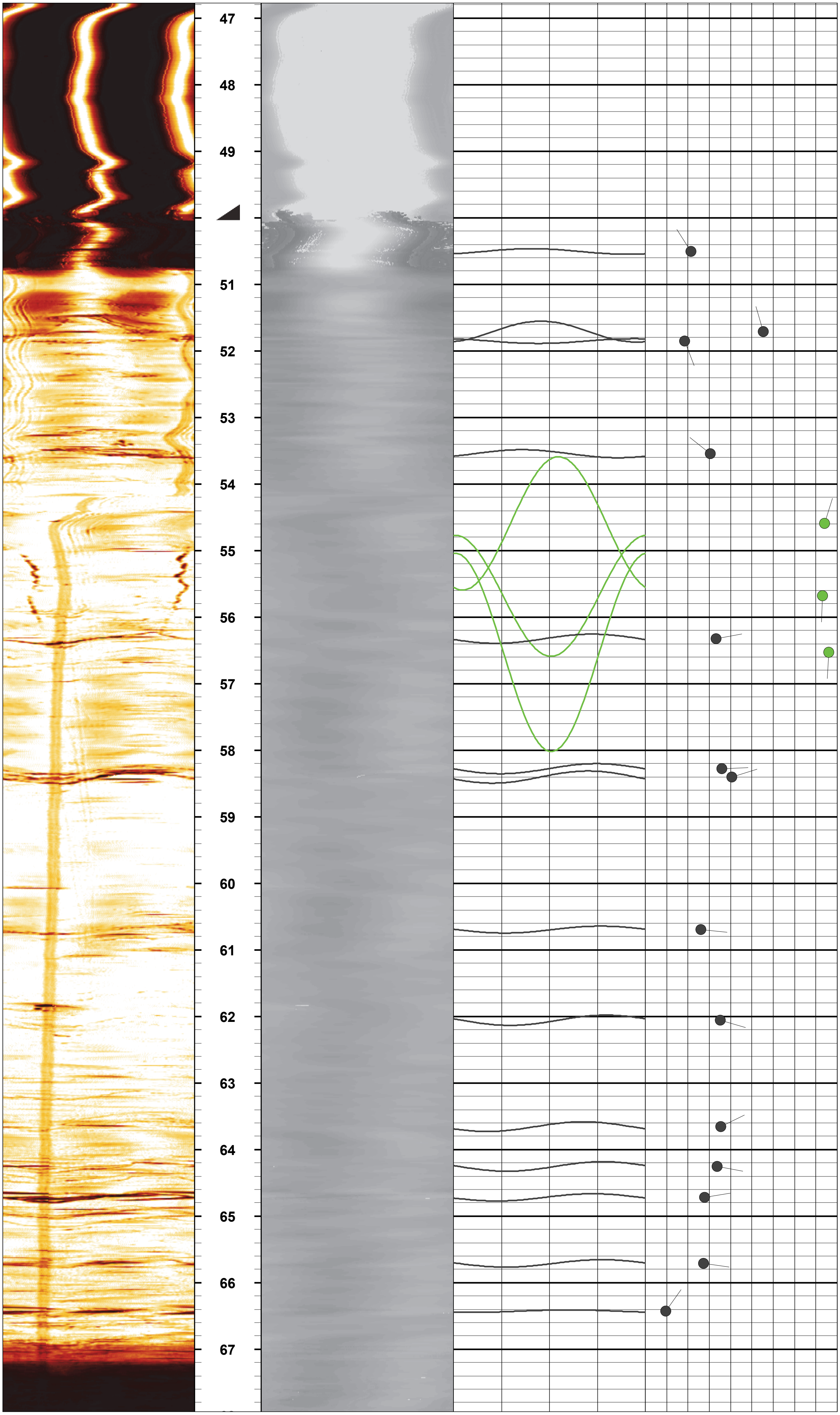
Bottom of Casing

Structure

Discontinuous Fract

Part. Open Fract

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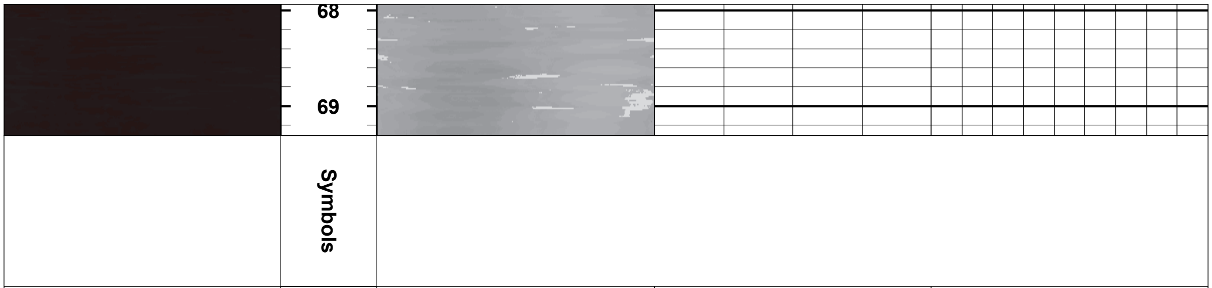


0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
Acoustic Amplitude	**Depth**	**Acoustic Travel Time**	**Plane Projection**	**Dip & Dip Direction**

Hydro Log

ARM GEOPHYSICS
Surface & Borehole Services

COMP	Stantec
WELL	B12
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec STATE: TN
WELL ID: B12 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00
DRILLING MEAS. FROM: Ground Surface STICK UP: 2.41

K.B. N/A
D.F. N/A
G.L. N/A

LOGGING DATE	04.02.2019	04.02.2019	04.02.2019	04.02.2019	No Test Run
RUN NO	1	2	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	70	70	70	70	
ARM DEPTH (FT)	69.9	69.94	N/A	N/A	
BTM LOGGED INTERVAL (FT)	69.9	69.94	67	67	
TOP LOGGED INTERVAL (FT)	3.72	4.27	51	51	
CASING SIZE (IN)/DEPTH (FT)	4/50	4/50	4/50	4/50	
CASING ARM (FT)	50.03	50.03	50.03	50.03	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	23.28	23.28	23.28	23.28	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

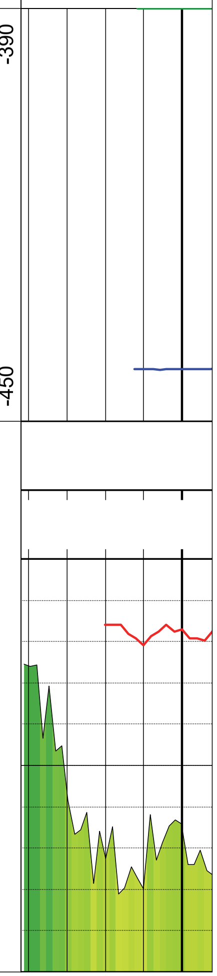
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

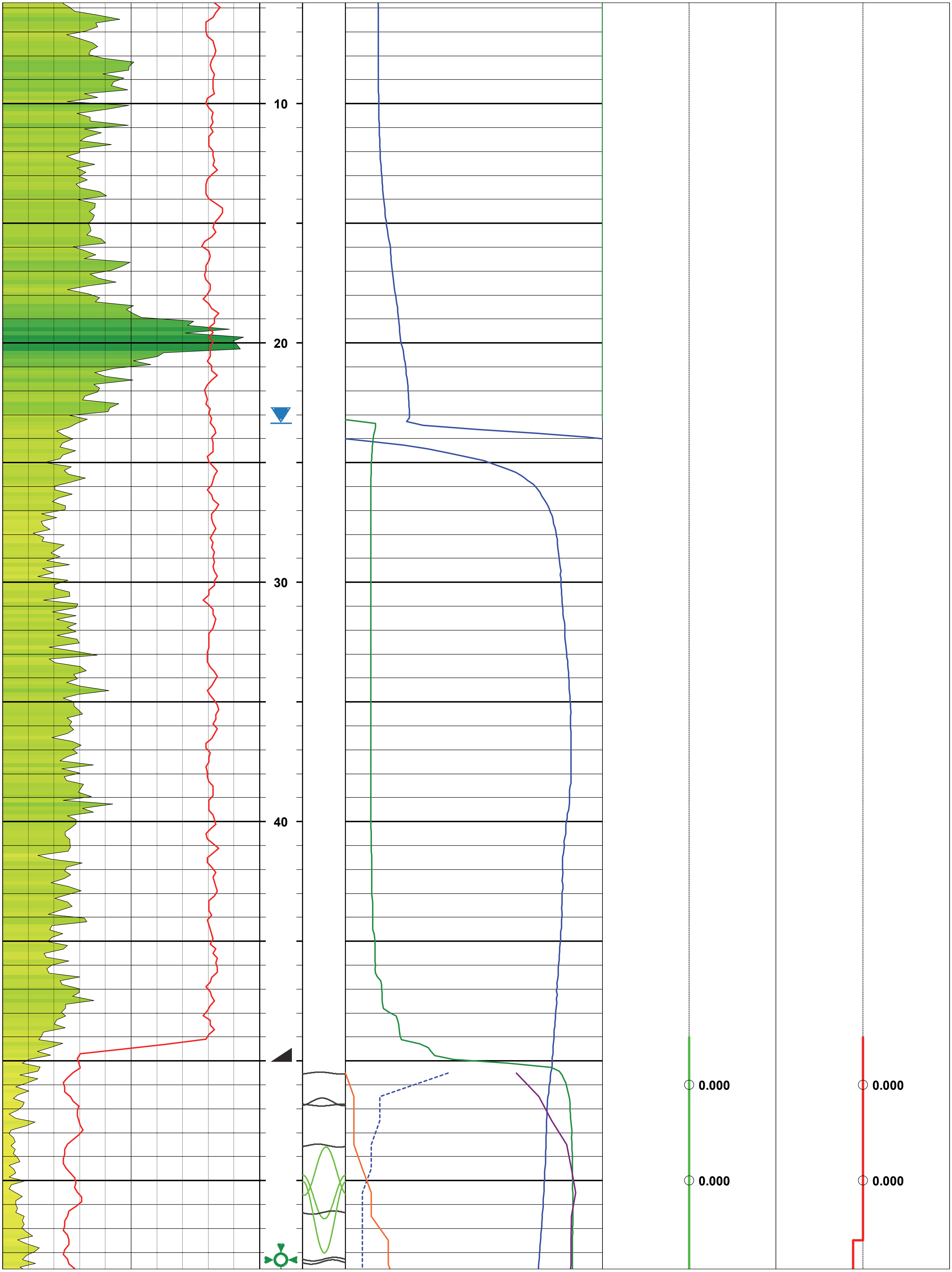
pH, O2%, and Redox data provided by Stantec.

Symbols

Bottom of Casing
Receiving Zone
Down Flow
Fluid Level
Producing Zone

Natural Gamma	0 CPS 200
3-Arm Caliper	2 in 4
Depth	1in:5ft
Symbols	
Televiewer Fractures	
Fluid Temperature	15 'C 19
Fluid Conductivity (25 'C)	0 uS/cm 2400
pH	7 7.3
O2%	0.4 0.7
Redox	-450 -390
Vertical Flow – Ambient	Gal/Min (Down / Up)
Vertical Flow – Pumping	Gal/Min (Down / Up)

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0.000
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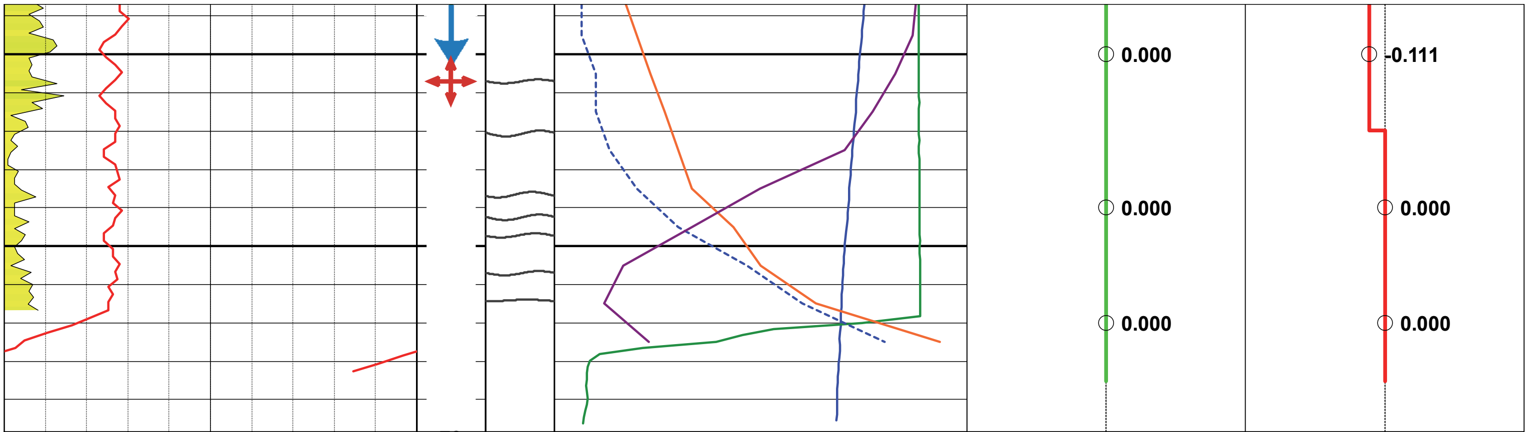
0.000
0.000



-450 -390
Redox

0.4 0.7
O2%

7 7.3
pH

0 uS/cm 2400
Fluid Conductivity (25 'C)

15 'C 19
Fluid Temperature

2 in 4
3-Arm Caliper

0 CPS 200
Natural Gamma

Symbols

1in:5ft
Depth

Televiewer Fractures

Down Up
Gal/Min
Ambient

Down Up
Gal/Min
Pumping

Vertical Flow

B13

Acoustic Televiewer

ARM GEOPHYSICS — Surface & Borehole Services

COMP	**Stantec**
WELL	**B13**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec — STATE: TN
WELL ID: B13 — ARM NO.: 180734
FIELD/SITE: Cumberland City — API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface — ELEVATION: TBD — K.B. N/A
LOG MEASURED FROM: Ground Surface — ABOVE PERM. DATUM: 0.00 — D.F. N/A
DRILLING MEAS. FROM: Ground Surface — STICK UP: 0.72 — G.L. N/A

LOGGING DATE	04.04.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	3				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	80.5				
ARM DEPTH (FT)	80.5				
BTM LOGGED INTERVAL (FT)	80.57				
TOP LOGGED INTERVAL (FT)	68				
CASING SIZE (IN)/DEPTH (FT)	4/69.7				
CASING ARM (FT)	69.85				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	30.58				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

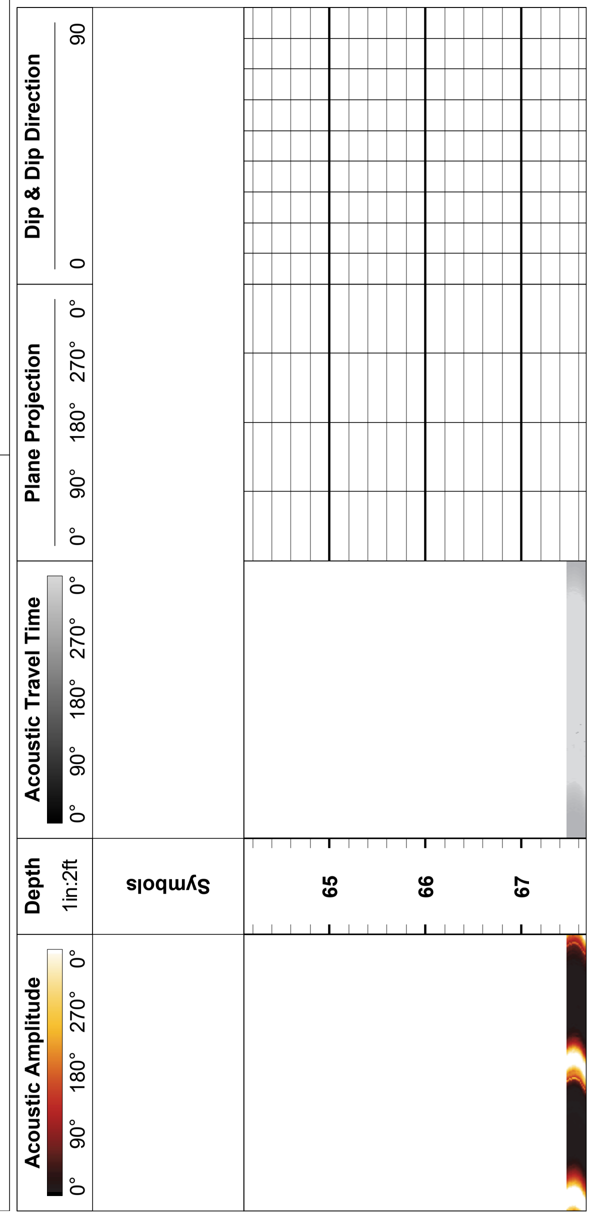
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

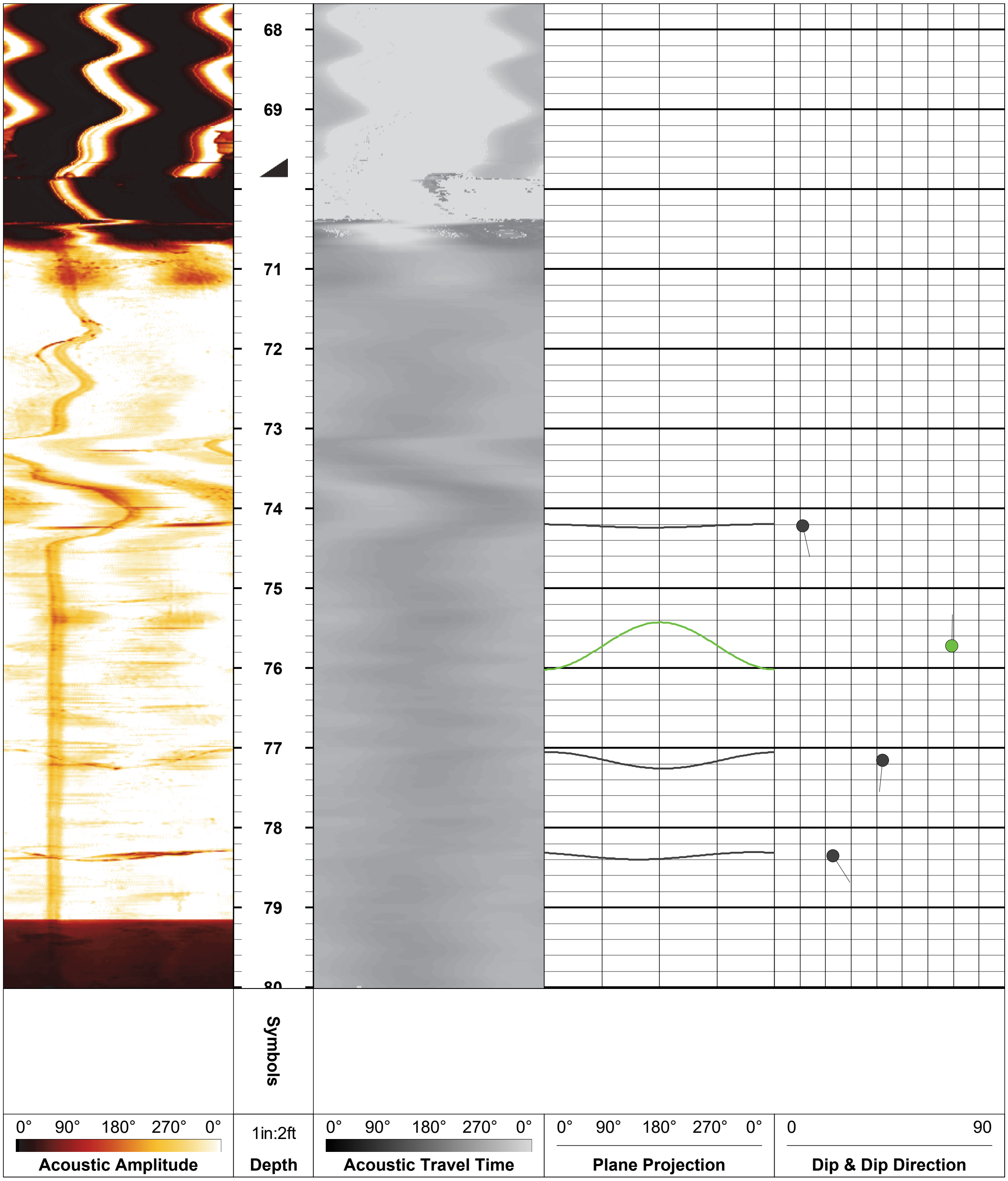
Symbols

Bottom of Casing

Structure

Discontinuous Fract
Part. Open Fract




68
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77
78
79
80
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

COMP	Stantec
WELL	B13
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec STATE: TN
WELL ID: B13 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 0.72 G.L. N/A

LOGGING DATE	04.04.2019	04.04.2019	04.04.2019	04.04.2019	No Test Run
RUN NO	1	2	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	80.5	80.5	80.5	80.5	
ARM DEPTH (FT)	80.5	80.6	N/A	N/A	
BTM LOGGED INTERVAL (FT)	80.59	80.6	79.50	79.49	
TOP LOGGED INTERVAL (FT)	5.41	5.96	72	71.88	
CASING SIZE (IN)/DEPTH (FT)	4/69.7	4/69.7	4/69.7	4/69.7	
CASING ARM (FT)	69.85	69.85	69.85	69.85	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	30.58	30.58	30.58	30.58	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

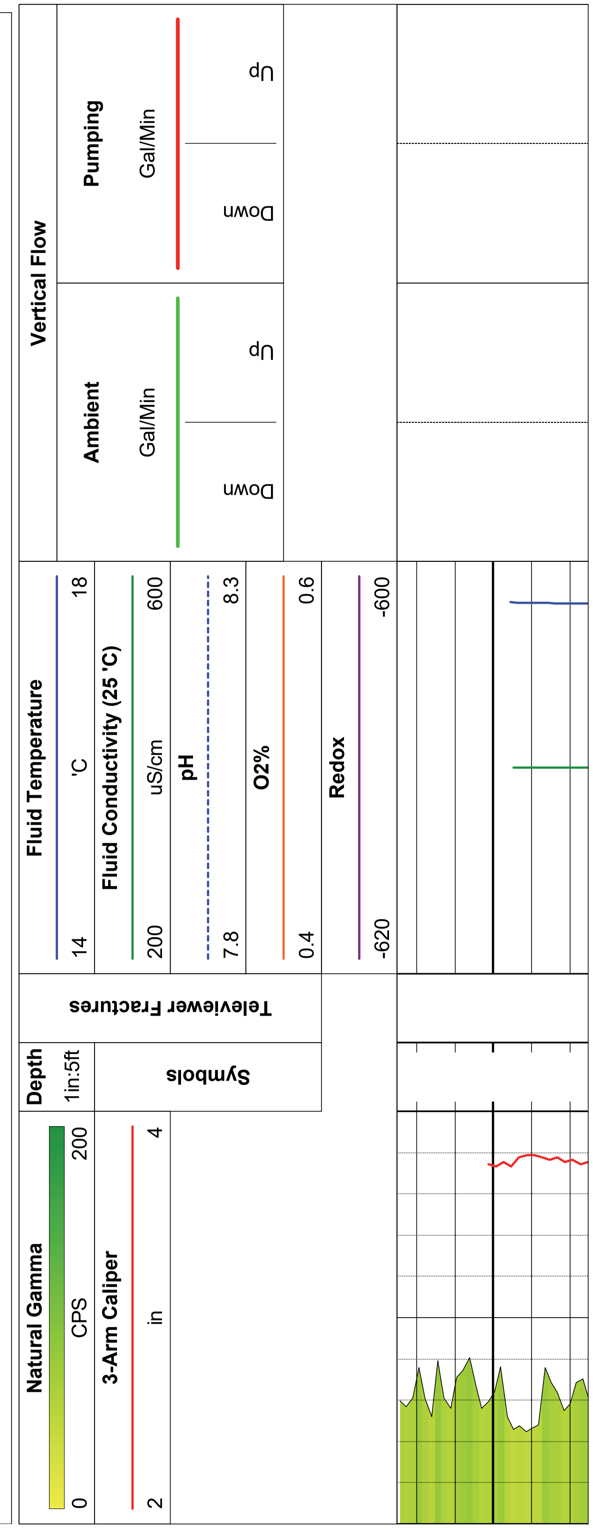
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

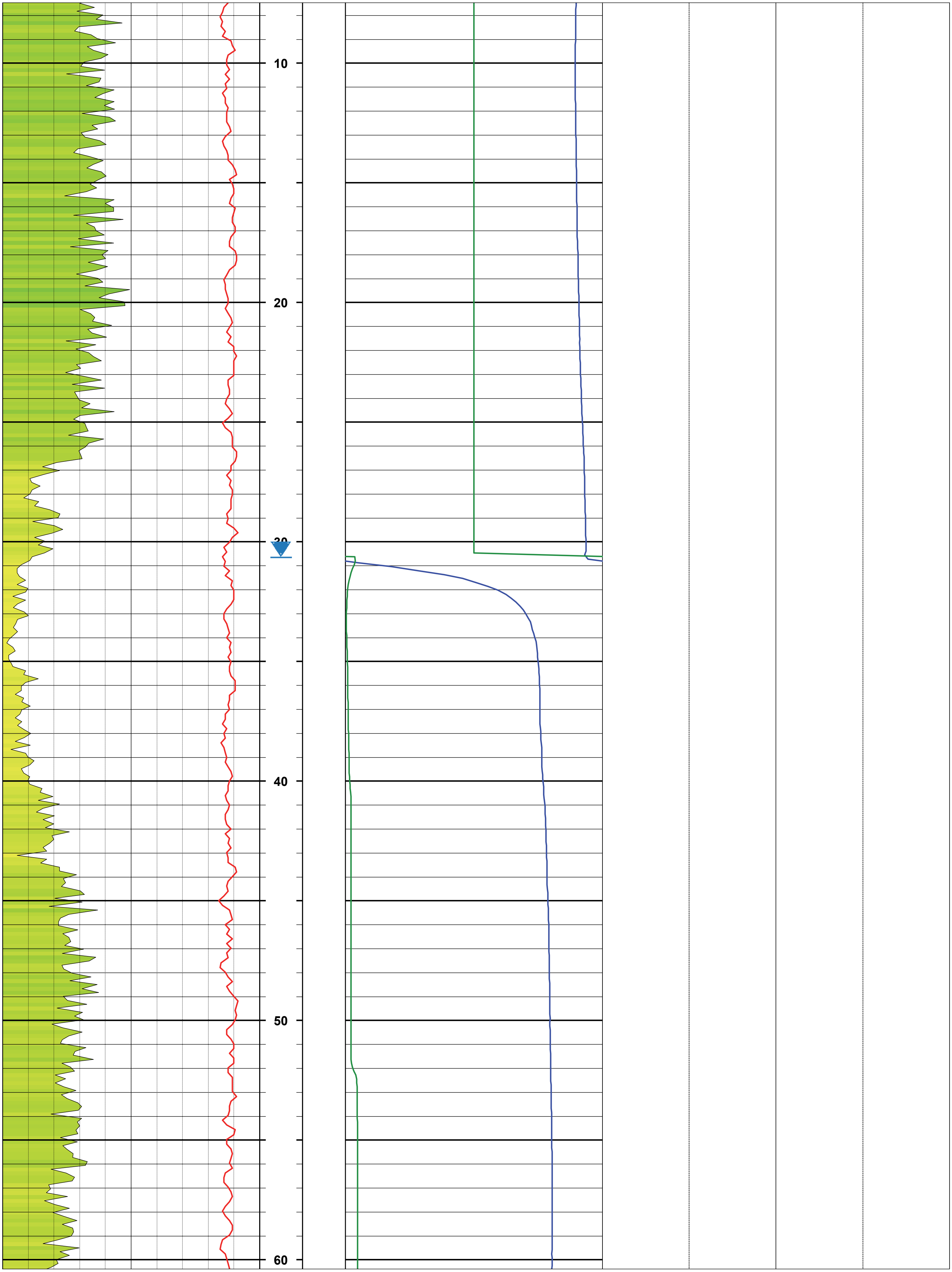
pH, O2%, and Redox data provided by Stantec.

Symbols

Bottom of Casing

Fluid Level




10
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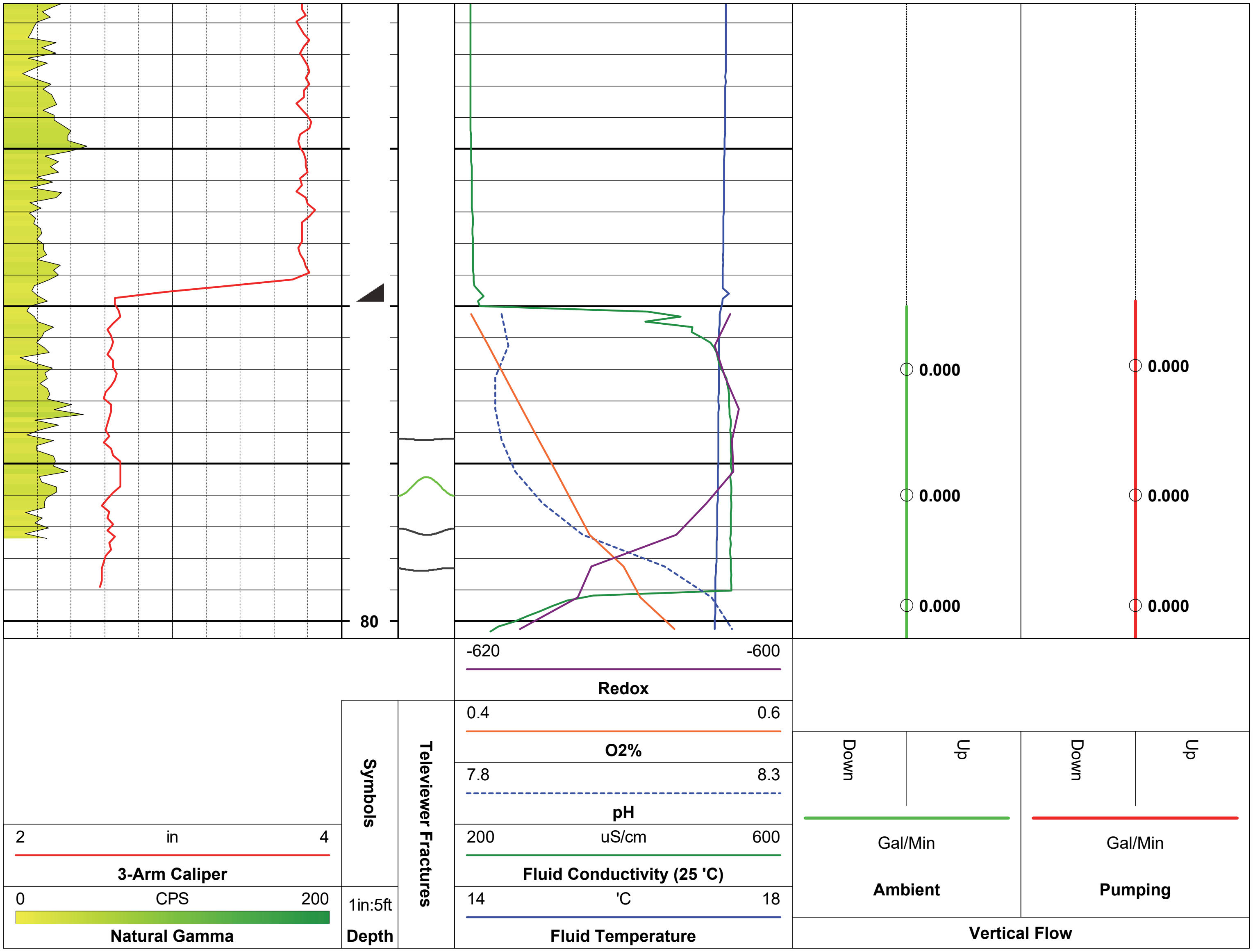


80
0.000
0.000
0.000
0.000
0.000
0.000
-620 -600
Redox
0.4 0.6
O2%
7.8 8.3
pH
200 uS/cm 600
Fluid Conductivity (25 'C)
14 'C 18
Fluid Temperature
2 in 4
3-Arm Caliper
0 CPS 200
Natural Gamma
Symbols
1in:5ft
Depth
Televiewer Fractures
Down
Up
Gal/Min
Ambient
Down
Up
Gal/Min
Pumping
Vertical Flow

B14

Acoustic Televiewer

COMP	**Stantec**
WELL	**B14**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec — STATE: TN

WELL ID: B14 — ARM NO.: 180734

FIELD/SITE: Cumberland City — API NO.: N/A

COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

OTHER SERVICES
Ford F-350

SEC: TBD TWP: TBD QUAD: TBD

PERMANENT DATUM: Ground Surface — ELEVATION: TBD — K.B. N/A

LOG MEASURED FROM: Ground Surface — ABOVE PERM. DATUM: 0.00 — D.F. N/A

DRILLING MEAS. FROM: Ground Surface — STICK UP: 2.31 — G.L. N/A

LOGGING DATE	05.03.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	3				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	145.1				
ARM DEPTH (FT)	145.38				
BTM LOGGED INTERVAL (FT)	145.38				
TOP LOGGED INTERVAL (FT)	120				
CASING SIZE (IN)/DEPTH (FT)	4/				
CASING ARM (FT)	125.38				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	71.23				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

Symbols

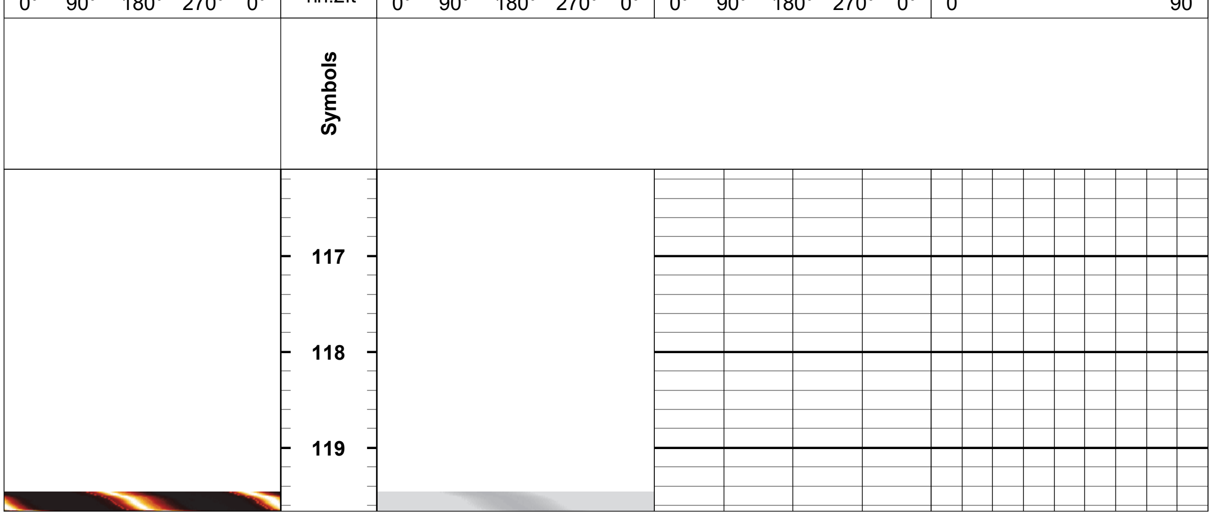
Bottom of Casing

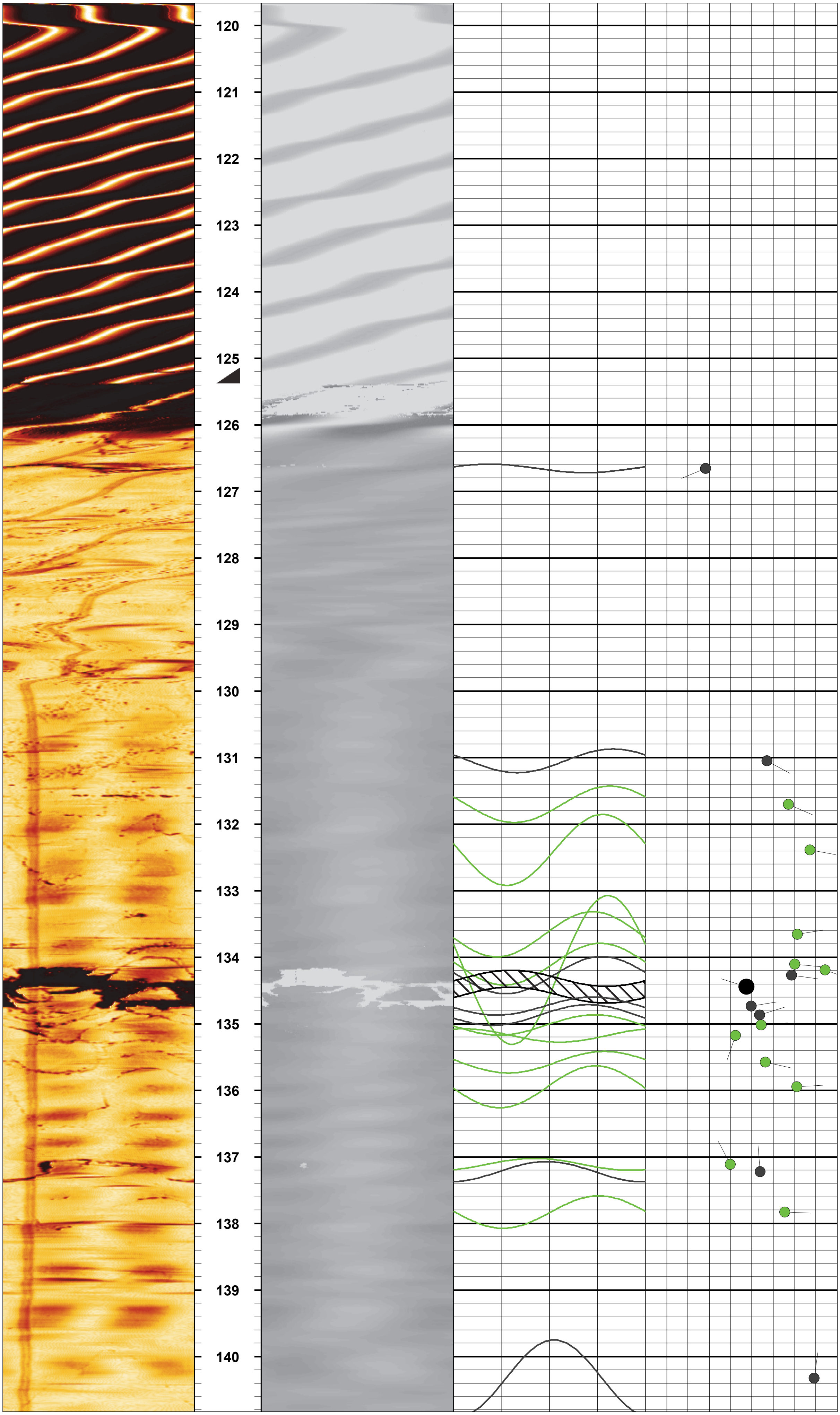
Structure

Discontinuous Fract — Part. Open Fract

Broken/Void/Soft Zone

Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90





120
121
122
123
124
125
126
127
128
129
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131
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134
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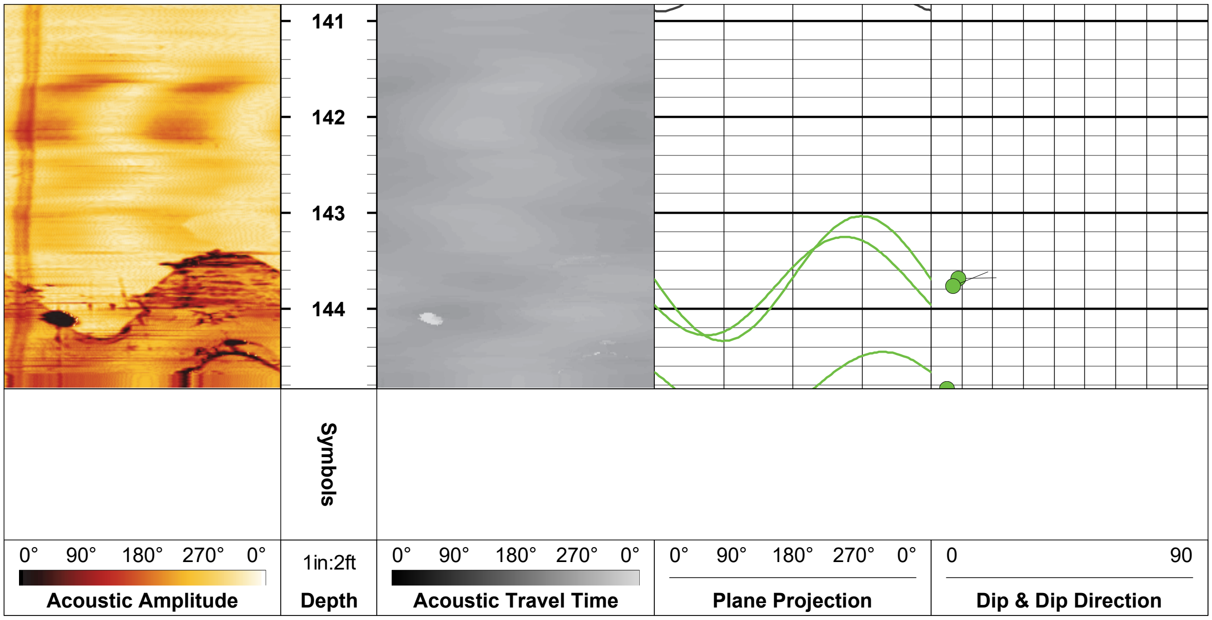
138
139
140


141
142
143
144
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

ARM GEOPHYSICS
Surface & Borehole Services

COMP	Stantec
WELL	B14
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec STATE: TN
WELL ID: B14 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 2.31 G.L. N/A

LOGGING DATE	05.03.2019	05.03.2019	05.03.2019	05.03.2019	No Test Run
RUN NO	1	2	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	145.1	145.1	145.1	145.1	
ARM DEPTH (FT)	145.3	145.3	N/A	N/A	
BTM LOGGED INTERVAL (FT)	145.34	145.3	143	143	
TOP LOGGED INTERVAL (FT)	3.82	4.37	128	128	
CASING SIZE (IN)/DEPTH (FT)	4/124.5	4/124.5	4/124.5	4/124.5	
CASING ARM (FT)	125.38	125.38	125.38	125.38	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	71.23	71.23	71.23	71.23	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

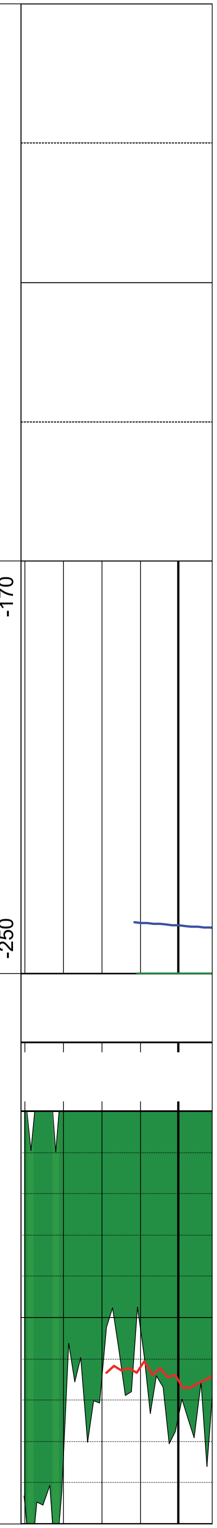
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

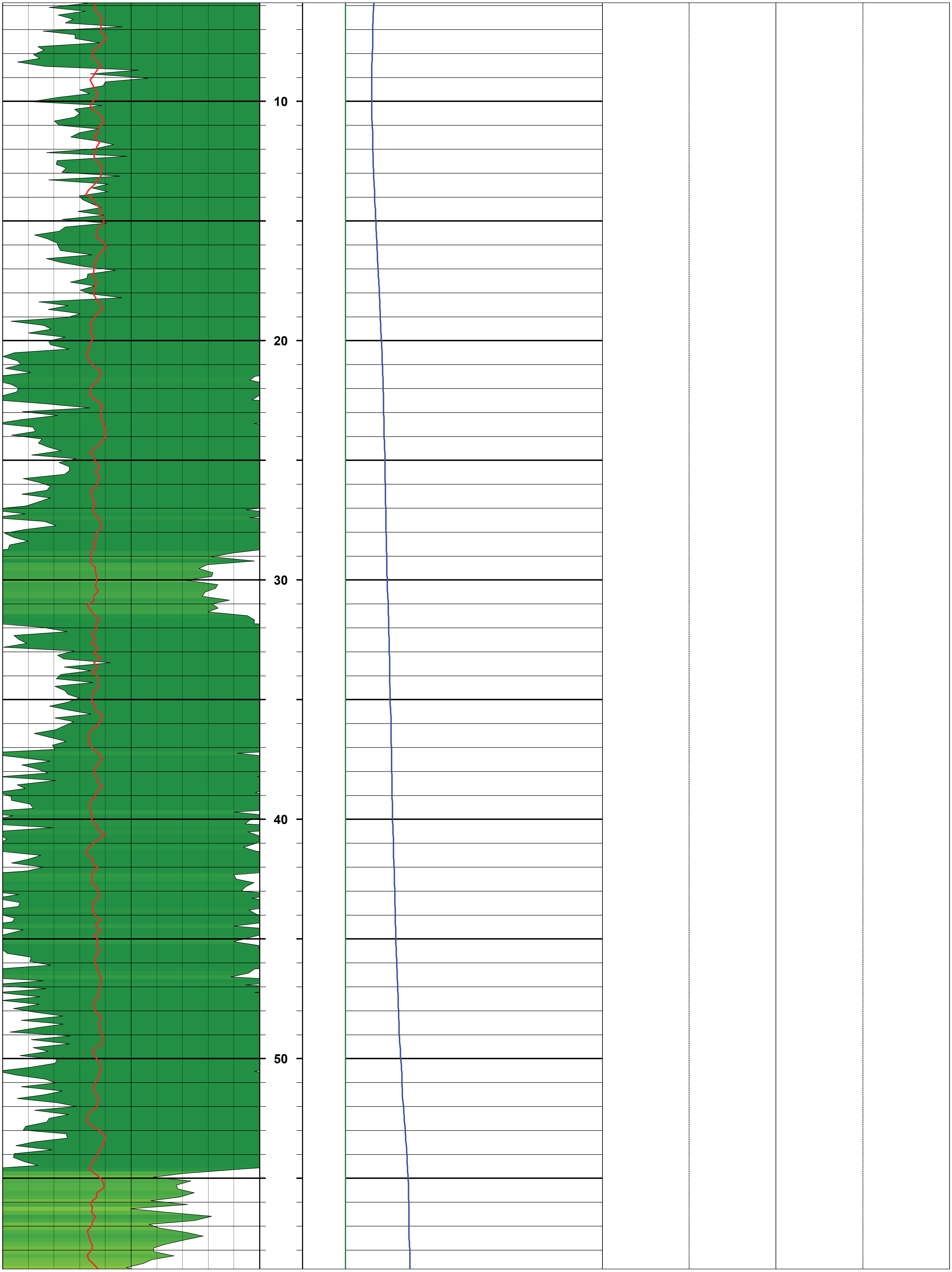
pH, O2%, and Redox data provided by Stantec.

Symbols

Fluid Level
Up Flow
Producing Zone

Natural Gamma (0 – CPS – 200) / 3-Arm Caliper (3 – in – 5)	Depth 1in:5ft / Symbols	Televiewer Fractures	Fluid Temperature (19 – 'C – 23) / Fluid Conductivity (25 'C) (0 – uS/cm – 1200) / pH (7 – 7.7) / O2% (0 – 0.2) / Redox (-250 – -170)	Vertical Flow: Ambient Gal/Min (Down, Up)	Vertical Flow: Pumping Gal/Min (Down, Up)

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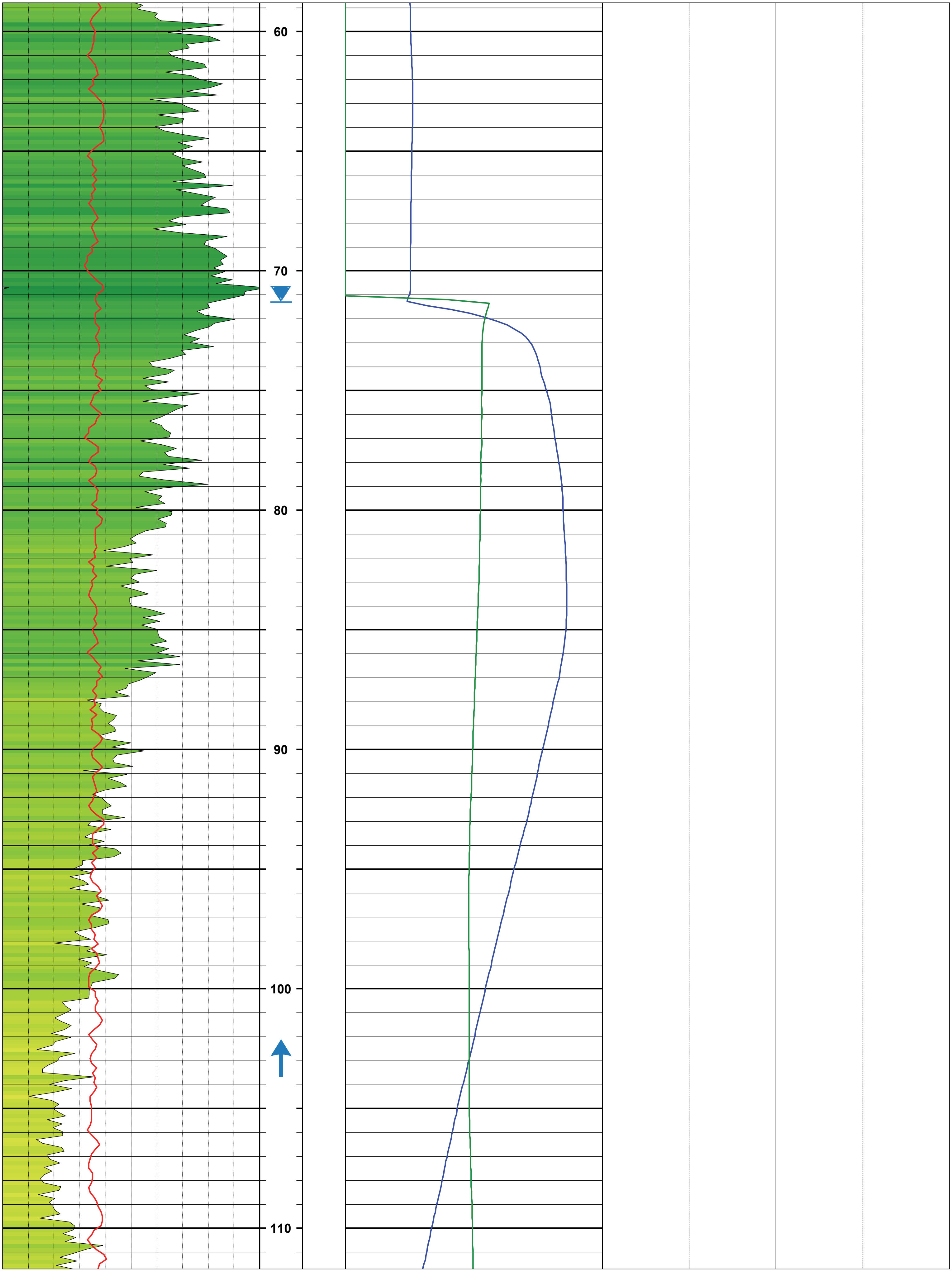
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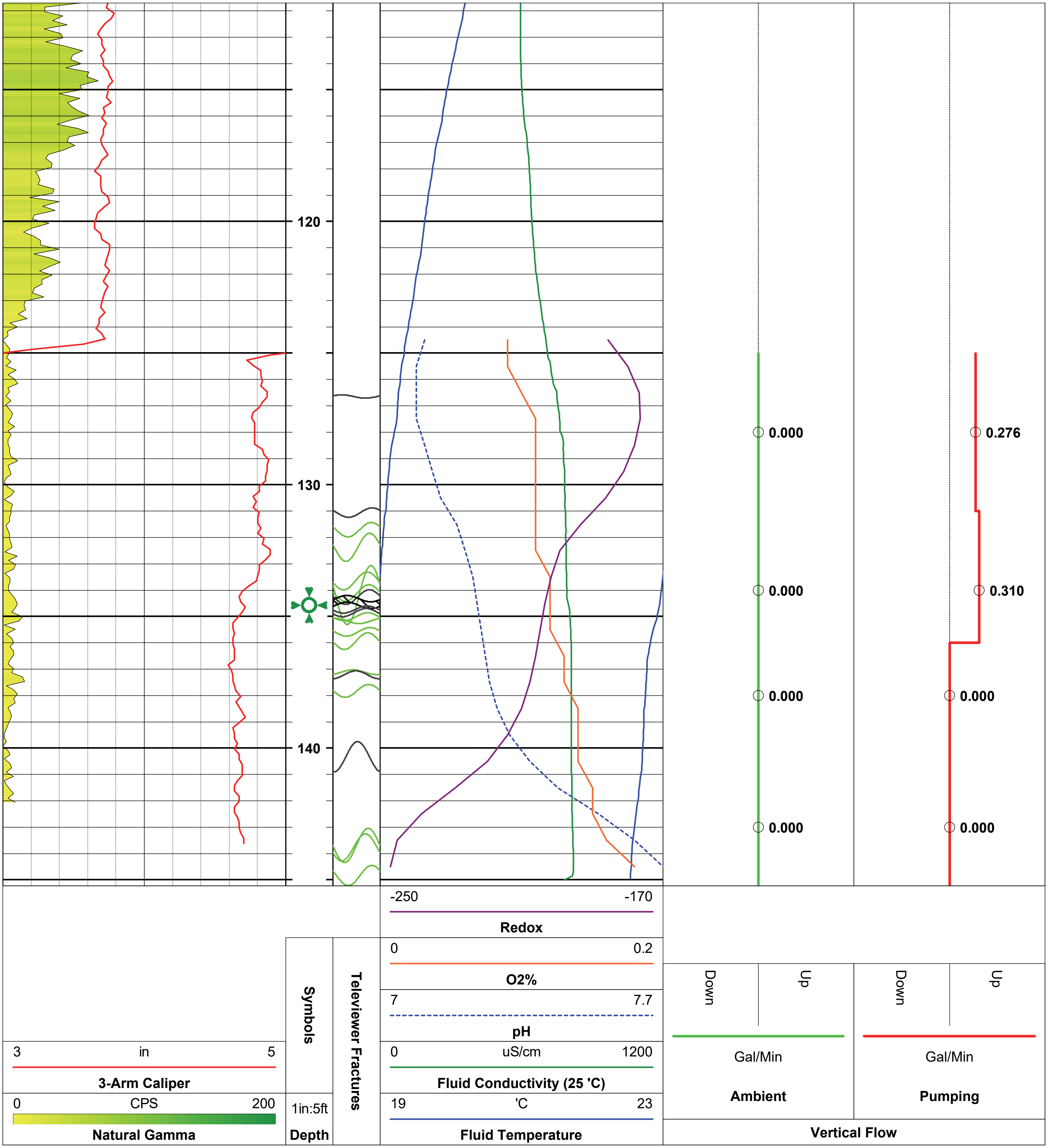
80
90
100
110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0.276
0.310
0.000
0.000
-250 -170
Redox
0 0.2
O2%
7 7.7
pH
0 uS/cm 1200
Fluid Conductivity (25 'C)
19 'C 23
Fluid Temperature
Symbols
Televiewer Fractures
3 in 5
3-Arm Caliper
0 CPS 200
Natural Gamma
1in:5ft
Depth
Down Up
Gal/Min
Ambient
Down Up
Gal/Min
Pumping
Vertical Flow

B16

Acoustic Televiewer

COMP	**Stantec**
WELL	**B16**
SITE	**Cumberland Fossil Plant**
CITY	**Cumberland City**
CNTY	**Stewart**
STATE	**TN**
ARM	**180734**

COMPANY:	Stantec	COUNTY:	Stewart
WELL ID:	B16	STATE:	TN
SITE:	Cumberland Fossil Plant	ARM NO.:	180734
CITY:	Cumberland City	WEATHER:	

LOCATION: TBD
LATITUDE: TBD
LONGITUDE: TBD
NORTHING: TBD
EASTING: TBD

ACQUISITION SETUP
Ford F-350

PERMANENT DATUM:	Ground Surface	ELEVATION: TBD	BIT SIZE: NQ3 (3")
LOG MEASURED FROM:	Ground Surface	ABOVE PERM. DATUM: 0.00	
DRILLING MEAS. FROM:	Ground Surface	STICK UP: 2.24	ROD SIZE: NQ (3")

LOGGING DATE	01.09.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	4				
TYPE LOG	ATV				
DRILLER DEPTH (FT)	130.0				
ARM DEPTH (FT)	144.8				
BTM LOGGED INTERVAL (FT)	144.8				
TOP LOGGED INTERVAL (FT)	120.0				
CASING SIZE (IN)	4.5				
CASING DEPTH (FT)	110.0				
ARM CASING DEPTH (FT)	125.4				
FLUID LEVEL IN HOLE (FT)	68.7				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
N/A

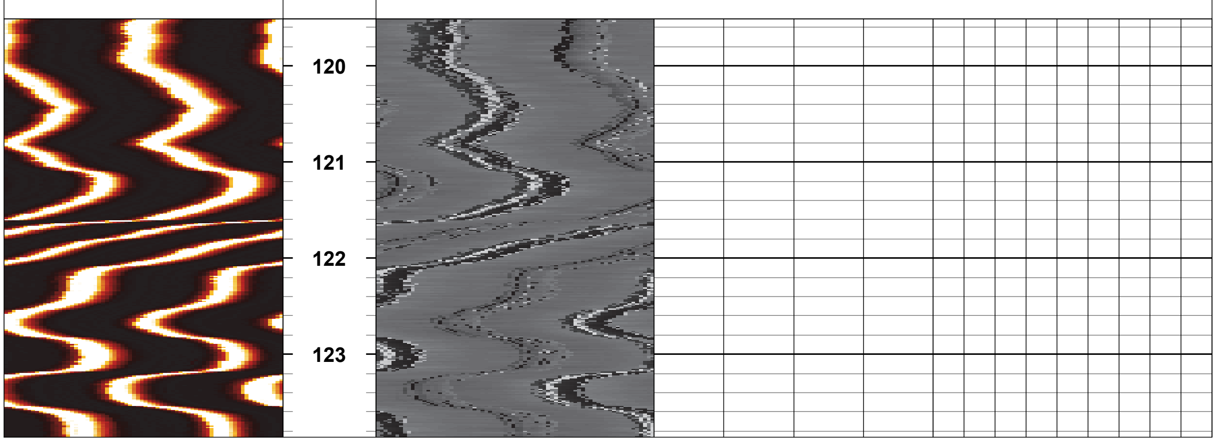
Symbols

Bottom of Casing

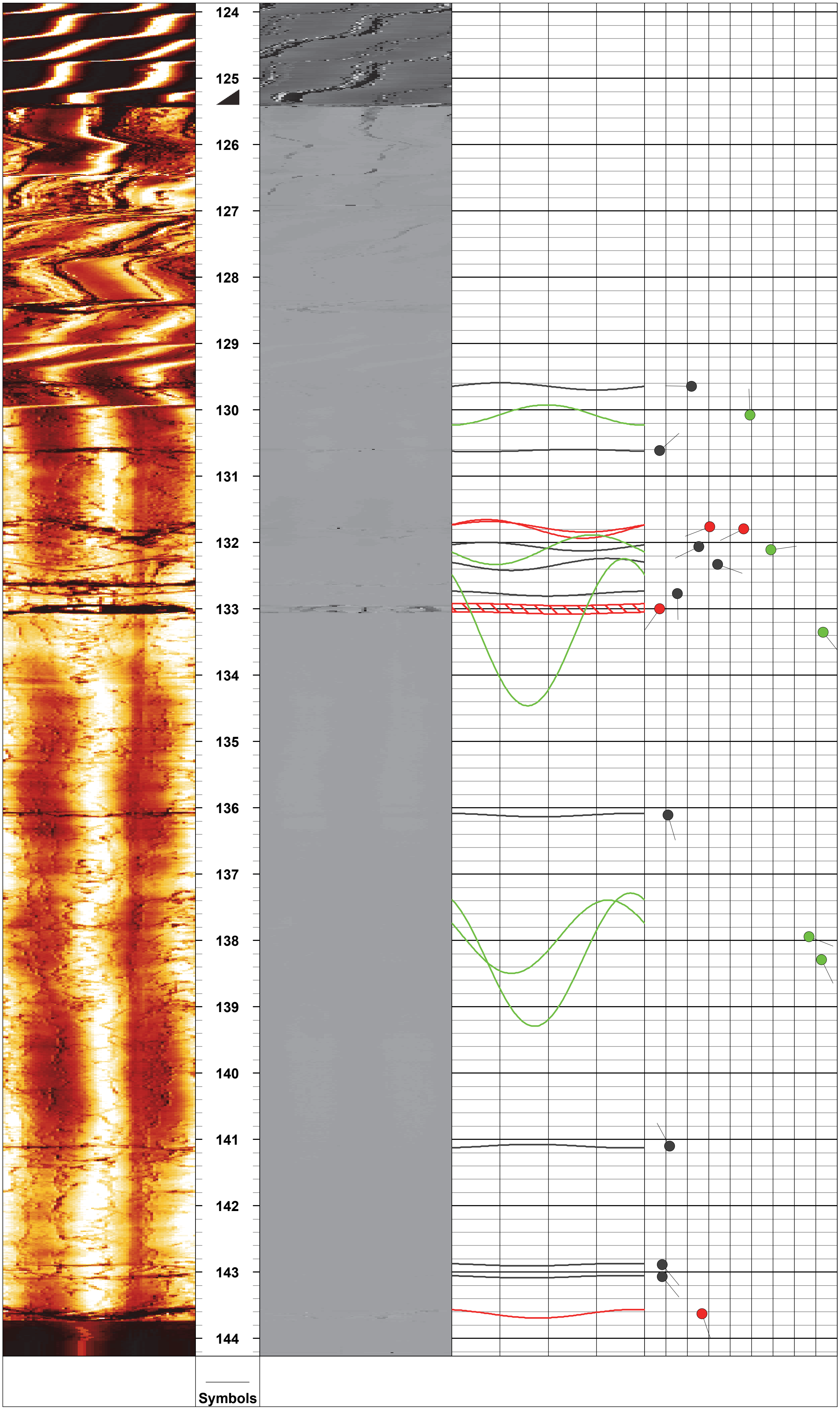
Structure

Open Fracture
Discontinuous Fract
Part. Open Fract

Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols			



B16 ATV.WCL


124
125
126
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128
129
130
131
132
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134
135
136
137
138
139
140
141
142
143
144
Symbols

B16 ATV.WCL

0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
Acoustic Amplitude	**Depth**	**Acoustic Travel Time**	**Plane Projection**	**Dip & Dip Direction**

Hydro Log

ARM GEOPHYSICS — Surface & Borehole Services

COMP	Stantec
WELL	B16
SITE	Cumberland Fossil Plant
CITY	Cumberland City
CNTY	Stewart
STATE	TN
ARM	180734

COMPANY: Stantec — COUNTY: Stewart
WELL ID: B16 — STATE: TN
SITE: Cumberland Fossil Plant — ARM NO.: 180734
CITY: Cumberland City — WEATHER:

LOCATION: TBD
LATITUDE: TBD
LONGITUDE: TBD
NORTHING: TBD
EASTING: TBD

ACQUSITION SETUP
Ford F-350

PERMANENT DATUM: Ground Surface — ELEVATION: TBD — BIT SIZE: NQ3 (3")
LOG MEASURED FROM: Ground Surface — ABOVE PERM. DATUM: 0.00
DRILLING MEAS. FROM: Ground Surface — STICK UP: 2.24 — ROD SIZE: NQ (3")

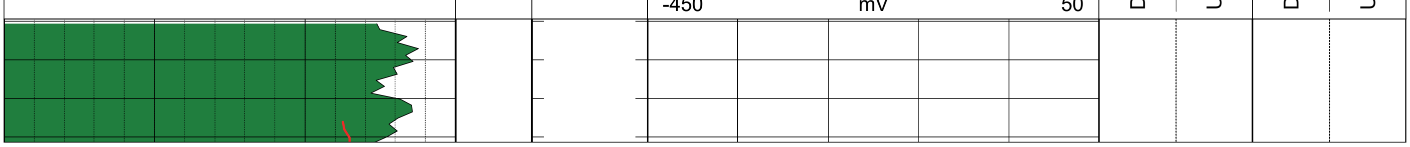
LOGGING DATE	01.09.2019	01.09.2019	01.09.2019	01.09.2019	01.09.2019
RUN NO	1	2	3	5	6
TYPE LOG	IDRO	FTC.GR	CAL	HPFM A	HPFM P
DRILLER DEPTH (FT)	130.0	130.0	130.0	130.0	130.0
ARM DEPTH (FT)	144.8	144.6	144.7	N/A	N/A
BTM LOGGED INTERVAL (FT)	144.8	144.6	144.7	143.0	143.0
TOP LOGGED INTERVAL (FT)	67.0	3.9	4.4	124.0	124.0
CASING SIZE (IN)	4.5	4.5	4.5	4.5	4.5
CASING DEPTH (FT)	110.0	110.0	110.0	110.0	110.0
ARM CASING DEPTH (FT)	125.4	125.4	125.4	125.4	125.4
FLUID LEVEL IN HOLE (FT)	68.7	68.7	68.7	68.7	68.7
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	3.2 W
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic
WITNESSED BY	N/A	N/A	N/A	N/A	N/A

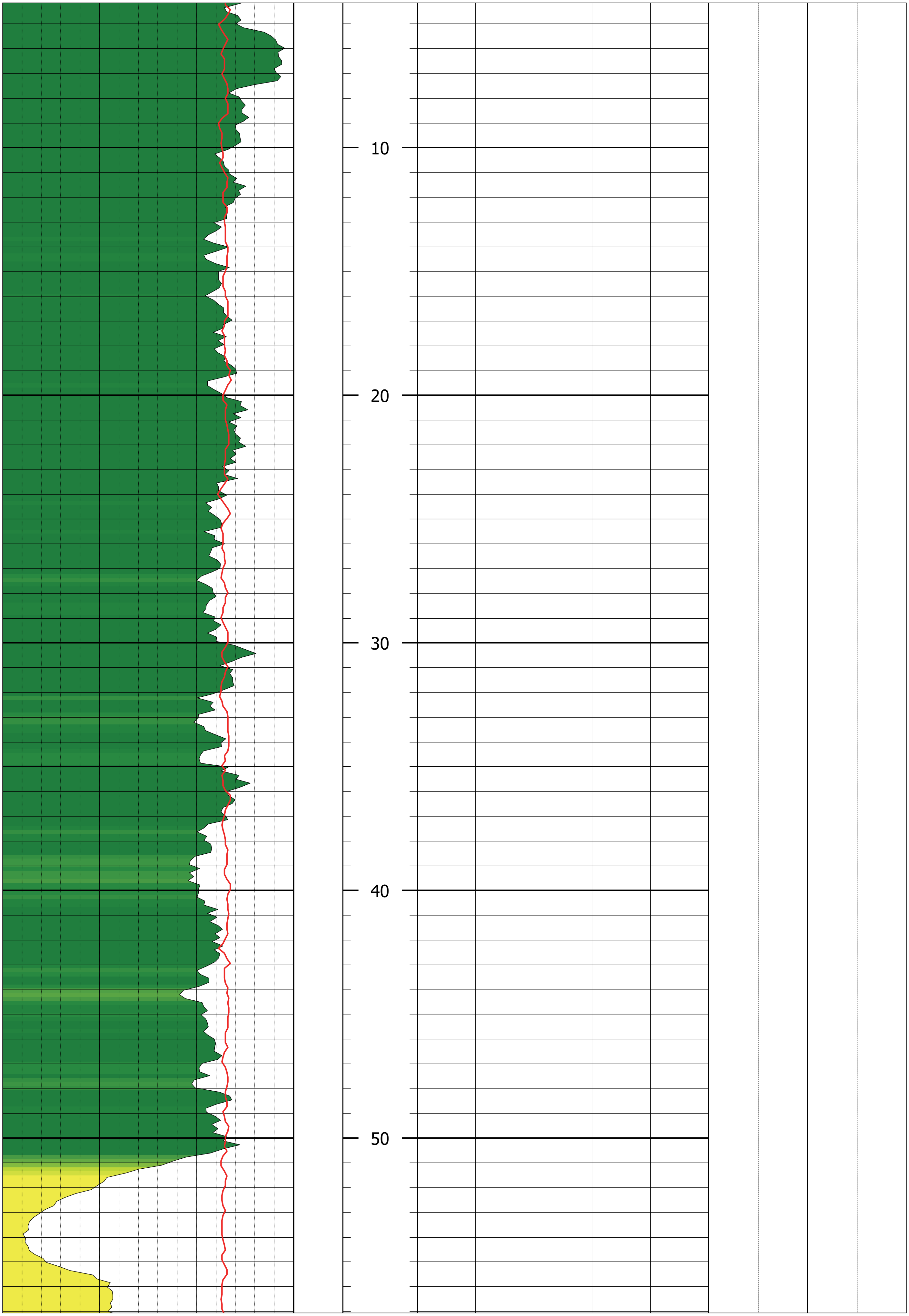
REMARKS:
N/A

Symbols

Bottom of Casing — Receiving Zone — Down Flow
Fluid Level — Producing Zone

Natural Gamma (0–300 CPS); 3-Arm Caliper (2–5 in)	Symbols	Depth 1in:5ft; Televiewer Features	Temperature (10–20 'C); Cond(FW) (400–2400 uS/cm); pH (5–15); O2% (100–150 %); O2ppm (10–20 ppm); Redox (-450–50 mV)	-Ambient Gal/Min (Down / Up)	-Pumping Gal/min (Down / Up)

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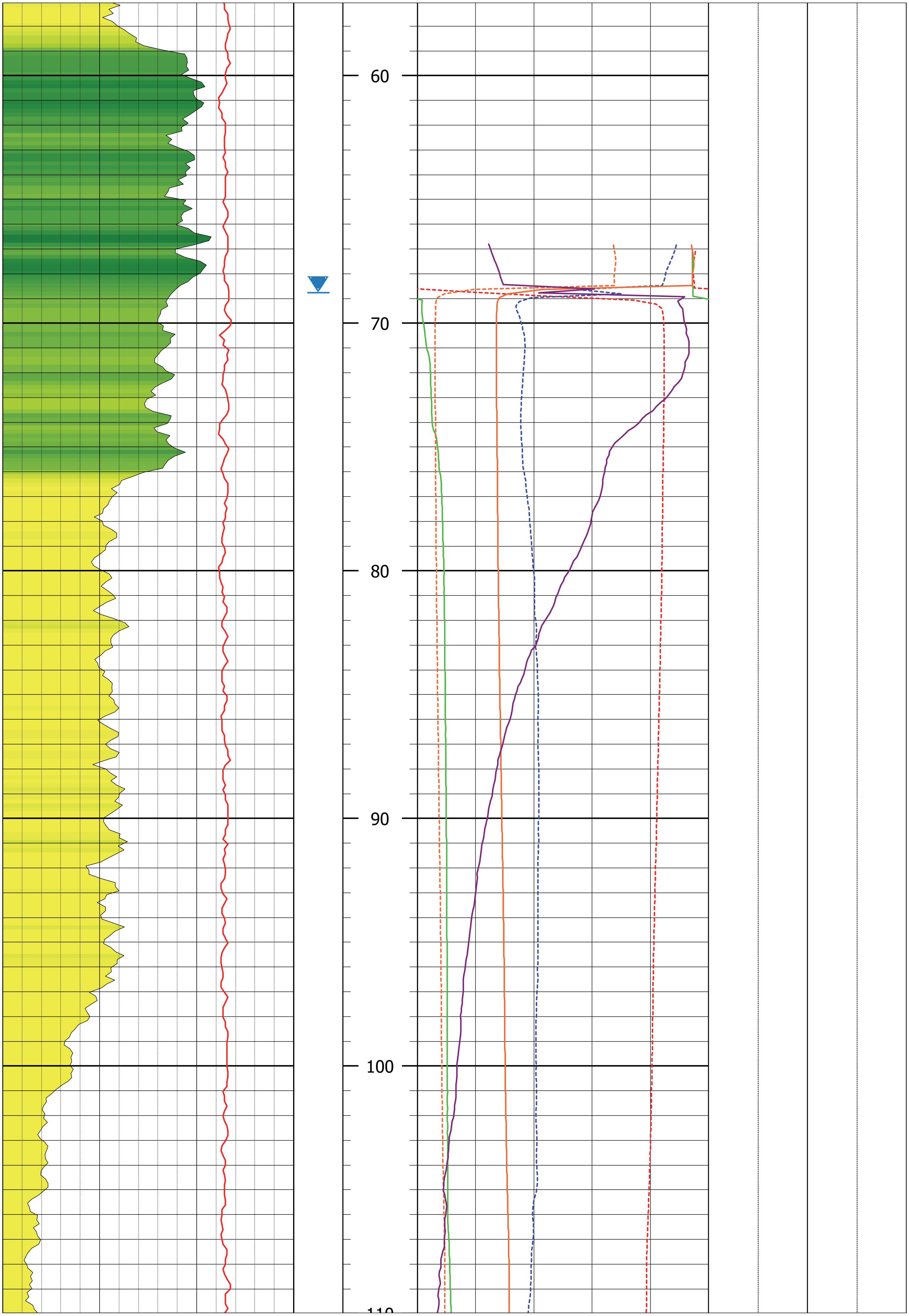

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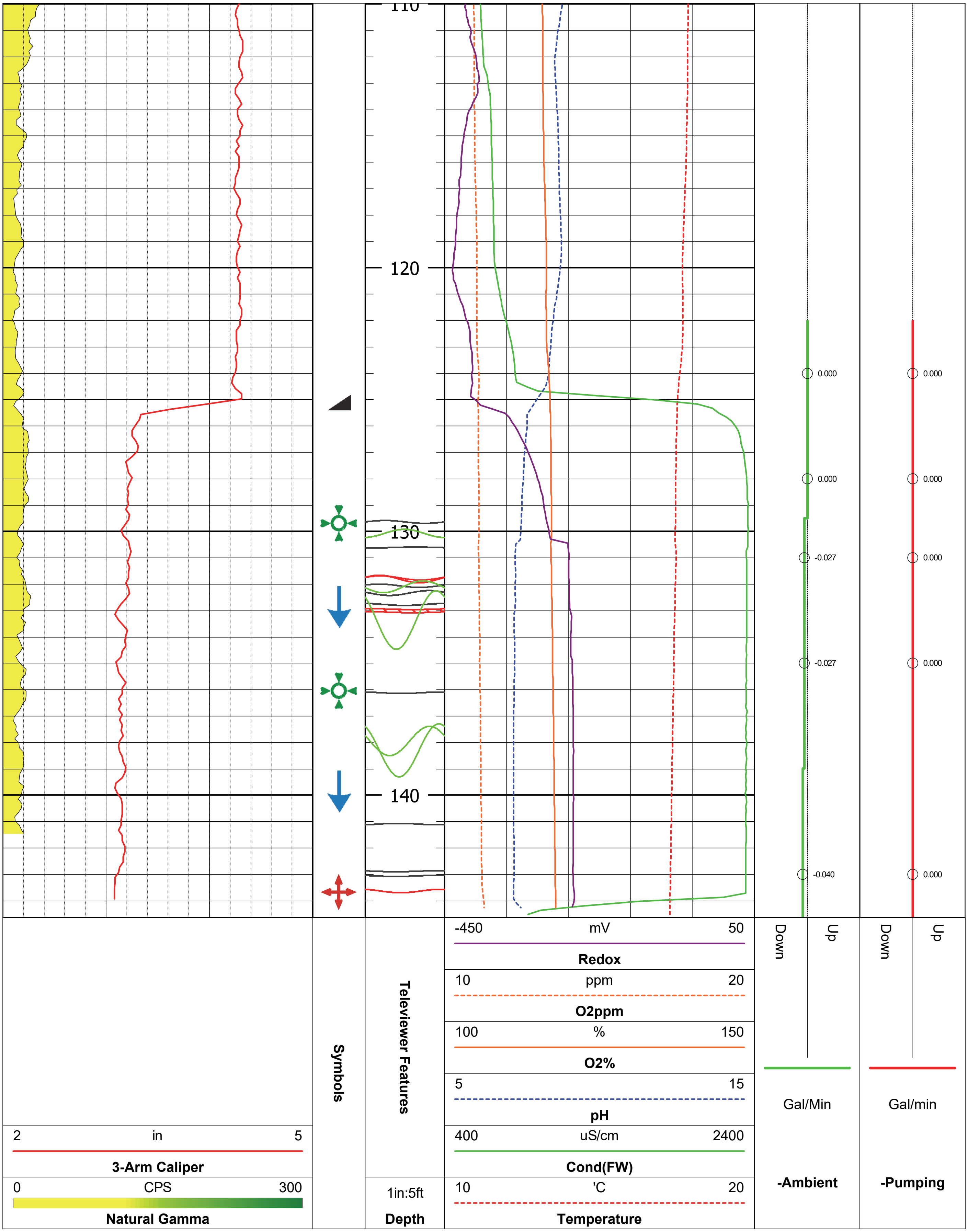
70
80
90
100
110


110
120
130
140
0.000
0.000
-0.027
-0.027
-0.040
0.000
0.000
0.000
0.000
0.000
2 in 5
3-Arm Caliper
0 CPS 300
Natural Gamma
Symbols
Televiewer Features
1in:5ft
Depth
-450 mV 50
Redox
10 ppm 20
O2ppm
100 % 150
O2%
5 15
pH
400 uS/cm 2400
Cond(FW)
10 'C 20
Temperature
Down
Up
Gal/Min
-Ambient
Down
Up
Gal/min
-Pumping

B17

Acoustic Televiewer

COMP	Stantec
WELL	B17
SITE	Cumberland Fossil Plant
CITY	Cumberland City
CNTY	Stewart
STATE	TN
ARM	180734

COMPANY:	Stantec	COUNTY:	Stewart
WELL ID:	B17	STATE:	TN
SITE:	Cumberland Fossil Plant	ARM NO.:	180734
CITY:	Cumberland City	WEATHER:	N/A

LOCATION: TBD
LATITUDE: TBD
LONGITUDE: TBD
NORTHING: TBD
EASTING: TBD

ACQUSITION SETUP
Ford F-350

PERMANENT DATUM:	Ground Surface	ELEVATION: TBD	BIT SIZE: NQ3 (3")
LOG MEASURED FROM:	Ground Surface	ABOVE PERM. DATUM: 0.00	
DRILLING MEAS. FROM:	Ground Surface	STICK UP: 2.4	ROD SIZE: NQ (3")

LOGGING DATE	01.08.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	3				
TYPE LOG	ATV				
DRILLER DEPTH (FT)	128.5				
ARM DEPTH (FT)	127.3				
BTM LOGGED INTERVAL (FT)	127.3				
TOP LOGGED INTERVAL (FT)	108.0				
CASING SIZE (IN)	4.5				
CASING DEPTH (FT)	108.5				
ARM CASING DEPTH (FT)	110.8				
FLUID LEVEL IN HOLE (FT)	59.5				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

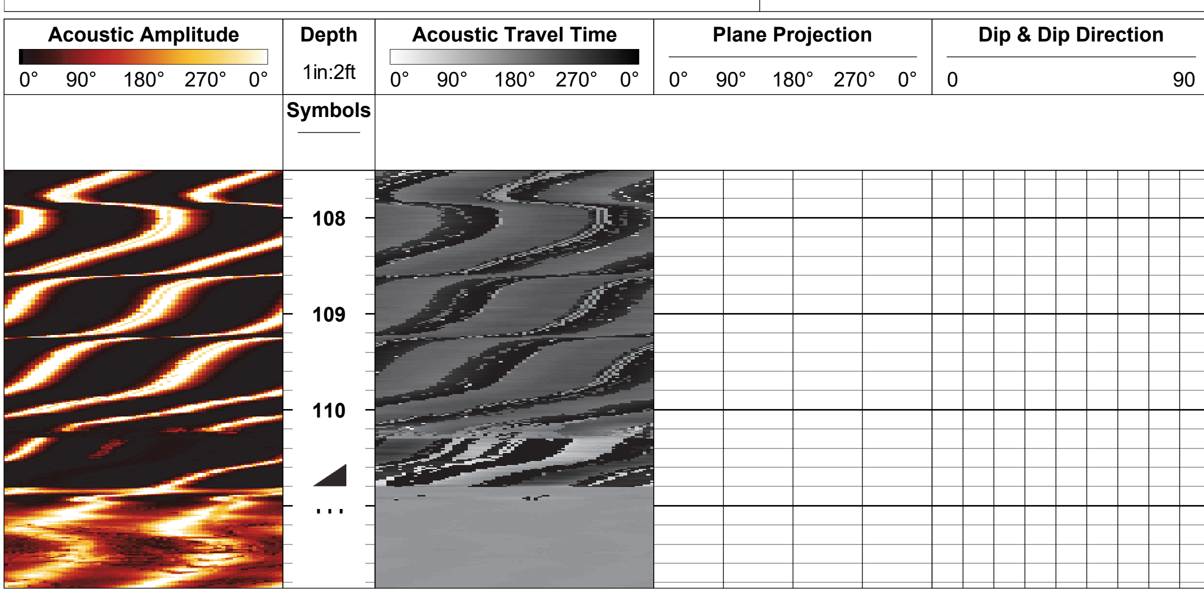
REMARKS:
N/A

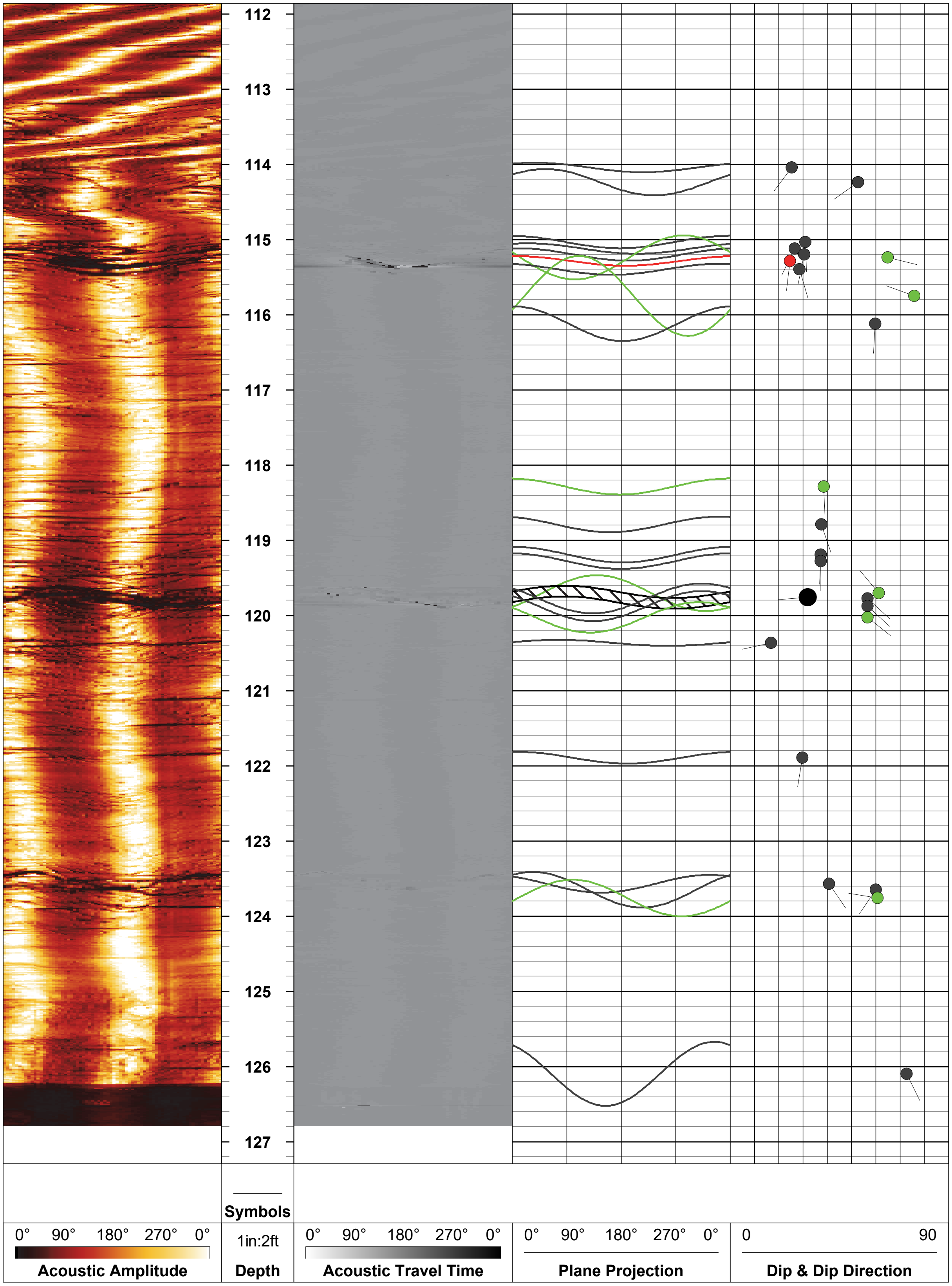
Symbols

Bottom of Casing

Structure

Open Fracture
Discontinuous Fract
Part. Open Fract
Broken/Void/Soft Zone




112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

ARM GEOPHYSICS — Surface & Borehole Services

COMP	Stantec
WELL	B17
SITE	Cumberland Fossil Plant
CITY	Cumberland City
CNTY	Stewart
STATE	TN
ARM	180734

COMPANY: Stantec
WELL ID: B17
SITE: Cumberland Fossil Plant
CITY: Cumberland City
COUNTY: Stewart
STATE: TN
ARM NO.: 180734
WEATHER:

LOCATION: TBD
LATITUDE: TBD
LONGITUDE: TBD
NORTHING: TBD
EASTING: TBD

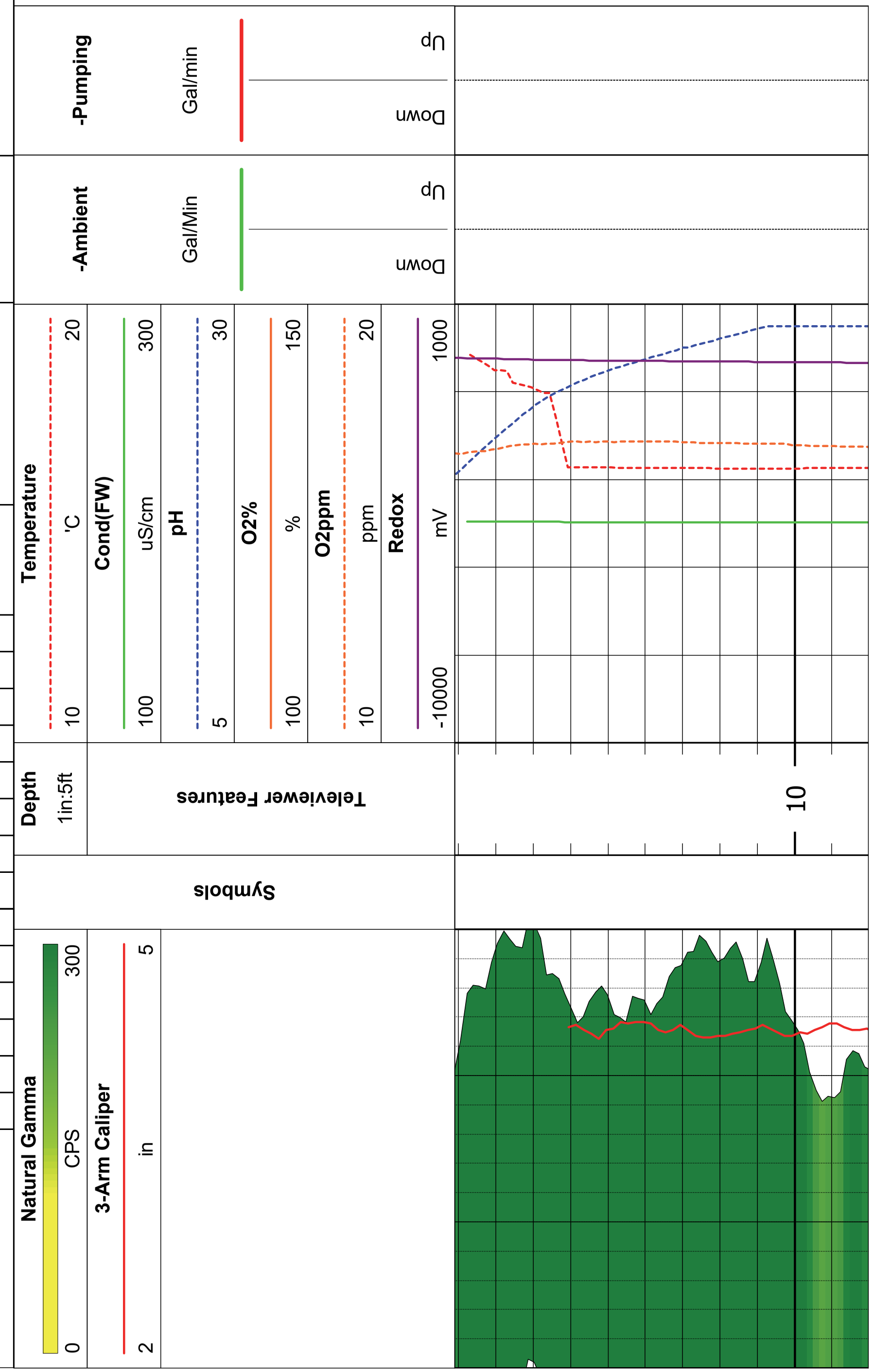
ACQUSITION SETUP
Ford F-350

PERMANENT DATUM: Ground Surface — ELEVATION: TBD
LOG MEASURED FROM: Ground Surface — ABOVE PERM. DATUM: 0.00
DRILLING MEAS. FROM: Ground Surface — STICK UP: 2.40

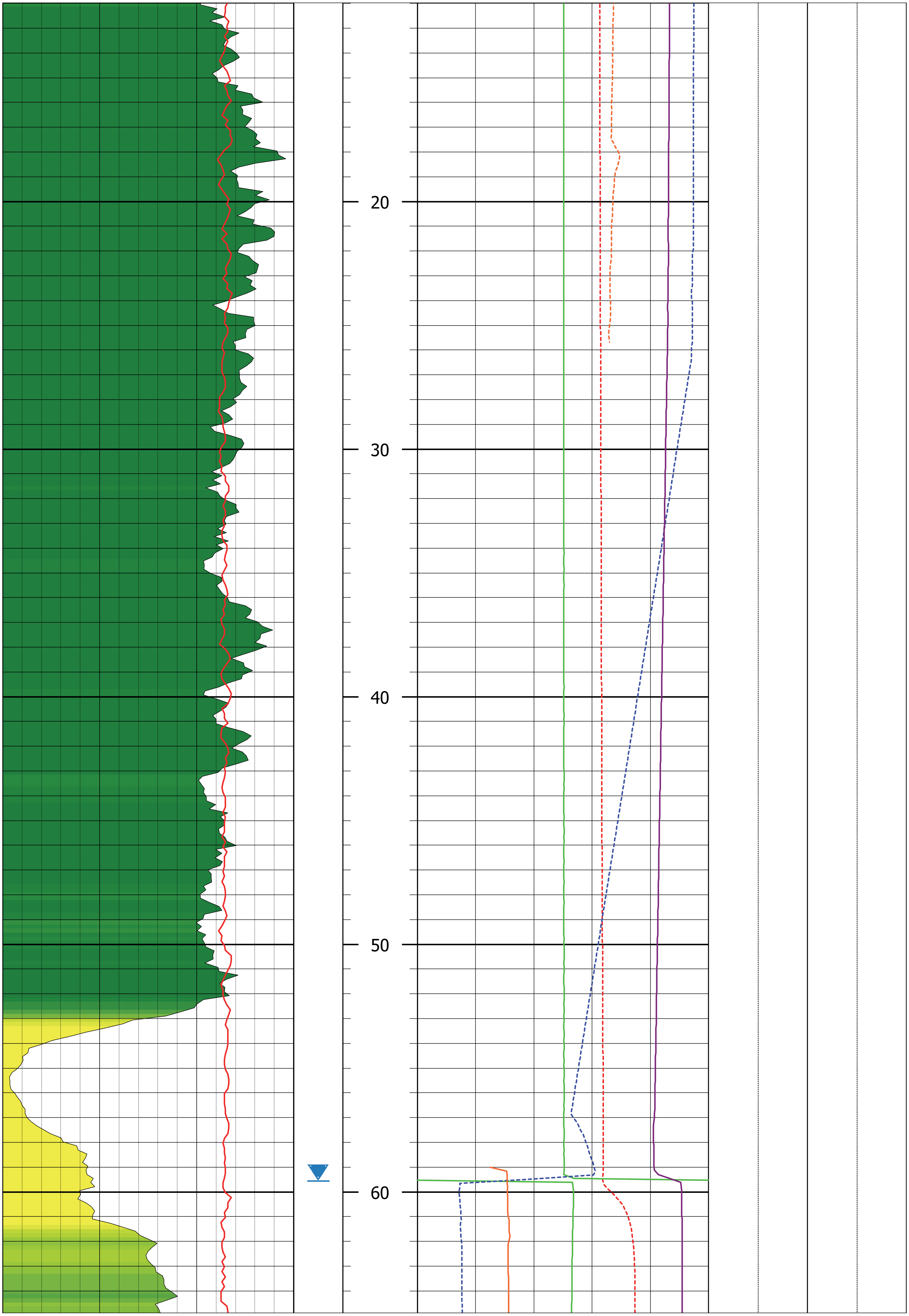
BIT SIZE: NQ3 (3")
ROD SIZE: NQ (3")

LOGGING DATE	01.08.2019	01.08.2019	01.08.2019	01.08.2019	01.08.2019
RUN NO	1	2	4	5	6
TYPE LOG	IDRO	CAL	FTC	HPFM A	HPFM P
DRILLER DEPTH (FT)	128.5	128.5	128.5	128.5	128.5
ARM DEPTH (FT)	128.0	128.0	127.0	N/A	N/A
BTM LOGGED INTERVAL (FT)	128.0	128.0	127.0	126.0	126.0
TOP LOGGED INTERVAL (FT)	57.0	4.3	3.7	107.0	107.0
CASING SIZE (IN)	4.5	4.5	4.5	4.5	4.5
CASING DEPTH (FT)	108.5	108.5	108.5	108.5	108.5
ARM CASING DEPTH (FT)	110.8	110.8	110.8	110.8	110.8
FLUID LEVEL IN HOLE (FT)	59.5	59.5	59.5	59.5	59.5
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	3.2 W
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic
WITNESSED BY	N/A	N/A	N/A	N/A	N/A

REMARKS:
N/A



B17 Hydro.WCL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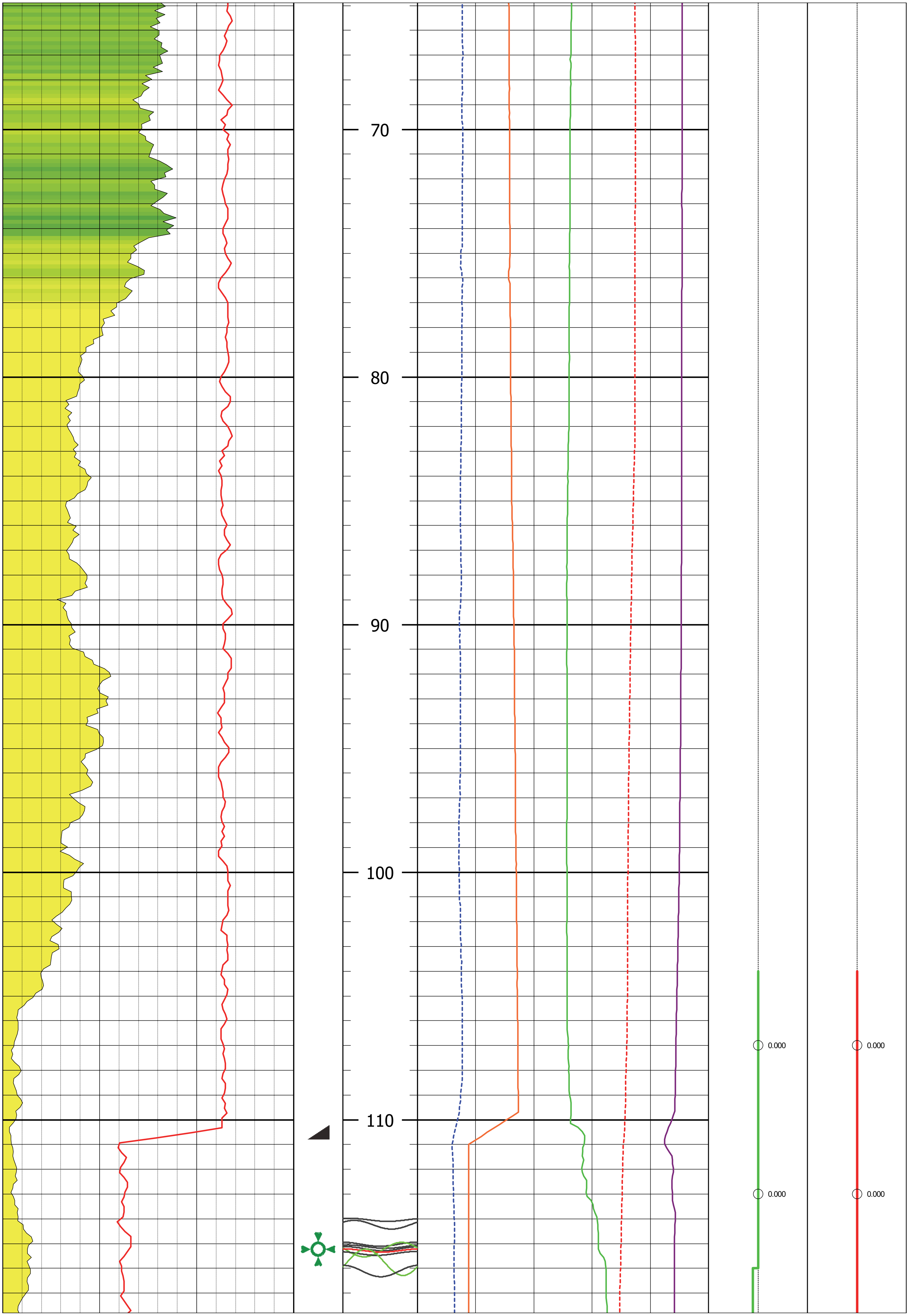
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100
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0.000
0.000
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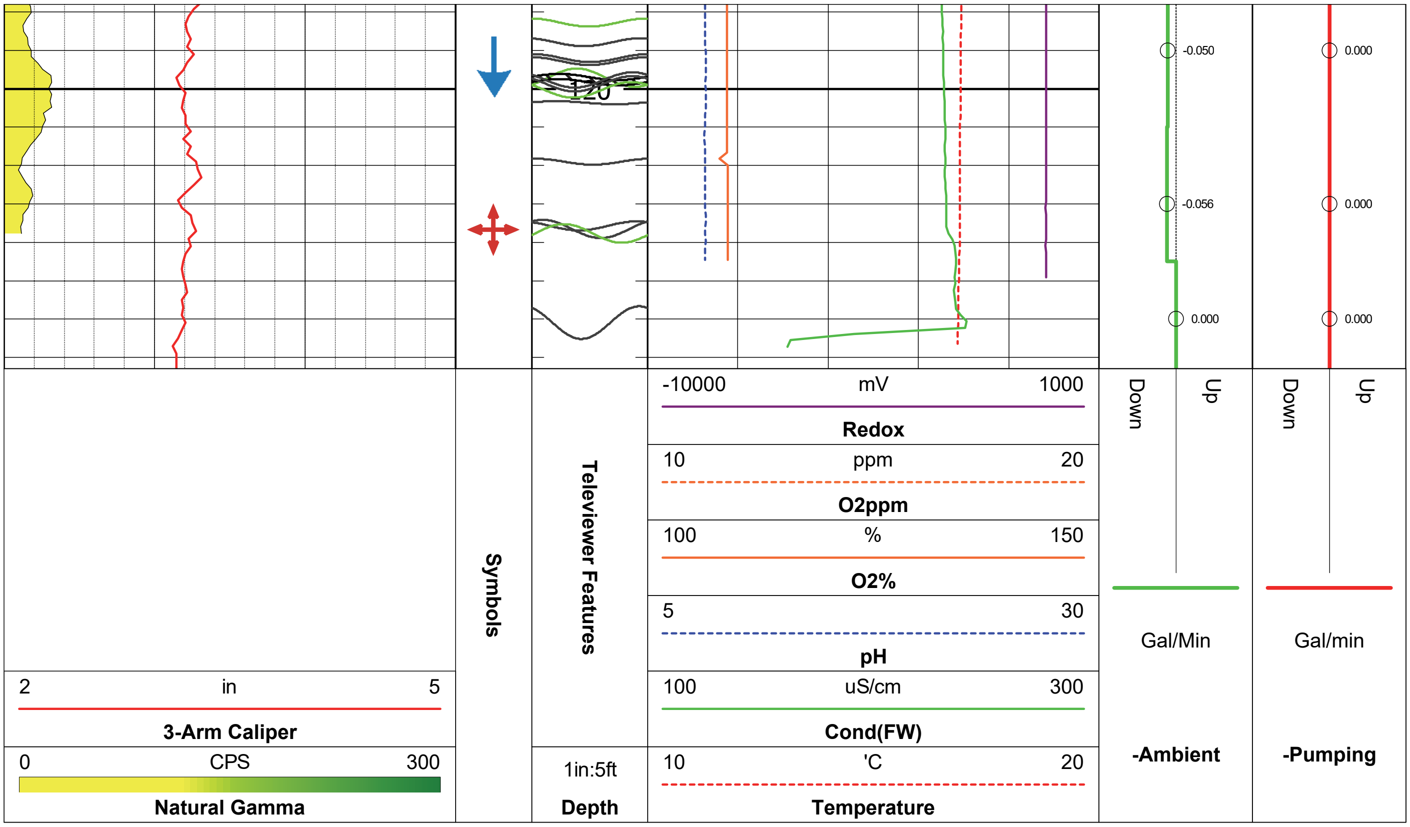
120
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Redox
10 ppm 20
O2ppm
100 % 150
O2%
5 30
pH
100 uS/cm 300
Cond(FW)
10 'C 20
Temperature
2 in 5
3-Arm Caliper
0 CPS 300
Natural Gamma
Symbols
Televiewer Features
1in:5ft
Depth
Down
Up
Gal/Min
-Ambient
Down
Up
Gal/min
-Pumping

B18

Acoustic Televiewer

COMP	**Stantec**
WELL	**B18**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec | STATE: TN
WELL ID: B18 | ARM NO.: 180734
FIELD/SITE: Cumberland City | API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface | ELEVATION: TBD | K.B. N/A
LOG MEASURED FROM: Ground Surface | ABOVE PERM. DATUM: 0.00 | D.F. N/A
DRILLING MEAS. FROM: Ground Surface | STICK UP: 1.3 | G.L. N/A

LOGGING DATE	04.30.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	2				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	91.4				
ARM DEPTH (FT)	91.74				
BTM LOGGED INTERVAL (FT)	91.74				
TOP LOGGED INTERVAL (FT)	5.37				
CASING SIZE (IN)/DEPTH (FT)	4/41				
CASING ARM (FT)	41.19				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	25.61				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

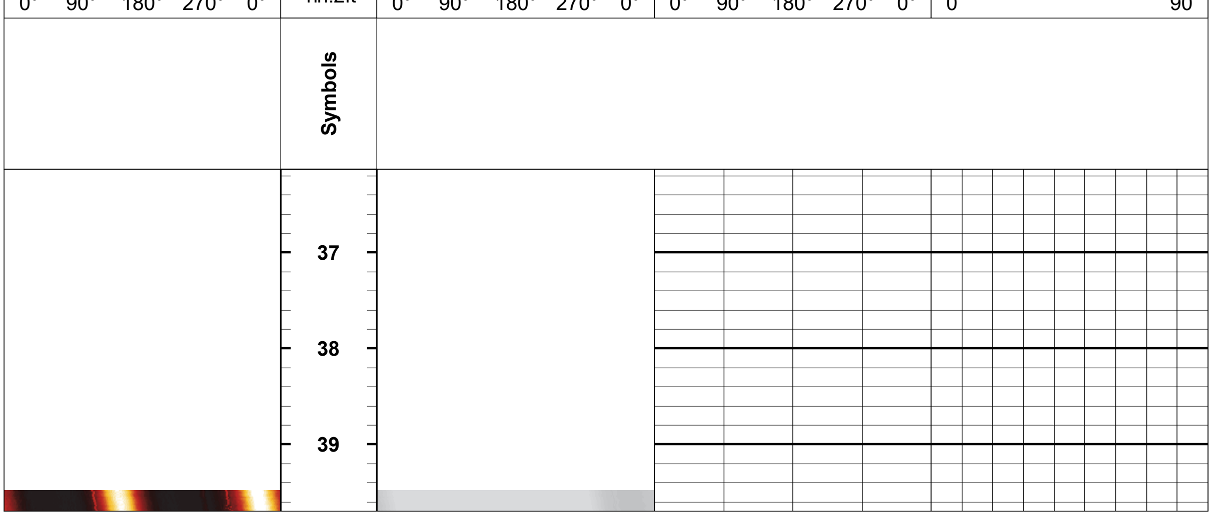
Symbols

Bottom of Casing

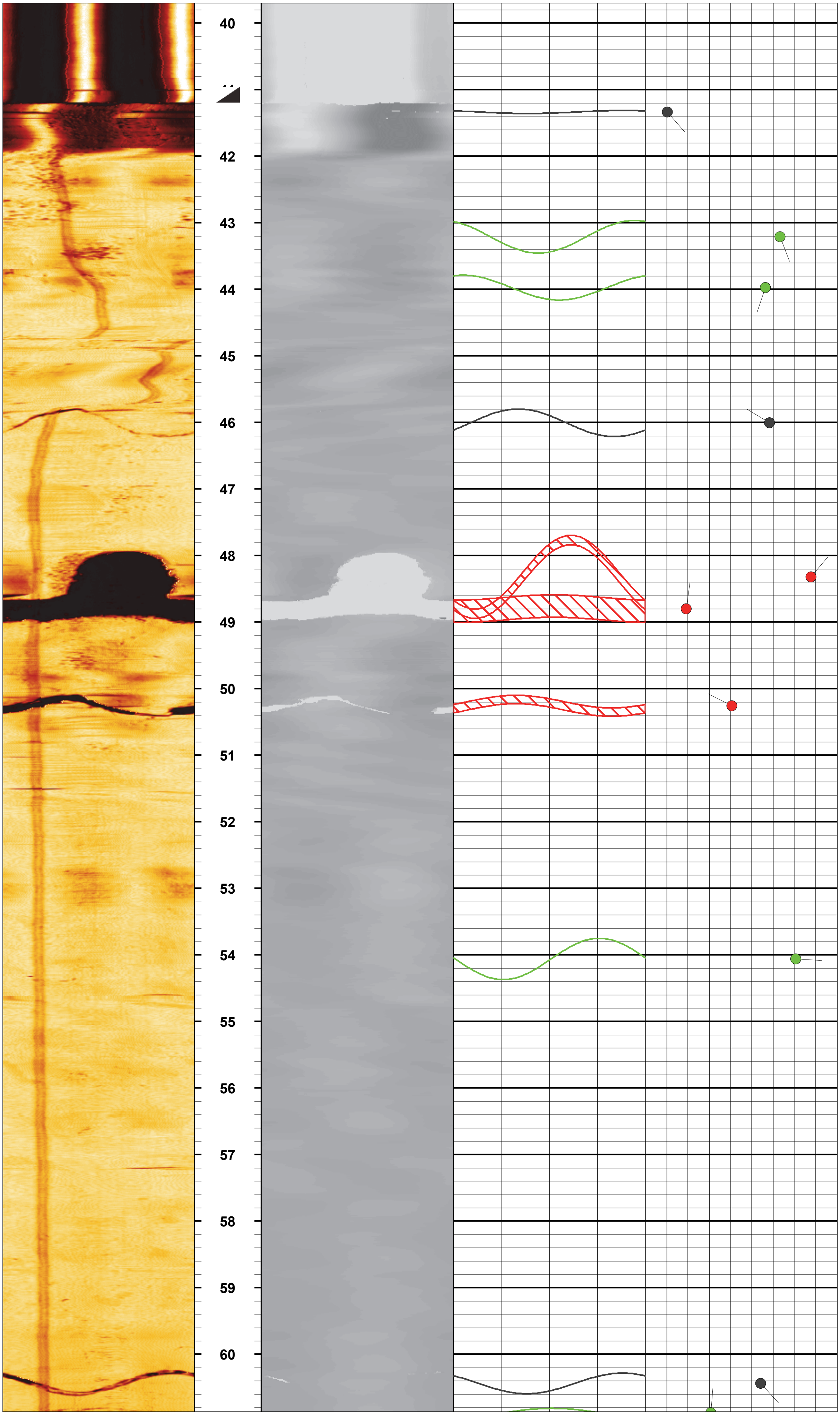
Structure

Open Fracture
Discontinuous Fract
Part. Open Fract
Broken/Void/Soft Zone

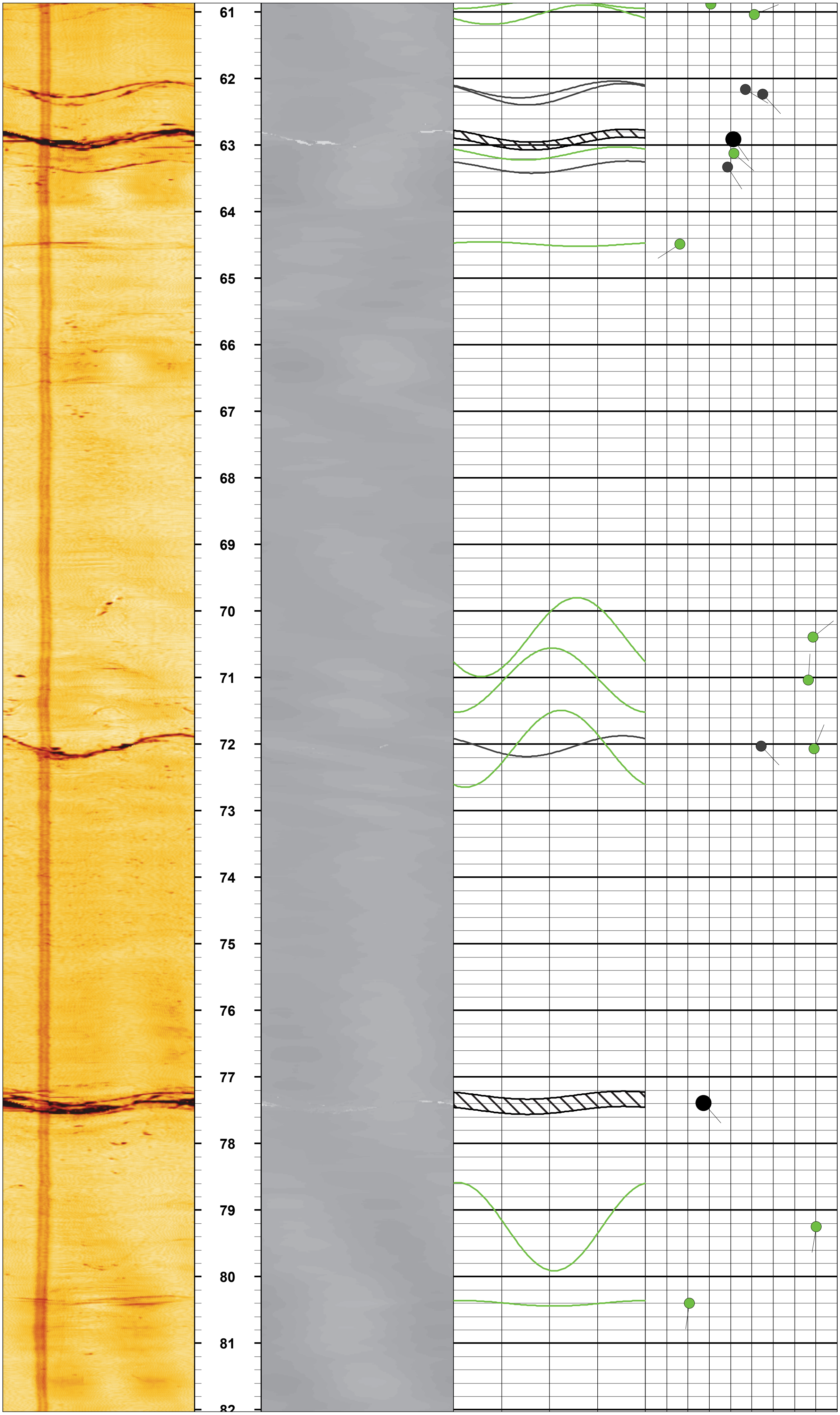
Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90



B18 ATV.WCL



 B18 ATV.WCL



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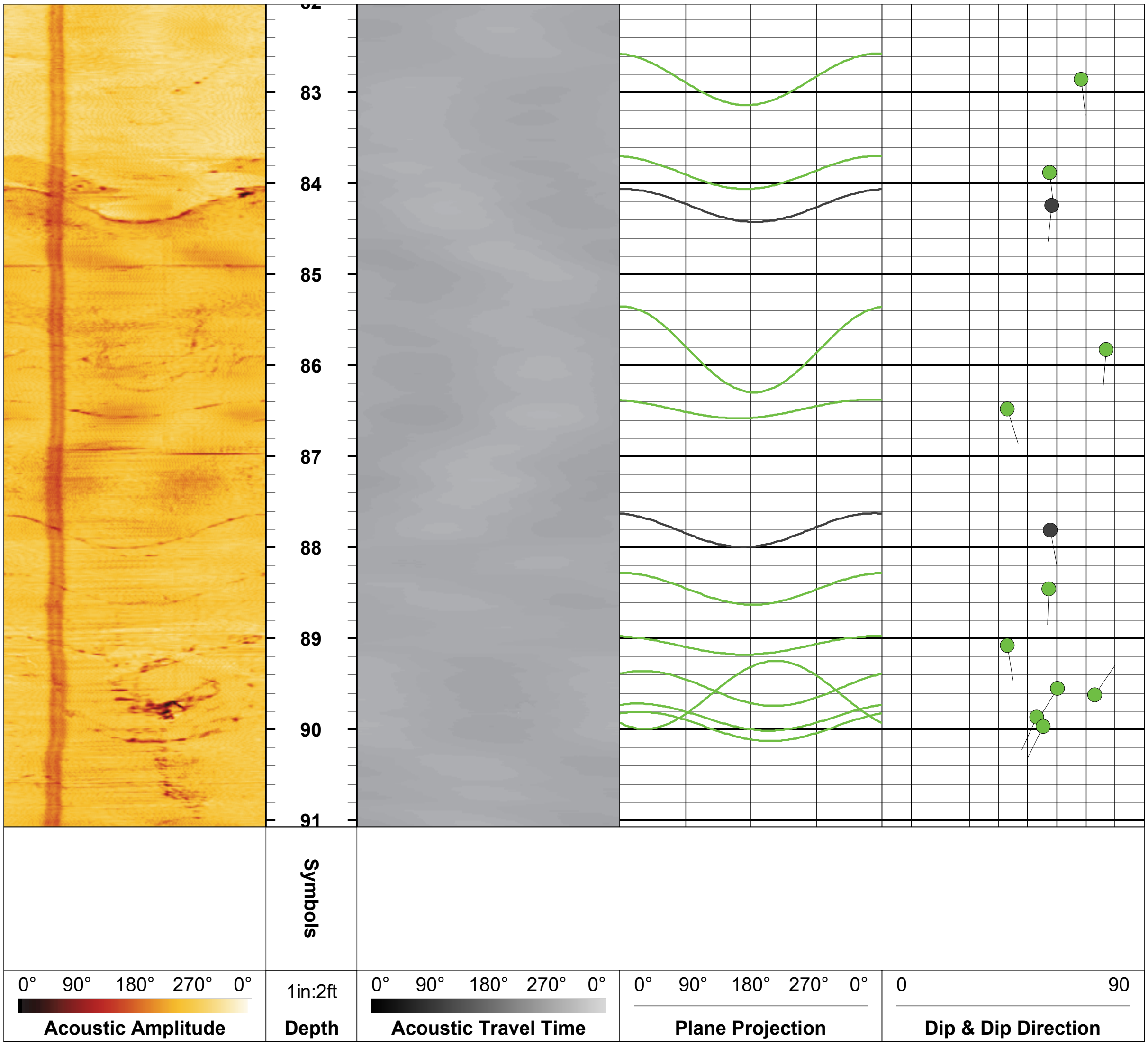


82
83
84
85
86
87
88
89
90
91
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

ARM GEOPHYSICS — Surface & Borehole Services

COMP	Stantec
WELL	B18
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec STATE: TN
WELL ID: B18 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

OTHER SERVICES
Ford F-350

SEC: TBD TWP: TBD QUAD: TBD

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 1.3 G.L. N/A

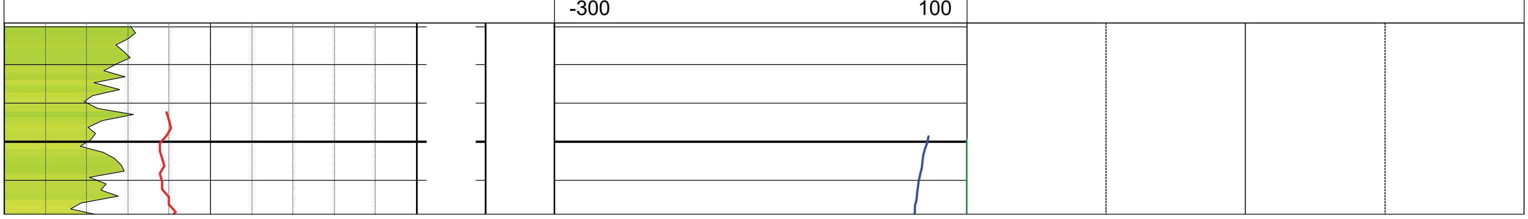
LOGGING DATE	04.30.2019	04.30.2019	05.01.2019	05.01.2019	No Test Run
RUN NO	1	3	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	91.4	91.4	91.4	91.4	
ARM DEPTH (FT)	91.6	91.61	N/A	N/A	
BTM LOGGED INTERVAL (FT)	91.67	91.61	88	88	
TOP LOGGED INTERVAL (FT)	4.83	40	44.5	43.99	
CASING SIZE (IN)/DEPTH (FT)	4/41	4/41	4/41	4/41	
CASING ARM (FT)	41.19	41.19	41.19	41.19	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	25.67	25.67	25.67	25.67	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

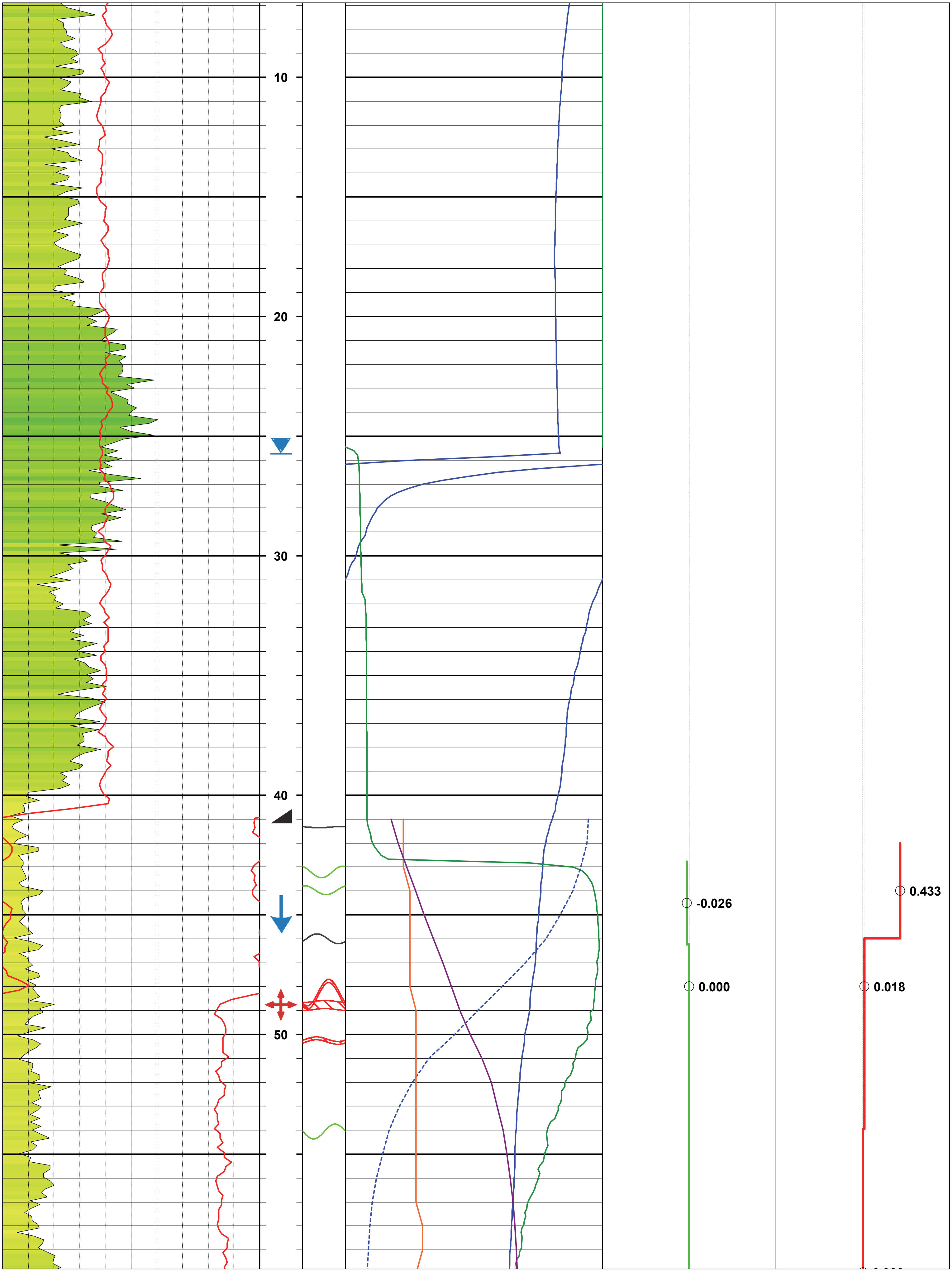
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")
pH, O2%, and Redox data provided by Stantec.

Symbols

Bottom of Casing — Receiving Zone
Fluid Level — Down Flow

Natural Gamma (0 CPS 200) / 3-Arm Caliper (3 in 5)	Depth 1in:5ft / Symbols	Televiewer Fractures	Fluid Temperature (22 'C 26) / Fluid Conductivity (25 'C) (0 uS/cm 4000) / pH (7 9) / O2% (-0.1 0.3) / Redox (-300 100)	Vertical Flow: Ambient Gal/Min (Down, Up) / Pumping Gal/Min (Down, Up)

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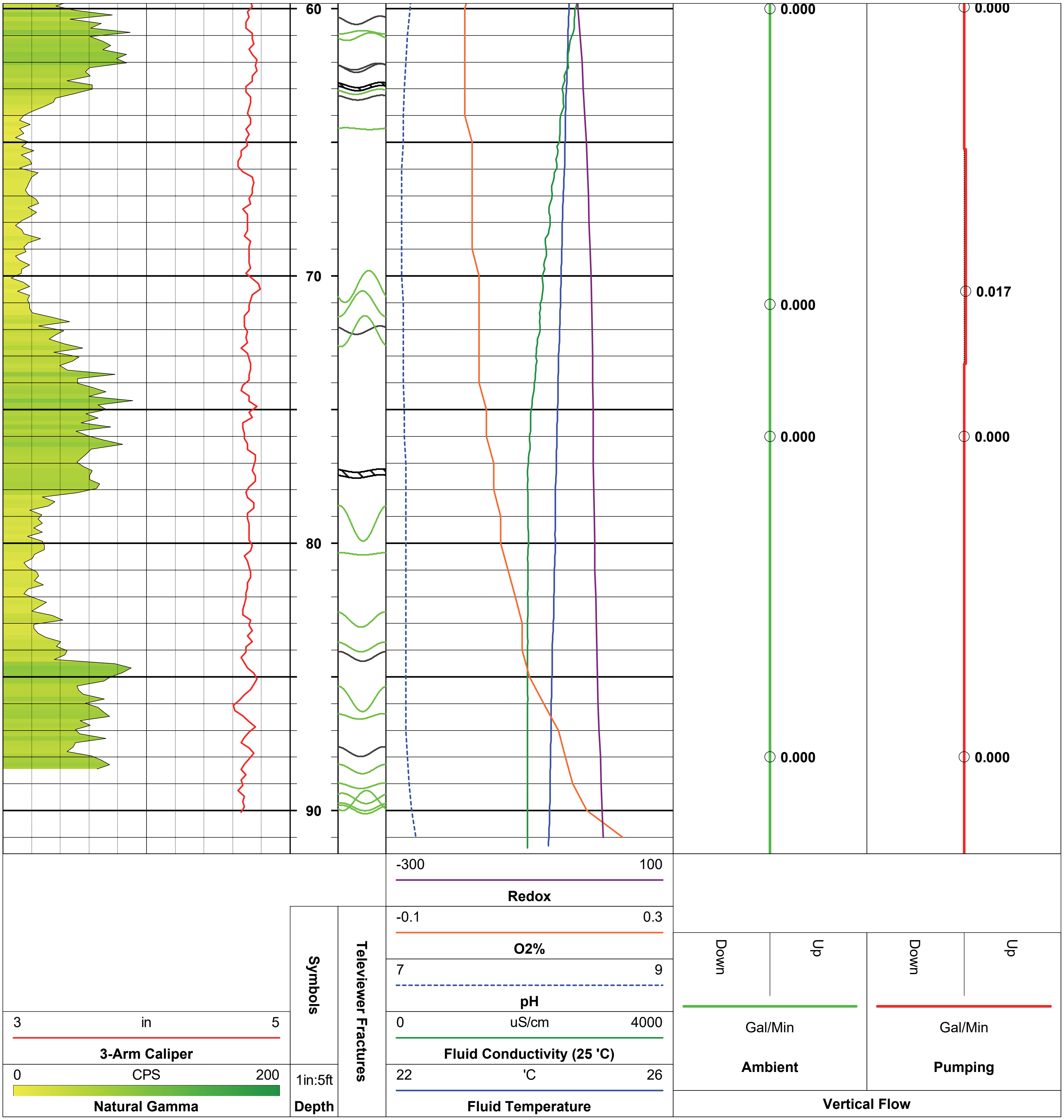
0.433
0.018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0.000
0.000
0.000
0.017
0.000
0.000
-300
100
Redox
-0.1
0.3
O2%
7
9
pH
0
uS/cm
4000
Fluid Conductivity (25 'C)
22
'C
26
Fluid Temperature
3
in
5
3-Arm Caliper
0
CPS
200
Natural Gamma
Symbols
1in:5ft
Depth
Televiewer Fractures
Down
Up
Gal/Min
Ambient
Down
Up
Gal/Min
Pumping
Vertical Flow

B19

Acoustic Televiewer

COMP	**Stantec**
WELL	**B19**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec — STATE: TN
WELL ID: B19 — ARM NO.: 180734
FIELD/SITE: Cumberland City — API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD
SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface — ELEVATION: TBD — K.B. N/A
LOG MEASURED FROM: Ground Surface — ABOVE PERM. DATUM: 0.00 — D.F. N/A
DRILLING MEAS. FROM: Ground Surface — STICK UP: 2.31 — G.L. N/A

LOGGING DATE	04.30.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	2				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	119.5				
ARM DEPTH (FT)	119.68				
BTM LOGGED INTERVAL (FT)	119.68				
TOP LOGGED INTERVAL (FT)	4.37				
CASING SIZE (IN)/DEPTH (FT)	4/45.3				
CASING ARM (FT)	45.11				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	15.55				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

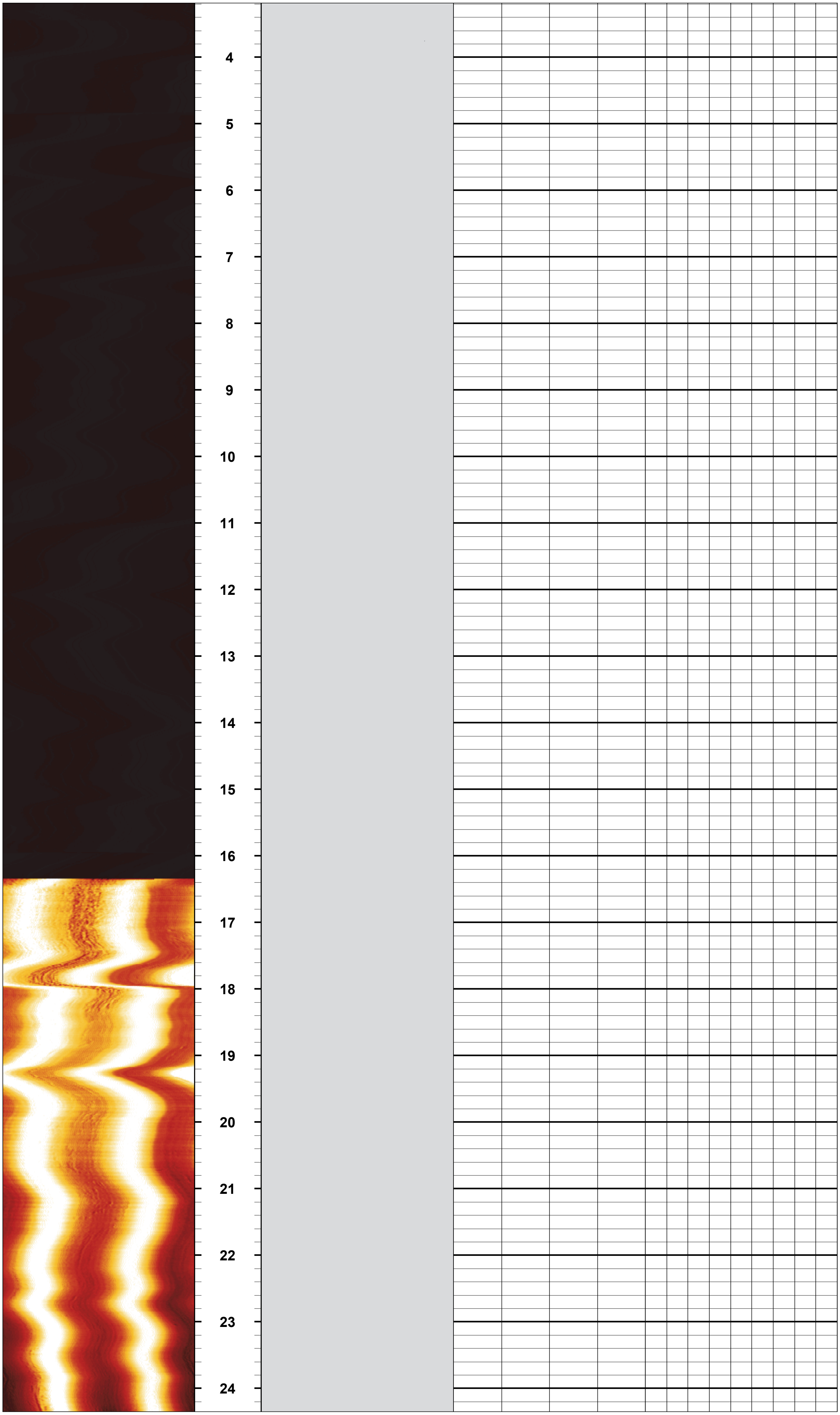
Symbols

Bottom of Casing

Structure

Open Fracture
Discontinuous Fract
Part. Open Fract

Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols			
	0			
	1			
	2			
	3			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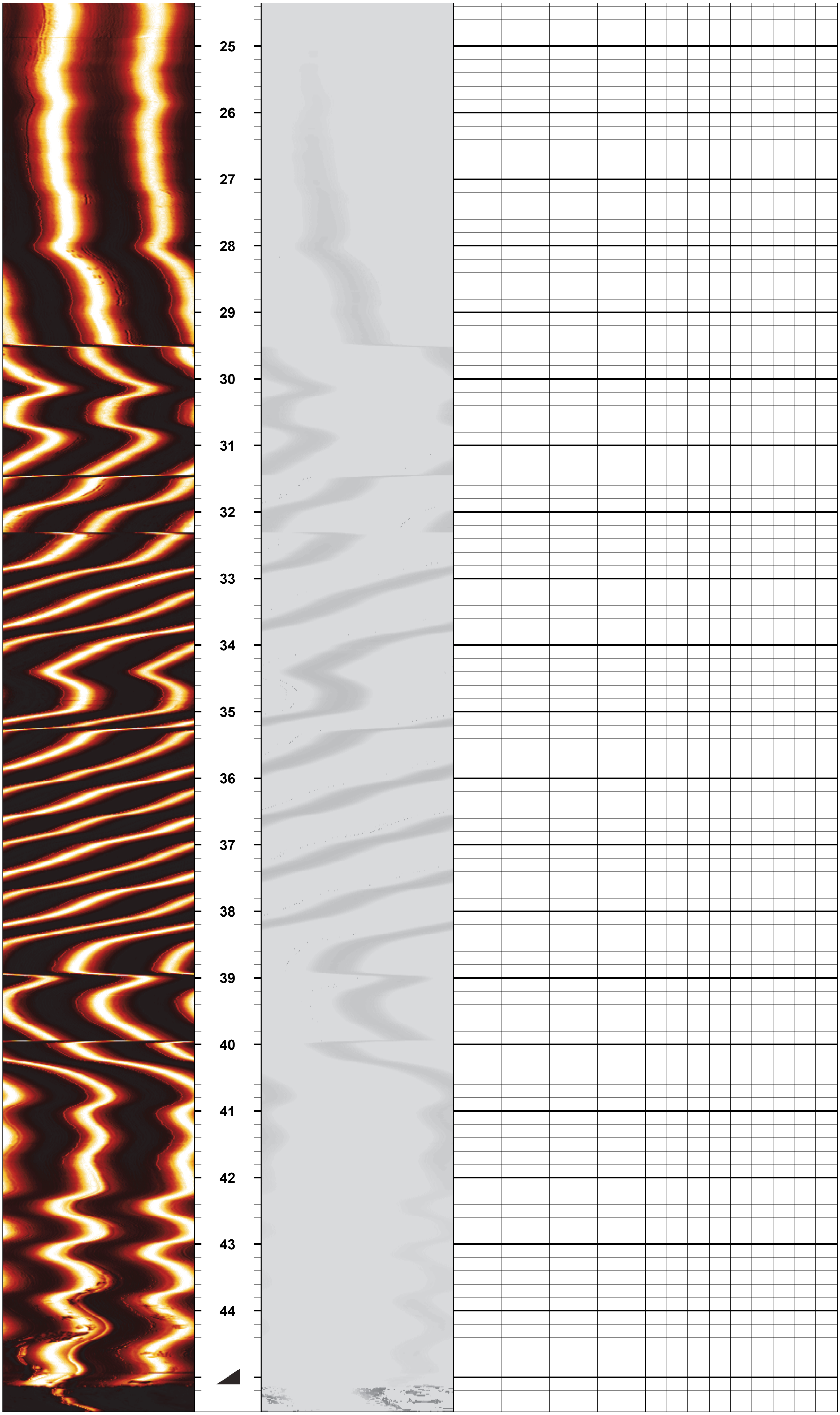
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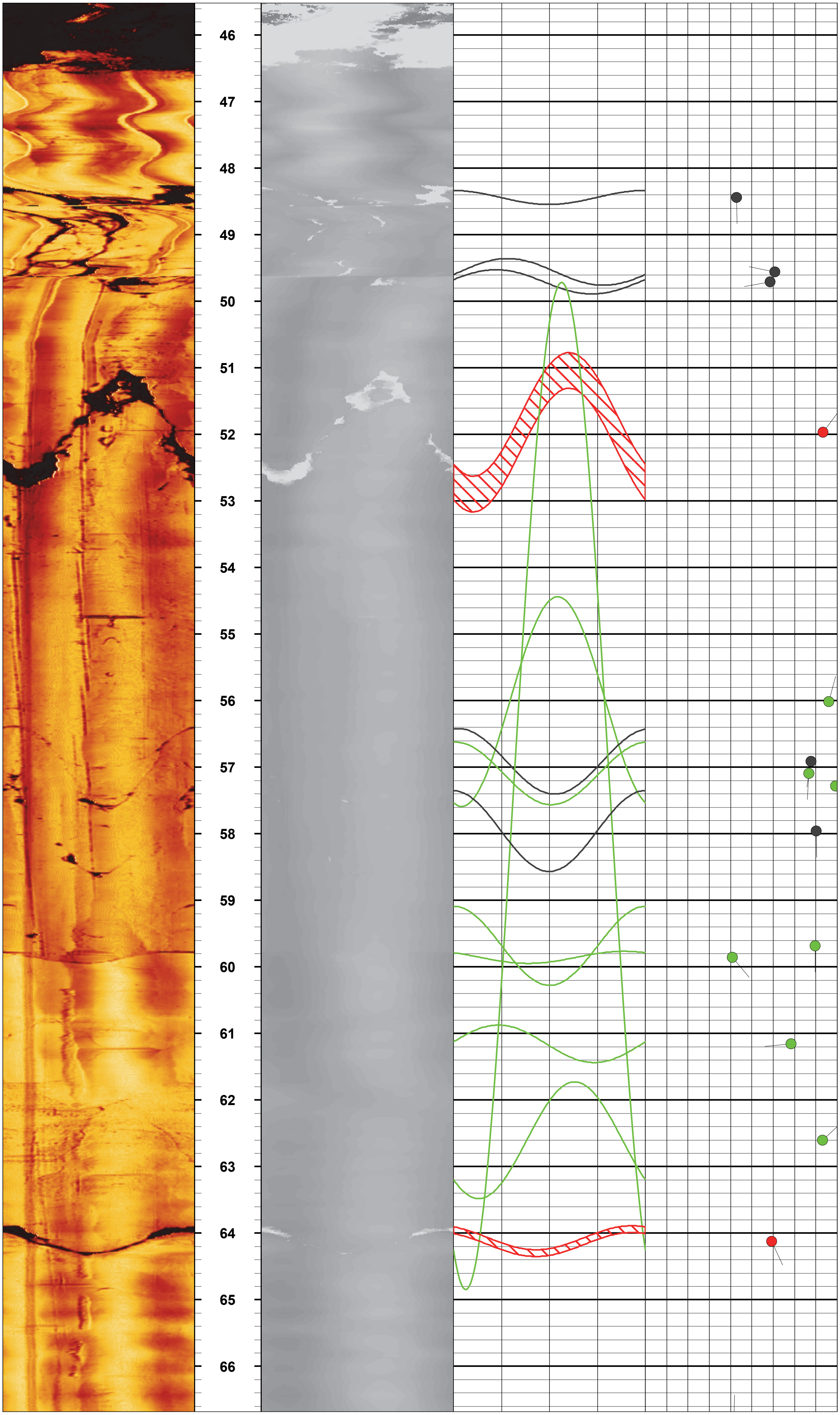
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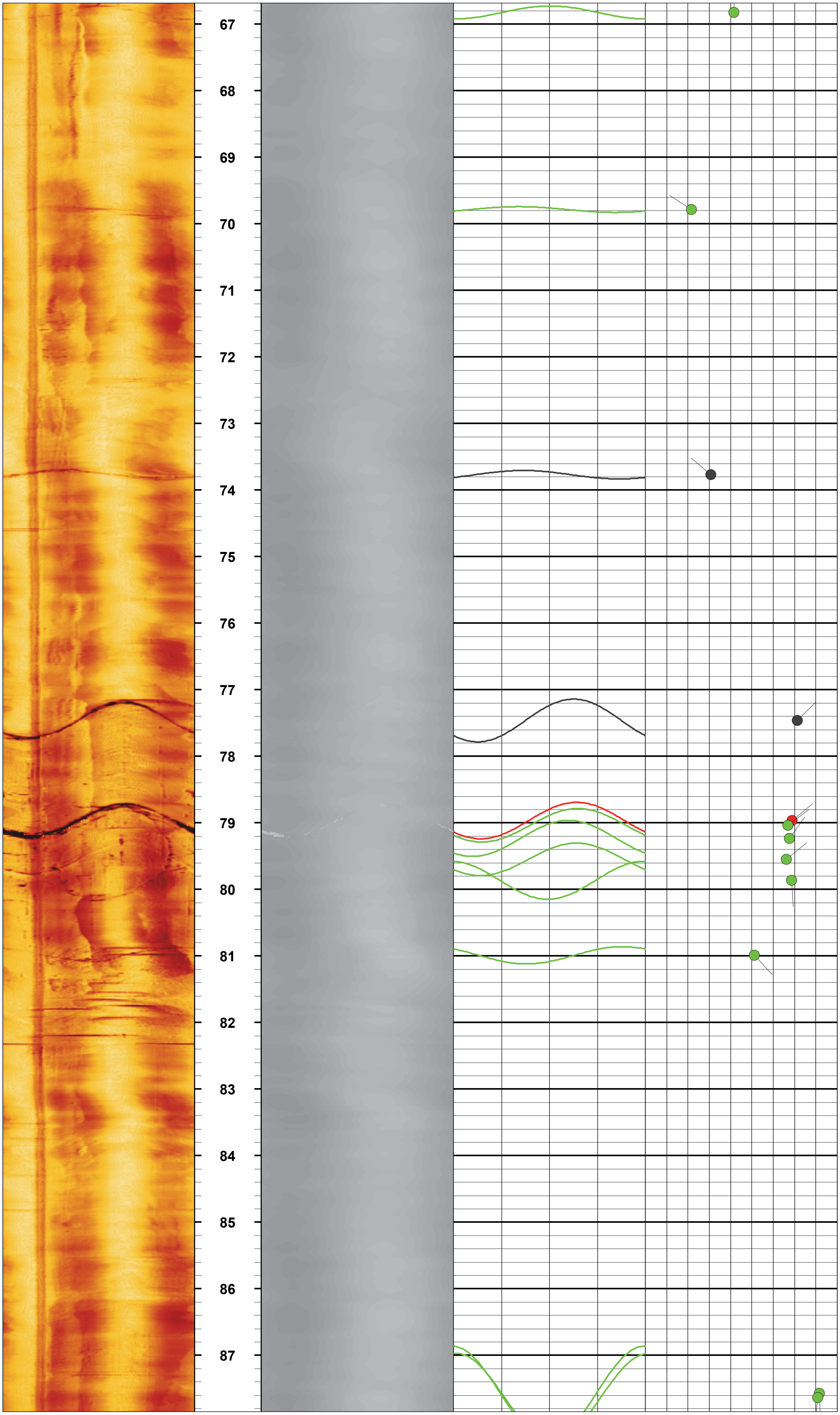
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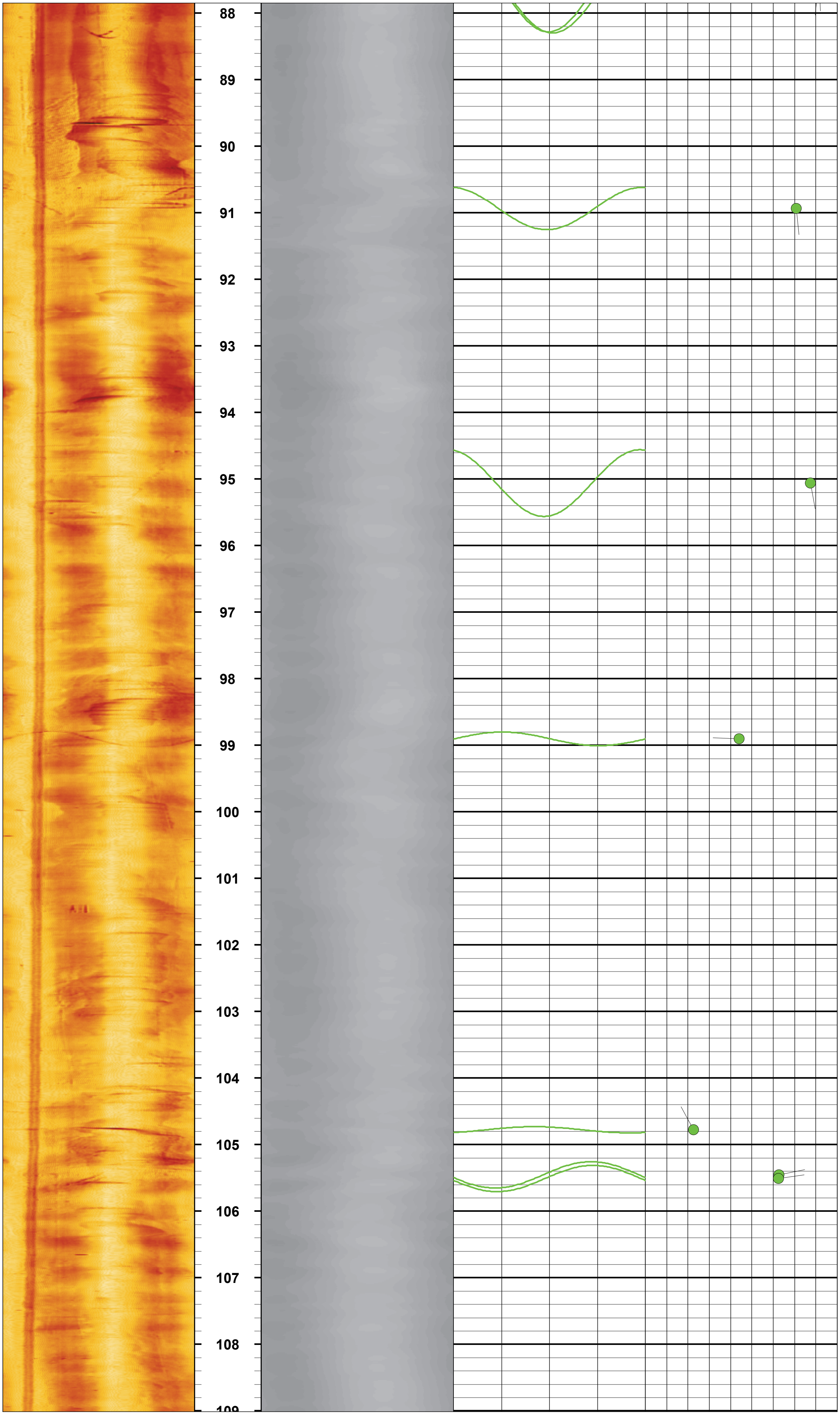
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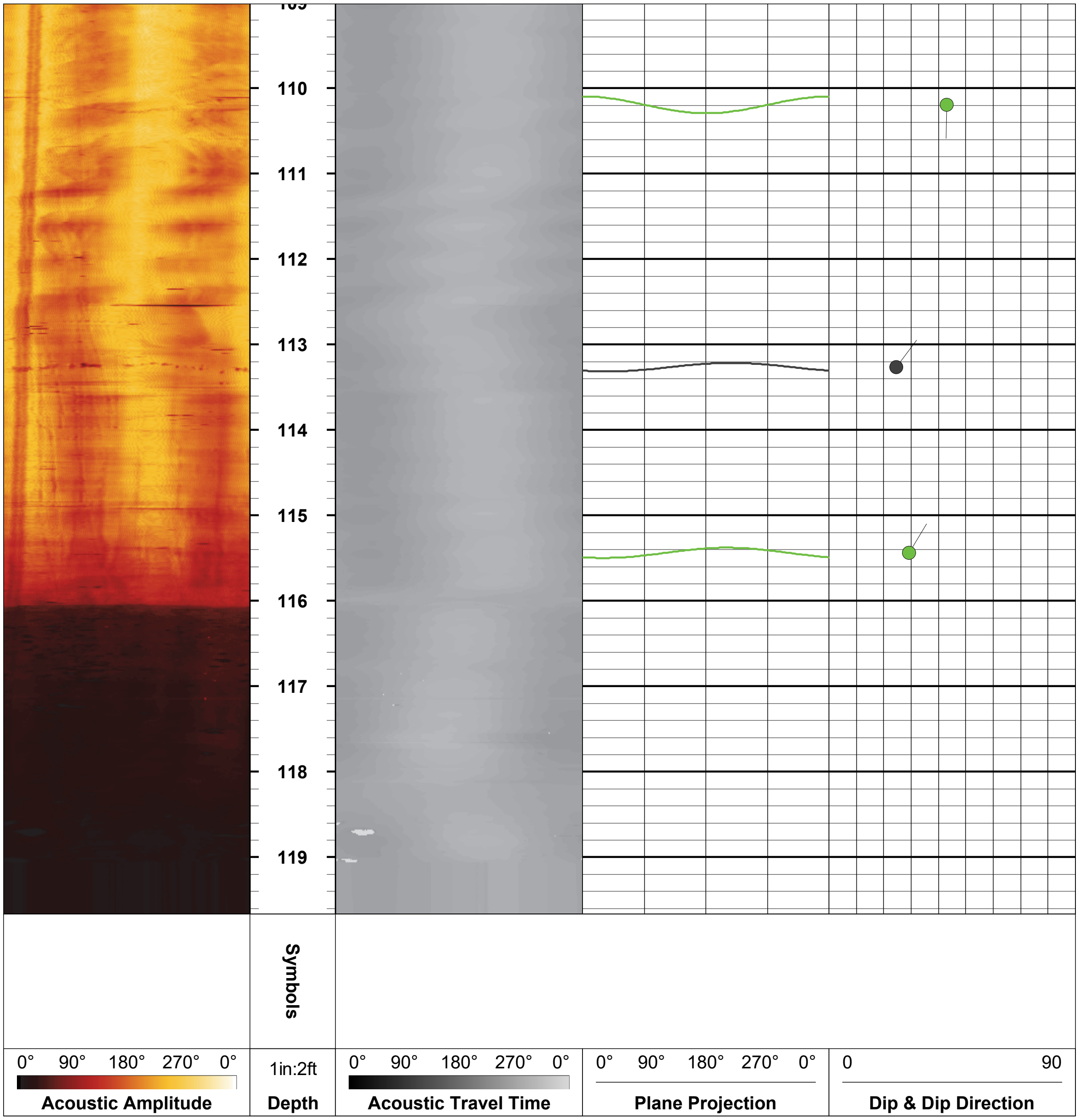

109
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116
117
118
119
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

ARM GEOPHYSICS
Surface & Borehole Services

COMP	Stantec
WELL	B19
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec STATE: TN
WELL ID: B19 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 2.31 G.L. N/A

LOGGING DATE	04.30.2019	04.30.2019	04.30.2019	04.30.2019	No Test Run
RUN NO	1	3	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	119.5	119.5	119.5	119.5	
ARM DEPTH (FT)	119.8	119.68	N/A	N/A	
BTM LOGGED INTERVAL (FT)	119.84	119.68	115.01	115.01	
TOP LOGGED INTERVAL (FT)	3.82	4.37	48.09	48	
CASING SIZE (IN)/DEPTH (FT)	4/45.3	4/45.3	4/45.3	4/45.3	
CASING ARM (FT)	45.11	45.11	45.11	45.11	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	15.55	15.55	15.55	15.55	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

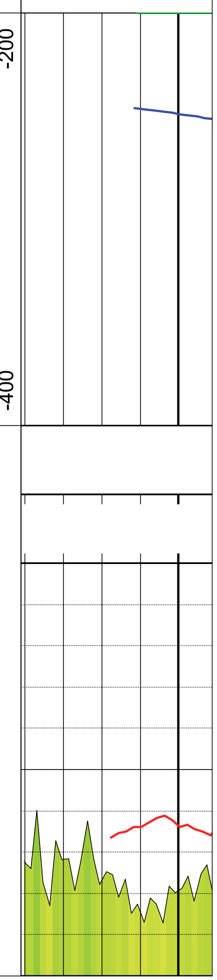
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

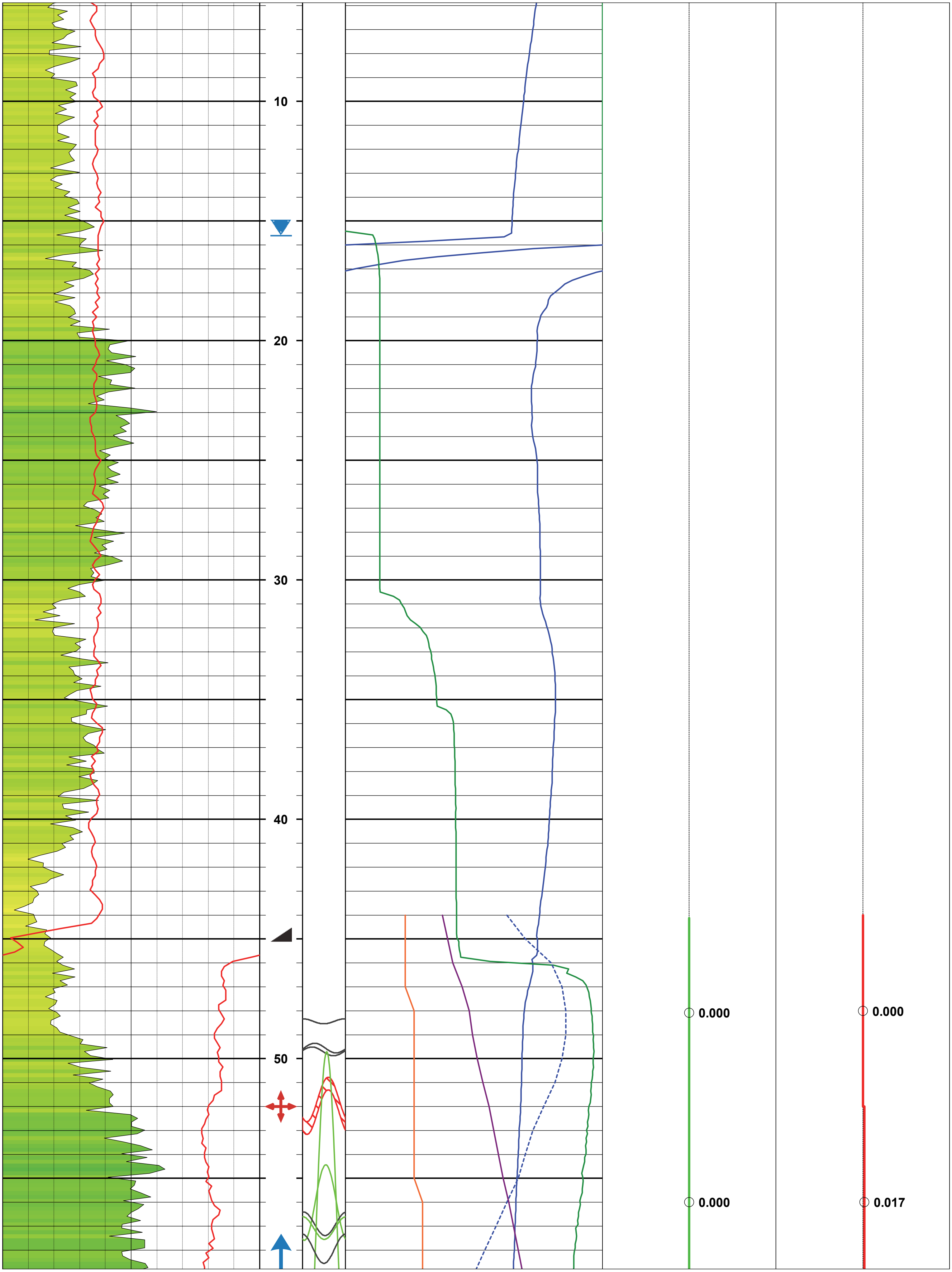
pH, O2%, and Redox data provided by Stantec.

Symbols

- Bottom of Casing
- Fluid Level
- Receiving Zone
- Producing Zone
- Up Flow

Natural Gamma (0 – 200 CPS); 3-Arm Caliper (3 – 5 in)	Depth 1in:5ft; Symbols	Televiewer Fractures	Fluid Temperature (22 – 26 'C); Fluid Conductivity (25 'C) (0 – 3600 uS/cm); pH (8.1 – 8.8); O2% (-0.1 – 0.2); Redox (-400 – -200)	Vertical Flow: Ambient Gal/Min (Down / Up); Pumping Gal/Min (Down / Up)

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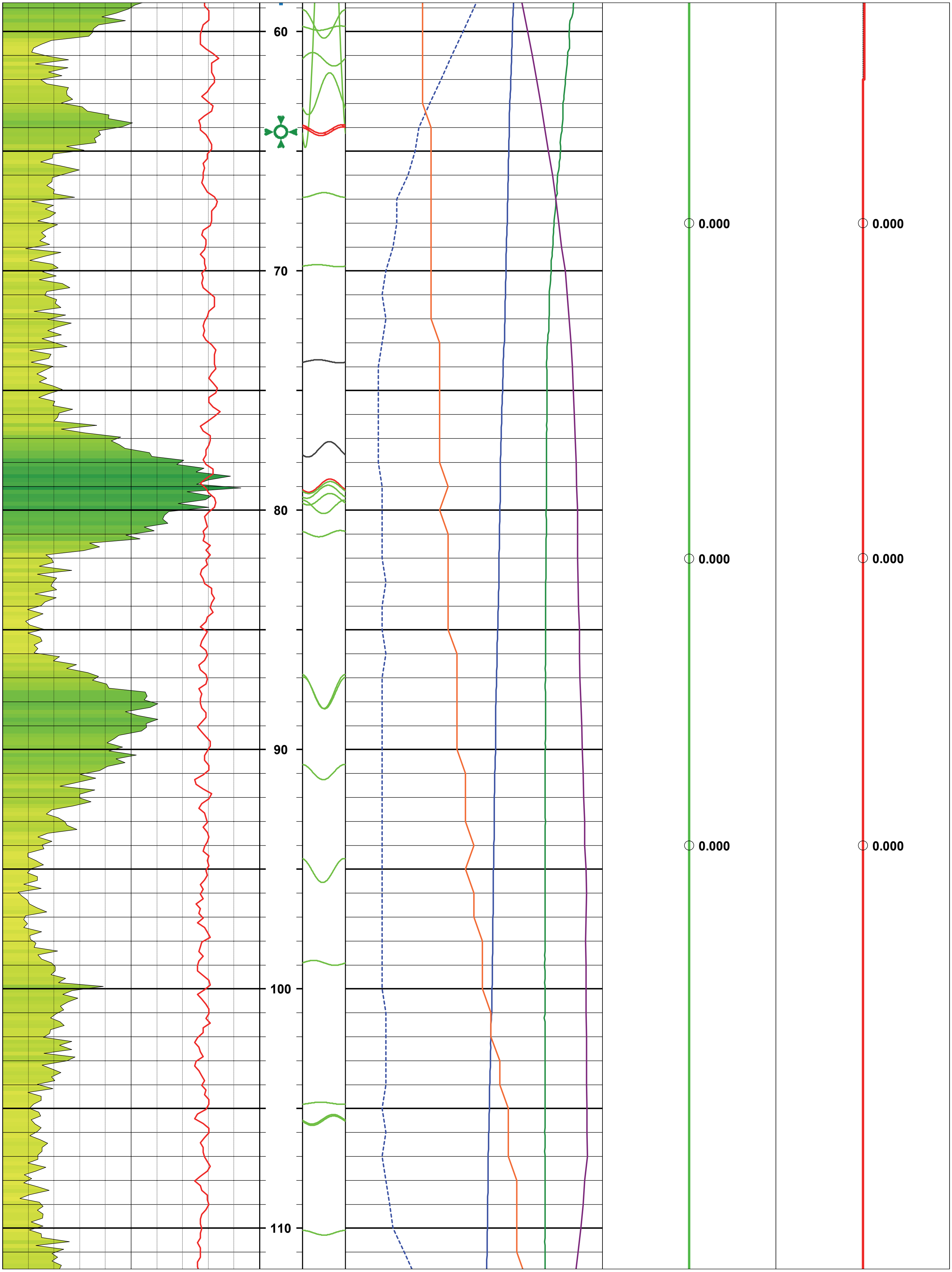
0.000
0.000
0.017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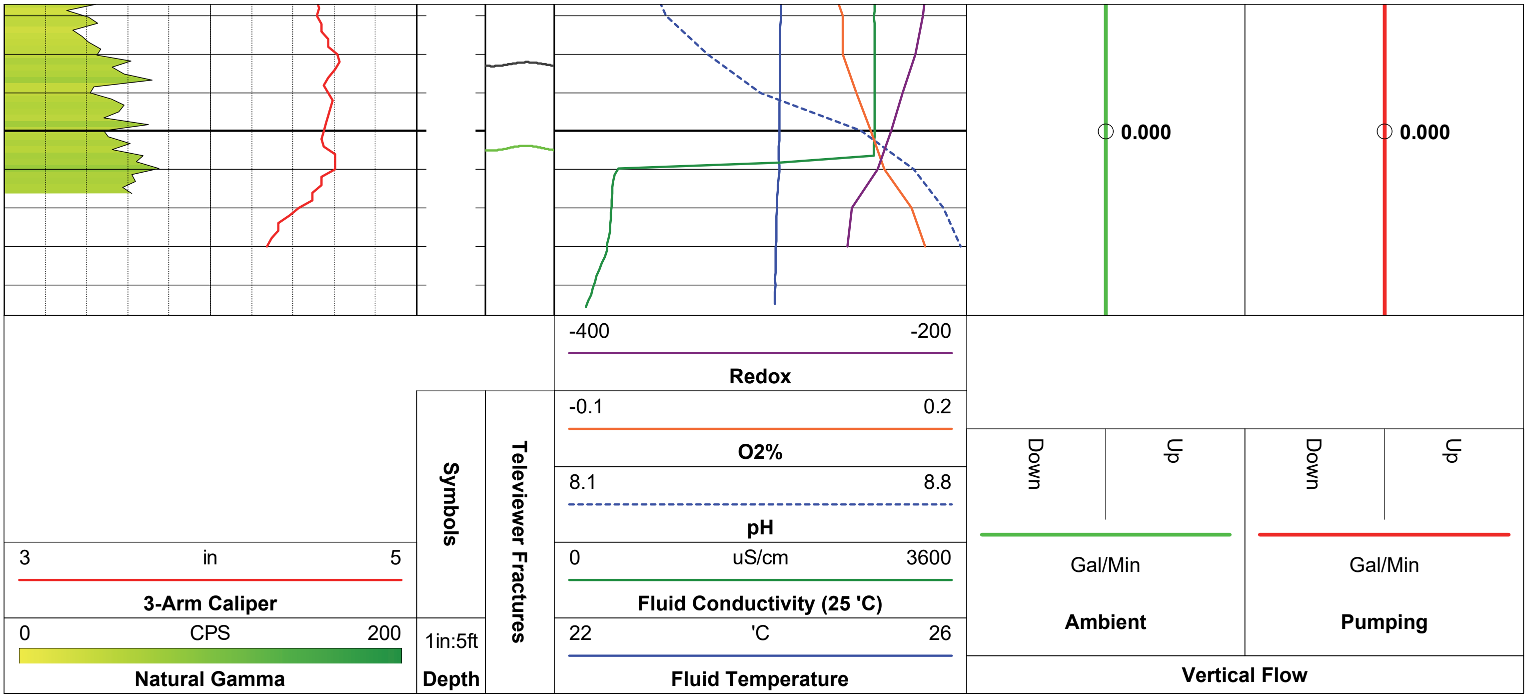
80
90
100
110
0.000
0.000
0.000
0.000
0.000
0.000


0.000
0.000
-400
-200
Redox
-0.1
0.2
O2%
8.1
8.8
pH
Symbols
Televiewer Fractures
Down
Up
Down
Up
3
in
5
3-Arm Caliper
0
uS/cm
3600
Fluid Conductivity (25 'C)
Gal/Min
Gal/Min
Ambient
Pumping
0
CPS
200
Natural Gamma
1in:5ft
Depth
22
'C
26
Fluid Temperature
Vertical Flow

TW01

Acoustic Televiewer

COMP	**Stantec**
WELL	**TW01**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec STATE: TN
WELL ID: TW01 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00
DRILLING MEAS. FROM: Ground Surface STICK UP: 1.6

K.B. N/A
D.F. N/A
G.L. N/A

LOGGING DATE	04.03.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	3				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	90.4				
ARM DEPTH (FT)	78				
BTM LOGGED INTERVAL (FT)	78				
TOP LOGGED INTERVAL (FT)	68				
CASING SIZE (IN)/DEPTH (FT)	4/70				
CASING ARM (FT)	69.95				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	36.07				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

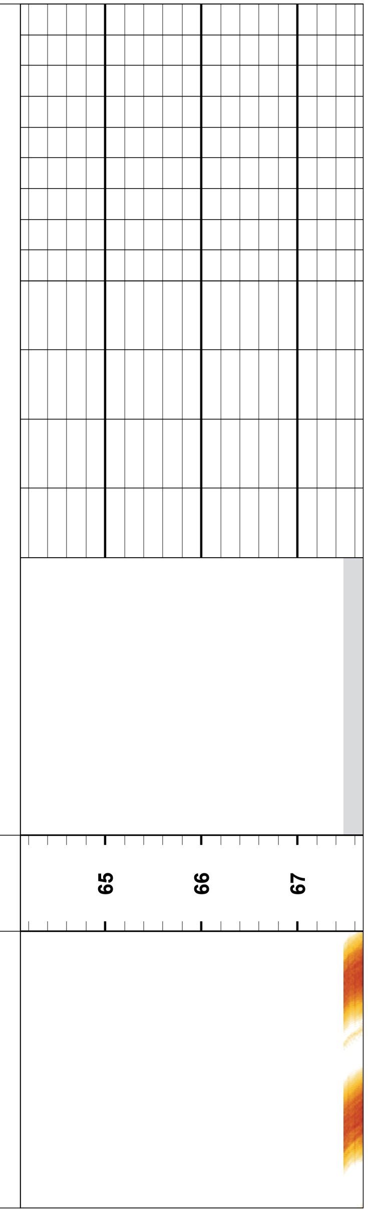
Symbols

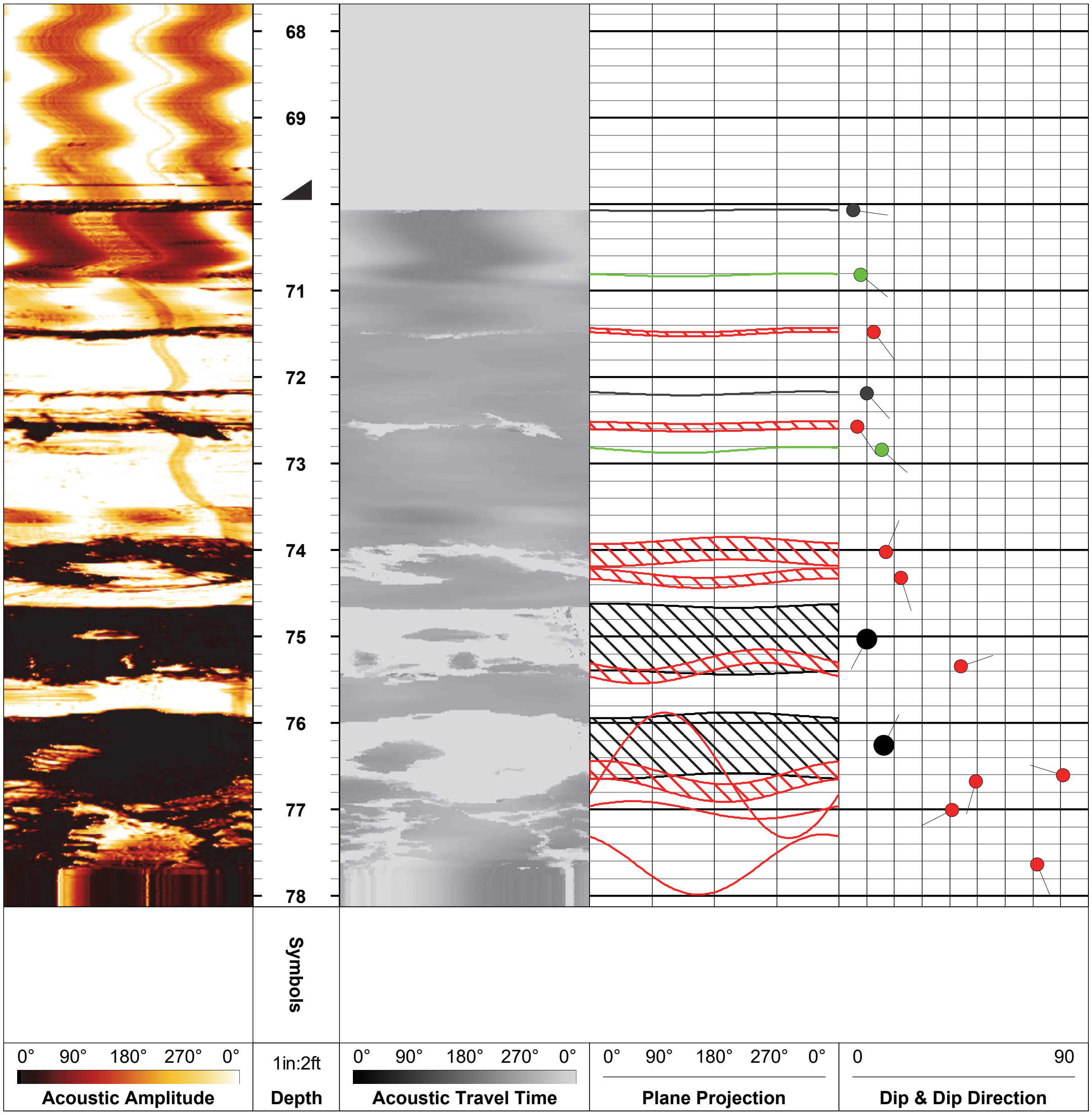
Bottom of Casing

Structure

Open Fracture
Discontinuous Fract
Part. Open Fract
Broken/Void/Soft Zone

Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols			




68
69
71
72
73
74
75
76
77
78
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

COMP	Stantec
WELL	TW01
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec STATE: TN
WELL ID: TW01 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD
SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 1.6 G.L. N/A

LOGGING DATE	04.03.2019	04.03.2019	04.03.2019	04.03.2019	No Test Run
RUN NO	1	2	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	90.4	90.4	90.4	90.4	
ARM DEPTH (FT)	88.6	88.7	N/A	N/A	
BTM LOGGED INTERVAL (FT)	88.69	88.74	74	74	
TOP LOGGED INTERVAL (FT)	4.53	5	71	67	
CASING SIZE (IN)/DEPTH (FT)	4/70	4/70	4/70	4/70	
CASING ARM (FT)	69.95	69.95	69.95	69.95	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	36.08	36.08	36.08	36.08	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

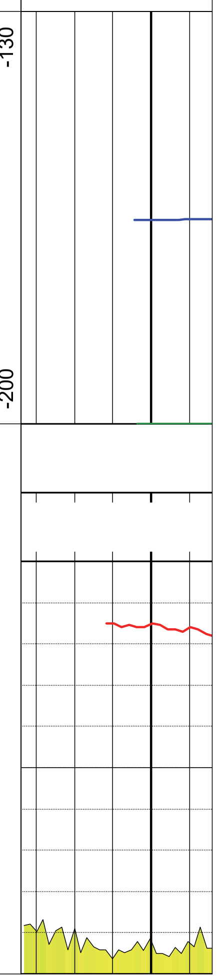
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

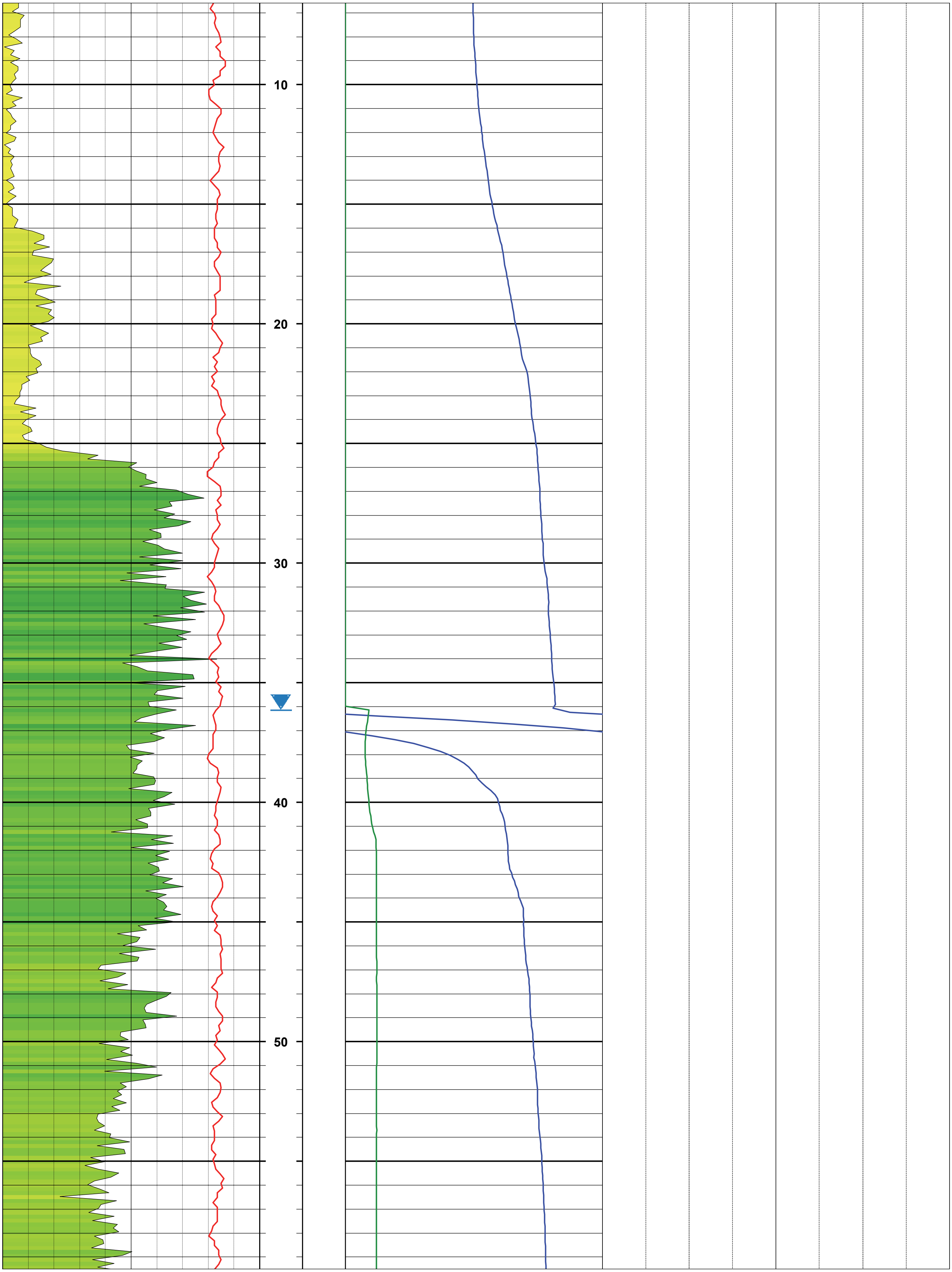
pH, O2%, and Redox data provided by Stantec.

Symbols

Bottom of Casing
Receiving Zone
Up Flow
Fluid Level
Producing Zone

Natural Gamma (0 – CPS – 200) / 3-Arm Caliper (2 – in – 4)	Depth 1in:5ft / Symbols	Televiewer Fractures	Fluid Temperature (14 – 'C – 18) / Fluid Conductivity (25 'C) (0 – uS/cm – 4400) / pH (7.8 – 8) / O2% (0.4 – 0.6) / Redox (-200 – -130)	Vertical Flow: Ambient Gal/Min (Down, Up) / Pumping Gal/Min (Down, Up)

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30
40
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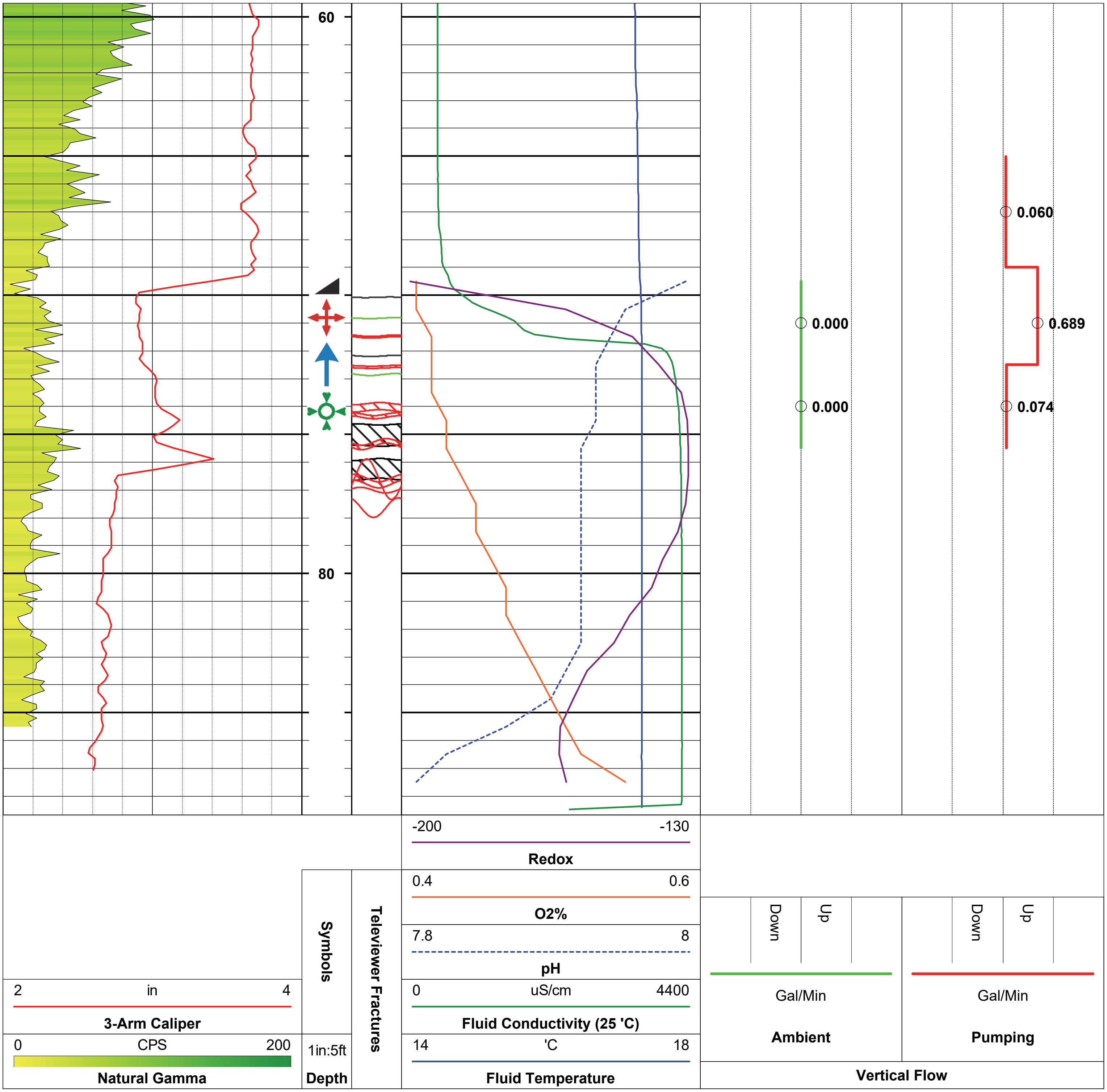
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80
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-200
-130
Redox
0.4
0.6
O2%
7.8
8
pH
0
uS/cm
4400
Fluid Conductivity (25 'C)
14
'C
18
Fluid Temperature
2
in
4
3-Arm Caliper
0
CPS
200
Natural Gamma
Symbols
1in:5ft
Depth
Televiewer Fractures
Down
Up
Gal/Min
Ambient
Down
Up
Gal/Min
Pumping
Vertical Flow

TW03

Acoustic Televiewer

COMP	**Stantec**
WELL	**TW03**
FLD	**Cumberland City**
CNTY	**Stewart**
STAT	**TN**
ARM	**180734**
API	**N/A**

COMPANY: Stantec STATE: TN
WELL ID: TW03 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM:	Ground Surface	ELEVATION:	TBD	K.B.	N/A
LOG MEASURED FROM:	Ground Surface	ABOVE PERM. DATUM:	0.00	D.F.	N/A
DRILLING MEAS. FROM:	Ground Surface	STICK UP:	0.9	G.L.	N/A

LOGGING DATE	04.03.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	3				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	99.4				
ARM DEPTH (FT)	99.56				
BTM LOGGED INTERVAL (FT)	99.56				
TOP LOGGED INTERVAL (FT)	73				
CASING SIZE (IN)/DEPTH (FT)	4/79.4				
CASING ARM (FT)	80.68				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	25.7				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

Symbols

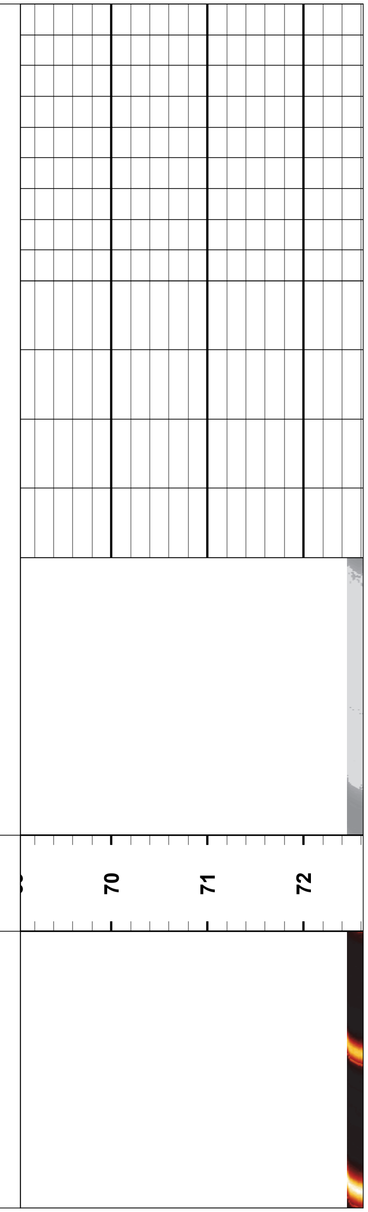
Bottom of Casing

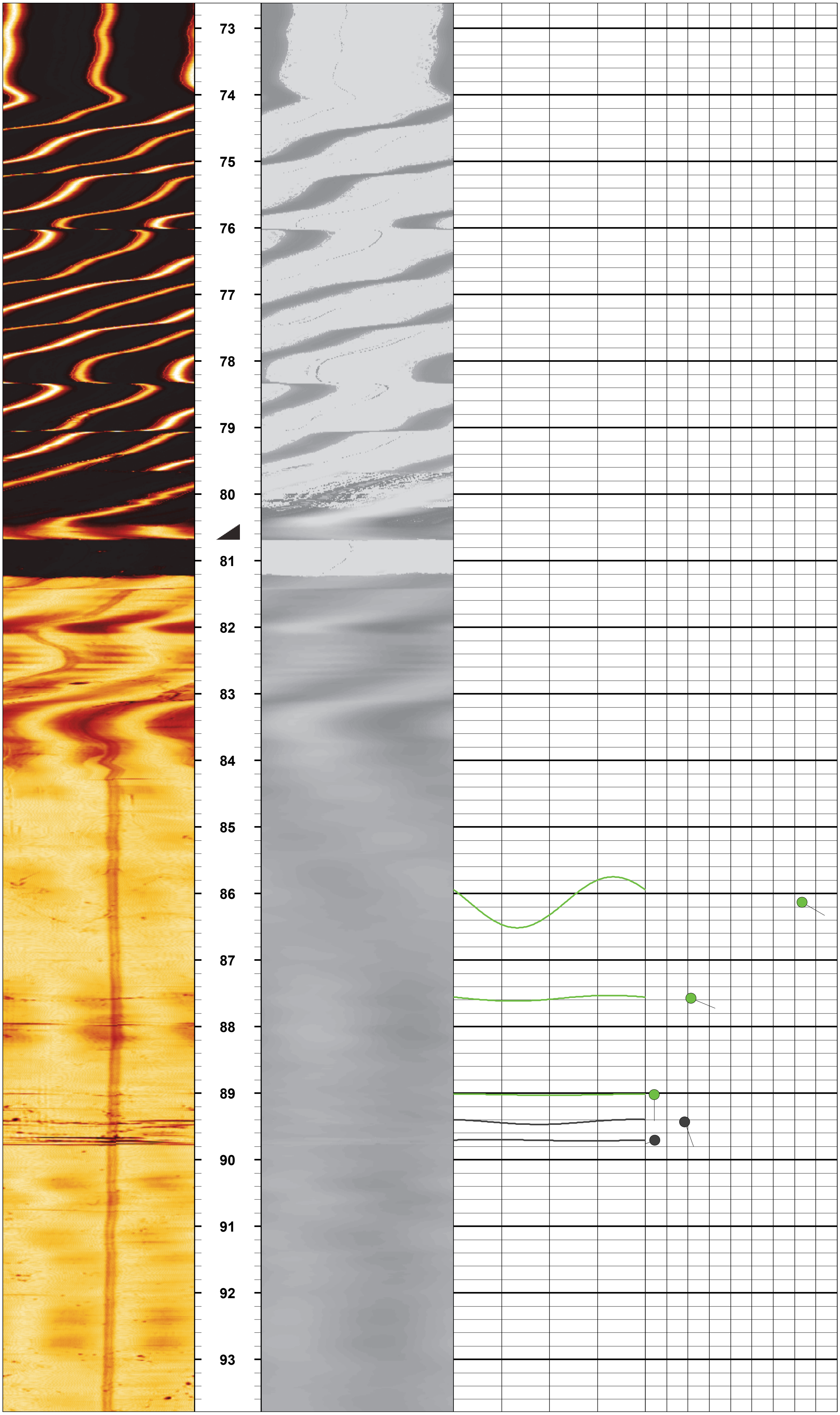
Structure

Discontinuous Fract

Part. Open Fract

Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols			

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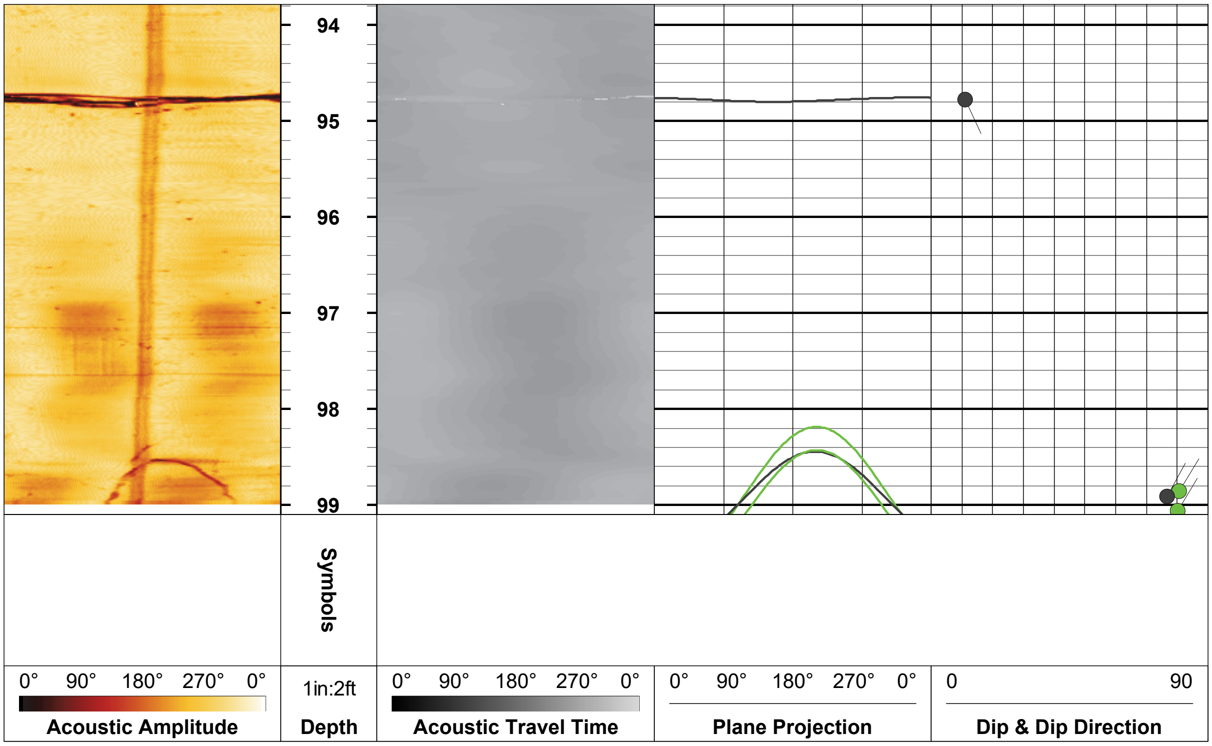

94
95
96
97
98
99
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

COMP Stantec
WELL TW03
FLD Cumberland City
CNTY Stewart
STAT TN
ARM 180734
API N/A

COMPANY:	Stantec	STATE:	TN
WELL ID:	TW03	ARM NO.:	180734
FIELD/SITE:	Cumberland City	API NO.:	N/A
COUNTY:	Stewart		

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM:	Ground Surface	ELEVATION:	TBD	K.B.	N/A
LOG MEASURED FROM:	Ground Surface	ABOVE PERM. DATUM:	0.00	D.F.	N/A
DRILLING MEAS. FROM:	Ground Surface	STICK UP:	0.9	G.L.	N/A

LOGGING DATE	04.03.2019	04.03.2019	04.03.2019	04.03.2019	No Test Run
RUN NO	1	2	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	99.4	99.4	99.4	99.4	
ARM DEPTH (FT)	99.5	99.58	N/A	N/A	
BTM LOGGED INTERVAL (FT)	99.53	99.58	98	98	
TOP LOGGED INTERVAL (FT)	5.23	5.78	80	80	
CASING SIZE (IN)/DEPTH (FT)	4/79.4	4/79.4	4/79.4	4/79.4	
CASING ARM (FT)	80.68	80.68	80.68	80.68	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	25.76	25.76	25.76	25.76	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

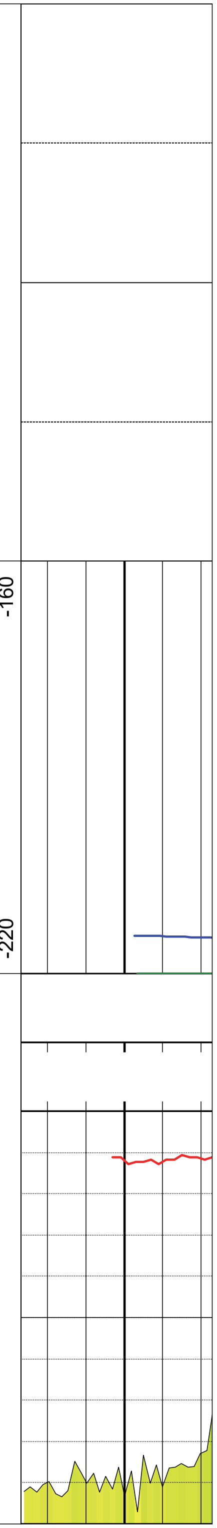
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

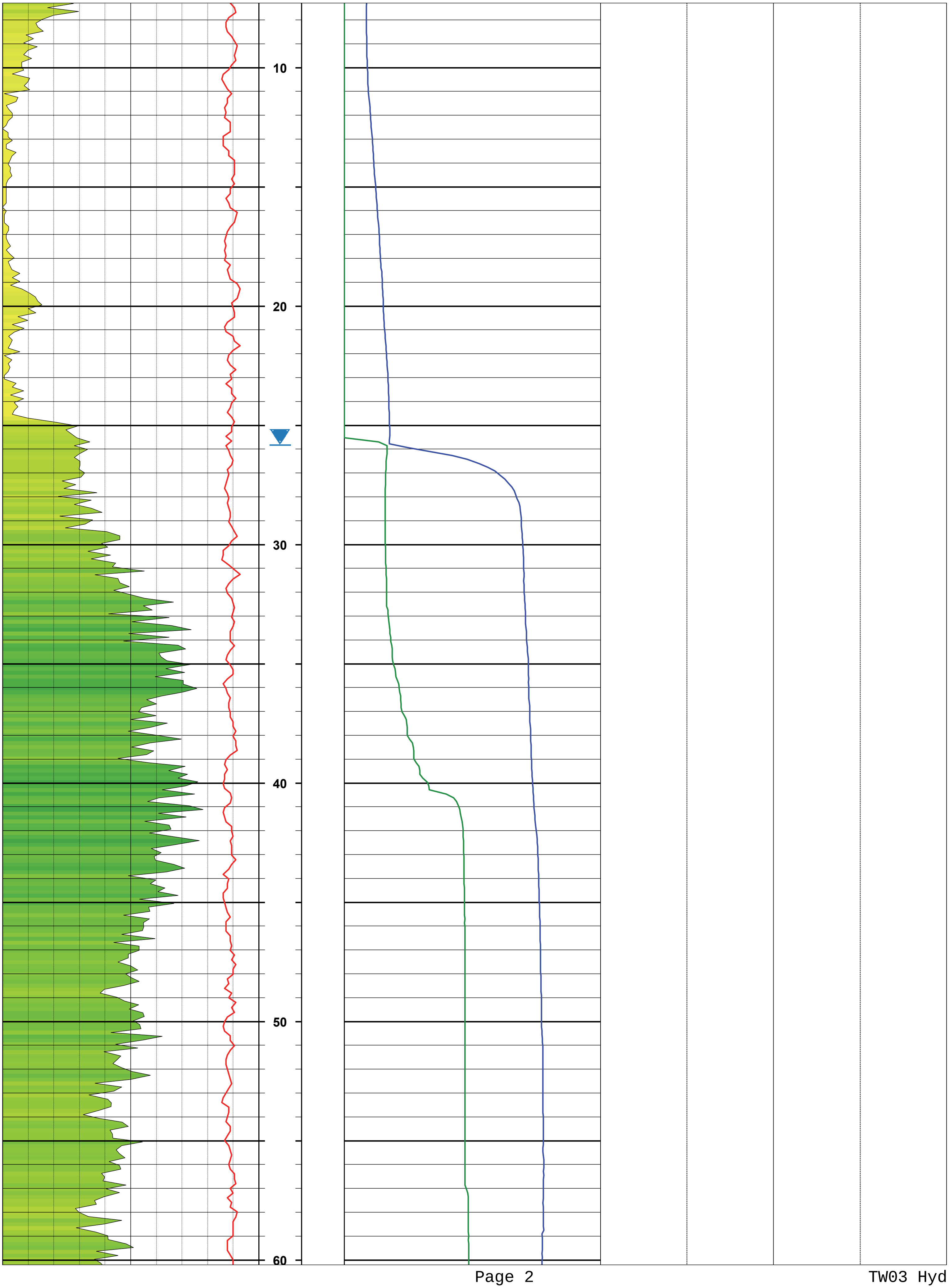
pH, O2%, and Redox data provided by Stantec.

Symbols

Bottom of Casing
Receiving Zone
Down Flow
Fluid Level
Producing Zone

Natural Gamma (0 – CPS – 200) / 3-Arm Caliper (2 – in – 4)	Depth 1in:5ft / Symbols	Televiewer Fractures	Fluid Temperature (14 – 'C – 18) / Fluid Conductivity (25 'C) (0 – uS/cm – 1600) / pH (7.3 – 7.6) / O2% (0.4 – 0.9) / Redox (-220 – -160)	Vertical Flow: Ambient Gal/Min (Down, Up)	Vertical Flow: Pumping Gal/Min (Down, Up)

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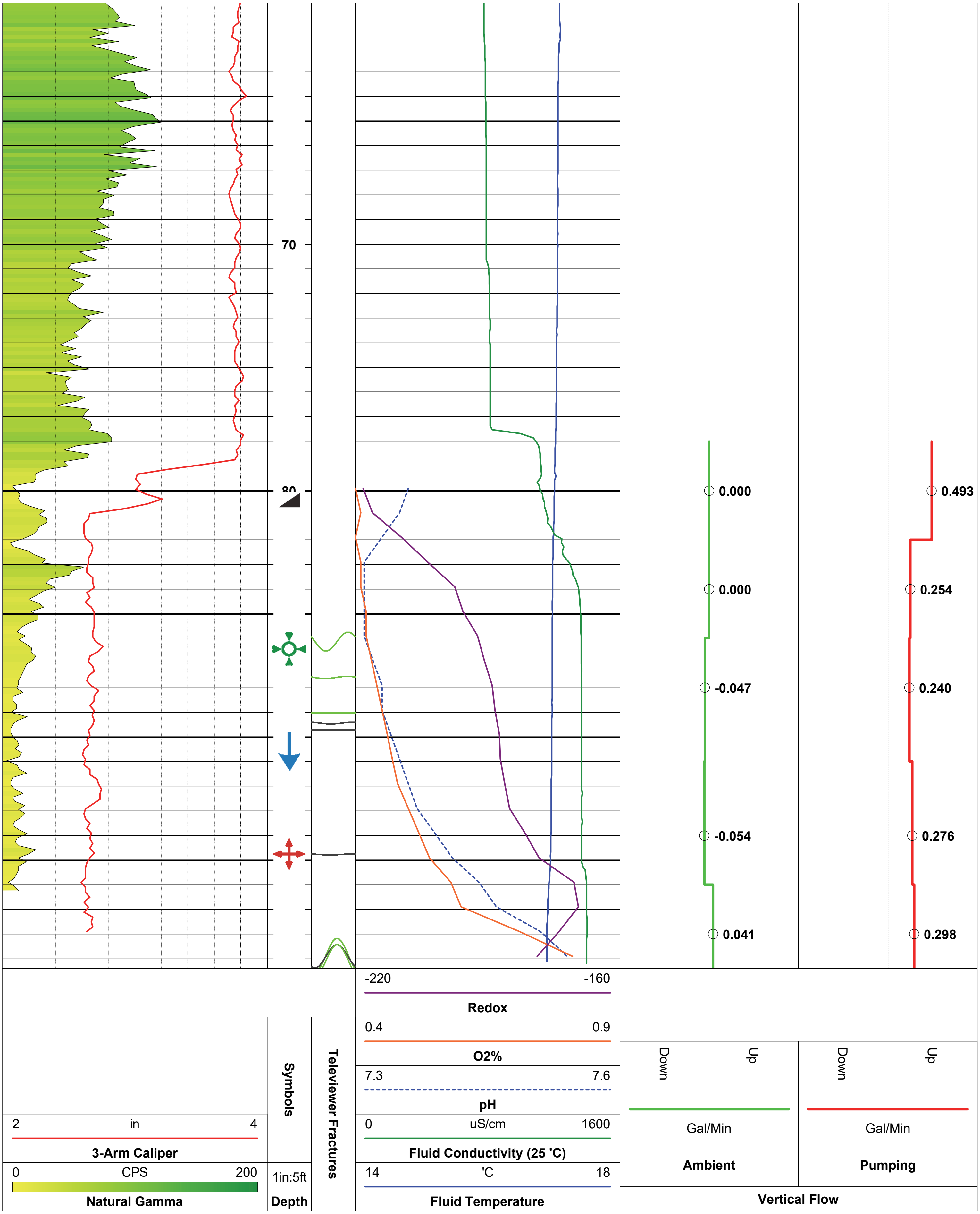

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0.000
0.000
-0.047
-0.054
0.041
0.493
0.254
0.240
0.276
0.298
2 in 4
3-Arm Caliper
0 CPS 200
Natural Gamma
Symbols
1in:5ft
Depth
Televiewer Fractures
-220 -160
Redox
0.4 0.9
O2%
7.3 7.6
pH
0 uS/cm 1600
Fluid Conductivity (25 'C)
14 'C 18
Fluid Temperature
Down
Up
Gal/Min
Ambient
Down
Up
Gal/Min
Pumping
Vertical Flow

TW05

Acoustic Televiwer

COMP	Stantec
WELL	TW05
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec — STATE: TN
WELL ID: TW05 — ARM NO.: 180734
FIELD/SITE: Cumberland City — API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

OTHER SERVICES
Ford F-350

SEC: TBD TWP: TBD QUAD: TBD

PERMANENT DATUM: Ground Surface — ELEVATION: TBD — K.B. N/A
LOG MEASURED FROM: Ground Surface — ABOVE PERM. DATUM: 0.00 — D.F. N/A
DRILLING MEAS. FROM: Ground Surface — STICK UP: 0.9 — G.L. N/A

LOGGING DATE	04.03.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	3				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	95.7				
ARM DEPTH (FT)	95.8				
BTM LOGGED INTERVAL (FT)	95.83				
TOP LOGGED INTERVAL (FT)	1.96				
CASING SIZE (IN)/DEPTH (FT)	4/75.5				
CASING ARM (FT)	75.24				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	24.32				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

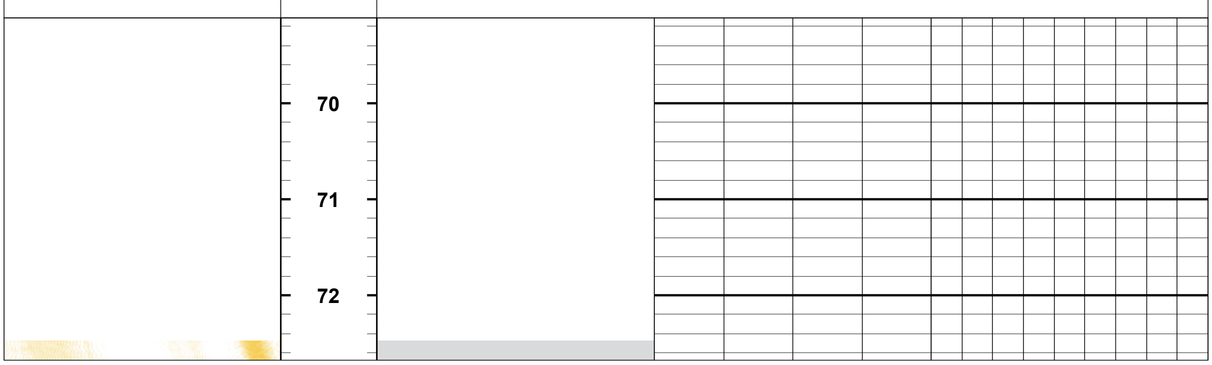
Symbols

Bottom of Casing

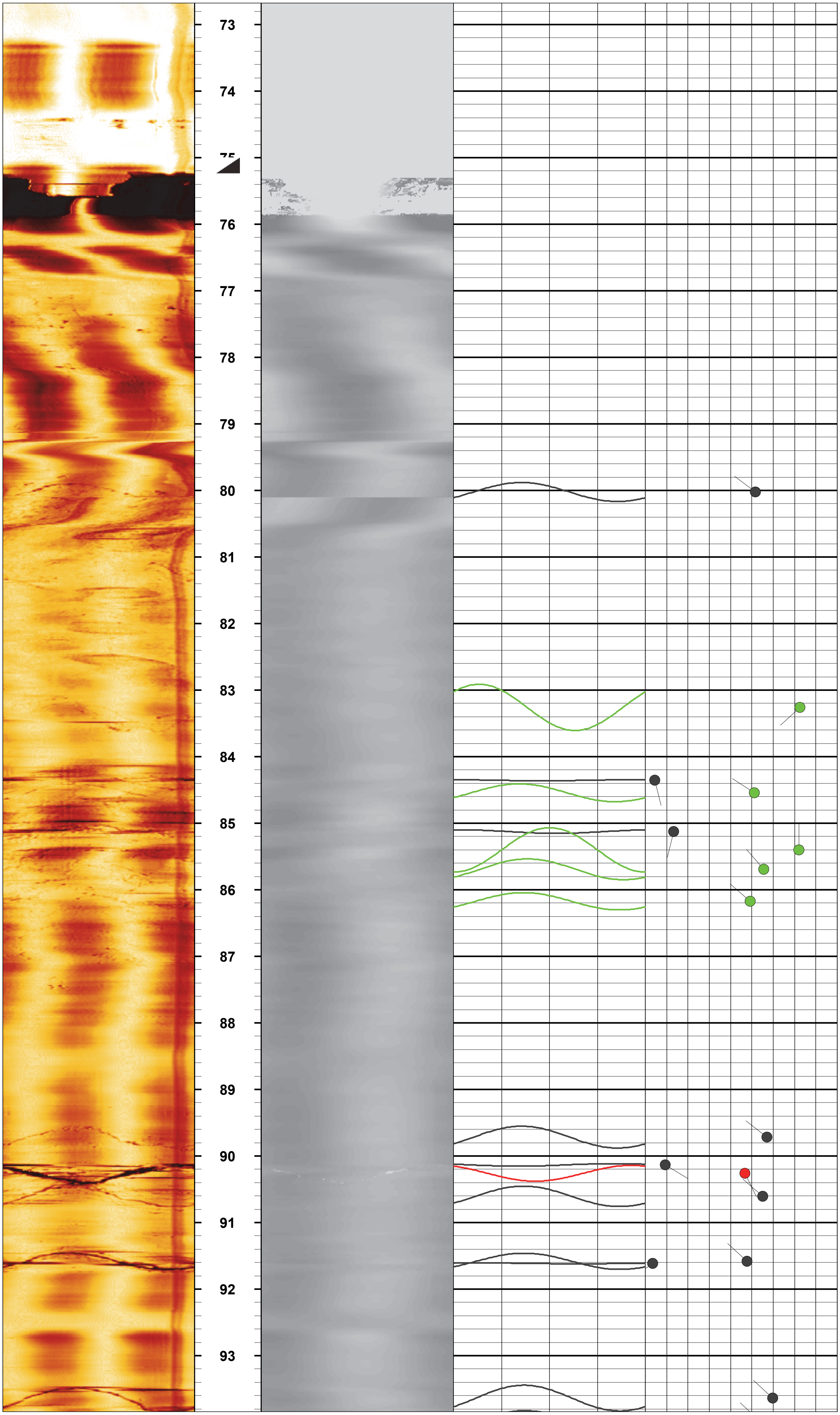
Structure

Open Fracture
Discontinuous Fract
Part. Open Fract

Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols			



TW05 ATV.WCL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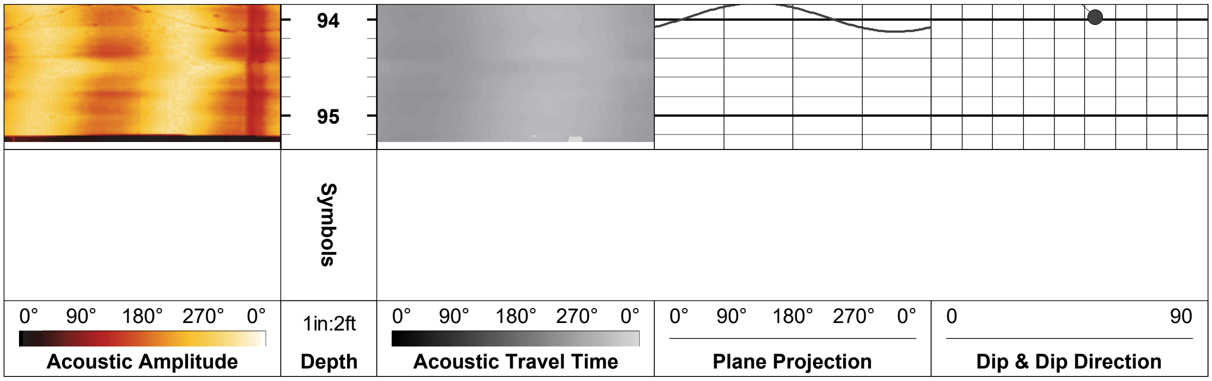

94
95
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

COMP	Stantec
WELL	TW05
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec　　STATE: TN
WELL ID: TW05　　ARM NO.: 180734
FIELD/SITE: Cumberland City　　API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD
SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface　　ELEVATION: TBD　　K.B. N/A
LOG MEASURED FROM: Ground Surface　　ABOVE PERM. DATUM: 0.00　　D.F. N/A
DRILLING MEAS. FROM: Ground Surface　　STICK UP: 1.96　　G.L. N/A

LOGGING DATE	04.03.2019	04.03.2019	04.04.2019	04.04.2019	No Test Run
RUN NO	1	2	4	5	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	95.7	95.7	95.7	95.7	
ARM DEPTH (FT)	95.7	95.83	N/A	N/A	
BTM LOGGED INTERVAL (FT)	95.79	95.83	95	95	
TOP LOGGED INTERVAL (FT)	4.17	4.72	78	78	
CASING SIZE (IN)/DEPTH (FT)	4/75.5	4/75.5	4/75.5	4/75.5	
CASING ARM (FT)	75.24	75.24	75.24	75.24	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	24.36	24.36	24.36	24.36	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

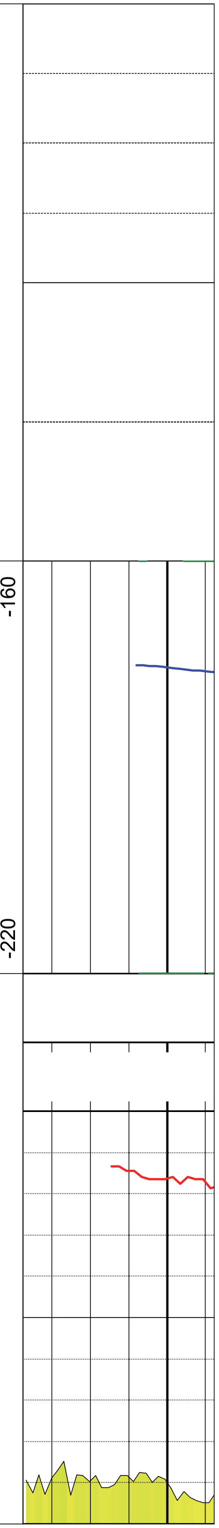
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

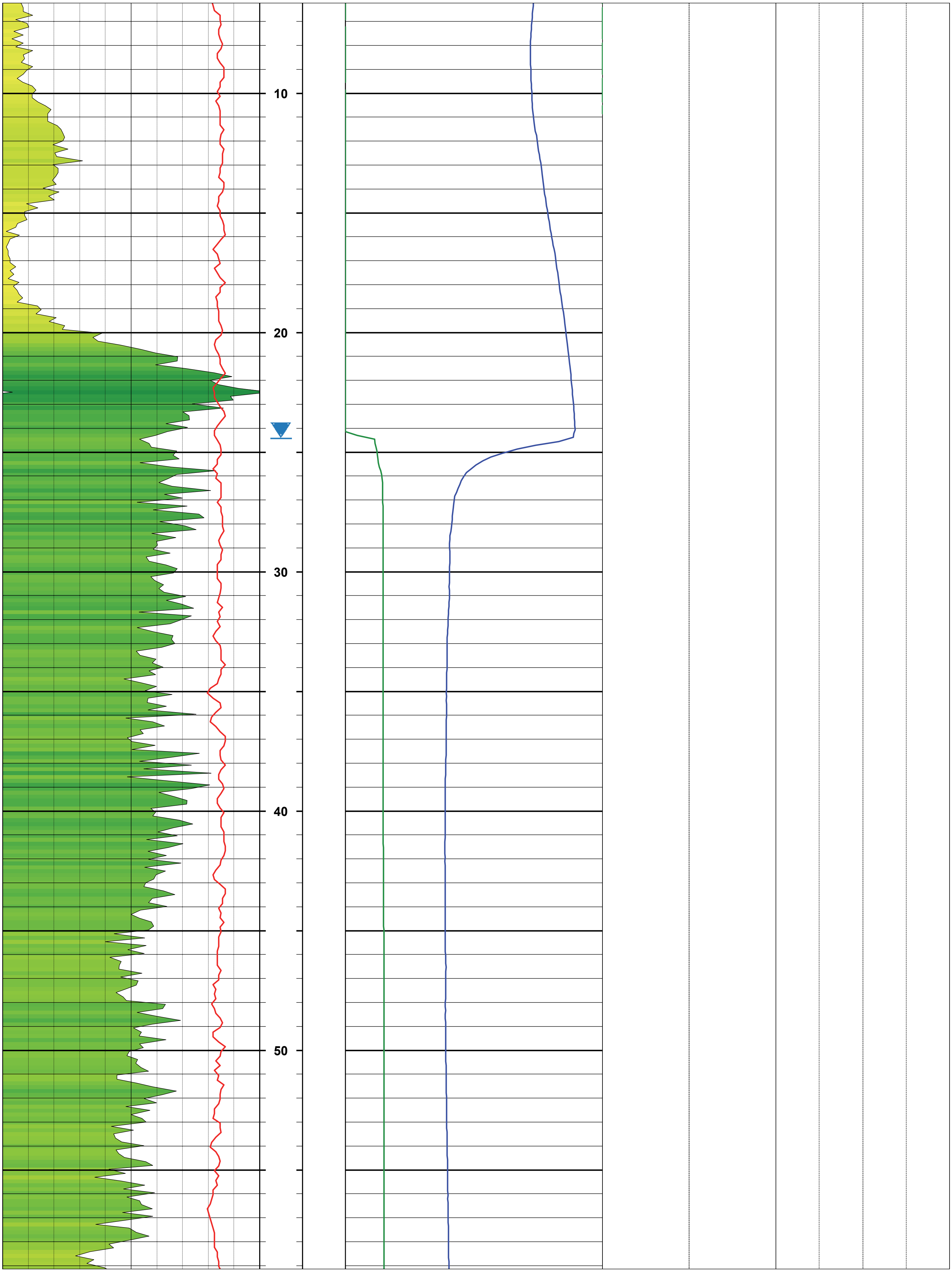
pH, O2%, and Redox data provided by Stantec.

Symbols

Bottom of Casing　Receiving Zone　Up Flow
Fluid Level　Producing Zone

Natural Gamma 0 CPS 200 / 3-Arm Caliper 2 in 4	Depth 1in:5ft	Symbols	Televiewer Fractures	Fluid Temperature 15 'C 19 / Fluid Conductivity (25 'C) 0 uS/cm 4800 / pH 7.1 7.5 / O2% 0.3 0.7 / Redox -220 -160	Vertical Flow: Ambient Gal/Min (Down, Up)	Pumping Gal/Min (Down, Up)

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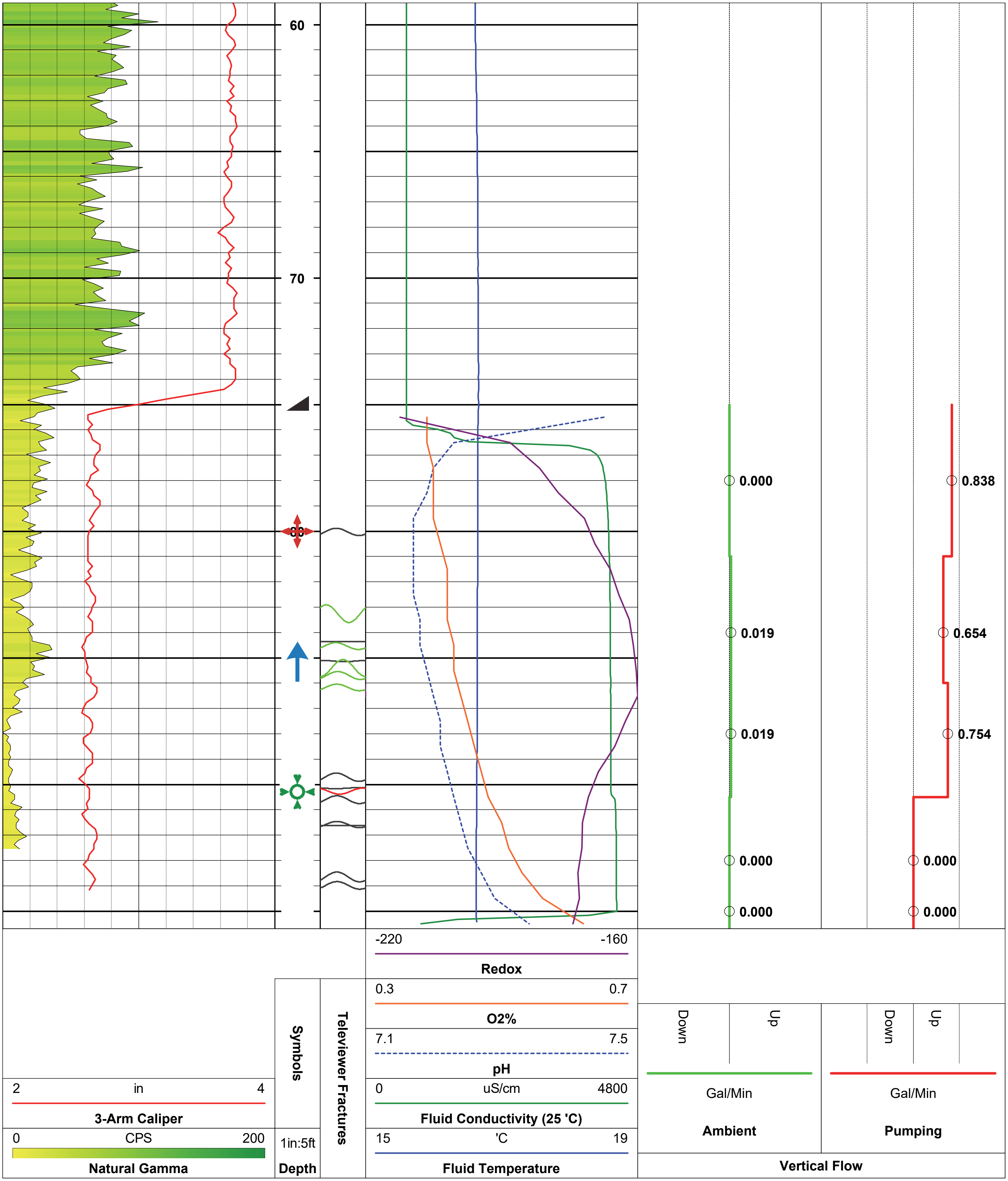

60
70
0.000
0.838
0.019
0.654
0.019
0.754
0.000
0.000
0.000
0.000
-220
-160
Redox
0.3
0.7
O2%
7.1
7.5
pH
0
uS/cm
4800
Fluid Conductivity (25 'C)
15
'C
19
Fluid Temperature
2
in
4
3-Arm Caliper
0
CPS
200
Natural Gamma
Symbols
Televiewer Fractures
1in:5ft
Depth
Down
Up
Down
Up
Gal/Min
Gal/Min
Ambient
Pumping
Vertical Flow

TW07

Acoustic Televiewer

COMP	**Stantec**
WELL	**TW07**
SITE	**Cumberland Fossil Plant**
CITY	**Cumberland City**
CNTY	**Stewart**
STATE	**TN**
ARM	**180734**

COMPANY:	Stantec	COUNTY:	Stewart
WELL ID:	TW07	STATE:	TN
SITE:	Cumberland Fossil Plant	ARM NO.:	180734
CITY:	Cumberland City	WEATHER:	N/A

LOCATION:	TBD	ACQUSITION SETUP Ford F-350
LATITUDE:	TBD	
LONGITUDE:	TBD	
NORTHING:	TBD	
EASTING:	TBD	

PERMANENT DATUM:	Ground Surface	ELEVATION:	TBD	BIT SIZE:	NQ3 (3")
LOG MEASURED FROM:	Ground Surface	ABOVE PERM. DATUM:	0.00	ROD SIZE:	NQ (3")
DRILLING MEAS. FROM:	Ground Surface	STICK UP:	2.0		

LOGGING DATE	01.09.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	4				
TYPE LOG	ATV				
DRILLER DEPTH (FT)	150.0				
ARM DEPTH (FT)	145.1				
BTM LOGGED INTERVAL (FT)	145.1				
TOP LOGGED INTERVAL (FT)	124.0				
CASING SIZE (IN)	4.5				
CASING DEPTH (FT)	130.0				
ARM CASING DEPTH (FT)	126.8				
FLUID LEVEL IN HOLE (FT)	67.5				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
N/A

Symbols

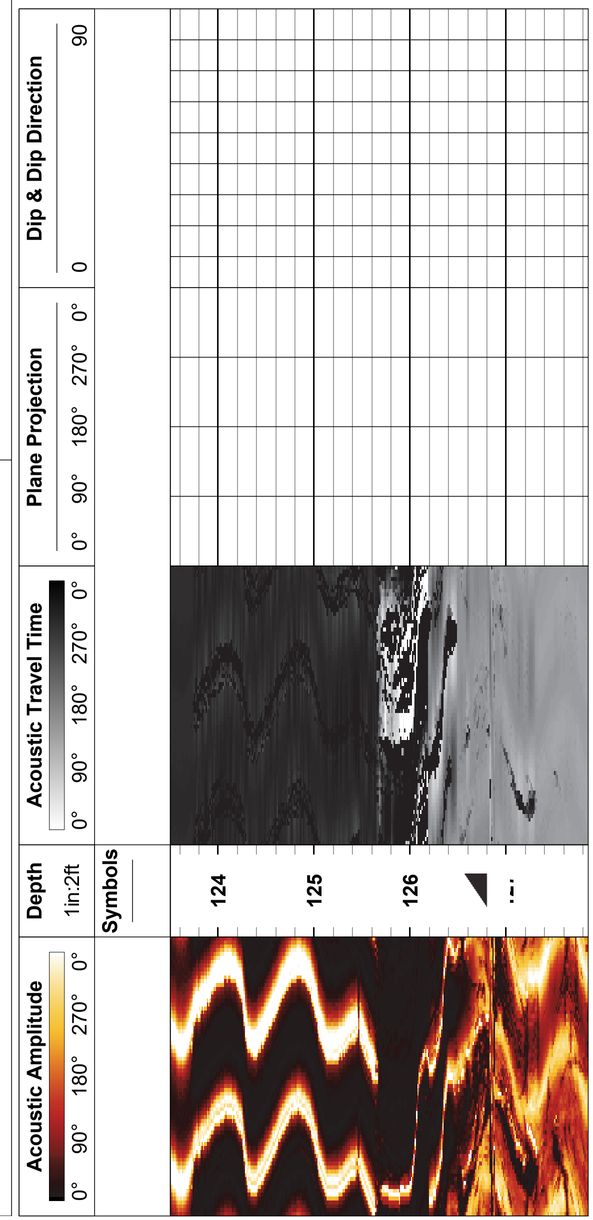
Bottom of Casing

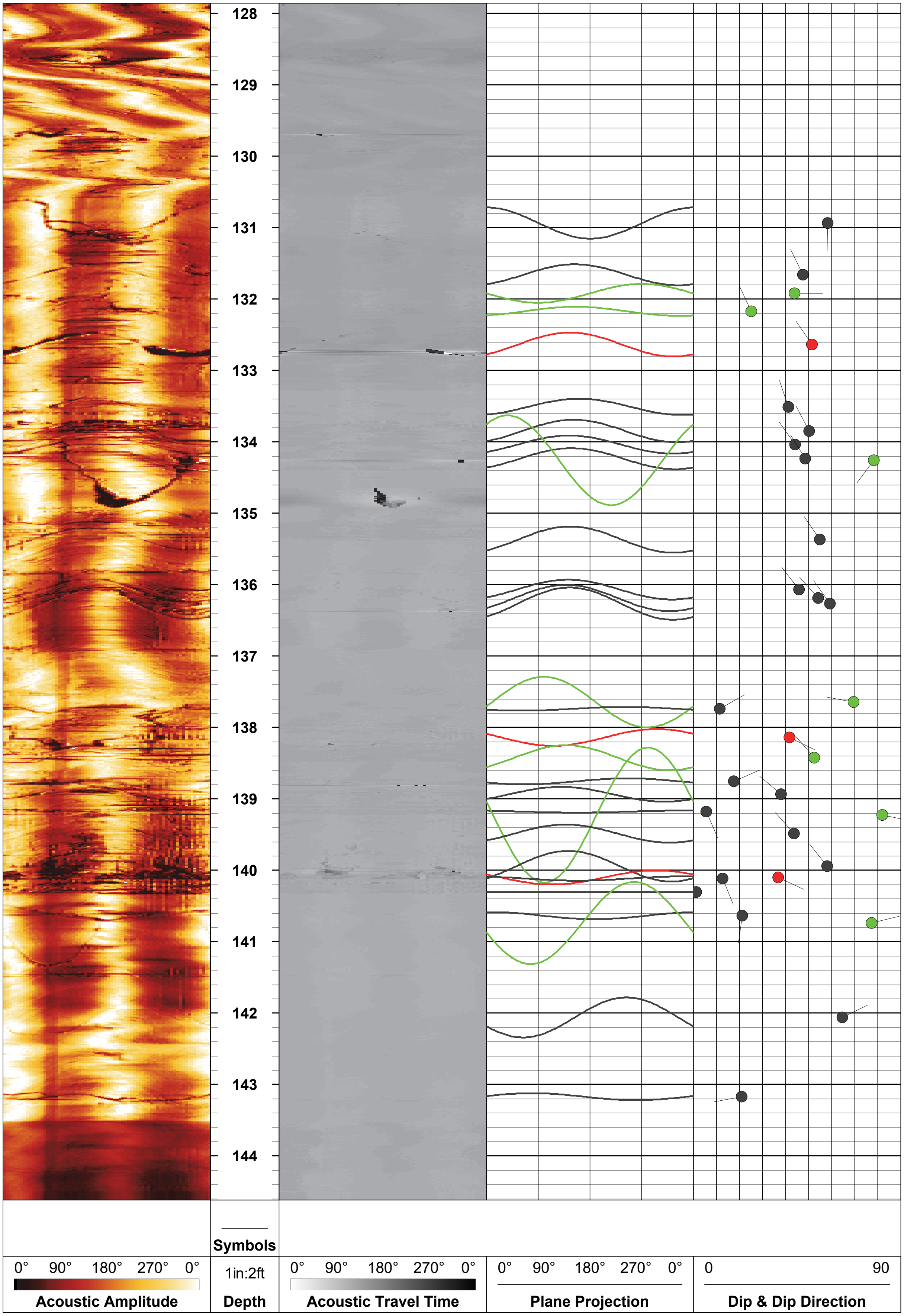
Structure

Open Fracture

Discontinuous Fract

Part. Open Fract




128
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142
143
144
Symbols
0° 90° 180° 270° 0°
Acoustic Amplitude
1in:2ft
Depth
0° 90° 180° 270° 0°
Acoustic Travel Time
0° 90° 180° 270° 0°
Plane Projection
0 90
Dip & Dip Direction

Hydro Log

COMP	**Stantec**
WELL	**TW07**
SITE	**Cumberland Fossil Plant**
CITY	**Cumberland City**
CNTY	**Stewart**
STATE	**TN**
ARM	**180734**

COMPANY:	Stantec	COUNTY:	Stewart
WELL ID:	TW07	STATE:	TN
SITE:	Cumberland Fossil Plant	ARM NO.:	180734
CITY:	Cumberland City	WEATHER:	N/A

LOCATION: TBD
LATITUDE: TBD
LONGITUDE: TBD
NORTHING: TBD
EASTING: TBD

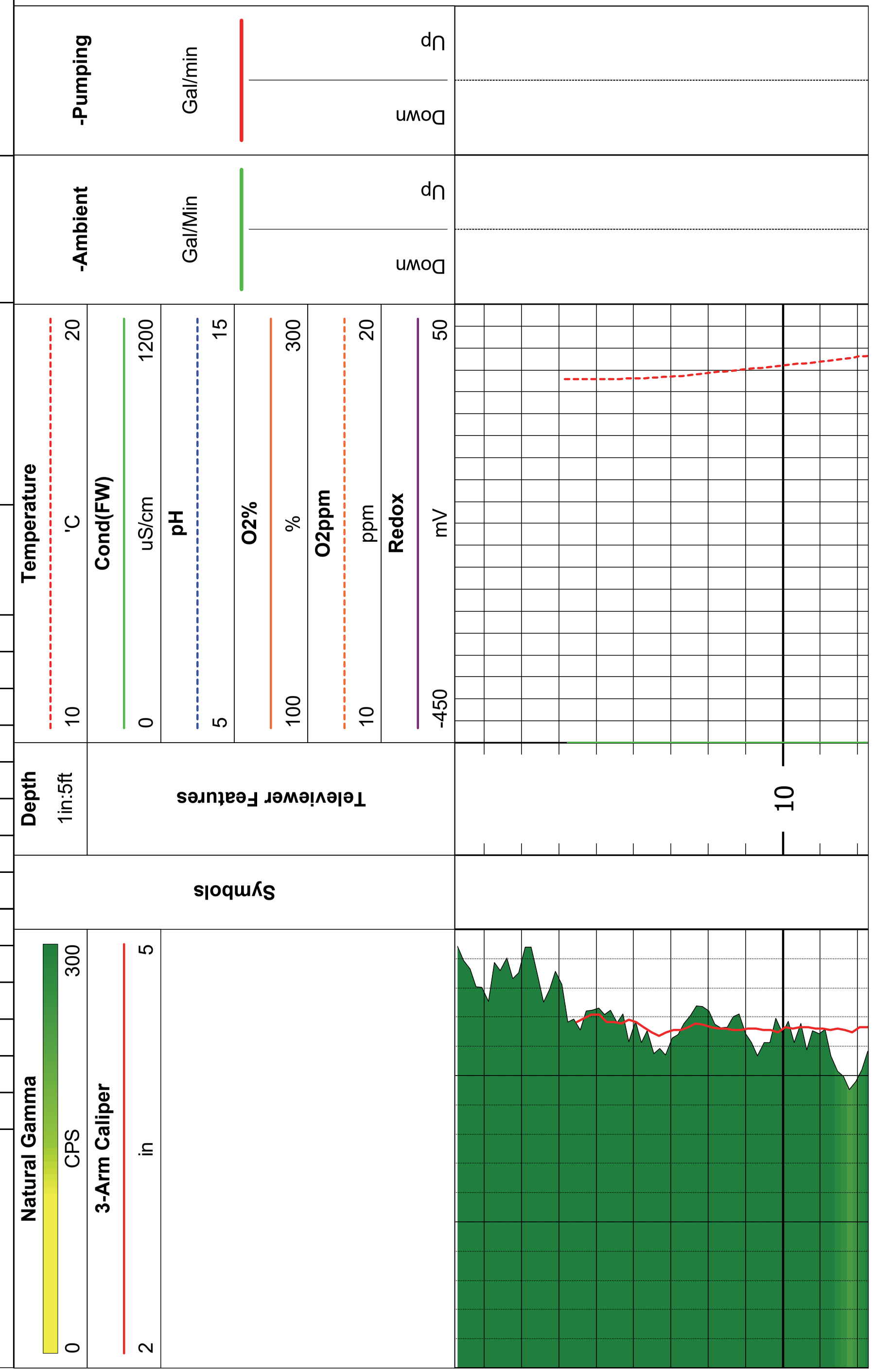
ACQUSITION SETUP
Ford F-350

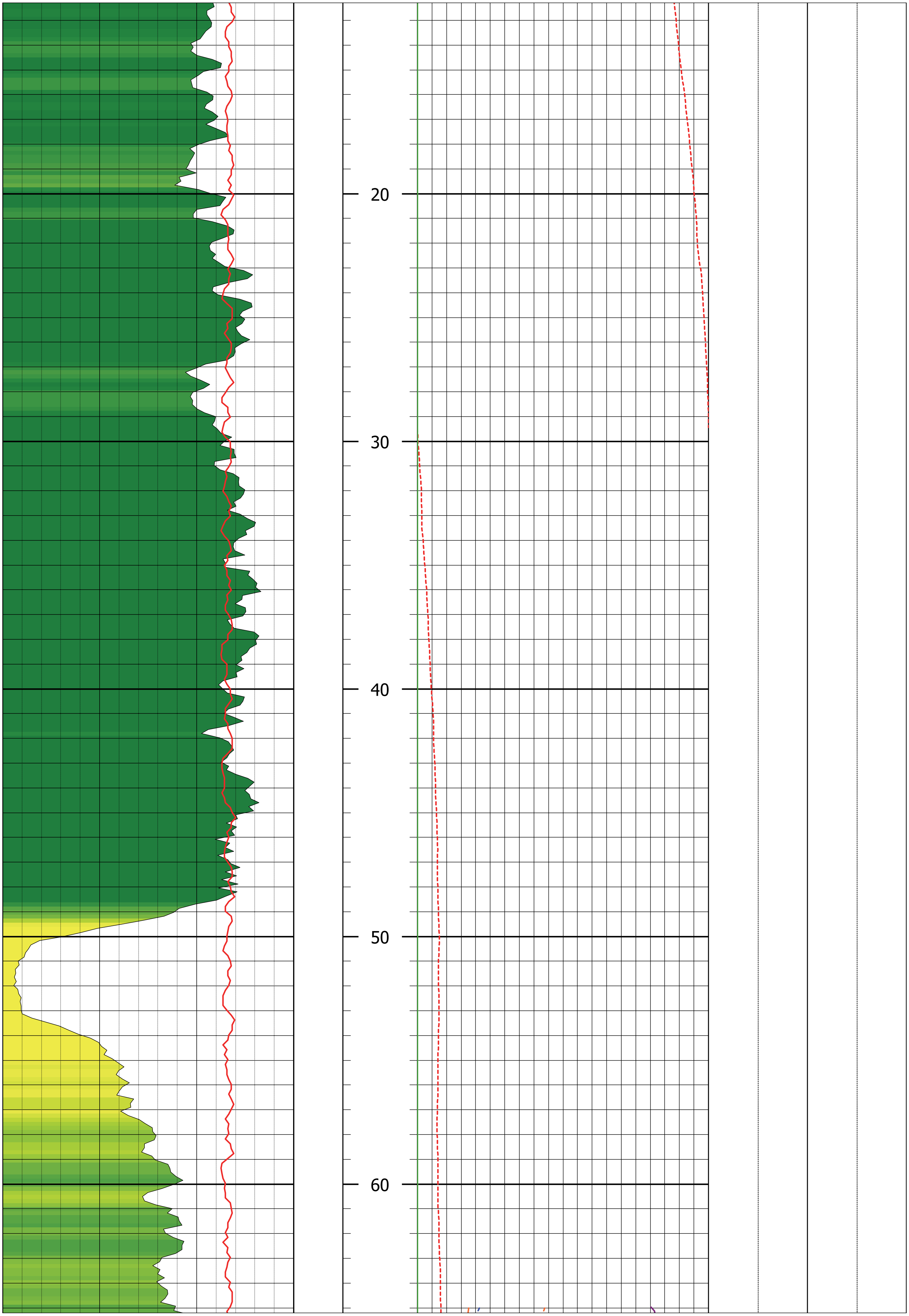
PERMANENT DATUM: Ground Surface ELEVATION: TBD
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00
DRILLING MEAS. FROM: Ground Surface STICK UP: 2.00

BIT SIZE: NQ3 (3")
ROD SIZE: NQ (3")

LOGGING DATE	01.09.2019	01.09.2019	01.09.2019	01.09.2019	01.09.2019
RUN NO	1	2	3	5	6
TYPE LOG	IDRO	FTC.GR	CAL	HPFM A	HPFM P
DRILLER DEPTH (FT)	150.0	150.0	150.0	150.0	150.0
ARM DEPTH (FT)	144.6	144.7	145.2	N/A	N/A
BTM LOGGED INTERVAL (FT)	144.6	144.7	145.2	142.0	142.0
TOP LOGGED INTERVAL (FT)	65.0	4.1	4.7	124.0	124.0
CASING SIZE (IN)	4.5	4.5	4.5	4.5	4.5
CASING DEPTH (FT)	130.0	130.0	130.0	130.0	130.0
ARM CASING DEPTH (FT)	126.8	126.8	126.8	126.8	126.8
FLUID LEVEL IN HOLE (FT)	67.5	67.5	67.5	67.5	67.5
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	3.2 W
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic
WITNESSED BY	N/A	N/A	N/A	N/A	N/A

REMARKS:
N/A

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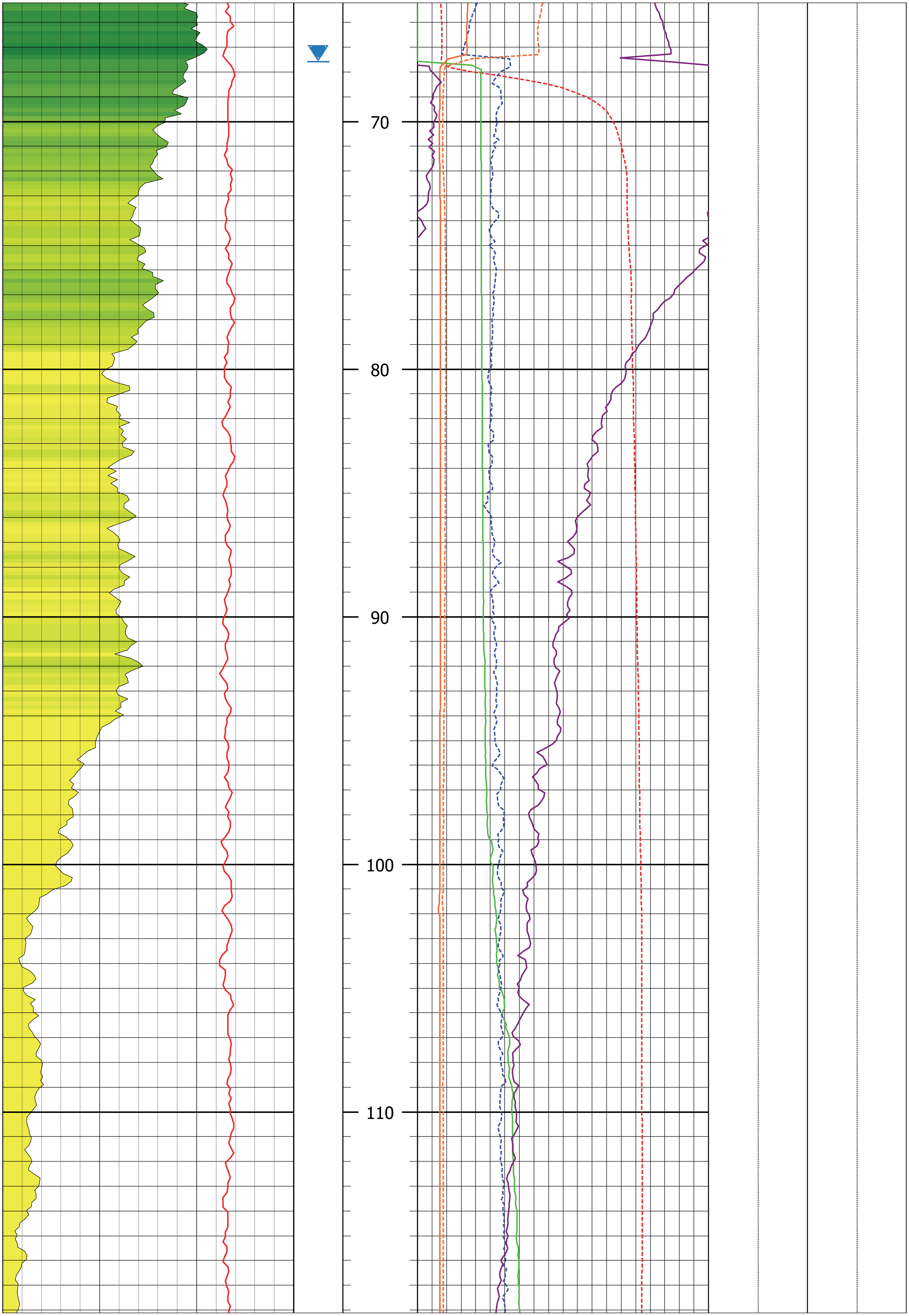
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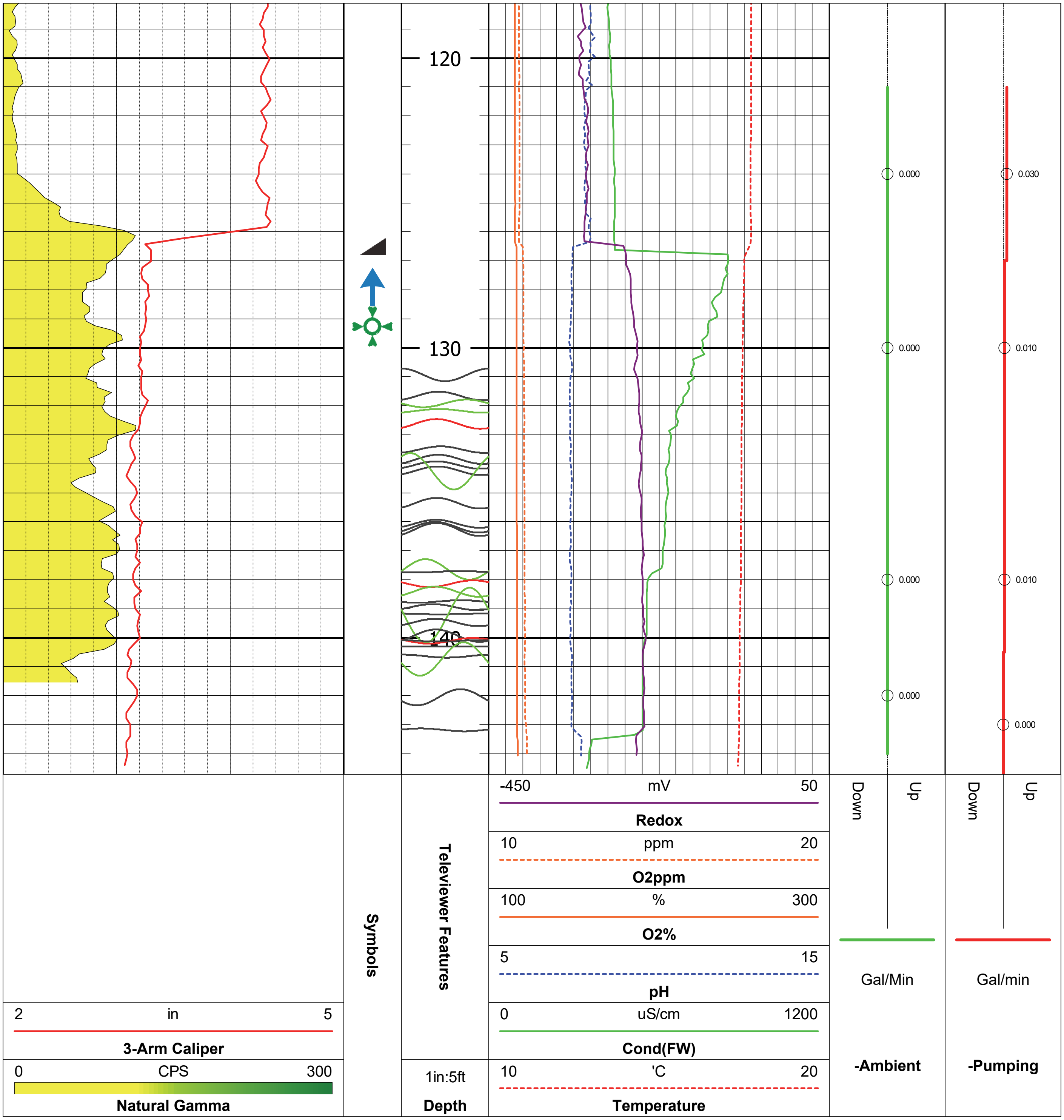
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Redox
10 ppm 20
O2ppm
100 % 300
O2%
5 15
pH
0 uS/cm 1200
Cond(FW)
10 'C 20
Temperature
Down Up
Gal/Min
-Ambient
Down Up
Gal/min
-Pumping
Symbols
Televiewer Features
1in:5ft
Depth
2 in 5
3-Arm Caliper
0 CPS 300
Natural Gamma

TW08

Acoustic Televiewer

COMP	Stantec
WELL	TW08
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec   STATE: TN
WELL ID: TW08   ARM NO.: 180734
FIELD/SITE: Cumberland City   API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD
SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface   ELEVATION: TBD   K.B. N/A
LOG MEASURED FROM: Ground Surface   ABOVE PERM. DATUM: 0.00   D.F. N/A
DRILLING MEAS. FROM: Ground Surface   STICK UP: 1.94   G.L. N/A

LOGGING DATE	02.05.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	4				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	148.5				
ARM DEPTH (FT)	148.8				
BTM LOGGED INTERVAL (FT)	148.99				
TOP LOGGED INTERVAL (FT)	125				
CASING SIZE (IN)/DEPTH (FT)	4.5/				
CASING ARM (FT)	128.61				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	67.39				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

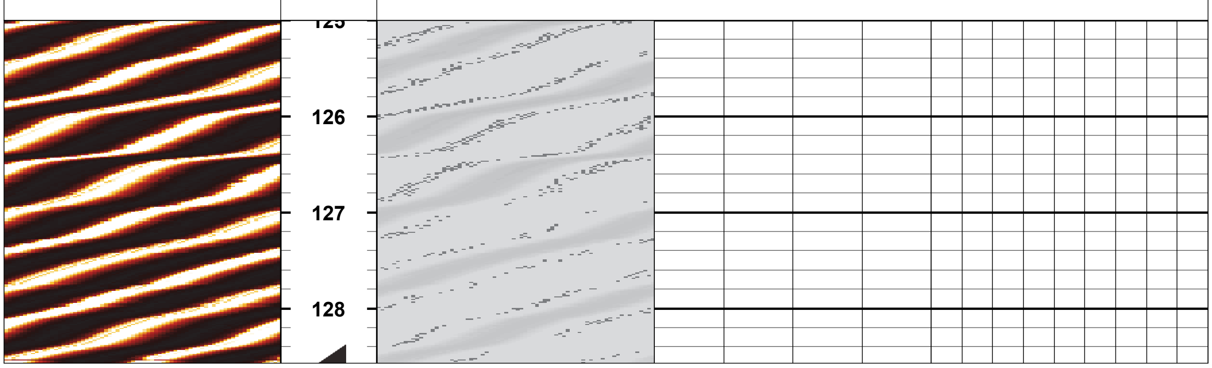
Symbols

Bottom of Casing

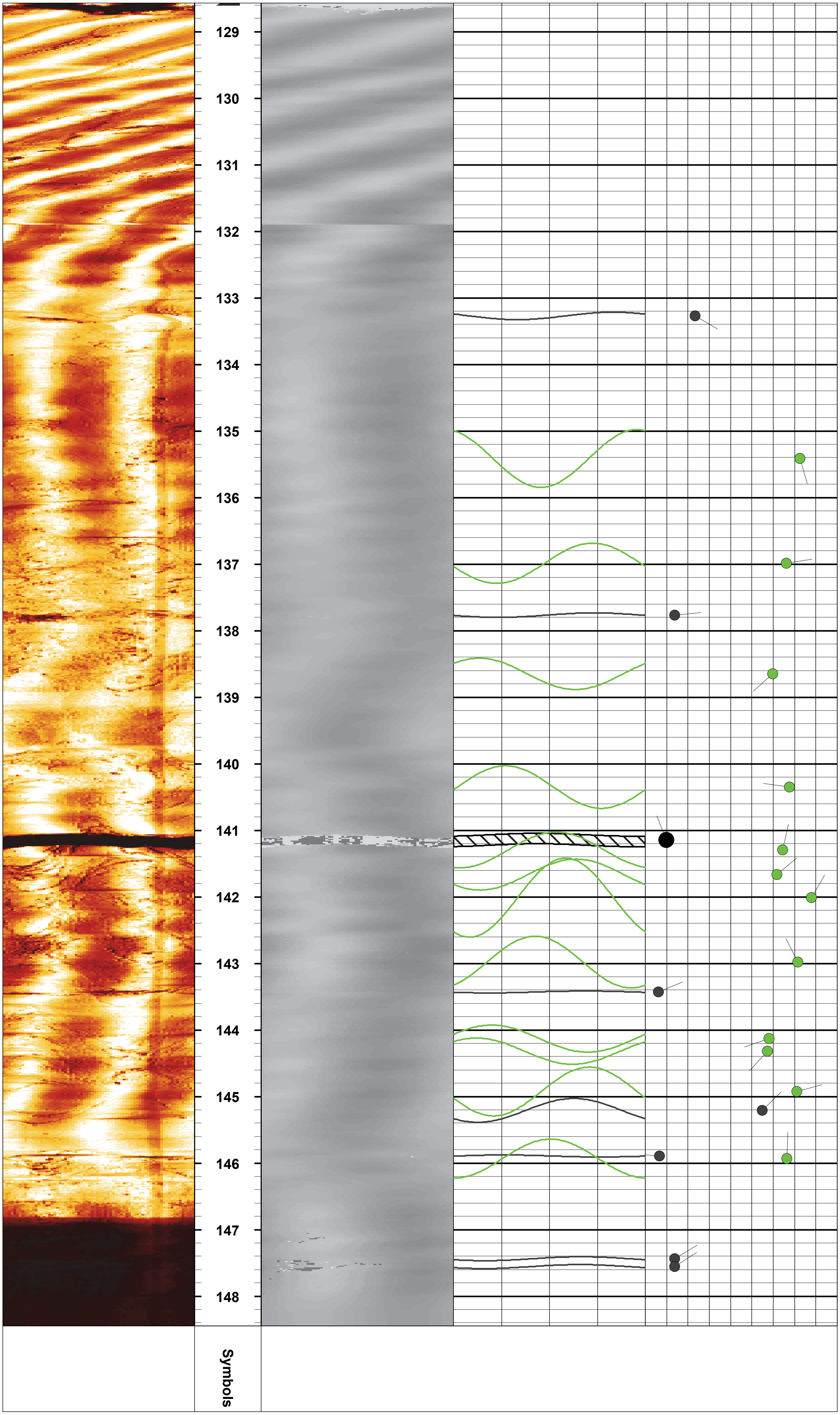
Structure

Discontinuous Fract
Part. Open Fract
Broken/Void/Soft Zone

Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
	Symbols			



TW08 ATV.WCL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145
146
147
148
Symbols

0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
Acoustic Amplitude	**Depth**	**Acoustic Travel Time**	**Plane Projection**	**Dip & Dip Direction**

Hydro Log

ARM GEOPHYSICS
Surface & Borehole Services

COMP	Stantec
WELL	TW08
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec STATE: TN
WELL ID: TW08 ARM NO.: 180734
FIELD/SITE: Cumberland City API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD
SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface ELEVATION: TBD K.B. N/A
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00 D.F. N/A
DRILLING MEAS. FROM: Ground Surface STICK UP: 1.94 G.L. N/A

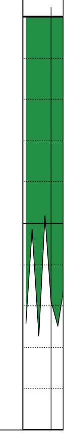
LOGGING DATE	02.05.2019	02.05.2019	02.05.2019	02.05.2019	02.05.2019
RUN NO	1	2	3	5	6
TYPE LOG	Idronaut	FTC.GR	CAL	HPFM A	HPFM P
DRILLER DEPTH (FT)	148.5	148.5	148.5	148.5	148.5
ARM DEPTH (FT)	148.69	148.7	148.79	N/A	N/A
BTM LOGGED INTERVAL (FT)	149.89	148.83	148.79	148	148
TOP LOGGED INTERVAL (FT)	65	4.19	4.74	131	131
CASING SIZE (IN)/DEPTH (FT)	4.5/128.5	4.5/128.5	4.5/128.5	4.5/128.5	4.5/128.5
CASING ARM (FT)	128.61	128.61	128.61	128.61	128.61
BIT SIZE (IN)	3.0	3.0	3.0	3.0	3.0
FLUID LEVEL IN HOLE (FT)	67.41	67.41	67.41	67.41	67.41
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	3.2 W
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic
WITNESSED BY	N/A	N/A	N/A	N/A	N/A

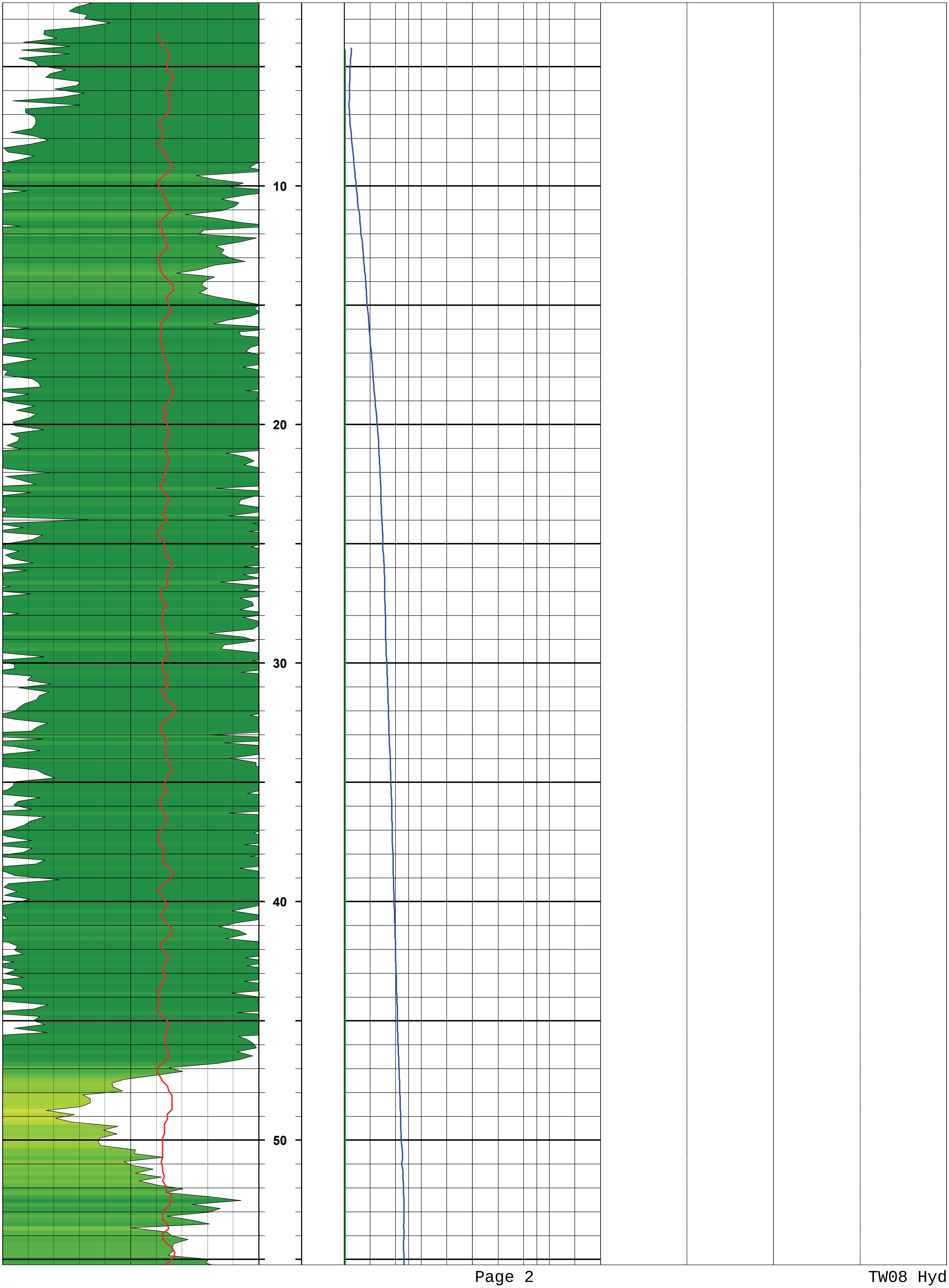
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

Symbols

Bottom of Casing
Producing Zone
Fluid Level
Up Flow

Natural Gamma 0 CPS 200 / 3-Arm Caliper 3 in 5	Depth 1in:5ft / Symbols	Televiewer Fractures	Fluid Temperature 8 'C 12 / Fluid Conductivity (25 'C) 0 uS/cm 400 / Pressure -100 dbar 100 / Fluid Temperature#1 8 'C 12 / Redox -2200 mV 100 / O2% 0 % 100 / pH 2 12	Vertical Flow: Ambient Gal/Min Down Up / Pumping Gal/Min Down Up

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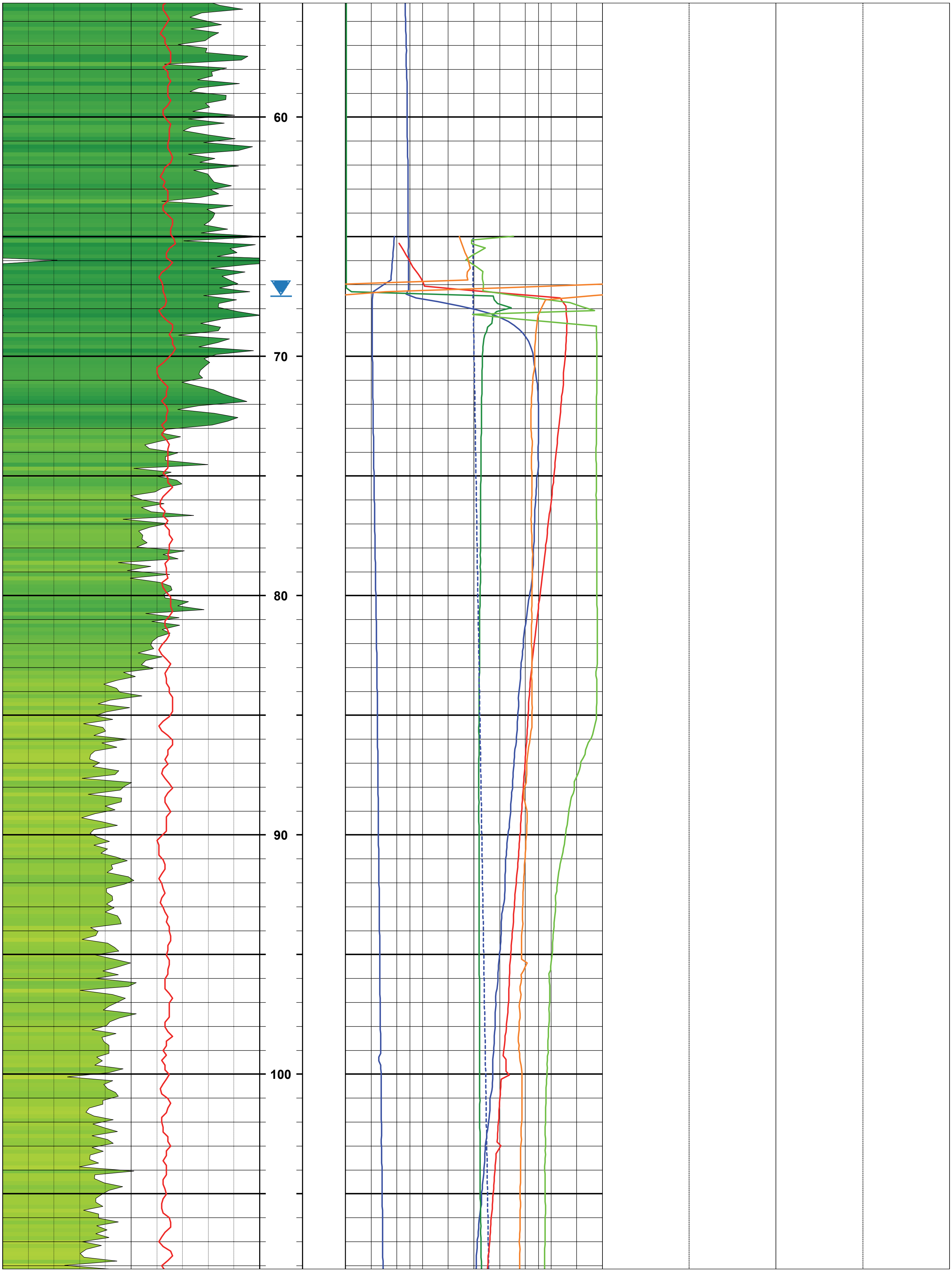
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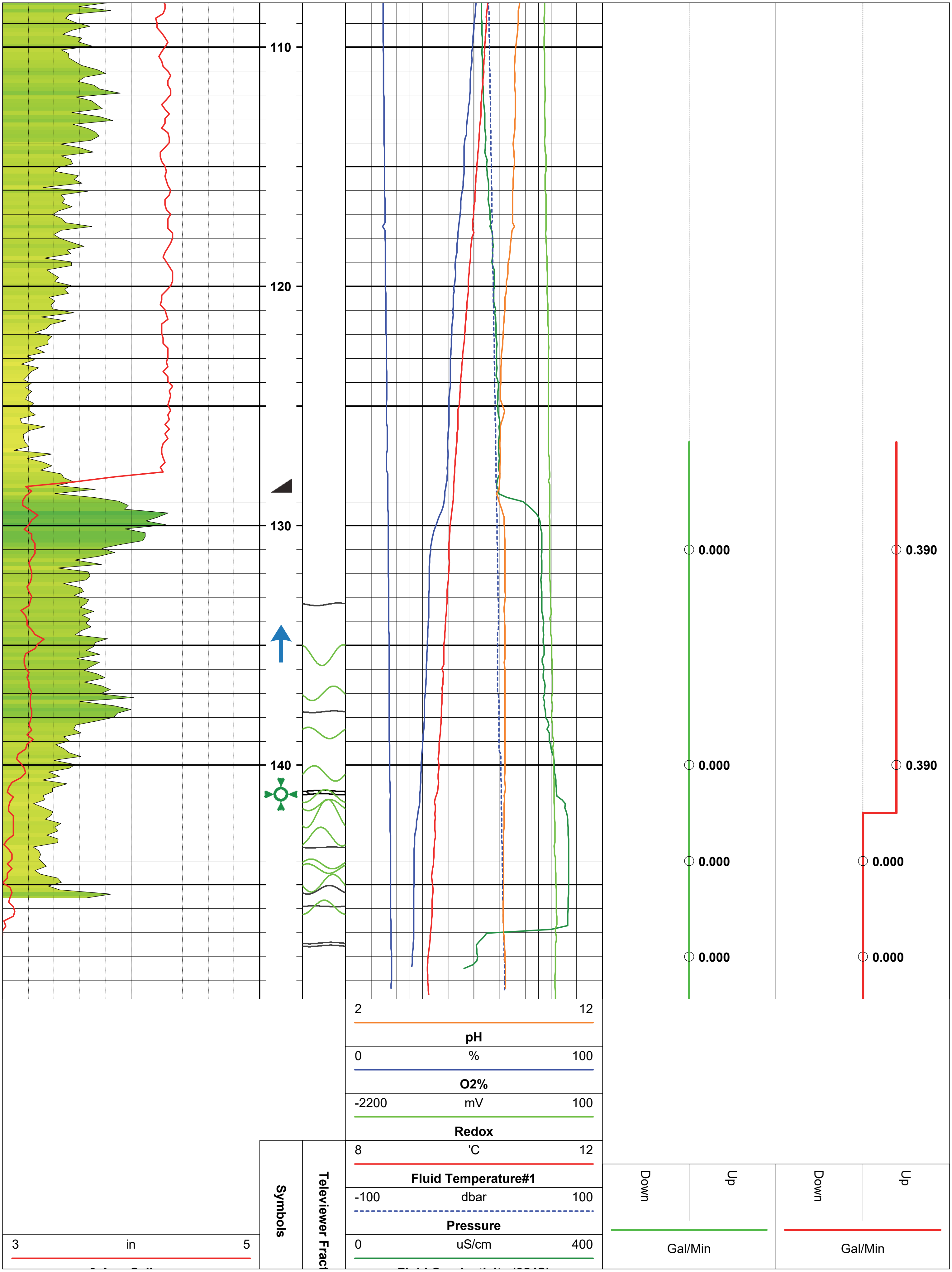

110
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130
140
0.000
0.390
0.000
0.390
0.000
0.000
0.000
0.000
2
12
pH
0
%
100
O2%
-2200
mV
100
Redox
8
'C
12
Fluid Temperature#1
-100
dbar
100
Pressure
0
uS/cm
400
3
in
5
Symbols
Televiewer Fract
Down
Up
Down
Up
Gal/Min
Gal/Min

3-Arm Caliper		Features (partial)	Fluid Conductivity (25 'C)	Ambient	Pumping
0 CPS 200	1in:5ft		8 'C 12		
Natural Gamma	Depth		Fluid Temperature	Vertical Flow	

TW09

Acoustic Televiewer

COMP	Stantec
WELL	TW09
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec
WELL ID: TW09
FIELD/SITE: Cumberland City
COUNTY: Stewart

STATE: TN
ARM NO.: 180734
API NO.: N/A

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

OTHER SERVICES
Ford F-350

SEC: TBD TWP: TBD QUAD: TBD

PERMANENT DATUM: Ground Surface ELEVATION: TBD
LOG MEASURED FROM: Ground Surface ABOVE PERM. DATUM: 0.00
DRILLING MEAS. FROM: Ground Surface STICK UP: 1.09

K.B. N/A
D.F. N/A
G.L. N/A

LOGGING DATE	02.05.2019	No Test Run	No Test Run	No Test Run	No Test Run
RUN NO	4				
TYPE LOG	ATV.GR				
DRILLER DEPTH (FT)	157.7				
ARM DEPTH (FT)	158				
BTM LOGGED INTERVAL (FT)	158.14				
TOP LOGGED INTERVAL (FT)	135				
CASING SIZE (IN)/DEPTH (FT)	4.5/133.2				
CASING ARM (FT)	137.62				
BIT SIZE (IN)	3.0				
FLUID LEVEL IN HOLE (FT)	74.53				
MAG. DECLINATION (DEG)	3.2 W				
RECORDED BY	D. Rajkovic				
WITNESSED BY	N/A				

REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

Symbols

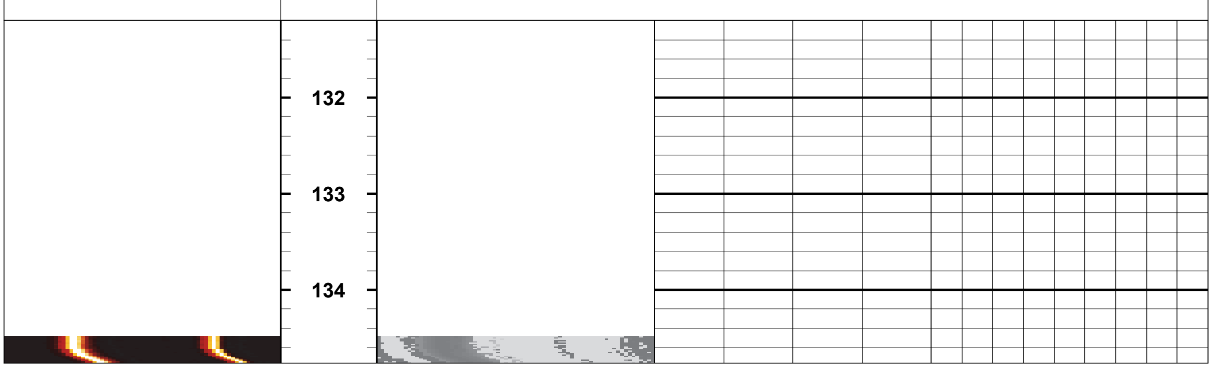
Bottom of Casing

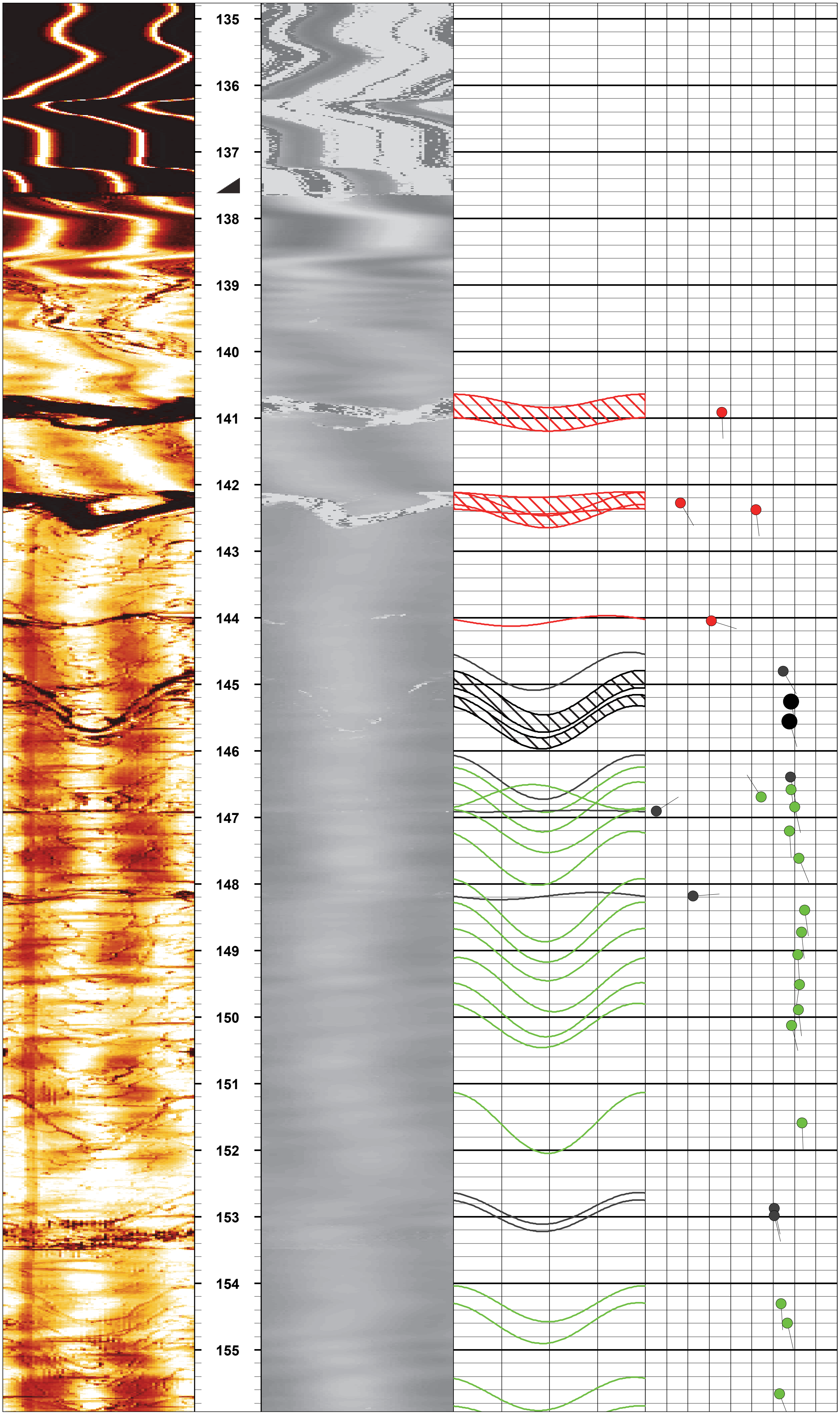
Structure

Open Fracture
Discontinuous Fract
Part. Open Fract
Broken/Void/Soft Zone

Acoustic Amplitude	Depth	Acoustic Travel Time	Plane Projection	Dip & Dip Direction
0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90

Symbols

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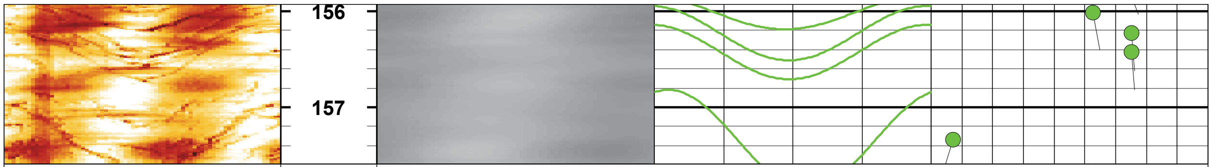


Symbols

0° 90° 180° 270° 0°	1in:2ft	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	0 90
Acoustic Amplitude	**Depth**	**Acoustic Travel Time**	**Plane Projection**	**Dip & Dip Direction**

Hydro Log

ARM GEOPHYSICS
Surface & Borehole Services

COMP	Stantec
WELL	TW09
FLD	Cumberland City
CNTY	Stewart
STAT	TN
ARM	180734
API	N/A

COMPANY: Stantec   STATE: TN
WELL ID: TW09   ARM NO.: 180734
FIELD/SITE: Cumberland City   API NO.: N/A
COUNTY: Stewart

LOCATION: TBD
NORTHING: TBD
EASTING: TBD

SEC: TBD TWP: TBD QUAD: TBD

OTHER SERVICES
Ford F-350

PERMANENT DATUM: Ground Surface   ELEVATION: TBD   K.B. N/A
LOG MEASURED FROM: Ground Surface   ABOVE PERM. DATUM: 0.00   D.F. N/A
DRILLING MEAS. FROM: Ground Surface   STICK UP: 1.09   G.L. N/A

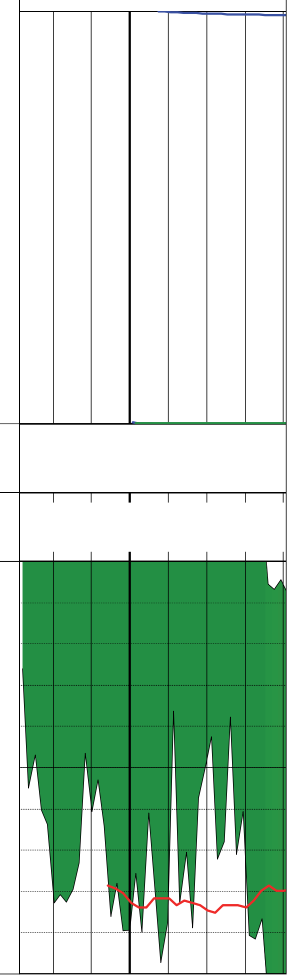
LOGGING DATE	02.05.2019	02.05.2019	02.05.2019	02.05.2019	No Test Run
RUN NO	1	2	5	6	
TYPE LOG	FTC.GR	CAL	HPFM A	HPFM P	
DRILLER DEPTH (FT)	157.7	157.7	157.7	157.7	
ARM DEPTH (FT)	158	158.19	N/A	N/A	
BTM LOGGED INTERVAL (FT)	158.2	158.19	156	156	
TOP LOGGED INTERVAL (FT)	5.04	5.59	139	139	
CASING SIZE (IN)/DEPTH (FT)	4.5/133.2	4.5/133.2	4.5/133.2	4.5/133.2	
CASING ARM (FT)	137.62	137.62	137.62	137.62	
BIT SIZE (IN)	3.0	3.0	3.0	3.0	
FLUID LEVEL IN HOLE (FT)	74.62	74.62	74.62	74.62	
MAG. DECLINATION (DEG)	3.2 W	3.2 W	3.2 W	3.2 W	
RECORDED BY	D. Rajkovic	D. Rajkovic	D. Rajkovic	D. Rajkovic	
WITNESSED BY	N/A	N/A	N/A	N/A	

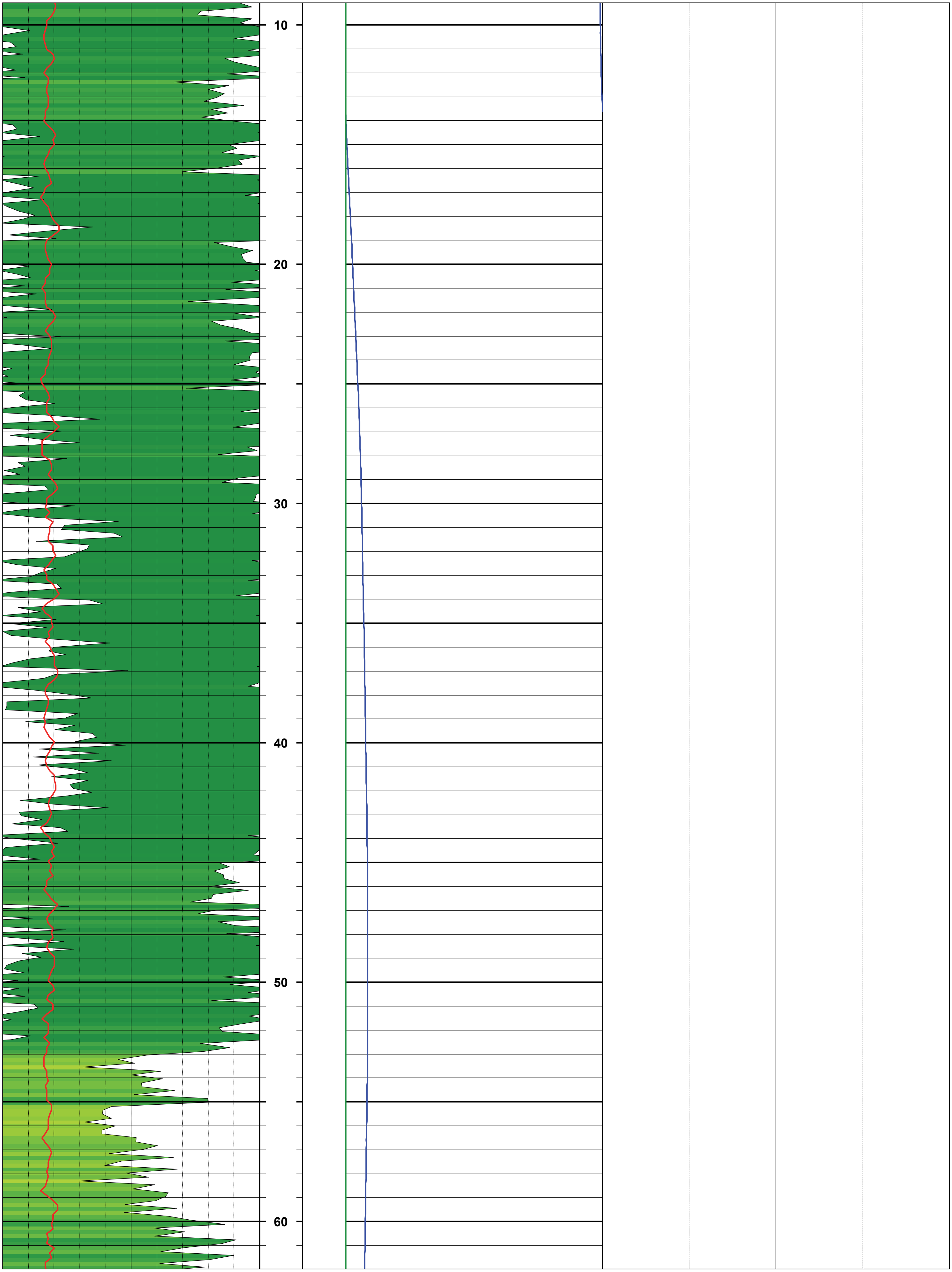
REMARKS:
Bit Size: NQ3 (3")
Rod Size: NQ (3")

Symbols

Bottom of Casing
Producing Zone
Fluid Level
Up Flow

Natural Gamma (0 CPS 200) / 3-Arm Caliper (2 in 4)	Depth 1in:5ft / Symbols	Televiewer Fractures	Fluid Temperature (16 'C 20) / Fluid Conductivity (25 'C) (0 uS/cm 800)	Vertical Flow – Ambient Gal/Min (Down / Up)	Vertical Flow – Pumping Gal/Min (Down / Up)

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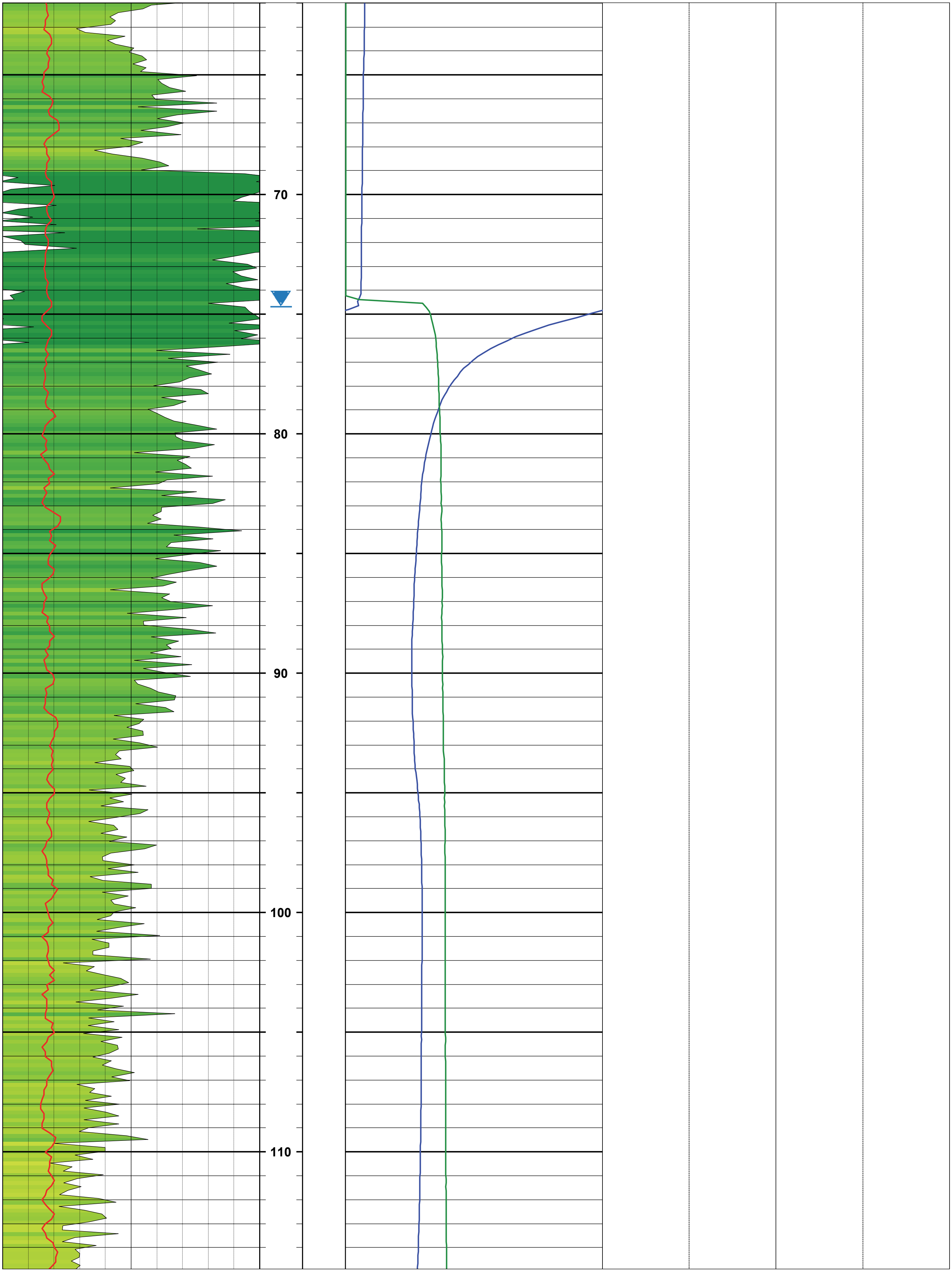
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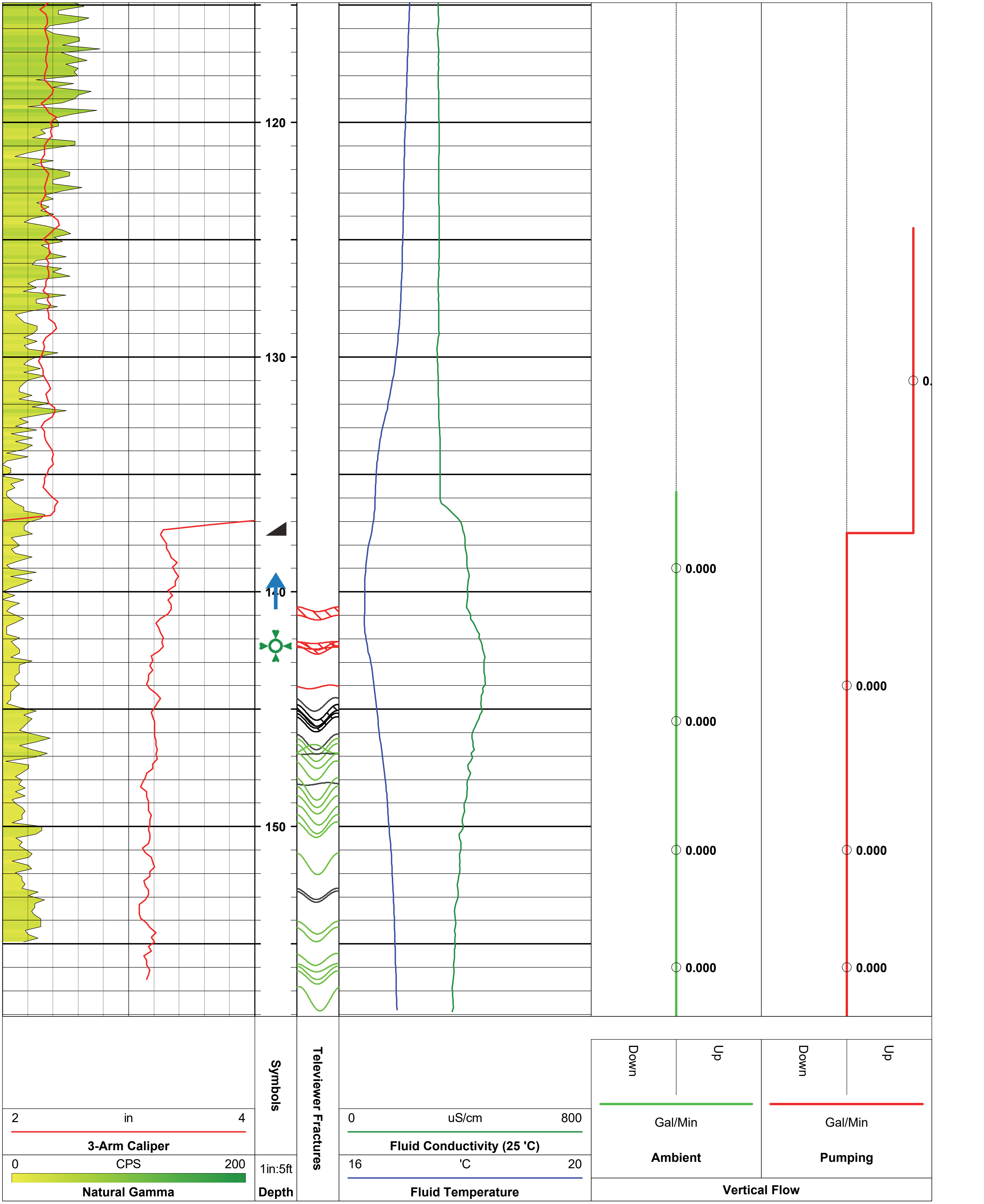

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Symbols
Televiewer Fractures
Down
Up
Down
Up
2
in
4
3-Arm Caliper
0
CPS
200
Natural Gamma
1in:5ft
Depth
0
uS/cm
800
Fluid Conductivity (25 'C)
16
'C
20
Fluid Temperature
Gal/Min
Ambient
Gal/Min
Pumping
Vertical Flow

ATTACHMENT C
TABULATED LISTING OF PLANE ORIENTATIONS

Planar Orientations

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)
93-1D	84.57	321.91	7.56	119.85	Broken/Void/Soft Zone	N52E/8NW
93-1D	86.4	354.04	46.48	0	Part. Open Fract	N84E/46NW
93-1D	87.36	71.88	57.78	0	Part. Open Fract	N18W/58NE
93-1D	88.56	82.7	41.02	0	Part. Open Fract	N7W/41NE
93-1D	88.95	280.01	61.44	0	Part. Open Fract	N10E/61NW
93-1D	90.76	125.89	39.4	6.38	Open Fracture	N36E/39SE
93-1D	92.02	68.67	46.51	0	Bedding	N21W/47NE
93-1D	92.5	311.59	68.85	0	Discontinuous Fract	N42E/69NW
93-1D	92.57	58.53	31.14	0	Part. Open Fract	N31W/31NE
93-1D	94.05	143.1	34.44	0	Part. Open Fract	N53E/34SE
93-1D	95.46	17.55	43.65	0	Bedding	N72W/44NE
93-1D	95.68	48.79	37.96	0	Bedding	N41W/38NE
93-1D	98.68	37.72	70.22	0	Bedding	N52W/70NE
93-1D	99.14	63.94	55.69	0	Bedding	N26W/56NE
93-1D	105.47	15.55	53.43	0	Bedding	N74W/53NE
93-1D	105.65	9.93	51.15	0	Bedding	N80W/51NE
93-1D	105.8	7.01	61.69	0	Bedding	N83W/62NE
93-1D	106.7	51.16	62.13	0	Bedding	N39W/62NE
93-1D	107.65	28.21	63.72	0	Part. Open Fract	N62W/64NE
93-1D	107.98	15.62	64.11	0	Bedding	N74W/64NE
93-1D	108.33	15.61	64.09	0	Bedding	N74W/64NE
93-1D	109.02	24.33	65.25	0	Bedding	N66W/65NE
93-1D	109.13	27.49	65.19	0	Bedding	N63W/65NE
93-1D	110.23	204.13	67.64	0	Bedding	N66W/68SW
93-1D	110.77	200.13	61.35	0	Bedding	N70W/61SW
93-1D	111.23	208.32	63.78	0	Bedding	N62W/64SW
93-1D	111.63	196.75	63.41	0	Bedding	N73W/63SW
93-1D	113.57	142.14	40.98	0	Bedding	N52E/41SE
93-1D	113.92	129.82	40.92	0	Bedding	N40E/41SE
93-1D	117.55	137.91	58.8	0	Bedding	N48E/59SE
93-1D	119.11	334.68	67.54	0	Bedding	N65E/68NW
93-1D	119.43	344.66	65.9	0	Bedding	N75E/66NW
93-1D	119.53	344.15	64.94	0	Bedding	N74E/65NW
93-1D	119.84	354.82	39.48	0	Bedding	N85E/39NW
93-1D	120.8	39.39	47.91	0	Bedding	N51W/48NE
93-1D	121.21	18.99	50.05	0	Part. Open Fract	N71W/50NE
93-1D	122.59	332.64	52.03	0	Part. Open Fract	N63E/52NW
93-1D	124.18	2.75	64.18	0	Bedding	N87W/64NE
93-1D	124.34	5.16	68.07	0	Part. Open Fract	N85W/68NE
93-1D	124.5	352.74	67.05	0	Bedding	N83E/67NW
93-1D	124.99	359.84	64.61	0	Part. Open Fract	N90E/65NW
93-1D	125.13	357.64	58.67	0	Part. Open Fract	N88E/59NW
93-1D	125.42	349.07	73.74	0	Part. Open Fract	N79E/74NW
93-1D	127.07	119.85	73.72	0	Discontinuous Fract	N30E/74SE
93-1D	127.4	297.75	42.75	0	Discontinuous Fract	N28E/43NW
93-1D	127.47	116.51	49.4	0	Part. Open Fract	N27E/49SE
93-1D	127.61	295.82	44.85	0	Discontinuous Fract	N26E/45NW
93-1D	128.01	328.43	69.06	0	Filled Fracture	N58E/69NW
93-1D	128.42	358.45	78.06	0	Bedding	N88E/78NW
93-1D	129.94	18.45	54.69	0	Bedding	N72W/55NE
93-1D	131.34	5.91	78.12	0	Bedding	N84W/78NE
93-1D	131.63	3.28	78.98	0	Bedding	N87W/79NE
93-1D	132.06	115.25	58.46	0	Discontinuous Fract	N25E/58SE

Planar Orientations

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)
93-1D	132.81	20.62	81.21	0	Part. Open Fract	N69W/81NE
93-1D	134.31	4.42	76.85	0	Bedding	N86W/77NE
93-1D	134.93	10.07	77.45	0	Bedding	N80W/77NE
93-1D	137.18	149.11	14.06	0	Bedding	N59E/14SE
93-1D	139.59	8.96	72.02	0	Bedding	N81W/72NE
93-1D	140.99	20.7	83.23	0	Part. Open Fract	N69W/83NE
93-1D	142.85	7.97	77.9	0	Bedding	N82W/78NE
93-1D	143.77	27.72	77.1	0	Bedding	N62W/77NE
93-1D	144.24	14.04	77.07	0	Bedding	N76W/77NE
B11	84.07	18.59	22.52	0	Part. Open Fract	N71W/23NE
B11	84.31	90.17	34.32	0	Part. Open Fract	N0E/34SE
B11	84.42	142.93	76.67	0	Discontinuous Fract	N53E/77SE
B11	84.57	15.85	19.94	0	Part. Open Fract	N74W/20NE
B11	85.27	3.48	27.19	0	Part. Open Fract	N87W/27NE
B11	86.52	135.07	23.71	0	Part. Open Fract	N45E/24SE
B11	88	34.38	29.74	0	Part. Open Fract	N56W/30NE
B11	90.04	285.46	58.07	0	Discontinuous Fract	N15E/58NW
B11	90.8	354.22	48.8	0	Discontinuous Fract	N84E/49NW
B11	90.95	345.18	49.27	0	Part. Open Fract	N75E/49NW
B11	91.07	341.12	47.26	0	Part. Open Fract	N71E/47NW
B11	93.74	189.83	13.36	0	Part. Open Fract	N80W/13SW
B11	93.76	16.48	77.28	0	Discontinuous Fract	N74W/77NE
B11	97.43	193.97	14.96	0	Part. Open Fract	N76W/15SW
B11	98.85	284.33	7.1	0	Part. Open Fract	N14E/7NW
B11	99.05	15.55	10.6	0	Part. Open Fract	N74W/11NE
B11	99.29	51.51	3.84	0	Part. Open Fract	N38W/4NE
B11	100.13	213.12	10.14	0	Part. Open Fract	N57W/10SW
B11	101.26	142.94	12.57	0	Part. Open Fract	N53E/13SE
B11	101.36	90.29	76.4	0	Discontinuous Fract	N0E/76SE
B11	102.34	290.64	76.99	0	Discontinuous Fract	N21E/77NW
B11	102.49	346.68	22.47	0	Part. Open Fract	N77E/22NW
B12	50.51	326.77	21.49	0	Part. Open Fract	N57E/21NW
B12	51.71	343.71	55.42	0	Part. Open Fract	N74E/55NW
B12	51.85	158.98	18.53	0	Part. Open Fract	N69E/19SE
B12	53.54	308.11	30.49	0	Part. Open Fract	N38E/30NW
B12	54.59	16.92	83.99	0	Discontinuous Fract	N73W/84NE
B12	55.68	182.86	83.05	0	Discontinuous Fract	N87W/83SW
B12	56.32	80.08	33.19	0	Part. Open Fract	N10W/33NE
B12	56.53	183.59	86.01	0	Discontinuous Fract	N86W/86SW
B12	58.28	87.99	35.94	0	Part. Open Fract	N2W/36NE
B12	58.4	72.73	40.49	0	Part. Open Fract	N17W/40NE
B12	60.7	96.22	26.19	0	Part. Open Fract	N6E/26SE
B12	62.06	105.83	35.1	0	Part. Open Fract	N16E/35SE
B12	63.65	63.3	35.39	0	Part. Open Fract	N27W/35NE
B12	64.25	100.41	33.67	0	Part. Open Fract	N10E/34SE
B12	64.71	80.43	27.76	0	Part. Open Fract	N10W/28NE
B12	65.71	98.32	27.41	0	Part. Open Fract	N8E/27SE
B12	66.42	35.86	9.49	0	Part. Open Fract	N54W/9NE
B13	74.22	166.9	11.15	0	Part. Open Fract	N77E/11SE
B13	75.72	1.26	69.23	0	Discontinuous Fract	N89W/69NE
B13	77.16	185.49	42.33	0	Part. Open Fract	N85W/42SW
B13	78.35	147.99	22.92	0	Part. Open Fract	N58E/23SE
B14	126.65	247.57	28.17	0	Part. Open Fract	N22W/28SW

Planar Orientations

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)
B14	131.05	119.33	57.09	0	Part. Open Fract	N29E/57SE
B14	131.71	113.79	67.18	0	Discontinuous Fract	N24E/67SE
B14	132.38	100.07	77.29	0	Discontinuous Fract	N10E/77SE
B14	133.66	81.08	71.22	0	Discontinuous Fract	N9W/71NE
B14	134.1	95.36	70.08	0	Discontinuous Fract	N5E/70SE
B14	134.19	110.03	84.4	0	Discontinuous Fract	N20E/84SE
B14	134.27	98	68.58	0	Part. Open Fract	N8E/69SE
B14	134.44	287.58	47.38	20.92	Broken/Void/Soft Zone	N18E/47NW
B14	134.73	80.8	49.7	0	Part. Open Fract	N9W/50NE
B14	134.87	73.08	53.67	0	Part. Open Fract	N17W/54NE
B14	135.02	85.15	54.41	0	Discontinuous Fract	N5W/54NE
B14	135.18	198.5	42.21	0	Discontinuous Fract	N72W/42SW
B14	135.58	103.18	56.31	0	Discontinuous Fract	N13E/56SE
B14	135.95	86.27	71.07	0	Discontinuous Fract	N4W/71NE
B14	137.12	332.34	39.82	0	Discontinuous Fract	N62E/40NW
B14	137.22	354.88	53.84	0	Part. Open Fract	N85E/54NW
B14	137.83	92.63	65.32	0	Discontinuous Fract	N3E/65SE
B14	140.32	8.53	79.21	0	Part. Open Fract	N81W/79NE
B14	143.69	89.19	8.86	0	Discontinuous Fract	N1W/9NE
B14	143.77	67.51	7.02	0	Discontinuous Fract	N22W/7NE
B14	144.84	116.86	5.27	0	Discontinuous Fract	N27E/5SE
B16	129.64	270.66	22.01	0	Part. Open Fract	N1E/22NW
B16	130.08	357.37	49.18	0	Discontinuous Fract	N87E/49NW
B16	130.61	48.25	7.08	0	Part. Open Fract	N42W/7NE
B16	131.76	249.45	30.59	0	Open Fracture	N21W/31SW
B16	131.8	244.25	46.34	0	Open Fracture	N26W/46SW
B16	132.06	243.89	25.33	0	Part. Open Fract	N26W/25SW
B16	132.11	81.57	59	0	Discontinuous Fract	N8W/59NE
B16	132.33	110.12	34.03	0	Part. Open Fract	N20E/34SE
B16	132.77	178.54	15.43	0	Part. Open Fract	N89E/15SE
B16	133	215.54	7.13	15.01	Open Fracture	N54W/7SW
B16	133.35	141.57	83.31	0	Discontinuous Fract	N52E/83SE
B16	136.11	164.18	11.07	0	Part. Open Fract	N74E/11SE
B16	137.95	111.62	76.72	0	Discontinuous Fract	N22E/77SE
B16	138.29	154.18	82.59	0	Discontinuous Fract	N64E/83SE
B16	141.1	331.13	11.81	0	Part. Open Fract	N61E/12NW
B16	142.88	140.77	8.35	0	Part. Open Fract	N51E/8SE
B16	143.07	140.9	8.39	0	Part. Open Fract	N51E/8SE
B16	143.63	160.99	26.71	0	Open Fracture	N71E/27SE
B17	114.04	216.54	25.4	0	Part. Open Fract	N53W/25SW
B17	114.24	234.61	52.64	0	Part. Open Fract	N35W/53SW
B17	115.03	178.03	30.86	0	Part. Open Fract	N88E/31SE
B17	115.12	205.56	26.51	0	Part. Open Fract	N64W/27SW
B17	115.2	191.34	30.47	0	Part. Open Fract	N79W/30SW
B17	115.23	103.35	64.9	0	Discontinuous Fract	N13E/65SE
B17	115.29	186.94	24.7	0	Open Fracture	N83W/25SW
B17	115.4	164.31	28.49	0	Part. Open Fract	N74E/28SE
B17	115.75	290.19	75.9	0	Discontinuous Fract	N20E/76NW
B17	116.12	182.97	59.71	0	Part. Open Fract	N87W/60SW
B17	118.28	177.32	38.59	0	Discontinuous Fract	N87E/39SE
B17	118.79	161.55	37.49	0	Part. Open Fract	N72E/37SE
B17	119.19	181.94	37.41	0	Part. Open Fract	N88W/37SW
B17	119.28	179.59	37.42	0	Part. Open Fract	N90E/37SE

Planar Orientations

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)
B17	119.71	319.57	61.21	0	Discontinuous Fract	N50E/61NW
B17	119.76	265.57	31.91	14.49	Broken/Void/Soft Zone	N4W/32SW
B17	119.77	132.93	56.59	0	Part. Open Fract	N43E/57SE
B17	119.88	132.94	56.54	0	Part. Open Fract	N43E/57SE
B17	120.03	128.4	56.62	0	Discontinuous Fract	N38E/57SE
B17	120.36	256.98	16.84	0	Part. Open Fract	N13W/17SW
B17	121.89	189.45	29.69	0	Part. Open Fract	N81W/30SW
B17	123.57	145.97	40.85	0	Part. Open Fract	N56E/41SE
B17	123.65	214.11	60.05	0	Part. Open Fract	N56W/60SW
B17	123.76	279.68	60.65	0	Discontinuous Fract	N10E/61NW
B17	126.09	153.98	72.58	0	Part. Open Fract	N64E/73SE
B18	41.33	138.91	10.29	0	Part. Open Fract	N49E/10SE
B18	43.21	159.15	63.31	0	Discontinuous Fract	N69E/63SE
B18	43.98	198.48	56.27	0	Discontinuous Fract	N72W/56SW
B18	46	301.56	58.35	0	Part. Open Fract	N32E/58NW
B18	48.32	40.24	77.59	3.47	Open Fracture	N50W/78NE
B18	48.8	8.04	19.23	38.26	Open Fracture	N82W/19NE
B18	50.26	296.96	40.51	11.56	Open Fracture	N27E/41NW
B18	54.06	93.21	70.58	0	Discontinuous Fract	N3E/71SE
B18	60.43	137.21	54.13	0	Part. Open Fract	N47E/54SE
B18	60.88	4.68	30.84	0	Discontinuous Fract	N85W/31NE
B18	61.04	67.69	51.04	0	Discontinuous Fract	N22W/51NE
B18	62.16	120.9	46.86	0	Part. Open Fract	N31E/47SE
B18	62.23	137.87	55.09	0	Part. Open Fract	N48E/55SE
B18	62.91	145.02	41.23	11.36	Broken/Void/Soft Zone	N55E/41SE
B18	63.12	131.22	41.45	0	Discontinuous Fract	N41E/41SE
B18	63.32	147.06	38.6	0	Part. Open Fract	N57E/39SE
B18	64.48	237.65	16.18	0	Discontinuous Fract	N32W/16SW
B18	70.39	51.54	78.79	0	Discontinuous Fract	N38W/79NE
B18	71.03	3.81	76.47	0	Discontinuous Fract	N86W/76NE
B18	72.03	136.86	54.46	0	Part. Open Fract	N47E/54SE
B18	72.07	21.86	79.15	0	Discontinuous Fract	N68W/79NE
B18	77.39	138.62	27.24	23.53	Broken/Void/Soft Zone	N49E/27SE
B18	79.25	188.97	80.16	0	Discontinuous Fract	N81W/80SW
B18	80.4	188.35	20.64	0	Discontinuous Fract	N82W/21SW
B18	82.85	173.42	68.34	0	Discontinuous Fract	N83E/68SE
B18	83.88	173.22	57.51	0	Discontinuous Fract	N83E/58SE
B18	84.24	185.72	58.18	0	Part. Open Fract	N84W/58SW
B18	85.82	184.52	76.9	0	Discontinuous Fract	N85W/77SW
B18	86.48	162.73	43.02	0	Discontinuous Fract	N73E/43SE
B18	87.8	169.54	57.87	0	Part. Open Fract	N80E/58SE
B18	88.45	182.32	57.21	0	Discontinuous Fract	N88W/57SW
B18	89.08	171.03	43.08	0	Discontinuous Fract	N81E/43SE
B18	89.55	211.9	60.25	0	Discontinuous Fract	N58W/60SW
B18	89.62	34.48	73.11	0	Discontinuous Fract	N56W/73NE
B18	89.86	204.32	53.14	0	Discontinuous Fract	N66W/53SW
B18	89.97	206.62	55.27	0	Discontinuous Fract	N63W/55SW
B19	48.44	178.55	42.87	0	Part. Open Fract	N89E/43SE
B19	49.55	281.46	60.79	0	Part. Open Fract	N11E/61NW
B19	49.7	259.62	58.5	0	Part. Open Fract	N10W/59SW
B19	51.97	36.52	83.28	7.55	Open Fracture	N53W/83NE
B19	56.01	15.49	86.12	0	Discontinuous Fract	N75W/86NE
B19	56.91	189.37	77.76	0	Part. Open Fract	N81W/78SW

Planar Orientations

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)
B19	57.09	183.36	76.72	0	Discontinuous Fract	N87W/77SW
B19	57.28	22.94	89.16	0	Discontinuous Fract	N67W/89NE
B19	57.95	179.4	80.16	0	Part. Open Fract	N89E/80SE
B19	59.68	180.49	79.68	0	Discontinuous Fract	N90W/80SW
B19	59.85	140.08	40.78	0	Discontinuous Fract	N50E/41SE
B19	61.15	263.98	68.26	0	Discontinuous Fract	N6W/68SW
B19	62.6	47.26	83.05	0	Discontinuous Fract	N43W/83NE
B19	64.12	154.74	59.3	5.99	Open Fracture	N65E/59SE
B19	66.82	1.06	41.53	0	Discontinuous Fract	N89W/42NE
B19	69.78	302.54	21.67	0	Discontinuous Fract	N33E/22NW
B19	73.77	310.42	30.63	0	Part. Open Fract	N40E/31NW
B19	77.46	45.02	71.39	0	Part. Open Fract	N45W/71NE
B19	78.96	50.92	68.94	0	Open Fracture	N39W/69NE
B19	79.04	53.19	66.97	0	Discontinuous Fract	N37W/67NE
B19	79.24	35.56	67.68	0	Discontinuous Fract	N54W/68NE
B19	79.55	50.63	66.11	0	Discontinuous Fract	N39W/66NE
B19	79.86	176.74	68.5	0	Discontinuous Fract	N87E/69SE
B19	80.99	136.96	51.21	0	Discontinuous Fract	N47E/51SE
B19	87.57	177.96	81.53	0	Discontinuous Fract	N88E/82SE
B19	87.63	185.99	80.95	0	Discontinuous Fract	N84W/81SW
B19	90.93	174.64	70.75	0	Discontinuous Fract	N85E/71SE
B19	95.06	169.81	77.52	0	Discontinuous Fract	N80E/78SE
B19	98.9	271.93	44	0	Discontinuous Fract	N2E/44NW
B19	104.78	331.5	22.68	0	Discontinuous Fract	N62E/23NW
B19	105.45	78.18	62.62	0	Discontinuous Fract	N12W/63NE
B19	105.51	81.47	62.55	0	Discontinuous Fract	N9W/63NE
B19	110.19	180.7	43.03	0	Discontinuous Fract	N89W/43SW
B19	113.26	37.3	24.63	0	Part. Open Fract	N53W/25NE
B19	115.44	30.72	29.35	0	Discontinuous Fract	N59W/29NE
TW01	70.07	98	5.21	0	Part. Open Fract	N8E/5SE
TW01	70.82	129.09	7.99	0	Discontinuous Fract	N39E/8SE
TW01	71.48	143.08	12.64	6.45	Open Fracture	N53E/13SE
TW01	72.19	137.94	10.02	0	Part. Open Fract	N48E/10SE
TW01	72.57	145.45	6.7	10.31	Open Fracture	N55E/7SE
TW01	72.84	131.7	15.57	0	Discontinuous Fract	N42E/16SE
TW01	74.02	22.67	16.98	29.99	Open Fracture	N67W/17NE
TW01	74.32	162.97	22.29	13.13	Open Fracture	N73E/22SE
TW01	75.03	207.65	10.19	90.89	Broken/Void/Soft Zone	N62W/10SW
TW01	75.35	71.23	43.91	13.62	Open Fracture	N19W/44NE
TW01	76.26	25.55	16.26	80.99	Broken/Void/Soft Zone	N64W/16NE
TW01	76.61	287.68	81.01	0	Open Fracture	N18E/81NW
TW01	76.68	196.08	49.32	16.34	Open Fracture	N74W/49SW
TW01	77	242.97	40.73	0	Open Fracture	N27W/41SW
TW01	77.63	157.2	71.52	0	Open Fracture	N67E/72SE
TW03	86.13	119.68	73.48	0	Discontinuous Fract	N30E/73SE
TW03	87.58	112.46	21.5	0	Discontinuous Fract	N22E/22SE
TW03	89.02	179.45	4.07	0	Discontinuous Fract	N89E/4SE
TW03	89.43	159.69	18.34	0	Part. Open Fract	N70E/18SE
TW03	89.71	249.11	4.39	0	Part. Open Fract	N21W/4SW
TW03	94.77	154.69	11	0	Part. Open Fract	N65E/11SE
TW03	98.85	30.77	80.6	0	Discontinuous Fract	N59W/81NE
TW03	98.91	29.11	76.67	0	Part. Open Fract	N61W/77NE
TW03	99.06	31.22	80.06	0	Discontinuous Fract	N59W/80NE

Planar Orientations

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)
TW05	80.03	307.25	51.74	0	Part. Open Fract	N37E/52NW
TW05	83.26	227.79	72.5	0	Discontinuous Fract	N42W/73SW
TW05	84.35	165.78	4.41	0	Part. Open Fract	N76E/4SE
TW05	84.54	302.93	51.07	0	Discontinuous Fract	N33E/51NW
TW05	85.13	193.3	13.38	0	Part. Open Fract	N77W/13SW
TW05	85.4	0.18	72.04	0	Discontinuous Fract	N90W/72NE
TW05	85.69	318.95	55.68	0	Discontinuous Fract	N49E/56NW
TW05	86.17	311.37	49.1	0	Discontinuous Fract	N41E/49NW
TW05	89.72	307.73	56.96	0	Part. Open Fract	N38E/57NW
TW05	90.14	121.17	9.3	0	Part. Open Fract	N31E/9SE
TW05	90.26	153.43	46.65	0	Open Fracture	N63E/47SE
TW05	90.6	311.38	55.19	0	Part. Open Fract	N41E/55NW
TW05	91.58	312.28	47.76	0	Part. Open Fract	N42E/48NW
TW05	91.62	234.65	3.33	0	Part. Open Fract	N35W/3SW
TW05	93.64	312.12	59.87	0	Part. Open Fract	N42E/60NW
TW05	93.98	313.49	53.48	0	Part. Open Fract	N43E/53NW
TW07	130.93	180.7	58.4	0	Part. Open Fract	N89W/58SW
TW07	131.66	333.88	47.53	0	Part. Open Fract	N64E/48NW
TW07	131.91	89.78	43.98	0	Discontinuous Fract	N0W/44NE
TW07	132.17	335.25	25.17	0	Discontinuous Fract	N65E/25NW
TW07	132.63	325.25	51.49	0	Open Fracture	N55E/51NW
TW07	133.51	341.41	41.18	0	Part. Open Fract	N71E/41NW
TW07	133.84	332	50.19	0	Part. Open Fract	N62E/50NW
TW07	134.04	324.21	44.11	0	Part. Open Fract	N54E/44NW
TW07	134.23	328.12	48.59	0	Part. Open Fract	N58E/49NW
TW07	134.26	216.52	78.35	0	Discontinuous Fract	N53W/78SW
TW07	135.36	325.33	54.77	0	Part. Open Fract	N55E/55NW
TW07	136.07	322.28	45.9	0	Part. Open Fract	N52E/46NW
TW07	136.19	318.54	54.06	0	Part. Open Fract	N49E/54NW
TW07	136.26	324.36	59.37	0	Part. Open Fract	N54E/59NW
TW07	137.64	279.85	69.52	0	Discontinuous Fract	N10E/70NW
TW07	137.73	60.65	11.44	0	Part. Open Fract	N29W/11NE
TW07	138.14	115.76	41.66	0	Open Fracture	N26E/42SE
TW07	138.42	318.6	52.48	0	Discontinuous Fract	N49E/52NW
TW07	138.75	66.08	17.48	0	Part. Open Fract	N24W/17NE
TW07	138.94	309.75	38	0	Part. Open Fract	N40E/38NW
TW07	139.18	156.71	5.65	0	Part. Open Fract	N67E/6SE
TW07	139.22	101.39	81.96	0	Discontinuous Fract	N11E/82SE
TW07	139.48	318.28	43.66	0	Part. Open Fract	N48E/44NW
TW07	139.94	321.99	58.02	0	Part. Open Fract	N52E/58NW
TW07	140.1	114.5	36.71	0	Open Fracture	N25E/37SE
TW07	140.11	158.27	12.57	0	Part. Open Fract	N68E/13SE
TW07	140.3	298.7	1.2	0	Part. Open Fract	N29E/1NW
TW07	140.63	188.12	21.26	0	Part. Open Fract	N82W/21SW
TW07	140.74	76.64	77.21	0	Discontinuous Fract	N13W/77NE
TW07	142.06	63.6	64.69	0	Part. Open Fract	N26W/65NE
TW07	143.17	259.8	21.01	0	Part. Open Fract	N10W/21SW
TW08	133.27	119.61	23.36	0	Part. Open Fract	N30E/23SE
TW08	135.41	163.87	72.64	0	Discontinuous Fract	N74E/73SE
TW08	136.99	80.77	66.11	0	Discontinuous Fract	N9W/66NE
TW08	137.77	84.11	13.89	0	Part. Open Fract	N6W/14NE
TW08	138.65	228.44	59.7	0	Discontinuous Fract	N42W/60SW
TW08	140.35	277.54	67.52	0	Discontinuous Fract	N8E/68NW

Planar Orientations

Well ID	Depth (feet)	Dip Dir. (deg)	Dip (deg)	Aperture (mm)	Type	Strike/Dip (Quadrant)
TW08	141.15	338.37	9.84	17.74	Broken/Void/Soft Zone	N68E/10NW
TW08	141.29	12.66	64.5	0	Discontinuous Fract	N77W/65NE
TW08	141.67	49.65	61.72	0	Discontinuous Fract	N40W/62NE
TW08	142.01	30.25	77.98	0	Discontinuous Fract	N60W/78NE
TW08	142.98	332.89	71.58	0	Discontinuous Fract	N63E/72NW
TW08	143.43	67.51	6.26	0	Part. Open Fract	N22W/6NE
TW08	144.13	251.46	58.06	0	Discontinuous Fract	N19W/58SW
TW08	144.31	223.1	57.24	0	Discontinuous Fract	N47W/57SW
TW08	144.92	74.58	70.97	0	Discontinuous Fract	N15W/71NE
TW08	145.21	45.58	54.73	0	Part. Open Fract	N44W/55NE
TW08	145.89	275.14	6.53	0	Part. Open Fract	N5E/7NW
TW08	145.93	1.92	66.32	0	Discontinuous Fract	N88W/66NE
TW08	147.44	58.86	13.67	0	Part. Open Fract	N31W/14NE
TW08	147.56	57.03	13.7	0	Part. Open Fract	N33W/14NE
TW09	140.91	177.66	35.91	34.74	Open Fracture	N88E/36SE
TW09	142.28	149.86	16.48	28.58	Open Fracture	N60E/16SE
TW09	142.38	173.34	51.92	13.31	Open Fracture	N83E/52SE
TW09	144.04	107.34	30.98	0	Open Fracture	N17E/31SE
TW09	144.81	150.43	64.72	0	Part. Open Fract	N60E/65SE
TW09	145.26	170.01	68.35	11.6	Broken/Void/Soft Zone	N80E/68SE
TW09	145.56	164.21	67.52	7.27	Broken/Void/Soft Zone	N74E/68SE
TW09	146.39	168.39	68.01	0	Part. Open Fract	N78E/68SE
TW09	146.58	172.22	68.38	0	Discontinuous Fract	N82E/68SE
TW09	146.69	327.12	54.29	0	Discontinuous Fract	N57E/54NW
TW09	146.84	167.54	70.11	0	Discontinuous Fract	N78E/70SE
TW09	146.9	57.9	5.2	0	Part. Open Fract	N32W/5NE
TW09	147.2	176.08	67.65	0	Discontinuous Fract	N86E/68SE
TW09	147.62	157.89	72.06	0	Discontinuous Fract	N68E/72SE
TW09	148.18	85	22.47	0	Part. Open Fract	N5W/22NE
TW09	148.39	171.67	74.67	0	Discontinuous Fract	N82E/75SE
TW09	148.72	174.17	73.25	0	Discontinuous Fract	N84E/73SE
TW09	149.06	176.43	71.67	0	Discontinuous Fract	N86E/72SE
TW09	149.51	187.72	72.34	0	Discontinuous Fract	N82W/72SW
TW09	149.89	173.65	71.73	0	Discontinuous Fract	N84E/72SE
TW09	150.13	165.65	68.67	0	Discontinuous Fract	N76E/69SE
TW09	151.59	177.21	73.44	0	Discontinuous Fract	N87E/73SE
TW09	152.87	167.71	60.54	0	Part. Open Fract	N78E/61SE
TW09	152.98	166.54	60.45	0	Part. Open Fract	N77E/60SE
TW09	154.31	176.97	63.63	0	Discontinuous Fract	N87E/64SE
TW09	154.6	166.87	66.56	0	Discontinuous Fract	N77E/67SE
TW09	155.66	159.19	62.94	0	Discontinuous Fract	N69E/63SE
TW09	156.02	169.71	52.68	0	Discontinuous Fract	N80E/53SE
TW09	156.23	174.99	65.2	0	Discontinuous Fract	N85E/65SE
TW09	156.43	175.66	65.2	0	Discontinuous Fract	N86E/65SE
TW09	157.34	197.79	7.1	0	Discontinuous Fract	N72W/7SW

ATTACHMENT E.3

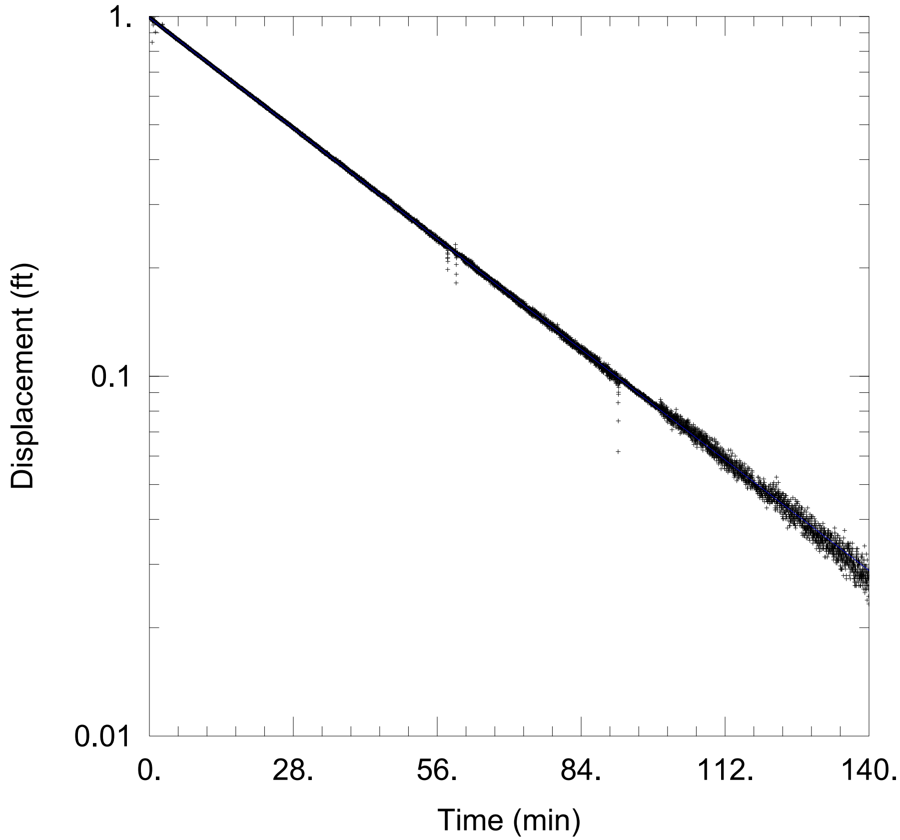
Hydraulic Conductivity (Slug) Testing Results

Stantec

Slug Test Results
CUF Temporary Wells

Well ID	Test	Test Date	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (cm/sec)
CUF-TW01	Falling Head 1	7/17/2019	0.1636	5.77E-05
	Rising Head 1	7/17/2019	0.1504	5.31E-05
	Falling Head 2	7/18/2019	0.1711	6.04E-05
	Rising Head 2	7/18/2019	0.1558	5.50E-05
	Falling Head 3	7/18/2019	0.1525	5.38E-05
	Rising Head 3	7/18/2019	0.1508	5.32E-05
CUF-TW03	Falling Head 1	7/18/2019	1.761	6.21E-04
	Rising Head 1	7/18/2019	1.888	6.66E-04
	Falling Head 2	7/18/2019	1.278	4.51E-04
	Rising Head 2	7/18/2019	1.548	5.46E-04
	Falling Head 3	7/18/2019	1.096	3.87E-04
	Rising Head 3	7/18/2019	1.511	5.33E-04
CUF-TW05	Falling Head 1	7/18/2019	3.401	1.20E-03
	Rising Head 1	7/18/2019	2.977	1.05E-03
	Falling Head 2	7/18/2019	2.546	8.98E-04
	Rising Head 2	7/18/2019	2.902	1.02E-03
	Falling Head 3	7/19/2019	2.434	8.59E-04
	Rising Head 3	7/19/2019	3.147	1.11E-03
	Falling Head 4	7/19/2019	2.601	9.18E-04
	Rising Head 4	7/19/2019	3.293	1.16E-03
CUF-TW07	Falling Head 1	7/16/2019	0.1624	5.73E-05
	Rising Head 1	7/16/2019	0.1457	5.14E-05
	Falling Head 2	7/17/2019	0.1588	5.60E-05
	Rising Head 2	7/17/2019	0.1354	4.78E-05
	Falling Head 3	7/17/2019	0.1463	5.16E-05
	Rising Head 3	7/17/2019	0.1329	4.69E-05
CUF-TW08	Falling Head 1	7/16/2019	0.1147	4.05E-05
	Rising Head 1	7/17/2019	0.1122	3.96E-05
	Falling Head 2	7/17/2019	0.1151	4.06E-05
	Rising Head 2	7/17/2019	0.1107	3.91E-05
	Falling Head 3	7/18/2019	0.1253	4.42E-05
	Rising Head 3	7/18/2019	0.1033	3.64E-05
CUF-TW09	Falling Head 1	7/15/2019	0.2461	8.68E-05
	Rising Head 1	7/15/2019	0.2459	8.67E-05
	Falling Head 2	7/15/2019	0.2133	7.52E-05
	Rising Head 2	7/15/2019	0.2377	8.39E-05
	Falling Head 3	7/16/2019	0.2162	7.63E-05
	Rising Head 3	7/16/2019	0.2314	8.16E-05

Notes
ft/day - feet per day
cm/sec - centimeters per second
Slug tests were conducted on July 15 through July 19, 2019. Test dates tabulated here reflect the start of each test. Test dates shown in the individual data reports reflect the end of each test.
Data analysis was completed using AQTESOLV™, Version 4.50 Professional
Analysis was completed using the Bouwer-Rice (1976) solution



TW01 FH T1

Data Set: C:\...\TW01_FH_T1.aqt
Date: 08/16/19 Time: 11:55:04

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW01
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1636 ft/day
y0 = 0.9914 ft

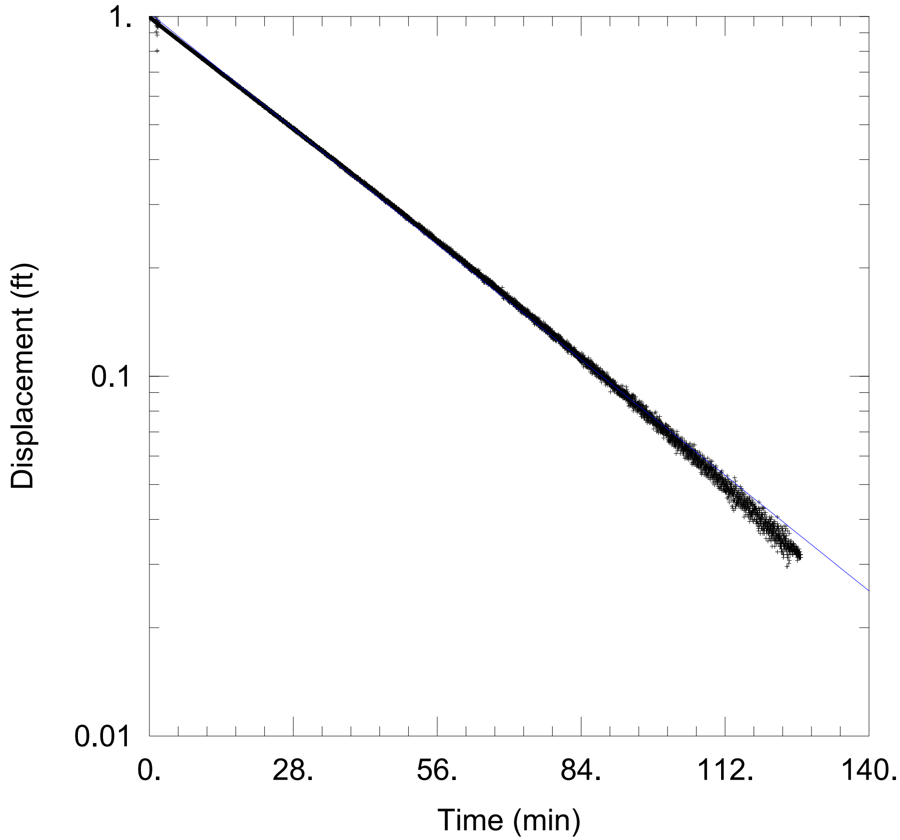
AQUIFER DATA

Saturated Thickness: 15.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 15.8 ft
Casing Radius: 0.167 ft

Static Water Column Height: 15.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW01 FH T2

Data Set: C:\...\TW01_FH_T2.aqt
Date: 08/16/19 Time: 11:54:51

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW01
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

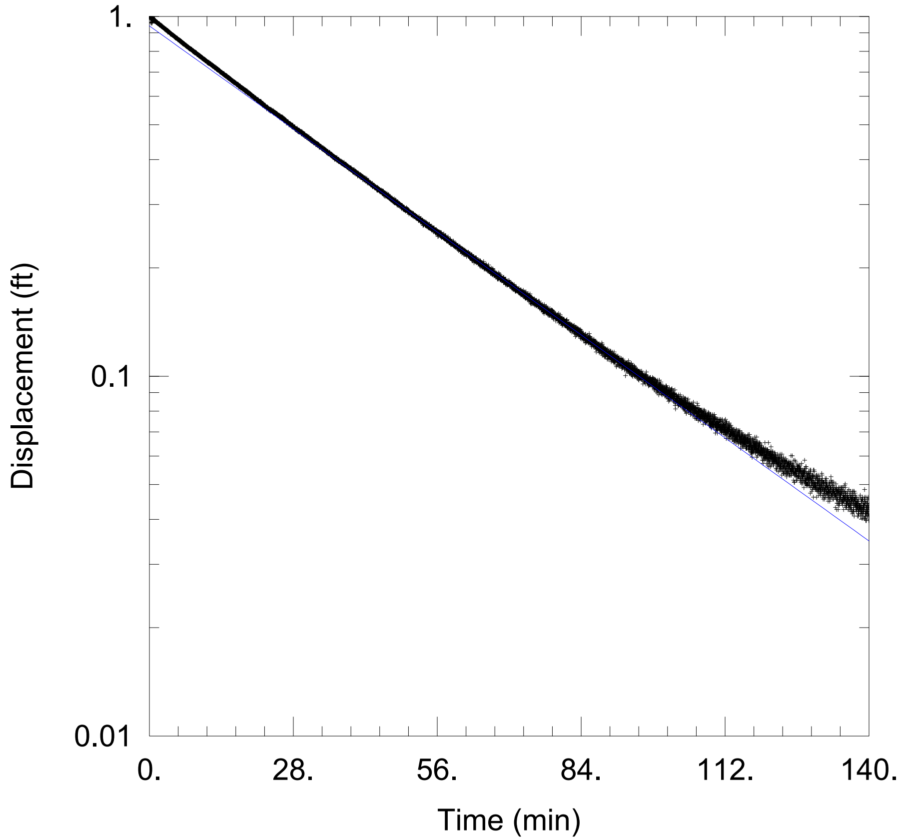
K = 0.1711 ft/day
y0 = 1.022 ft

AQUIFER DATA

Saturated Thickness: 15.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 15.8 ft
Casing Radius: 0.167 ft
Static Water Column Height: 15.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW01 FH T3

Data Set: C:\...\TW01_FH_T3.aqt
Date: 08/16/19 Time: 11:54:36

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW01
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

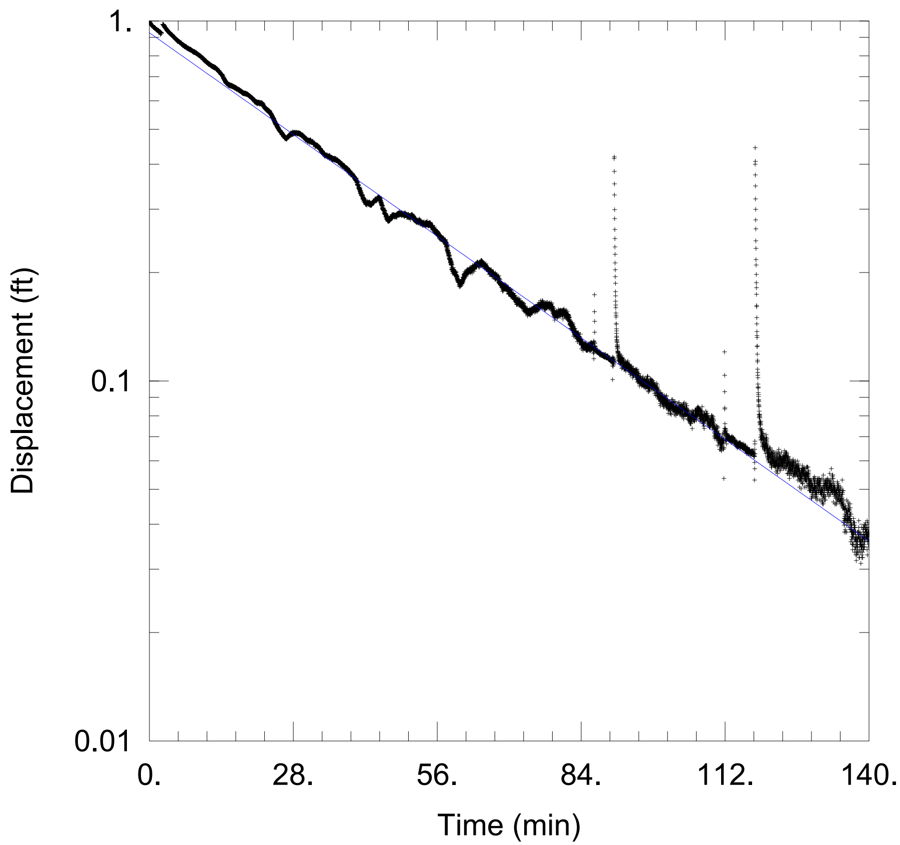
K = 0.1525 ft/day
y0 = 0.9411 ft

AQUIFER DATA

Saturated Thickness: 15.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 15.8 ft
Casing Radius: 0.167 ft
Static Water Column Height: 15.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW01 RH T1

Data Set: C:\...\TW01_RH_T1.aqt
Date: 08/16/19 Time: 11:54:22

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW01
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

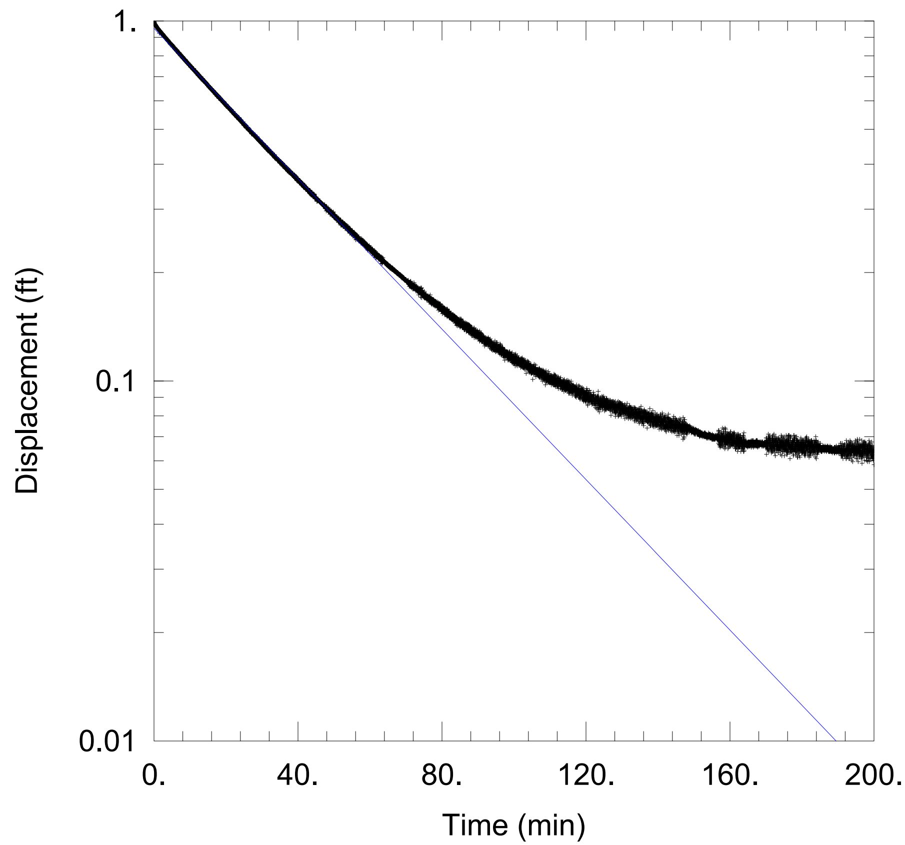
K = 0.1504 ft/day
y0 = 0.9271 ft

AQUIFER DATA

Saturated Thickness: 15.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 15.8 ft
Casing Radius: 0.167 ft
Static Water Column Height: 15.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW01 RH T2

Data Set: C:\...\TW01_RH_T2.aqt
Date: 08/16/19 Time: 11:54:08

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW01
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

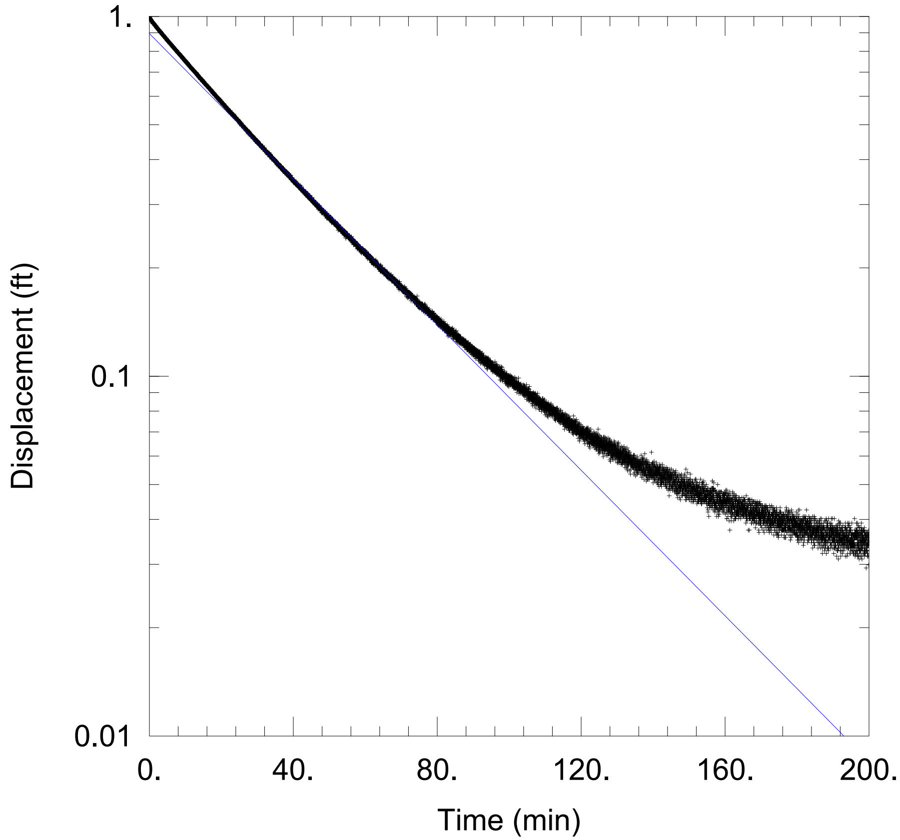
K = 0.1558 ft/day
y0 = 0.9537 ft

AQUIFER DATA

Saturated Thickness: 15.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 15.8 ft
Casing Radius: 0.167 ft
Static Water Column Height: 15.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW01 RH T3

Data Set: C:\...\TW01_RH_T3.aqt
Date: 08/16/19 Time: 11:53:54

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW01
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1508 ft/day
y0 = 0.8962 ft

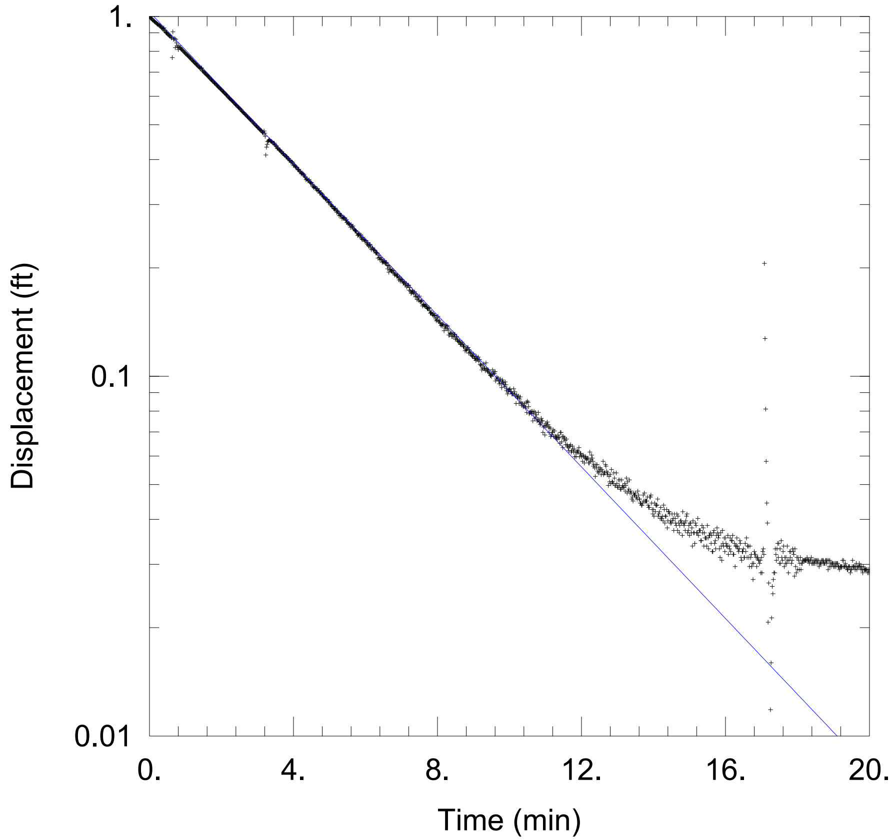
AQUIFER DATA

Saturated Thickness: 15.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW01)

Initial Displacement: 1. ft
Total Well Penetration Depth: 15.8 ft
Casing Radius: 0.167 ft

Static Water Column Height: 15.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW03 FH T1

Data Set: C:\...\TW03_FH_T1.aqt
Date: 08/16/19 Time: 11:53:40

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW03
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.761 ft/day
y0 = 1.028 ft

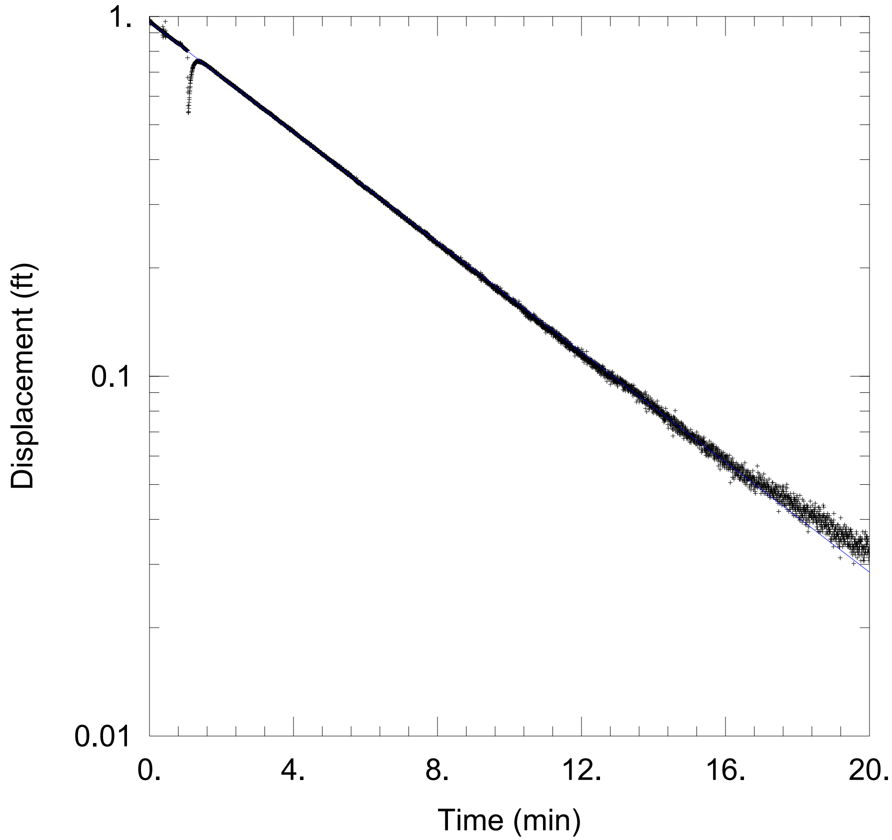
AQUIFER DATA

Saturated Thickness: 41.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 41.5 ft
Casing Radius: 0.167 ft

Static Water Column Height: 41.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW03 FH T2

Data Set: C:\...\TW03_FH_T2.aqt
Date: 08/16/19 Time: 11:53:26

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW03
Test Date: 07/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.278 ft/day
y0 = 0.964 ft

AQUIFER DATA

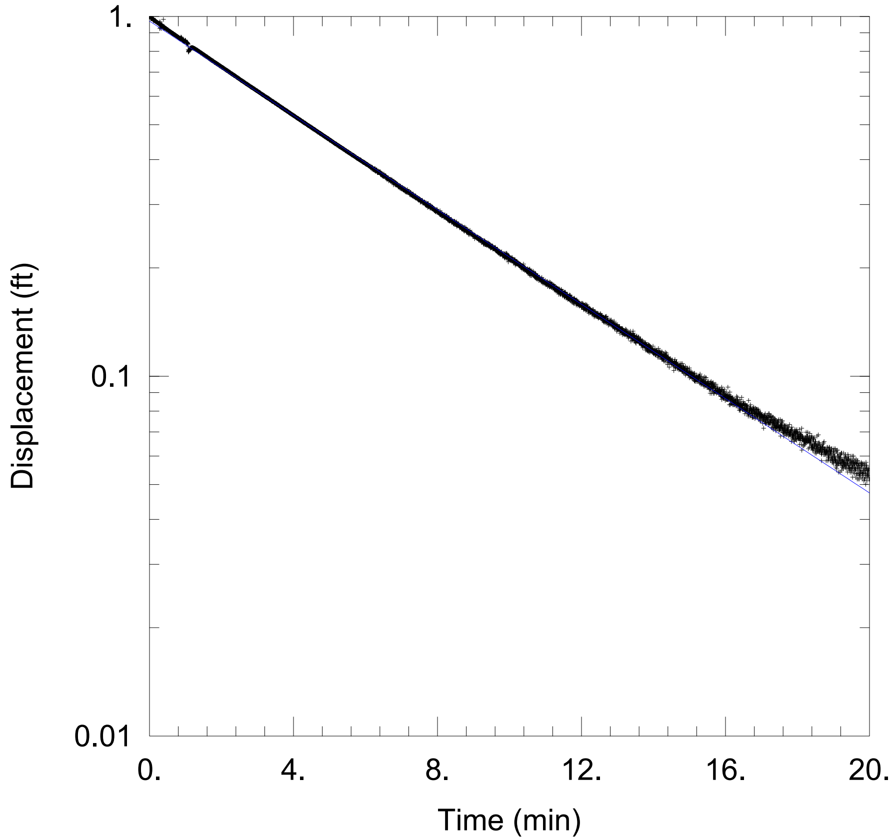
Saturated Thickness: 41.8 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 41.5 ft
Casing Radius: 0.167 ft

Static Water Column Height: 41.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW03 FH T3

Data Set: C:\...\TW03_FH_T3.aqt
Date: 08/16/19 Time: 11:53:05

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW03
Test Date: 07/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.096 ft/day
y0 = 0.9707 ft

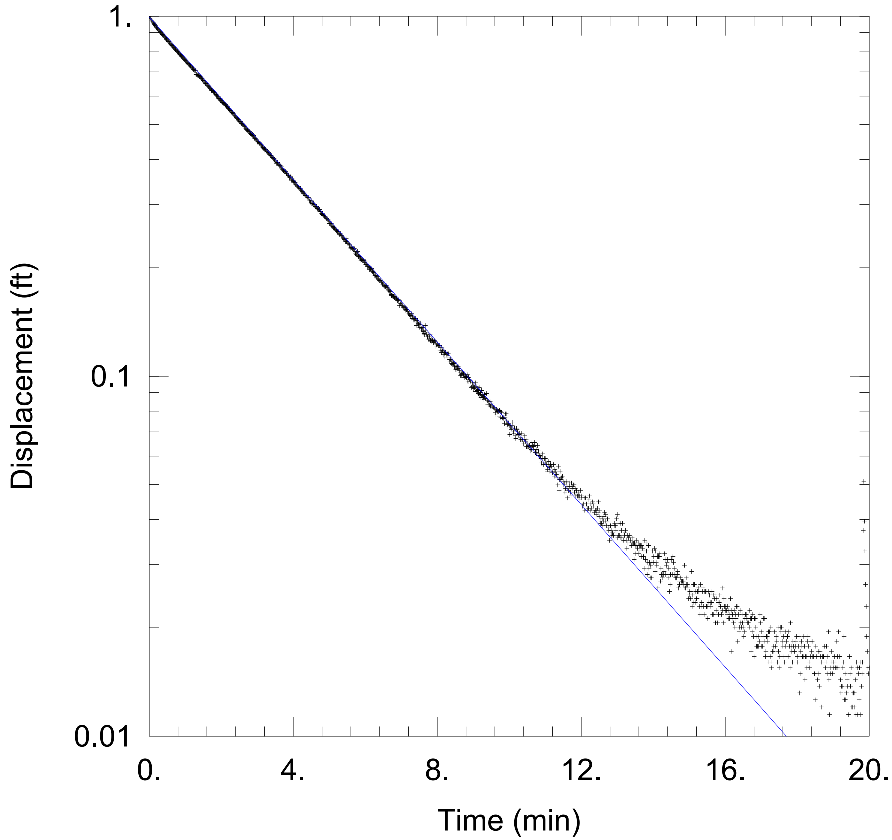
AQUIFER DATA

Saturated Thickness: 41.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 41.5 ft
Casing Radius: 0.167 ft

Static Water Column Height: 41.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW03 RH T1

Data Set: C:\...\TW03_RH_T1.aqt
Date: 08/16/19 Time: 11:52:51

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW03
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.888 ft/day
y0 = 0.9957 ft

AQUIFER DATA

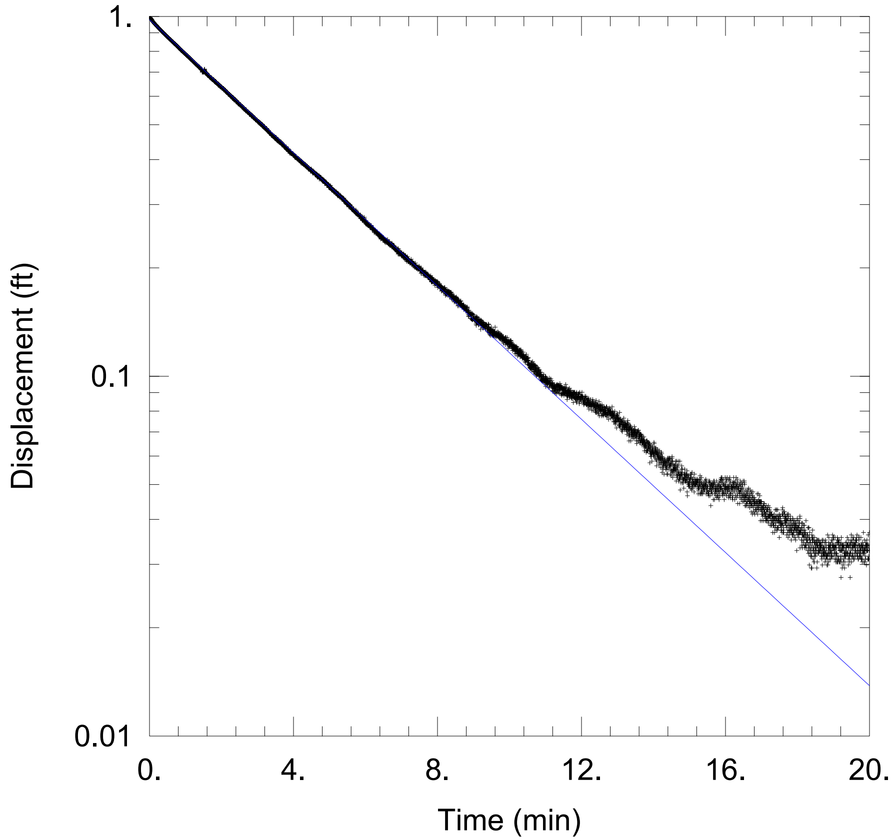
Saturated Thickness: 41.8 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 41.5 ft
Casing Radius: 0.167 ft

Static Water Column Height: 41.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW03 RH T2

Data Set: C:\...\TW03_RH_T2.aqt
Date: 08/16/19 Time: 11:52:37

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW03
Test Date: 07/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

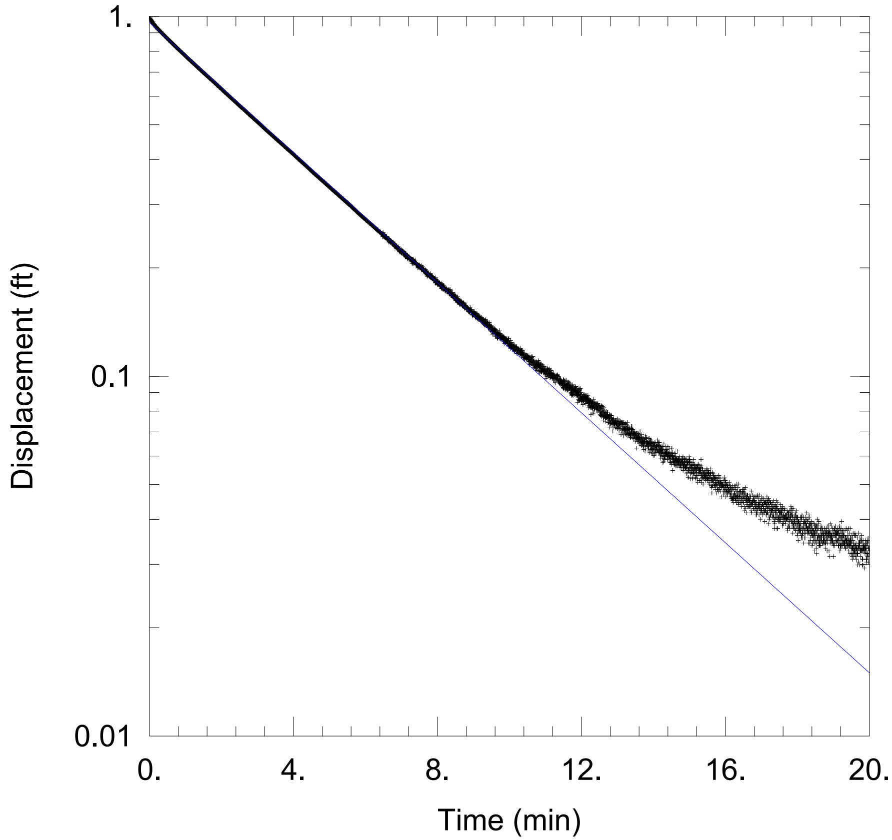
K = 1.548 ft/day
y0 = 0.9794 ft

AQUIFER DATA

Saturated Thickness: 41.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 41.5 ft
Casing Radius: 0.167 ft
Static Water Column Height: 41.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW03 RH T3

Data Set: C:\...\TW03_RH_T3.aqt
Date: 08/16/19 Time: 11:52:20

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW03
Test Date: 07/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.511 ft/day
y0 = 0.9616 ft

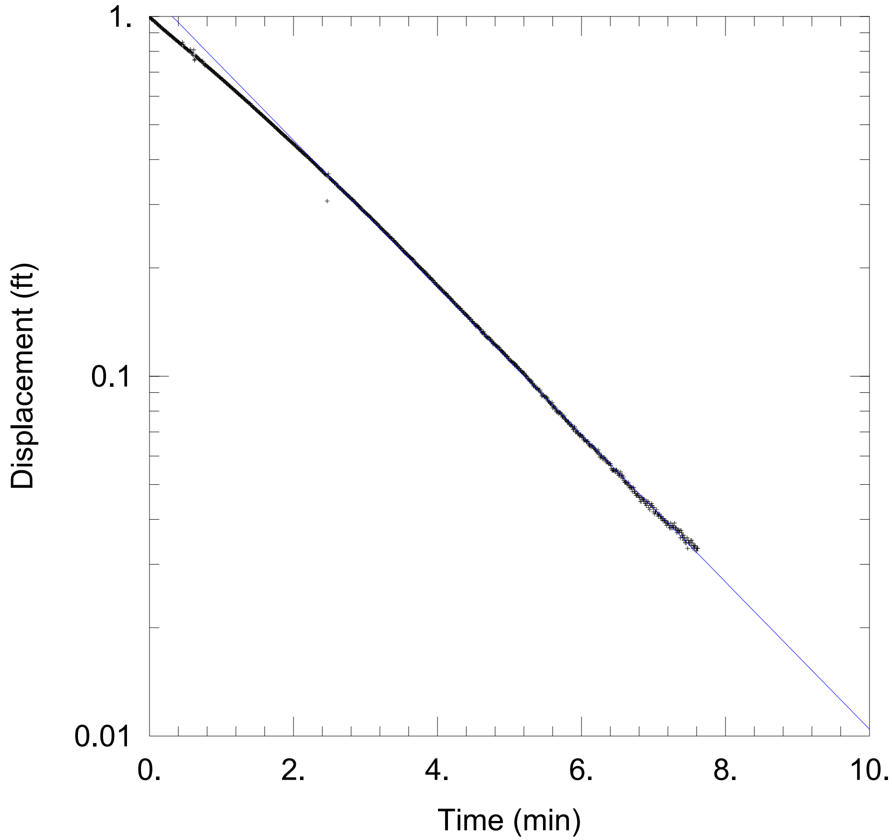
AQUIFER DATA

Saturated Thickness: 41.8 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW03)

Initial Displacement: 1. ft
Total Well Penetration Depth: 41.5 ft
Casing Radius: 0.167 ft

Static Water Column Height: 41.8 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW05 FH T1

Data Set: C:\...\TW05_FH_T1.aqt
Date: 08/16/19   Time: 11:58:35

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW05
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 3.401 ft/day
y0 = 1.161 ft

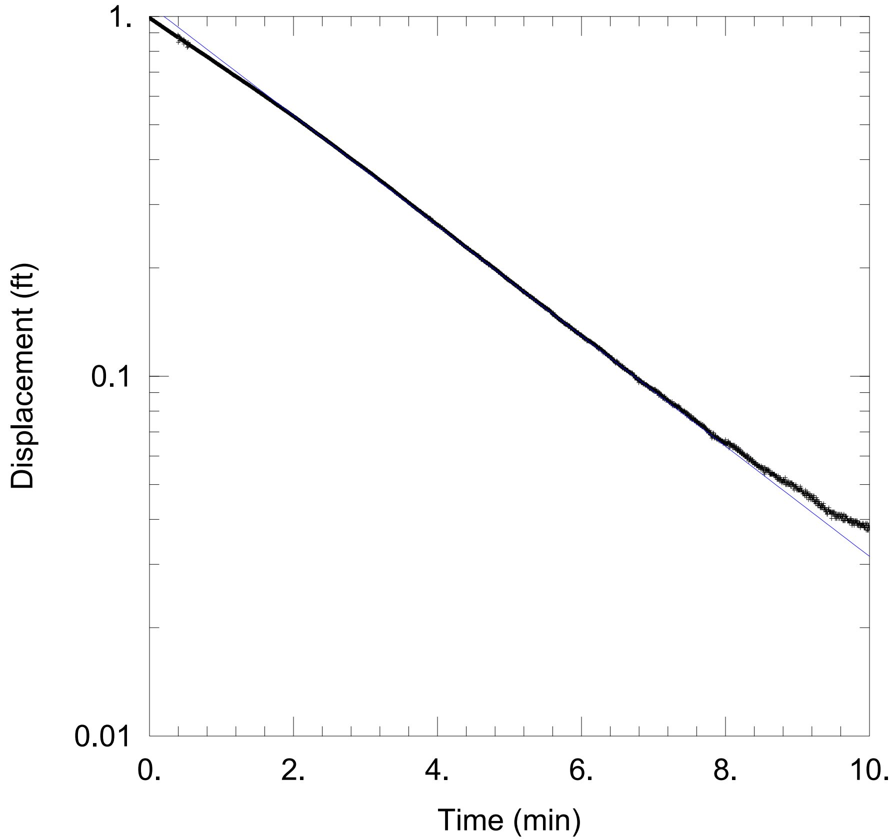
AQUIFER DATA

Saturated Thickness: 30. ft   Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft

Static Water Column Height: 30. ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW05 FH T2

Data Set: C:\...\TW05_FH_T2.aqt
Date: 08/16/19 Time: 11:58:22

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW05
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

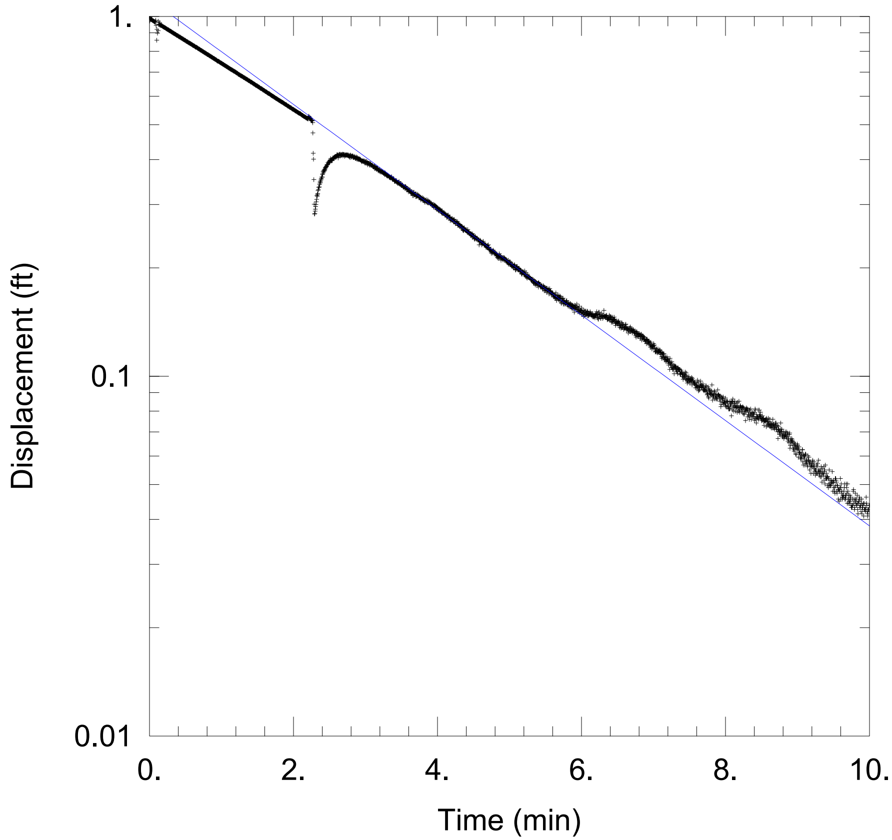
K = 2.546 ft/day
y0 = 1.074 ft

AQUIFER DATA

Saturated Thickness: 30. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft
Static Water Column Height: 30. ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW05 FH T3

Data Set: C:\...\TW05_FH_T3.aqt
Date: 08/16/19 Time: 11:58:08

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW05
Test Date: 07/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

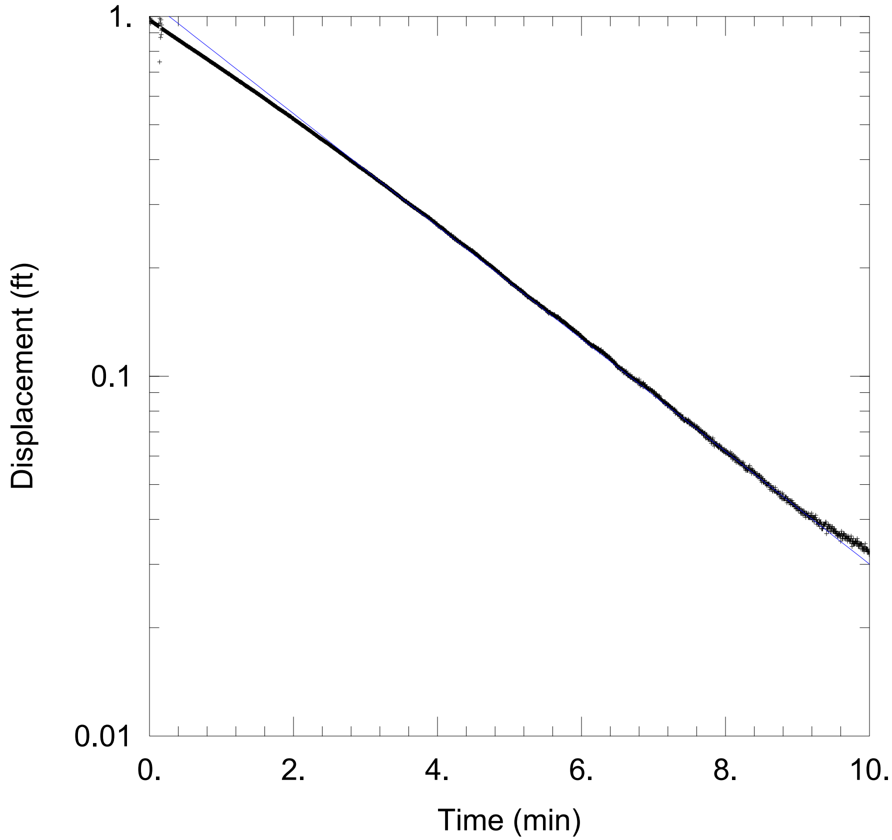
K = 2.434 ft/day
y0 = 1.117 ft

AQUIFER DATA

Saturated Thickness: 30. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft
Static Water Column Height: 30. ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW05 FH T4

Data Set: C:\...\TW05_FH_T4.aqt
Date: 08/16/19 Time: 11:57:55

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW05
Test Date: 07/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.601 ft/day
y0 = 1.103 ft

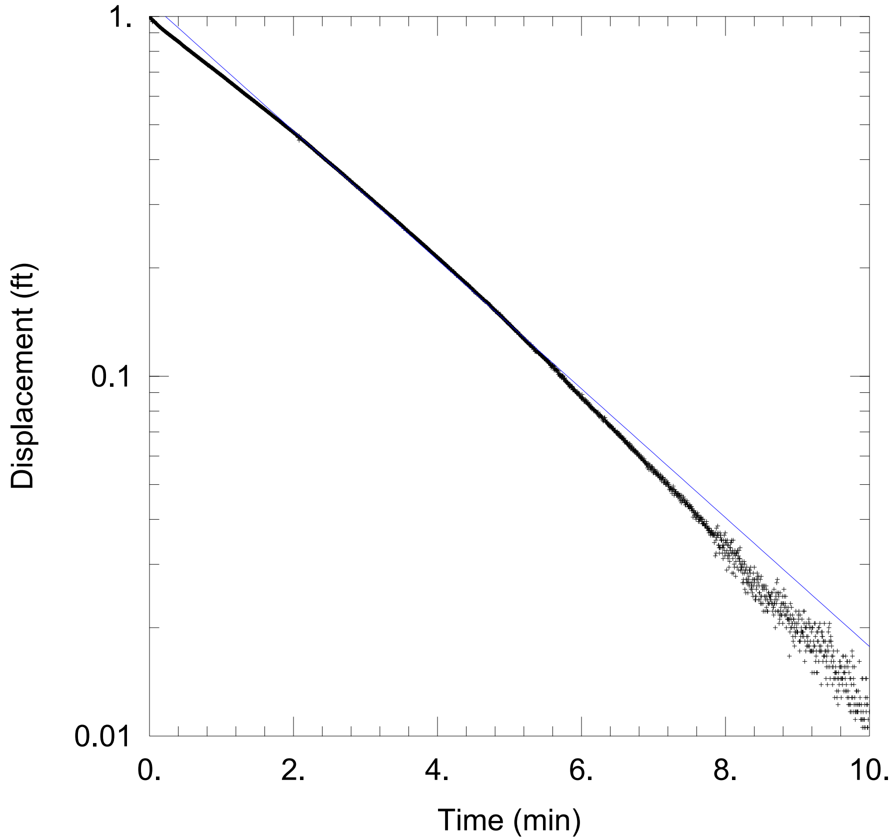
AQUIFER DATA

Saturated Thickness: 30. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft

Static Water Column Height: 30. ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW05 RH T1

Data Set: C:\...\TW05_RH_T1.aqt
Date: 08/16/19 Time: 11:57:40

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW05
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

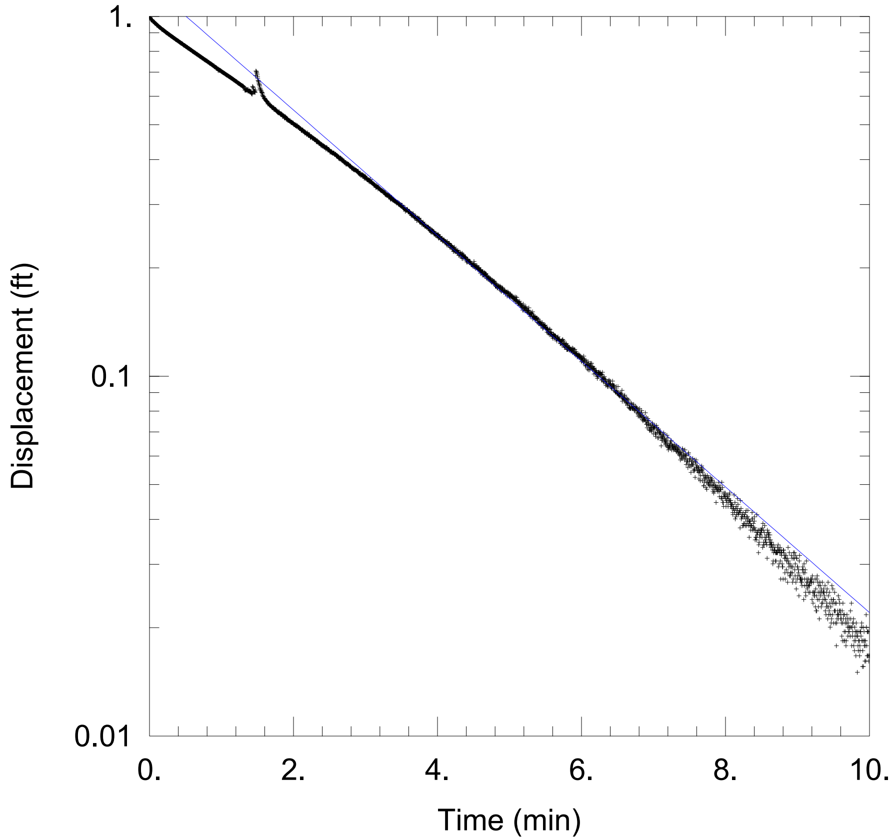
K = 2.977 ft/day
y0 = 1.096 ft

AQUIFER DATA

Saturated Thickness: 30. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft
Static Water Column Height: 30. ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW05 RH T2

Data Set: Z:\...\TW05_RH_T2.aqt
Date: 02/24/21 Time: 11:40:19

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW05
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

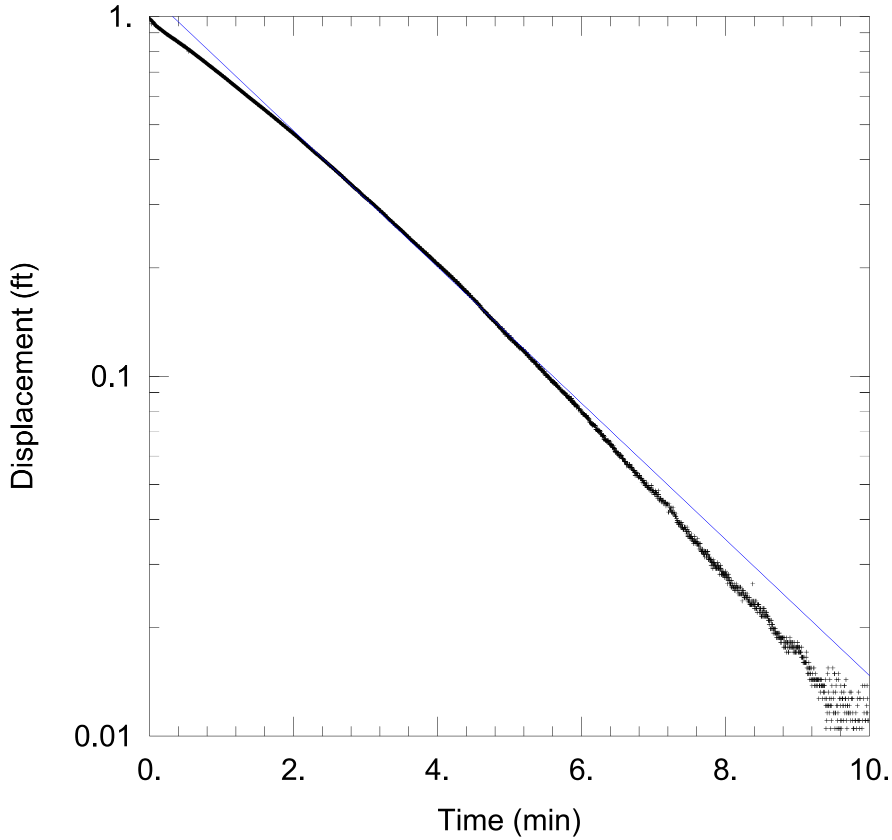
K = 2.902 ft/day
y0 = 1.227 ft

AQUIFER DATA

Saturated Thickness: 30. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft
Static Water Column Height: 30. ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW05 RH T3

Data Set: C:\...\TW05_RH_T3.aqt
Date: 08/16/19 Time: 11:57:15

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW05
Test Date: 07/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

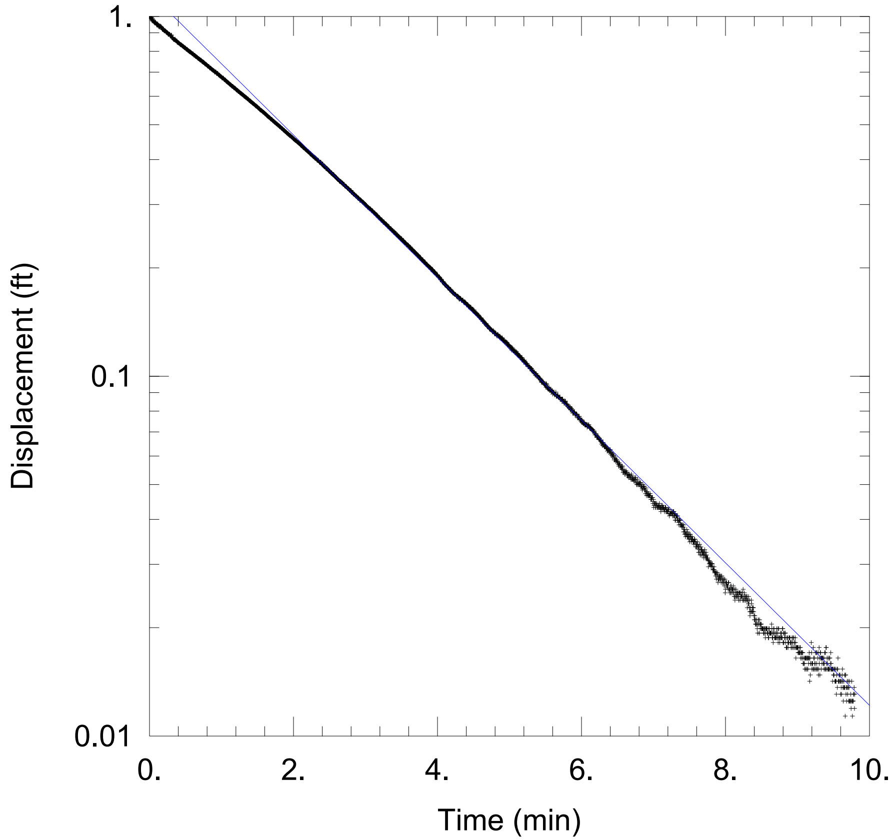
K = 3.147 ft/day
y0 = 1.15 ft

AQUIFER DATA

Saturated Thickness: 30. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft
Static Water Column Height: 30. ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW05 RH T4

Data Set: C:\...\TW05_RH_T4.aqt
Date: 08/16/19 Time: 11:57:02

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW05
Test Date: 07/19/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

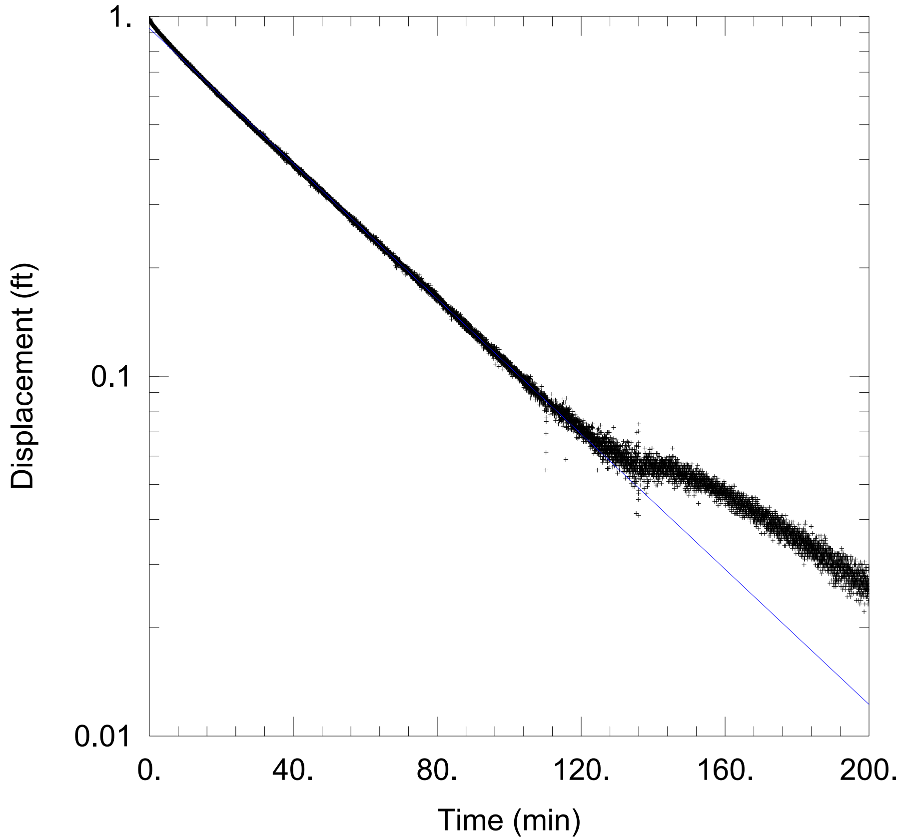
K = 3.293 ft/day
y0 = 1.165 ft

AQUIFER DATA

Saturated Thickness: 30. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW05)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft
Static Water Column Height: 30. ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW07 FH T1

Data Set: C:\...\TW07_FH_T1.aqt
Date: 08/16/19 Time: 11:56:49

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW07
Test Date: 07/16/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1624 ft/day
y0 = 0.9261 ft

AQUIFER DATA

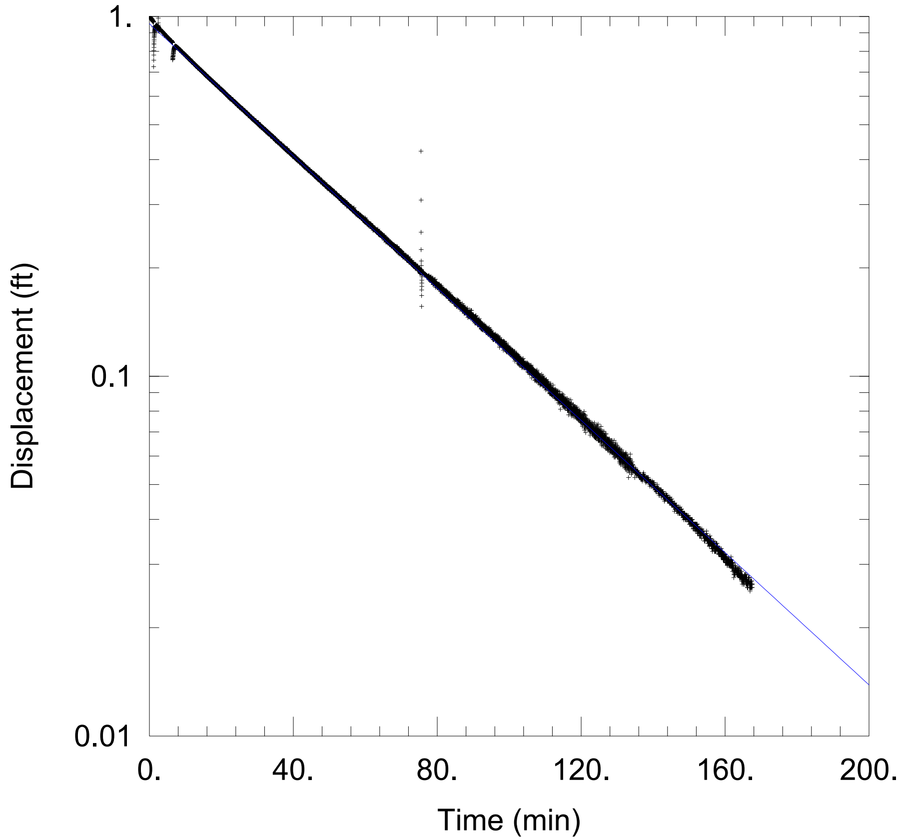
Saturated Thickness: 38.7 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW07)

Initial Displacement: 1. ft
Total Well Penetration Depth: 38.7 ft
Casing Radius: 0.167 ft

Static Water Column Height: 38.7 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW07 FH T2

Data Set: C:\...\TW07_FH_T2.aqt
Date: 08/16/19 Time: 11:56:35

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW07
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

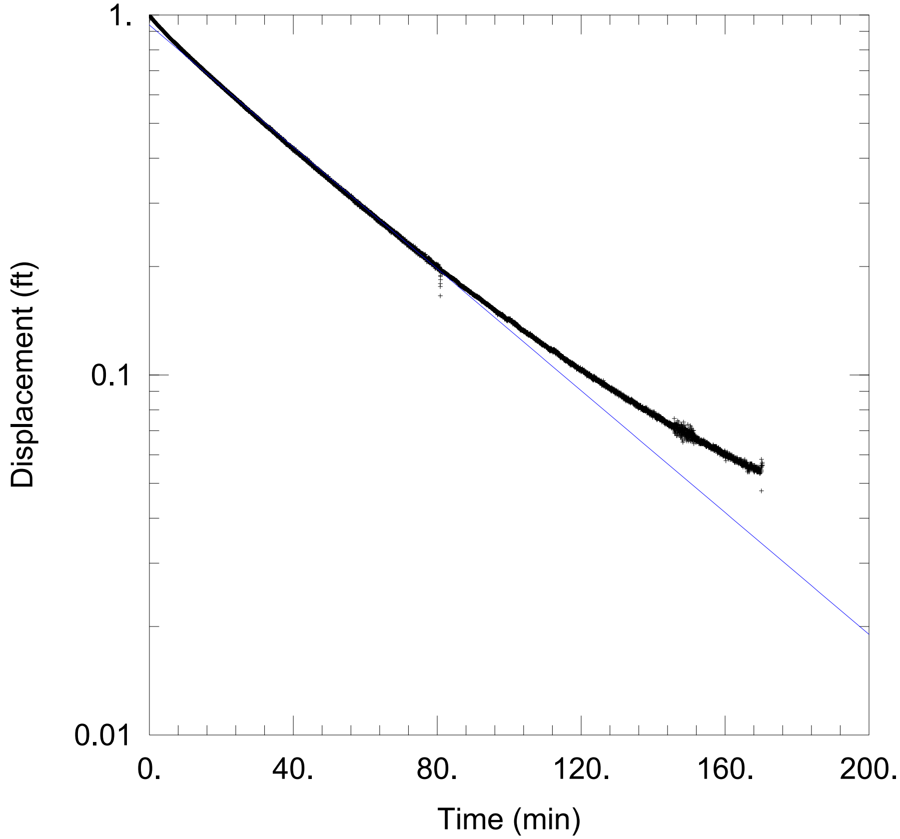
K = 0.1588 ft/day
y0 = 0.9543 ft

AQUIFER DATA

Saturated Thickness: 38.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW07)

Initial Displacement: 1. ft
Total Well Penetration Depth: 38.7 ft
Casing Radius: 0.167 ft
Static Water Column Height: 38.7 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW07 FH T3

Data Set: C:\...\TW07_FH_T3.aqt
Date: 08/16/19 Time: 11:56:24

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW07
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1463 ft/day
y0 = 0.9369 ft

AQUIFER DATA

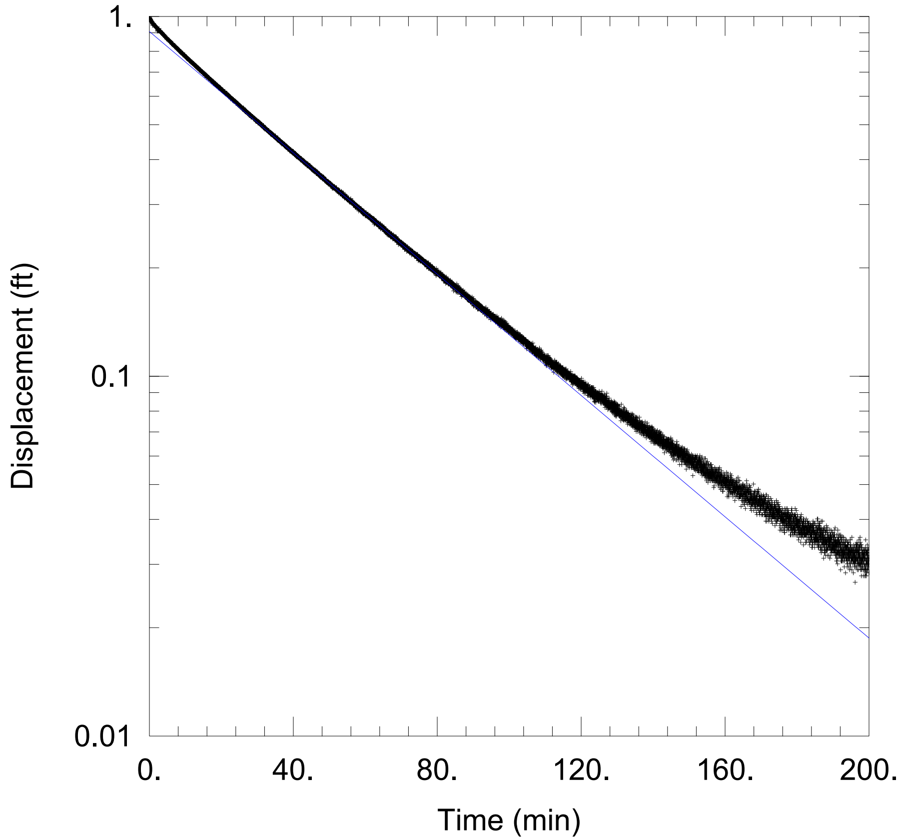
Saturated Thickness: 38.7 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW07)

Initial Displacement: 1. ft
Total Well Penetration Depth: 38.7 ft
Casing Radius: 0.167 ft

Static Water Column Height: 38.7 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW07 RH T1

Data Set: C:\...\TW07_RH_T1.aqt
Date: 08/16/19 Time: 11:56:06

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW07
Test Date: 07/16/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1457 ft/day
y0 = 0.9074 ft

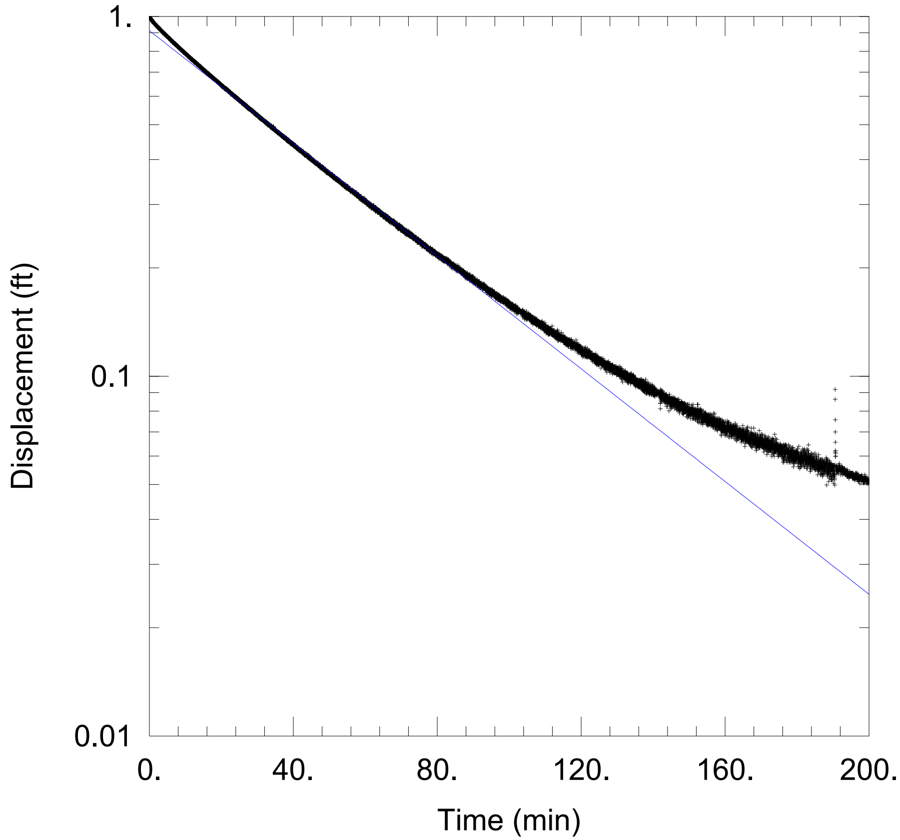
AQUIFER DATA

Saturated Thickness: 38.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW07)

Initial Displacement: 1. ft
Total Well Penetration Depth: 38.7 ft
Casing Radius: 0.167 ft

Static Water Column Height: 38.7 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW07 RH T2

Data Set: C:\...\TW07_RH_T2.aqt
Date: 08/16/19 Time: 11:55:48

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW07
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1354 ft/day
y0 = 0.9125 ft

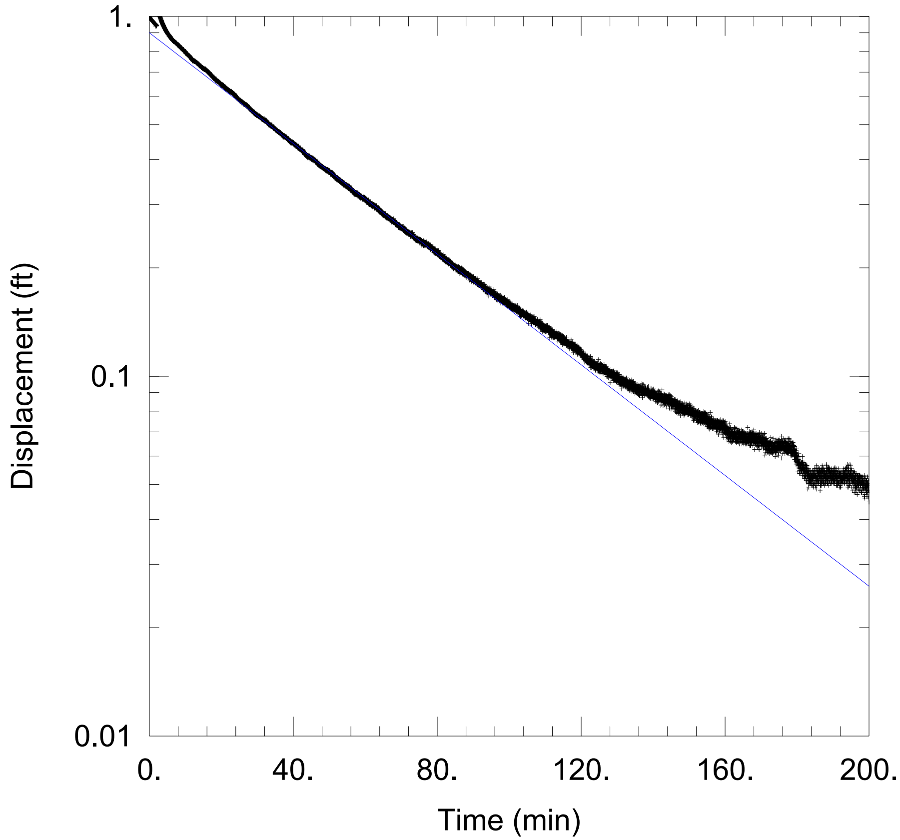
AQUIFER DATA

Saturated Thickness: 38.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW07)

Initial Displacement: 1. ft
Total Well Penetration Depth: 38.7 ft
Casing Radius: 0.167 ft

Static Water Column Height: 38.7 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW07 RH T3

Data Set: C:\...\TW07_RH_T3.aqt
Date: 08/16/19 Time: 11:55:34

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW07
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

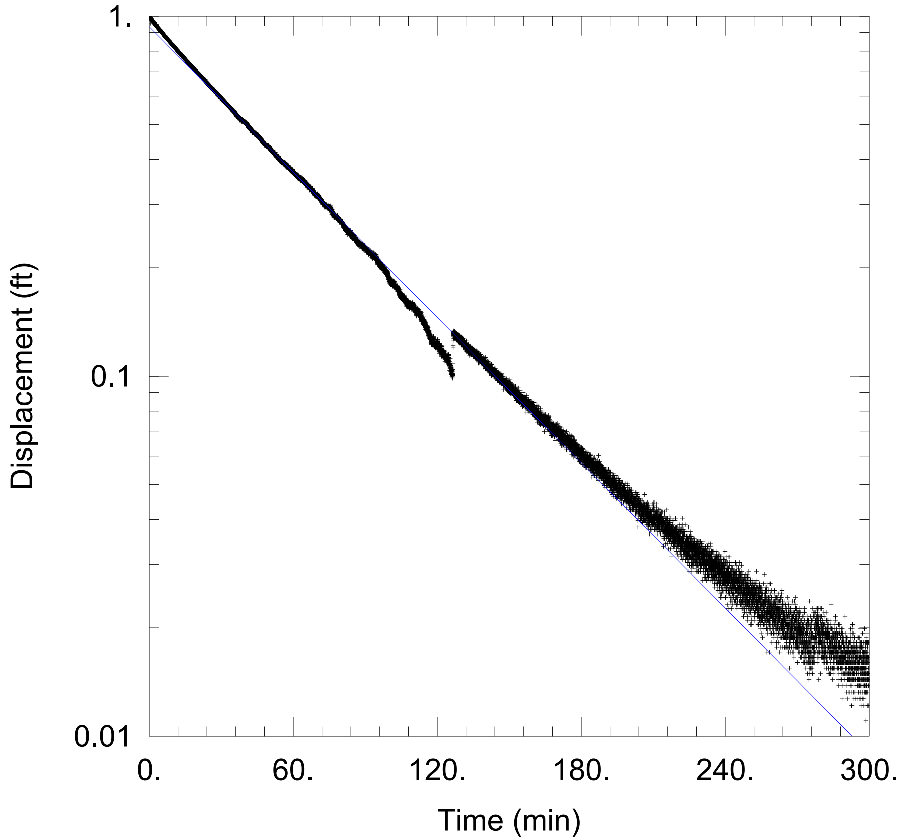
K = 0.1329 ft/day
y0 = 0.9003 ft

AQUIFER DATA

Saturated Thickness: 38.7 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW07)

Initial Displacement: 1. ft
Total Well Penetration Depth: 38.7 ft
Casing Radius: 0.167 ft
Static Water Column Height: 38.7 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW08 FH T1

Data Set: C:\...\TW08_FH_T1.aqt
Date: 08/16/19 Time: 12:02:10

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW08
Test Date: 07/16/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1147 ft/day
y0 = 0.9345 ft

AQUIFER DATA

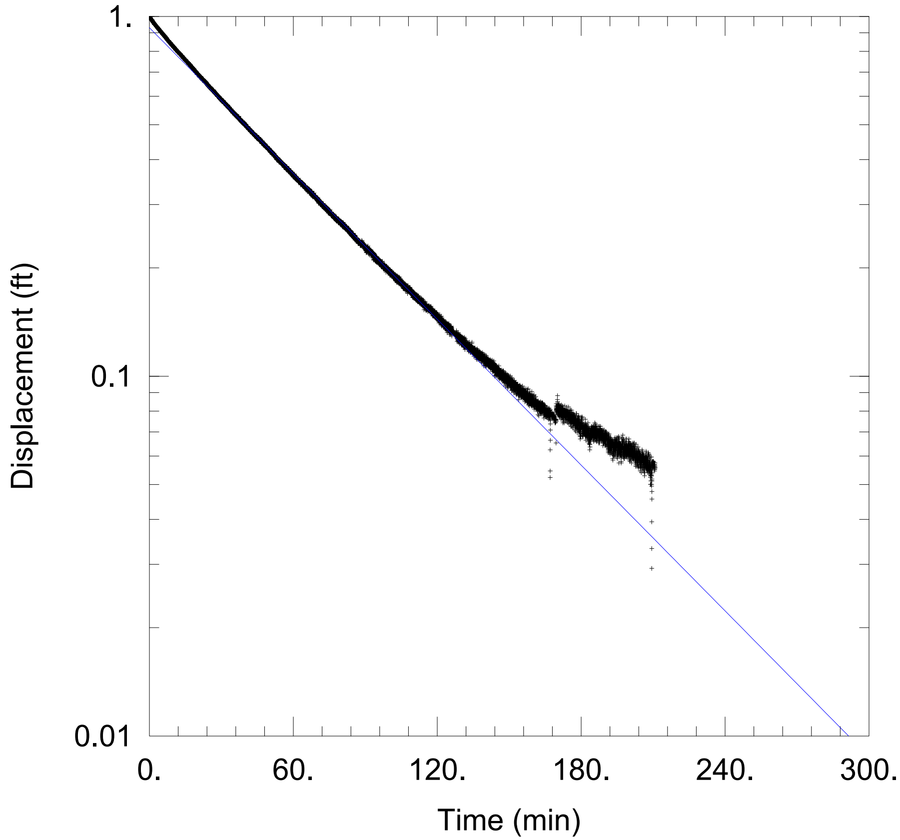
Saturated Thickness: 35.2 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW08)

Initial Displacement: 1. ft
Total Well Penetration Depth: 35.2 ft
Casing Radius: 0.167 ft

Static Water Column Height: 35.2 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW08 FH T2

Data Set: C:\...\TW08_FH_T2.aqt
Date: 08/16/19 Time: 12:01:42

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW08
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1151 ft/day
y0 = 0.9301 ft

AQUIFER DATA

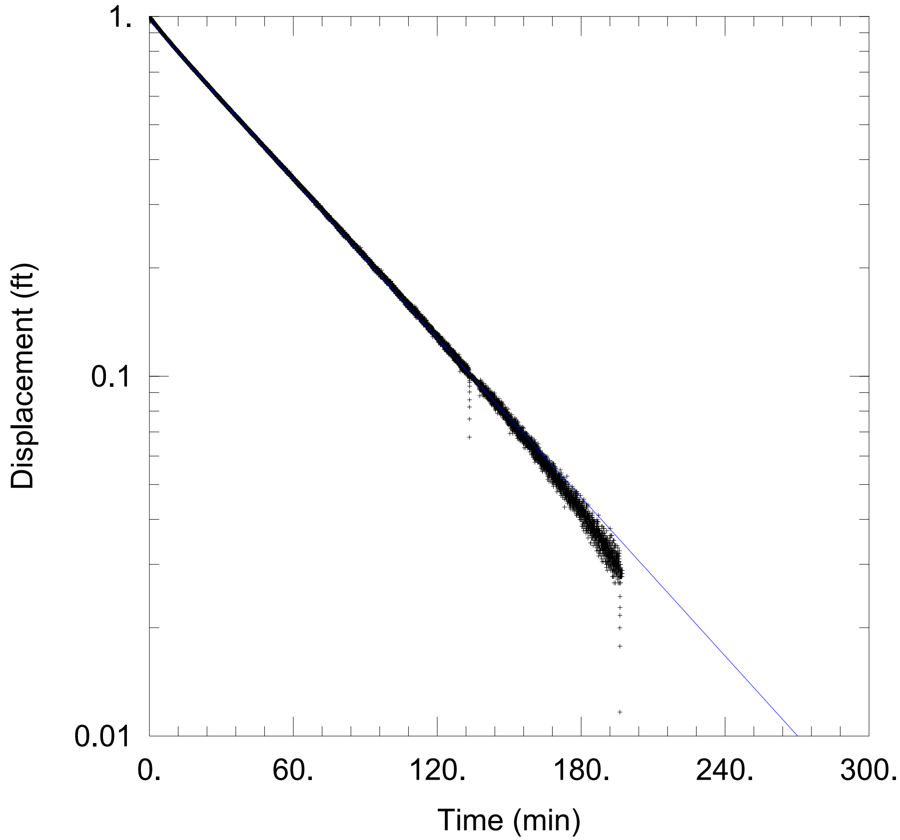
Saturated Thickness: 35.2 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW08)

Initial Displacement: 1. ft
Total Well Penetration Depth: 35.2 ft
Casing Radius: 0.167 ft

Static Water Column Height: 35.2 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW08 FH T3

Data Set: C:\...\TW08_FH_T3.aqt
Date: 08/16/19 Time: 12:01:29

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW08
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

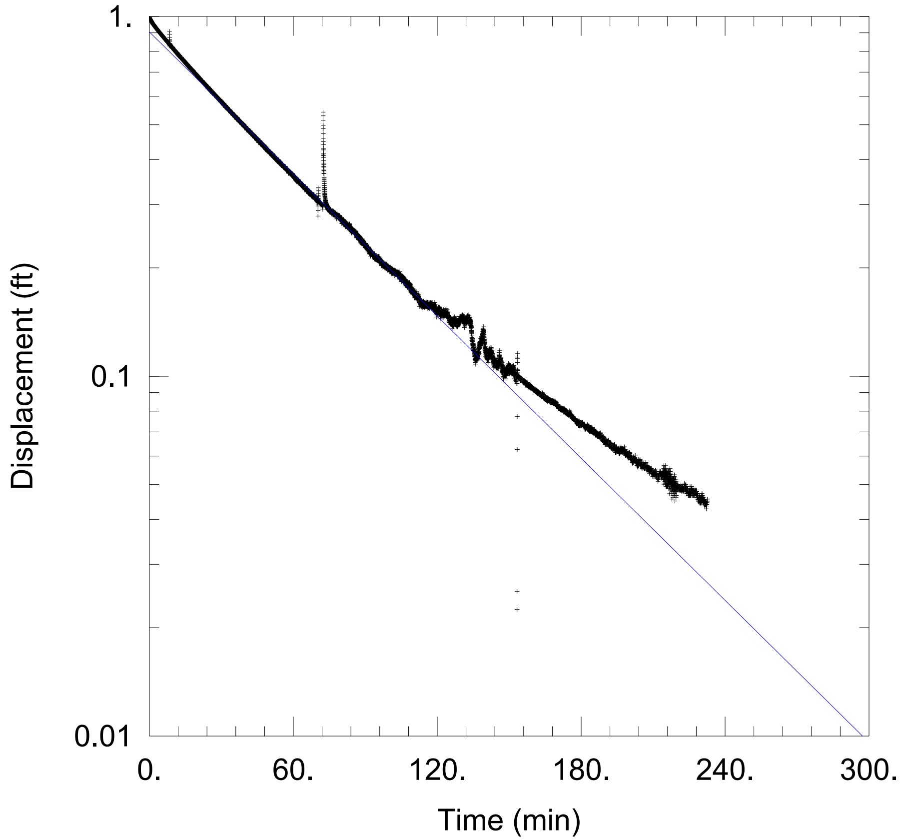
K = 0.1253 ft/day
y0 = 0.9709 ft

AQUIFER DATA

Saturated Thickness: 35.2 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW08)

Initial Displacement: 1. ft
Total Well Penetration Depth: 35.2 ft
Casing Radius: 0.167 ft
Static Water Column Height: 35.2 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW08 RH T1

Data Set: C:\...\TW08_RH_T1.aqt
Date: 08/16/19 Time: 12:01:17

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW08
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1122 ft/day
y0 = 0.9055 ft

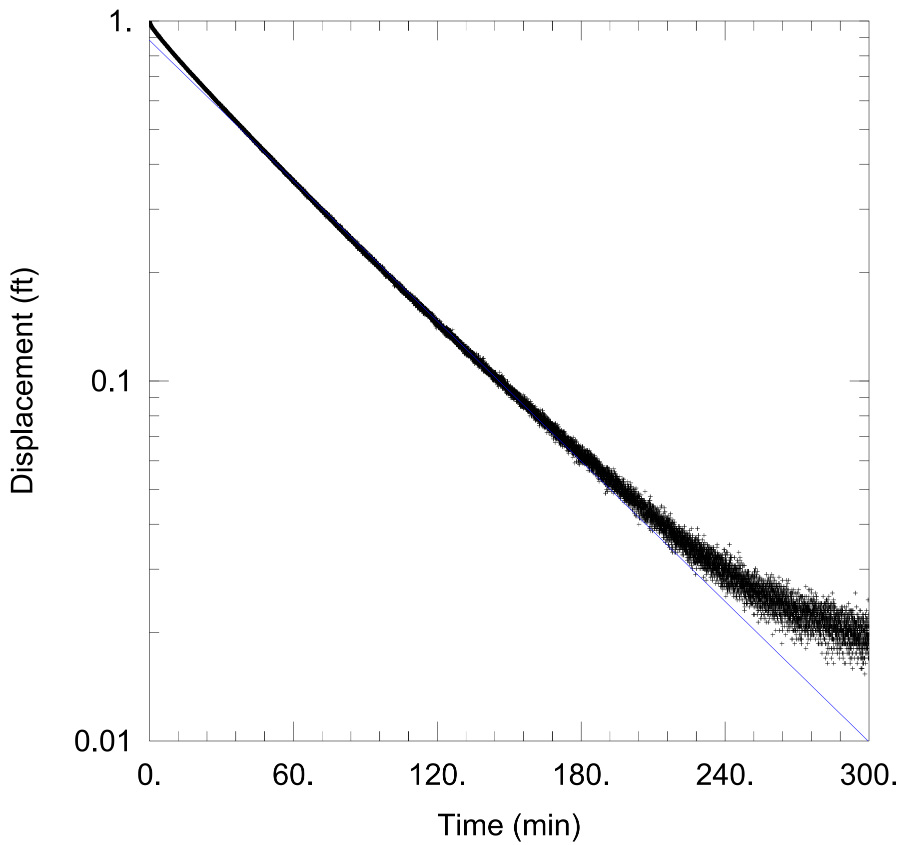
AQUIFER DATA

Saturated Thickness: 35.2 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW08)

Initial Displacement: 1. ft
Total Well Penetration Depth: 35.2 ft
Casing Radius: 0.167 ft

Static Water Column Height: 35.2 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW08 RH T2

Data Set: C:\...\TW08_RH_T2.aqt
Date: 08/16/19 Time: 12:00:57

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW08
Test Date: 07/17/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

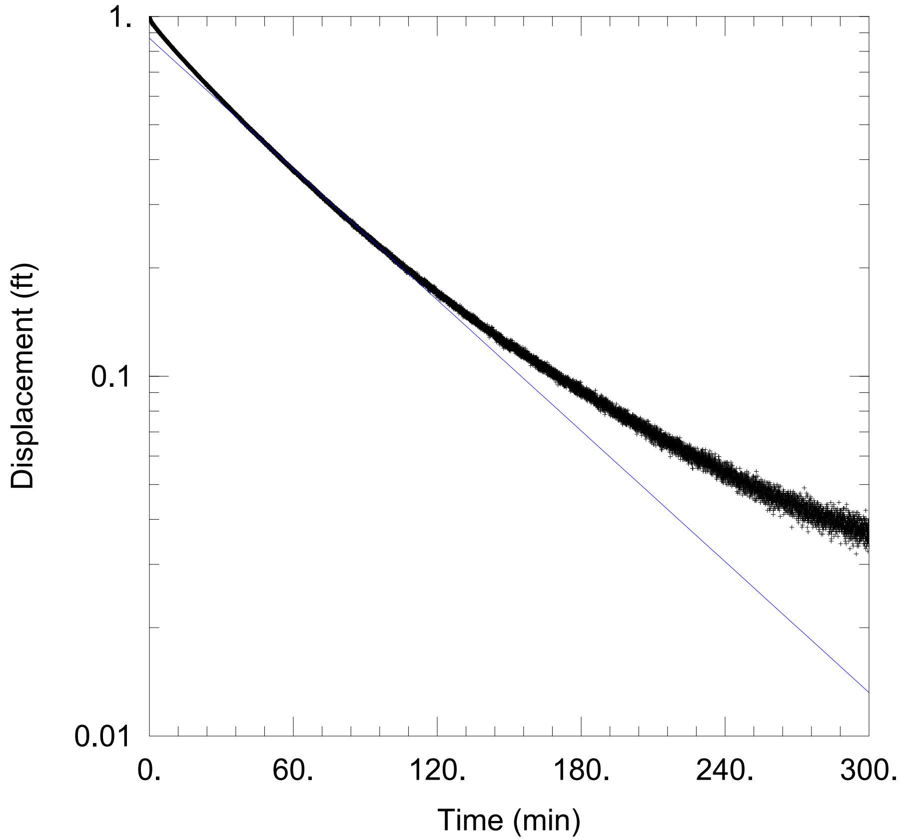
K = 0.1107 ft/day
y0 = 0.884 ft

AQUIFER DATA

Saturated Thickness: 35.2 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW08)

Initial Displacement: 1. ft
Total Well Penetration Depth: 35.2 ft
Casing Radius: 0.167 ft
Static Water Column Height: 35.2 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW08 RH T3

Data Set: C:\...\TW08_RH_T3.aqt
Date: 08/16/19 Time: 12:00:39

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW08
Test Date: 07/18/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1033 ft/day
y0 = 0.8697 ft

AQUIFER DATA

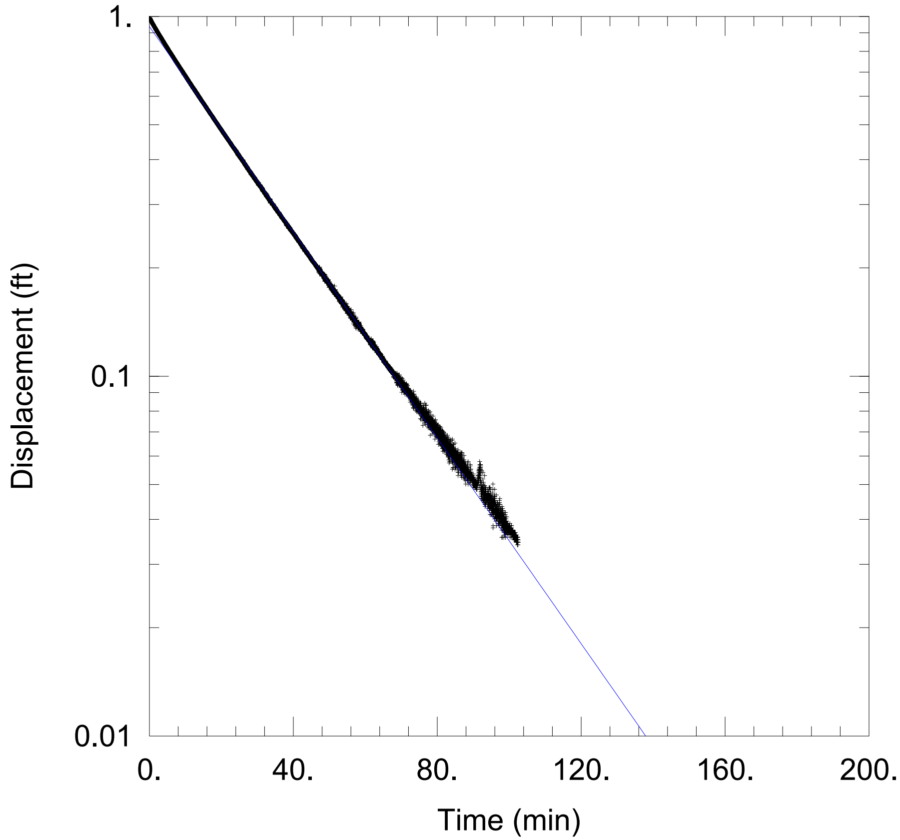
Saturated Thickness: 35.2 ft

Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW08)

Initial Displacement: 1. ft
Total Well Penetration Depth: 35.2 ft
Casing Radius: 0.167 ft

Static Water Column Height: 35.2 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW09 FH T1

Data Set: C:\...\TW09_FH_T1.aqt
Date: 08/16/19 Time: 12:00:25

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW09
Test Date: 07/15/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

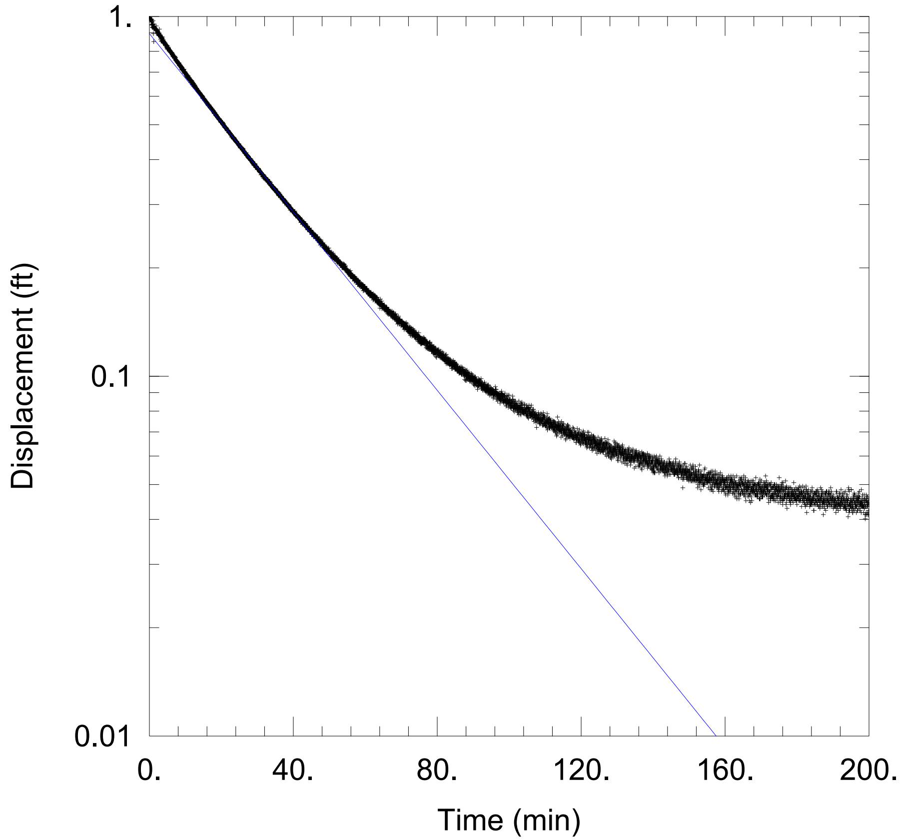
K = 0.2461 ft/day
y0 = 0.9375 ft

AQUIFER DATA

Saturated Thickness: 37.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW09)

Initial Displacement: 1. ft
Total Well Penetration Depth: 37.6 ft
Casing Radius: 0.167 ft
Static Water Column Height: 37.6 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW09 FH T2

Data Set: C:\...\TW09_FH_T2.aqt
Date: 08/16/19 Time: 12:00:13

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW09
Test Date: 07/15/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

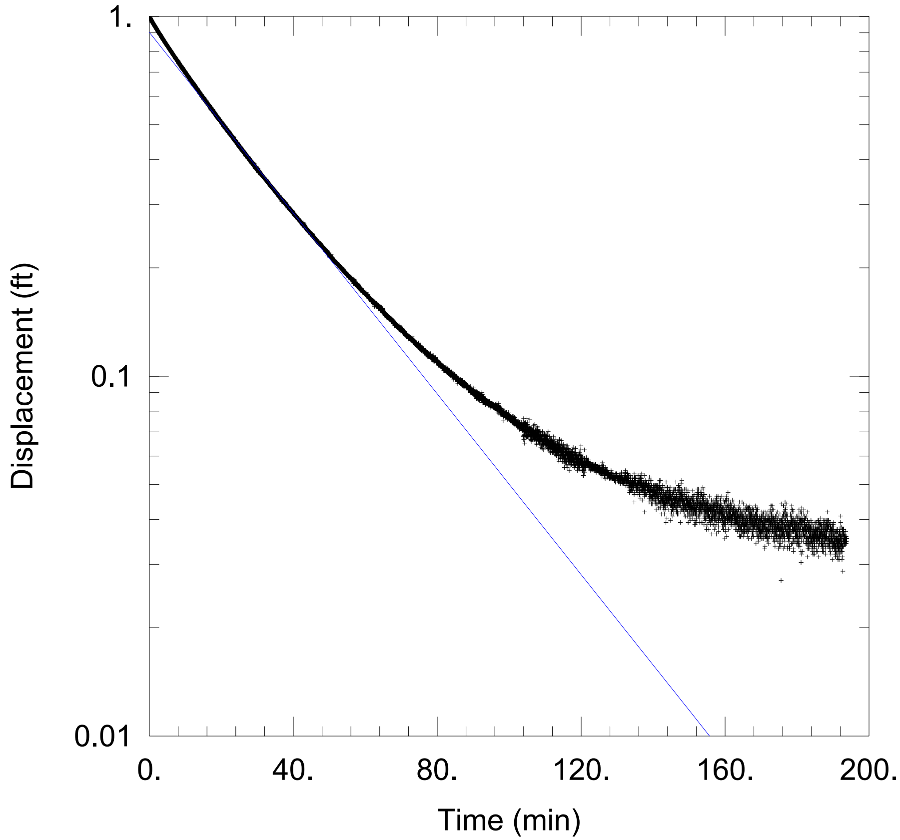
K = 0.2133 ft/day
y0 = 0.8956 ft

AQUIFER DATA

Saturated Thickness: 37.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW09)

Initial Displacement: 1. ft
Total Well Penetration Depth: 37.6 ft
Casing Radius: 0.167 ft
Static Water Column Height: 37.6 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW09 FH T3

Data Set: C:\...\TW09_FH_T3.aqt
Date: 08/16/19 Time: 11:59:56

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW09
Test Date: 07/16/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.2162 ft/day
y0 = 0.9026 ft

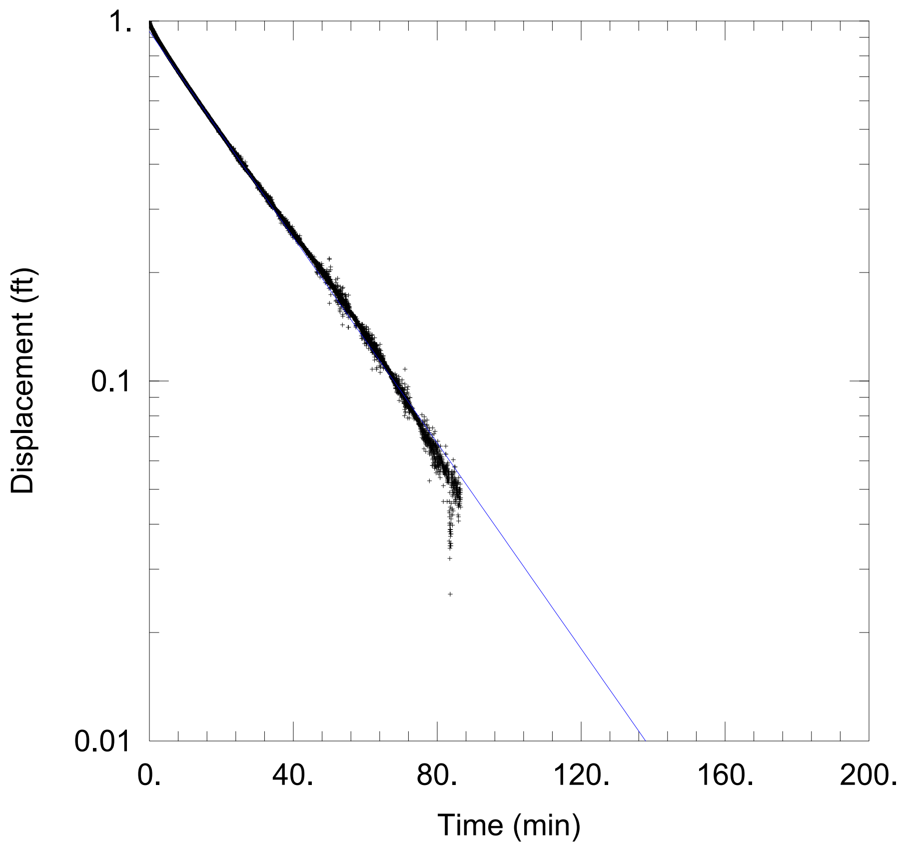
AQUIFER DATA

Saturated Thickness: 37.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW09)

Initial Displacement: 1. ft
Total Well Penetration Depth: 37.6 ft
Casing Radius: 0.167 ft

Static Water Column Height: 37.6 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW09 RH T1

Data Set: C:\...\TW09_RH_T1.aqt
Date: 08/16/19 Time: 11:59:41

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW09
Test Date: 07/15/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

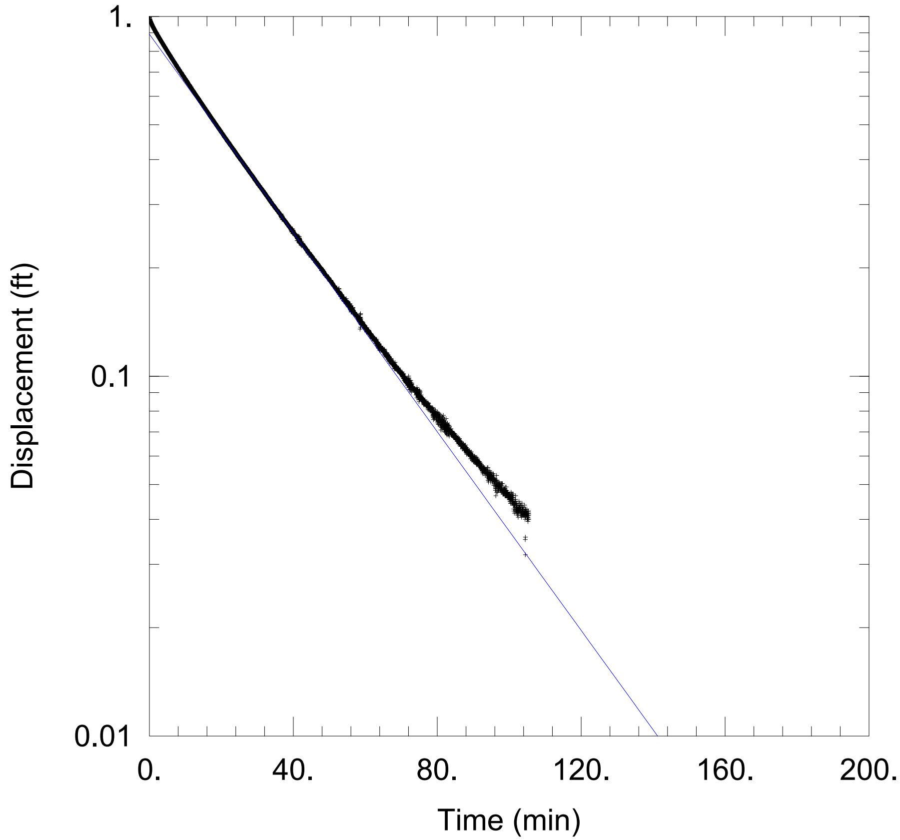
K = 0.2459 ft/day
y0 = 0.934 ft

AQUIFER DATA

Saturated Thickness: 37.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW09)

Initial Displacement: 1. ft
Total Well Penetration Depth: 37.6 ft
Casing Radius: 0.167 ft
Static Water Column Height: 37.6 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW09 RH T2

Data Set: C:\...\TW09_RH_T2.aqt
Date: 08/16/19 Time: 11:59:29

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW09
Test Date: 07/15/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.2377 ft/day
y0 = 0.8924 ft

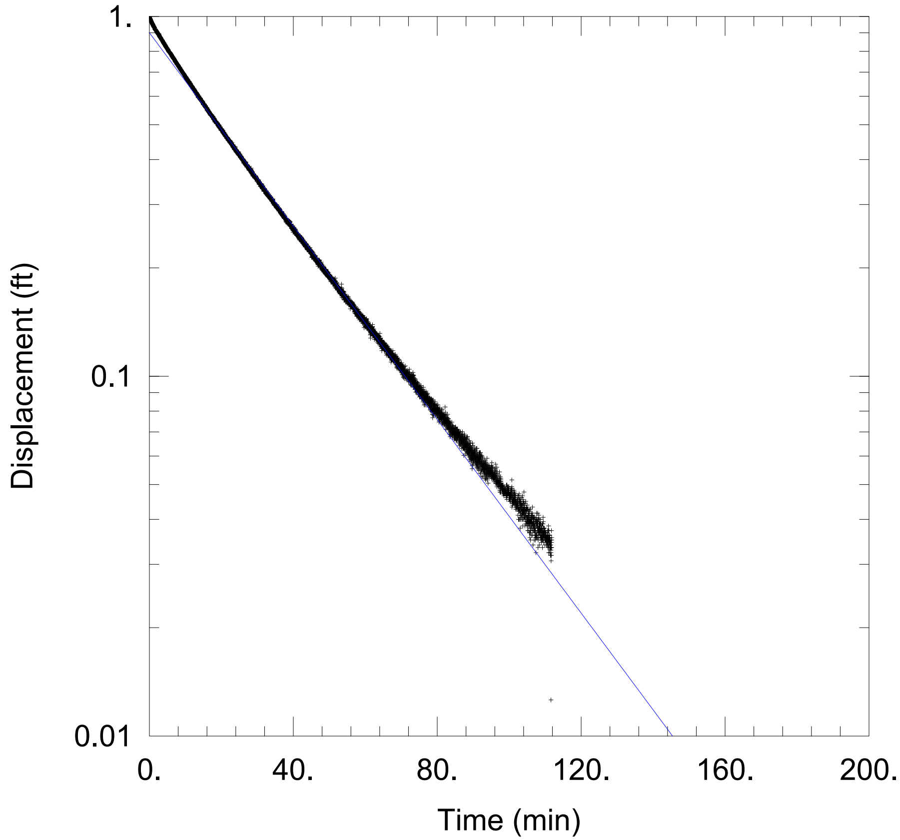
AQUIFER DATA

Saturated Thickness: 37.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW09)

Initial Displacement: 1. ft
Total Well Penetration Depth: 37.6 ft
Casing Radius: 0.167 ft

Static Water Column Height: 37.6 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.



TW09 RH T3

Data Set: C:\...\TW09_RH_T3.aqt
Date: 08/16/19 Time: 11:59:16

PROJECT INFORMATION

Company: Stantec
Client: TVA-CUF
Project: 175588209
Location: Cumberland City, TN
Test Well: TW09
Test Date: 07/16/19

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.2314 ft/day
y0 = 0.9005 ft

AQUIFER DATA

Saturated Thickness: 37.6 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (TW09)

Initial Displacement: 1. ft
Total Well Penetration Depth: 37.6 ft
Casing Radius: 0.167 ft

Static Water Column Height: 37.6 ft
Screen Length: 10.6 ft
Well Radius: 0.542 ft
Gravel Pack Porosity: 0.

ATTACHMENT E.4

Surface Geophysics Results

December 19, 2019

Mr. Mark Densmore
Stantec
837 North Oxford Road
Springfield, IL 62702

Re: Surface Geophysical Survey Report
TVA-Cumberland Fossil Plant
Stewart County, Tennessee
ARM Project 190513

Dear Mr. Densmore:

ARM Geophysics (ARM) has completed a geophysical survey at the Tennessee Valley Authority (TVA) Cumberland Fossil Plant (CUF) in Stewart County, Tennessee. The objectives of this work are to better characterize the uppermost foundation soils in the immediate vicinity of the mapped pre-construction channels of Wells Creek and in the area of historical grouting in the area of the Site and to identify potential locations for new groundwater monitoring wells.

WORK SCOPE

Phase 1 - Reprocessing previously collected electrical resistivity imaging (ERI) data

ARM reviewed existing reports involving previously collected ERI data for the area of investigation and reprocessed ERI profiles CUF-02+03 and CUF-08. ARM utilized high-resolution methods in the ERI data reprocessing and correlated the reprocessed ERI data with nearby boring logs. Results from the Phase 1 investigation are illustrated in Sheet 1.

Phase 2 - Collection of new geophysical data

ERI / IP Survey: ARM collected approximately 3,040 feet of ERI / IP field data on September 9-12, 2019 in the site area. The ERI / IP survey used dipole-dipole array techniques with electrode spacings of 10 feet. A computerized 8-channel resistivity meter was utilized for this survey. The ERI / IP data files were reviewed in the field, and the location and orientation of the traverses were recorded using a hand-held GPS. The ERI / IP field data collected in the site area were processed as 3D datasets using the computer application “Res3Dinv” (Loke 2016).

MASW Survey: ARM collected approximately 3,320 feet of MASW field data during the period September 9-10, 2019 in the site area. The MASW survey was carried-out using a 24-channel Geometrics Geode seismograph with 24 4.5 Hz geophones connected by a 24-takeout cable. ARM acquired the MASW data primarily using the following parameters:

• Geophone spacing = 5 feet
• Offset (distance between source and first geophone) = 10 feet
• Shot interval = 20 feet
• Record length = 1,000 msec
• Sampling interval = 0.25 msec
• Number of samples = 4,000
• Stacked shots/station = 1 (minimum)

During the geophysical investigation, ARM utilized a portable 40-kilogram (88 pound) automated weight-drop seismic source producing vertical ground motion. The portable seismic energy source utilized a motorized hammer mechanism to impact a metal plate on the ground surface, creating a seismic source wave. All the MASW data illustrated in this report was collected with this source*. As each MASW traverse was completed, ARM marked the spread center (between geophones 12 and 13) for each hammer shot for recording by a hand-held GPS. The MASW data files were reviewed in the field for quality control purposes. The MASW 2D profiles were generated using the software program ParkSeis (version 3.0).

*As an optional seismic source at this site, ARM tested a 16-pound sledgehammer against the side of a stationary wooden block to produce horizontal ground motion. Unfortunately, this source did not produce satisfactory and useable surface waves for use in the MASW survey.

Geophysical Survey Results

Results from the ERI / IP and MASW surveys are shown in the figures listed below (attached to this document):

Sheet N1 - Northern Area 3D ER Data - Depth Slices and Profiles
Sheet N2 - Northern Area 3D IP Data - Depth Slices and Profiles
Sheet N3 - Northern Area 3D ER Data - Elevation Slices and Profiles
Sheet N4 - Northern Area 3D IP Data - Elevation Slices and Profiles
Sheet NA1 - Northern Area 3D ER / IP / MASW Data - Profiles

Sheet S1 - Southern Area 3D ER Data - Depth Slices and Profiles
Sheet S2 - Southern Area 3D IP Data - Depth Slices and Profiles
Sheet S3 - Southern Area 3D ER Data - Elevation Slices and Profiles
Sheet S4 - Southern Area 3D IP Data - Elevation Slices and Profiles
Sheet SA1 - Southern Area 3D ER / IP / MASW Data – Profiles

Sheet M1 – North & South Areas 3MASW Profiles

The ER data generally reveal mixed moderate and higher resistivity values in the shallow portion of the profiles to depths approximately 20 feet to 40 feet below ground surface (bgs). This interval may represent dry-to-partially saturated unconsolidated soils and fill materials. Intermediate depth portions of the ER profiles (~40 feet to ~80 feet bgs) generally have low to moderate resistivity values associated with saturated fill / porous bedrock. Deeper portions of the ER profiles (~80 feet to ~150 feet bgs) generally transition from low or moderate resistivities into higher resistivity values with depth associated with porous bedrock (lower resistivity) transitioning into relatively impermeable bedrock (higher resistivity).

The IP data reveal low-to-higher chargeability values (0 to 28 milliseconds per second) in both the south and north areas. Very low IP values may correlate with interference from overhead power lines in the southern portion of Northern Area. Low IP values in the southern ¾ of the Southern Area may be due to noisy data in that area.

The MASW data reveal generally lower velocity materials associated with soils and weathered bedrock in the shallow portion of the profiles to depths approximately 20 feet to 50 feet bgs. Deeper portions of the MASW profiles generally have higher velocity values associated with soft-to-hard bedrock, however some localized deeper zones contain relatively low velocity materials extending 100 feet bgs or deeper.

Conclusions

The geophysical data collected for this project generally indicate the presence of lower resistivity and lower velocity materials in the shallow subsurface to depth of 20 to 40 feet bgs that may be associated with soil and unconsolidated bedrock materials. The deeper portions of the areas investigated in this study (40 feet bgs and deeper) generally have moderate-to-high resistivity values that are usually associated with bedrock materials. Exceptions to these trends are found in localized areas where low resistivity and low velocity materials extend into the bedrock interval (below 40 feet bgs). The buried floodplain and buried stream channel areas are 30' to 50' bgs and appear to coincide with low resistivity zones or anomalous low velocity zones in both the North and South areas.

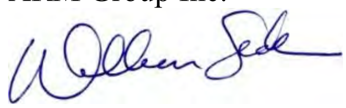
Limitations

The results stated, and the conclusions drawn from this report furnished by ARM to Stantec hereunder shall represent the opinion, efforts and judgment of ARM, based on standard industry practices. ARM cannot and does not warrant or guarantee that the accuracy or correctness thereof will always meet the desired results and expectations. All interpretations are opinions based on inferences from direct observations and geophysical measurements, and we cannot and do not guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or willful negligence on our part, be liable for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretations made by any of our officers, agents, or employees.

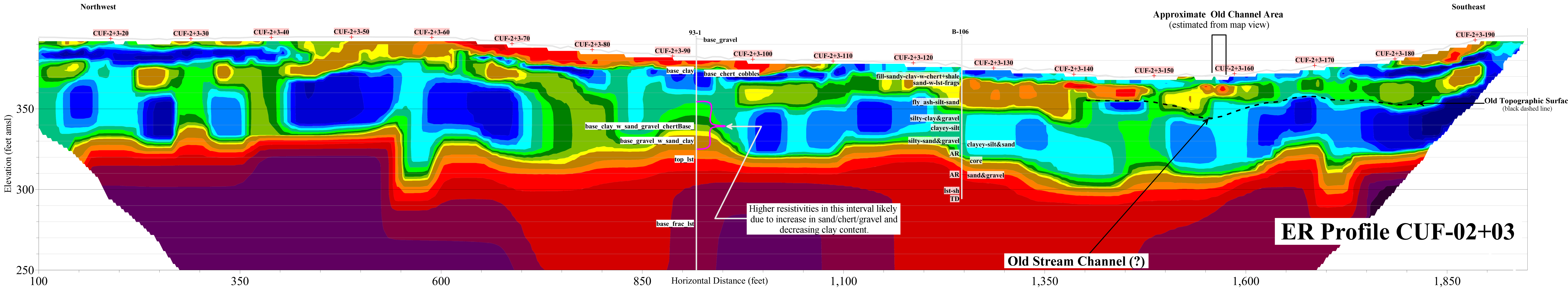
Closing

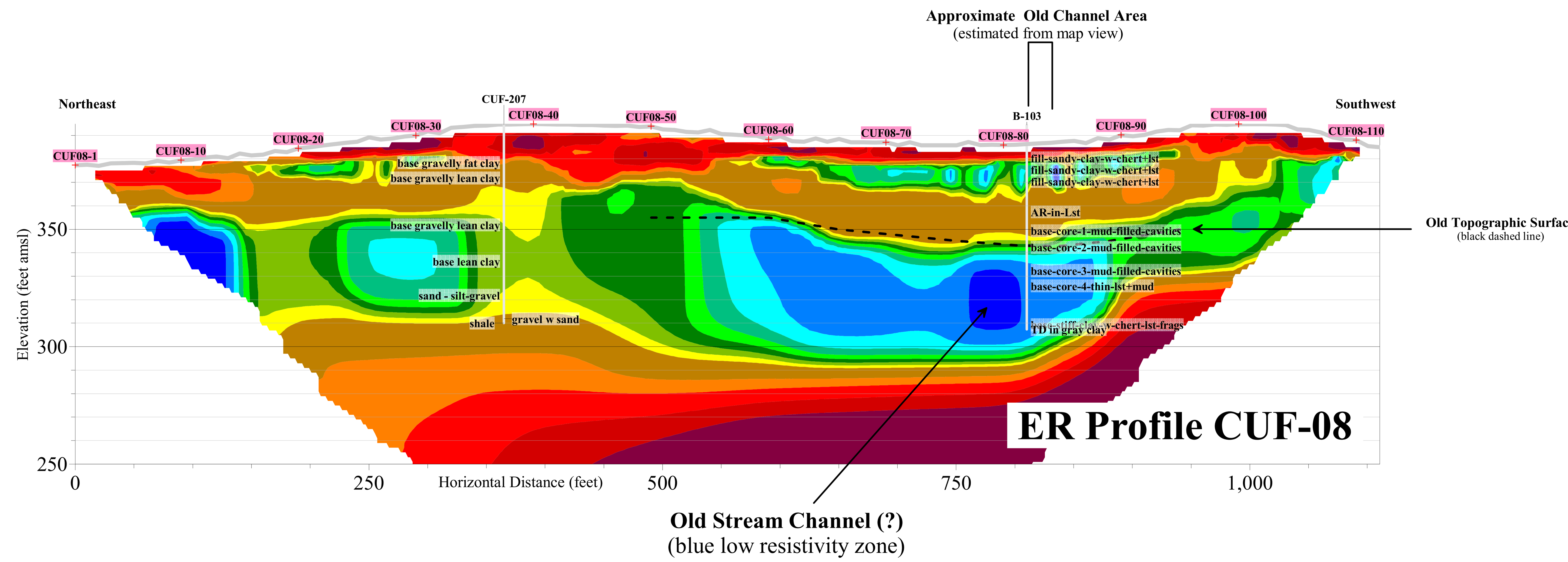
Please contact me at 717-508-0535 if you have any questions regarding this report. We appreciate your business and look forward to working with you again.

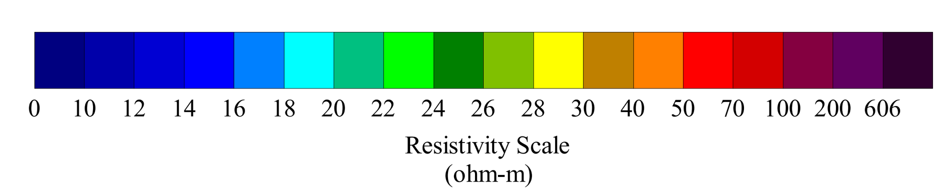
Respectfully submitted,
ARM Group Inc.

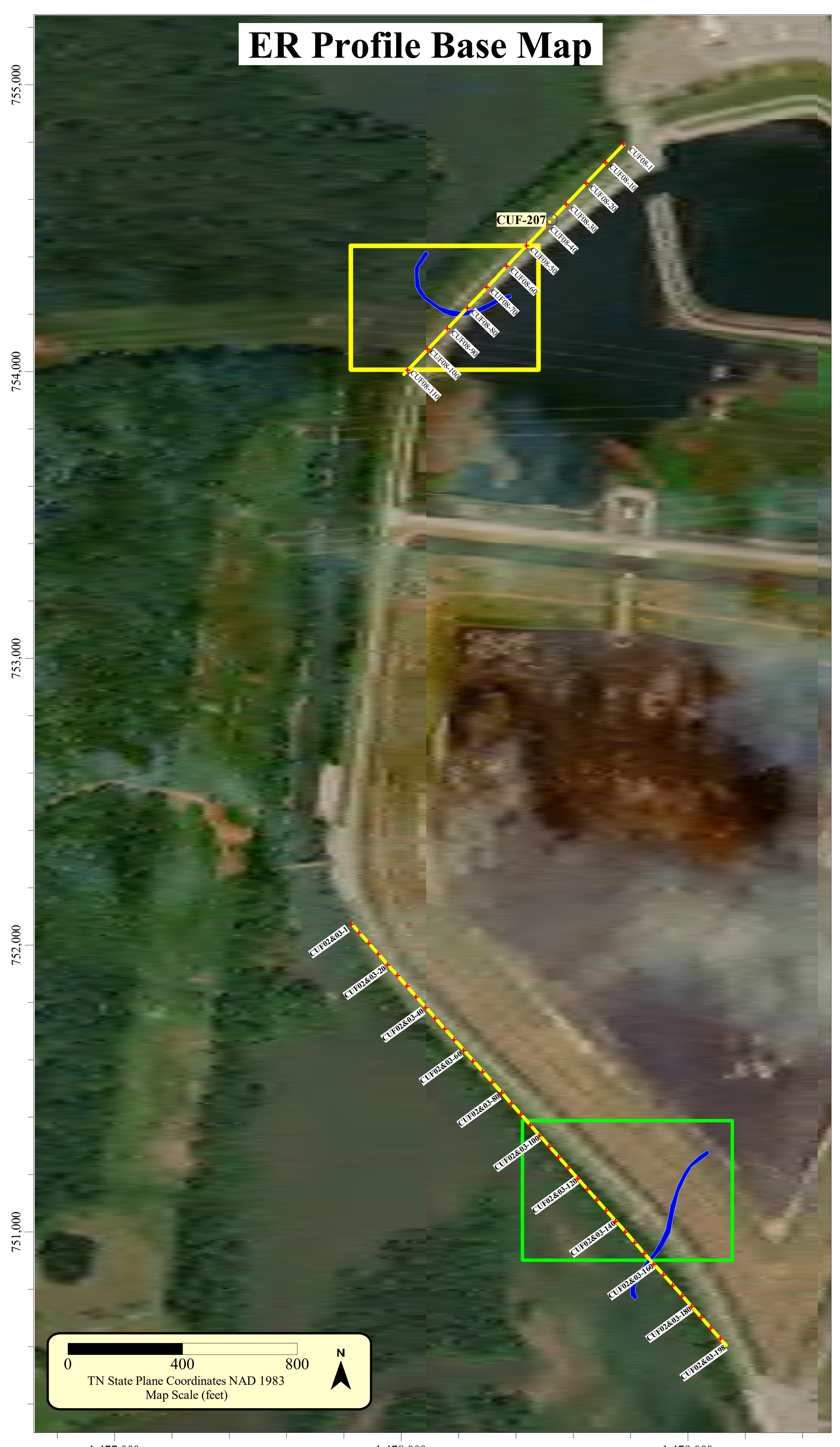


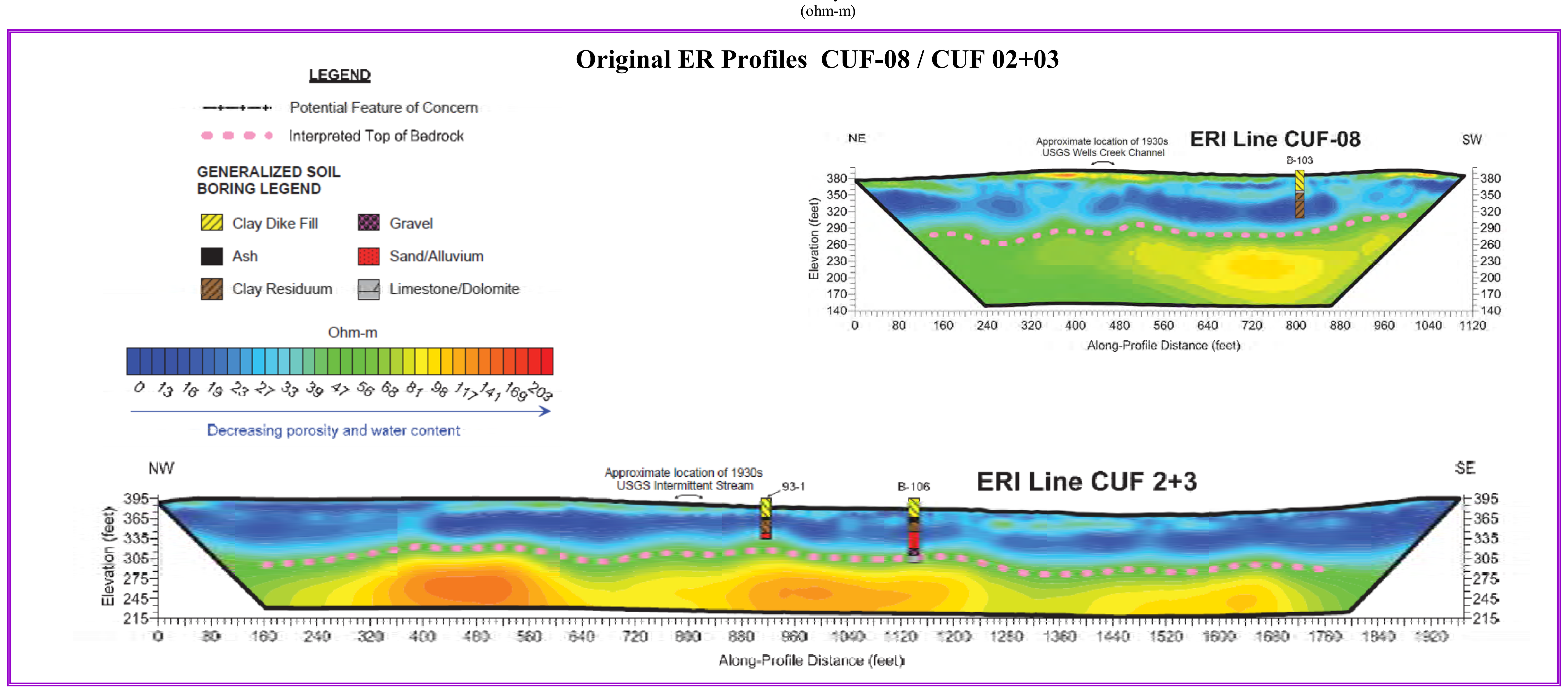
William J. Seaton, P.G., PhD.
Senior Geologist / Project Manager











designed	WJS
checked	
drawn	WJS
date	December 2019
project no.	190513

drawing title
Summary Sheet of ER Reprocessing Results

location
Stantec
TVA Cumberland Fossil Plant
Cumberland City, TN

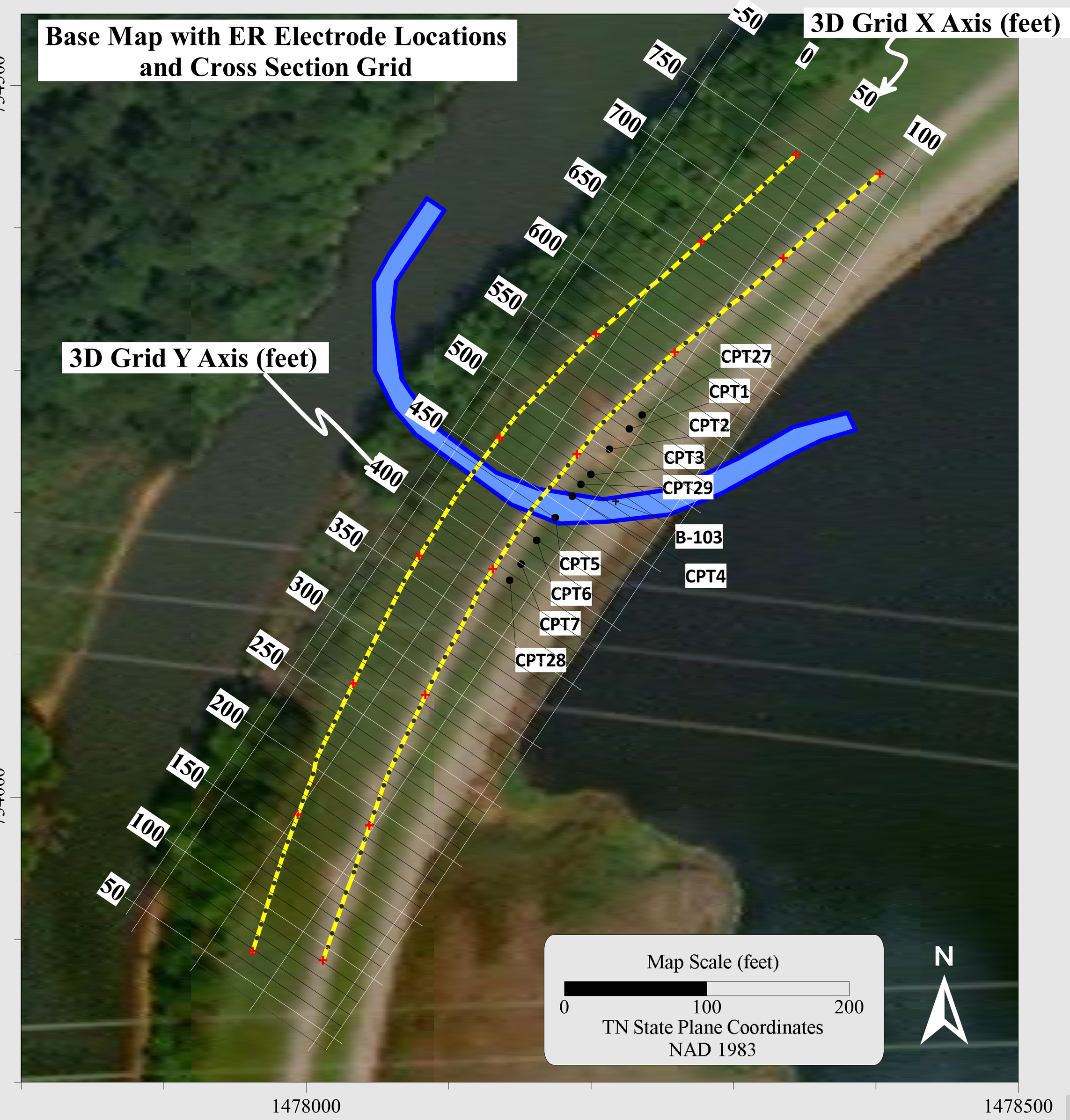
project title
Reprocessed ER Profile CUF-02+03 and CUF-08

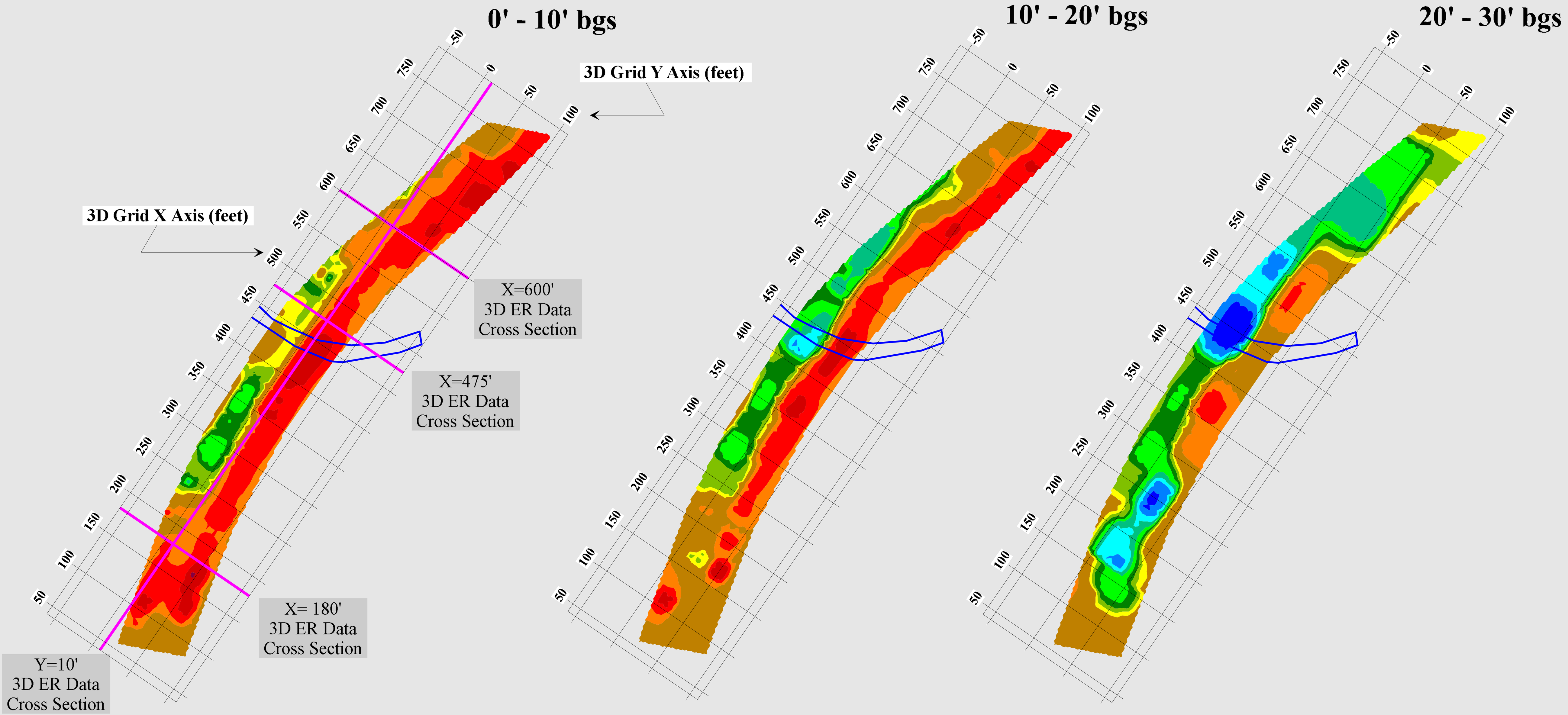
No. | Revision | Date | By

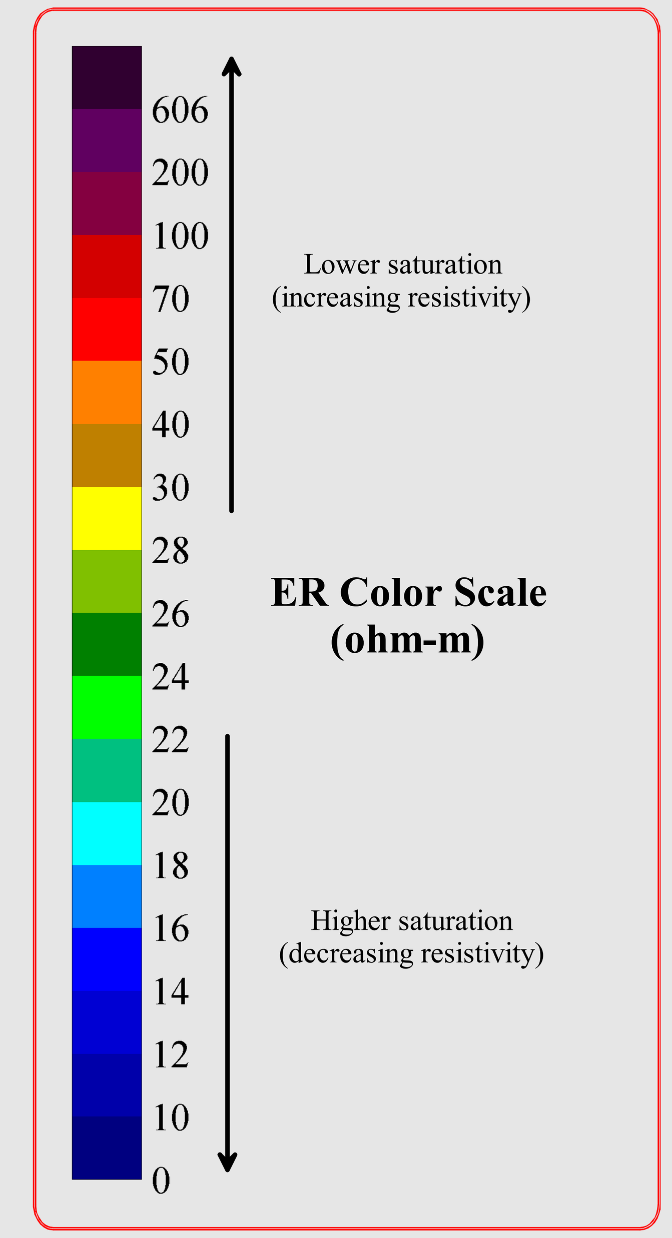
Sheet 1

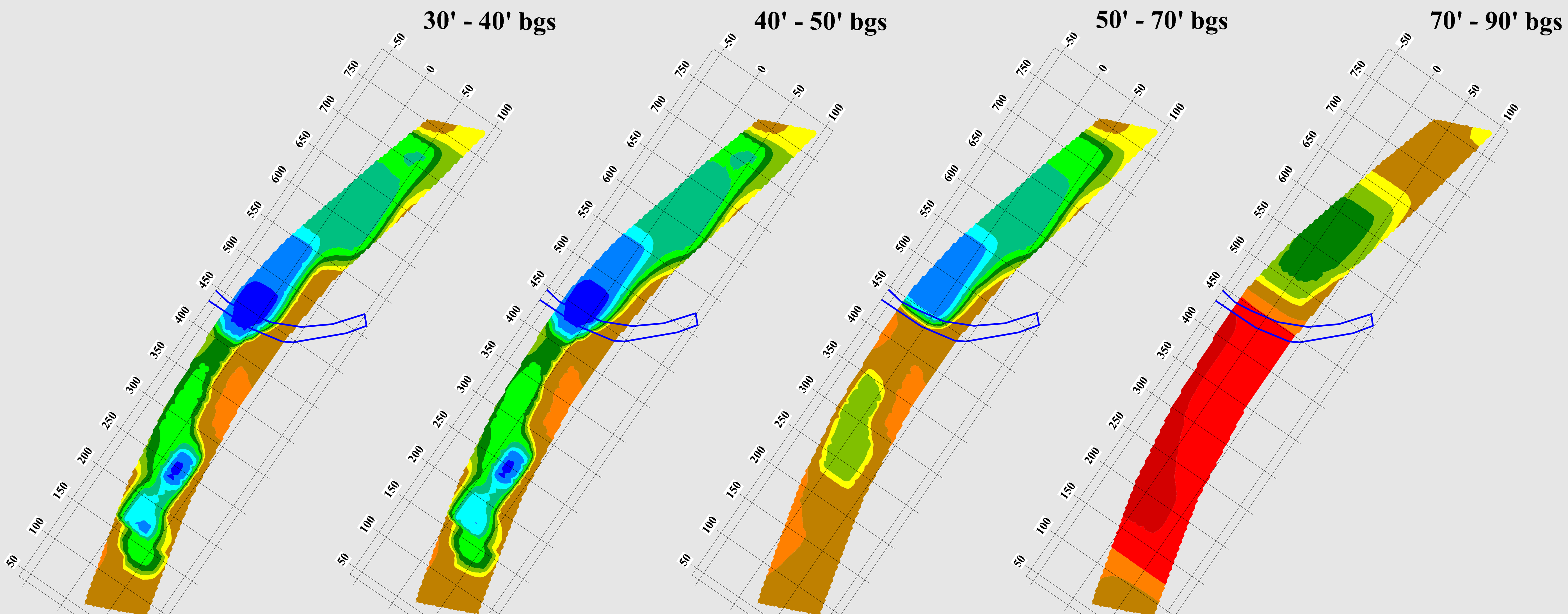
Northern Area
3D ER Data
Depth Slices & Profiles

3D ER Depth Slices

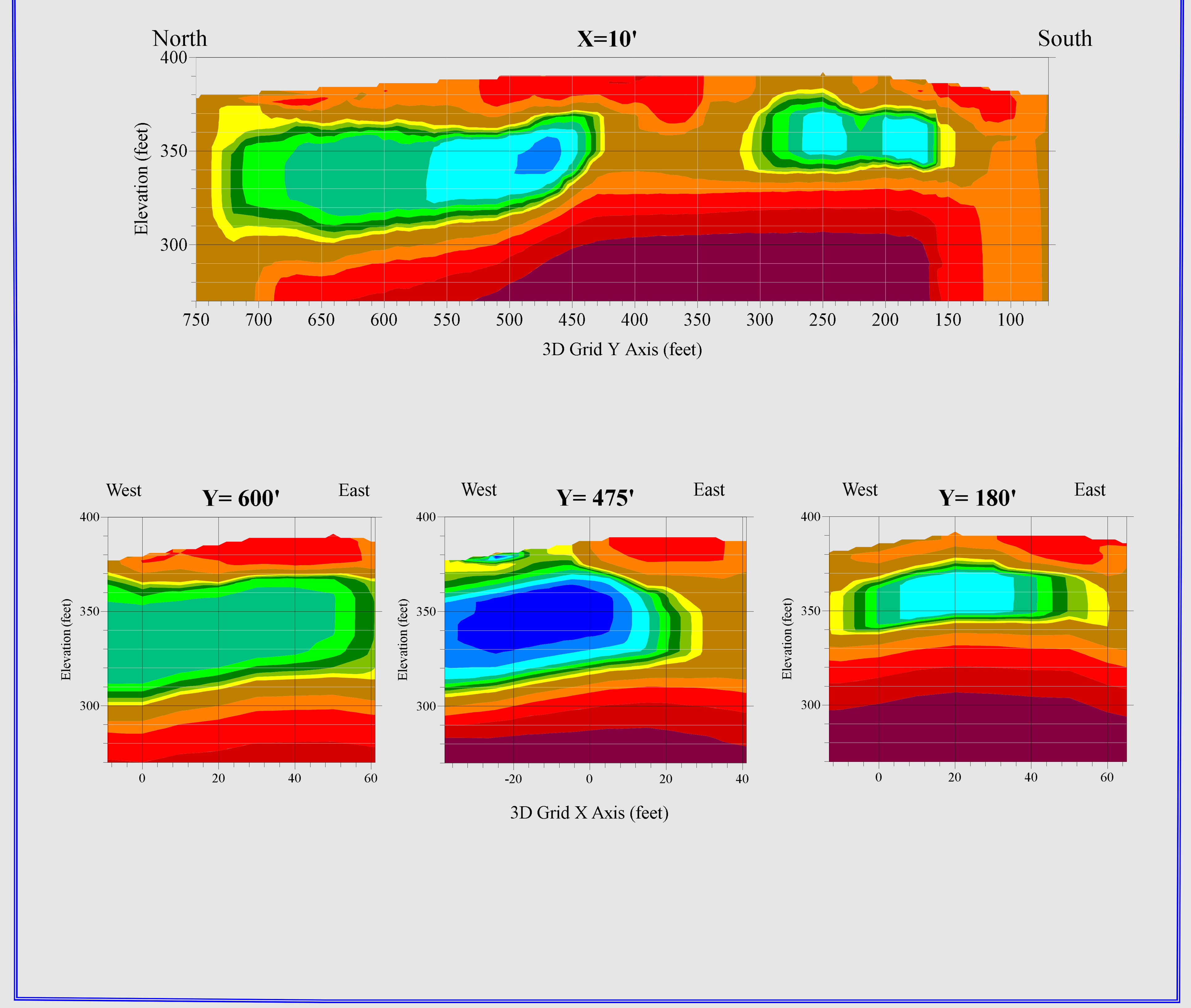








3D ER Profiles



ARM GEOPHYSICS Surface & Borehole Services

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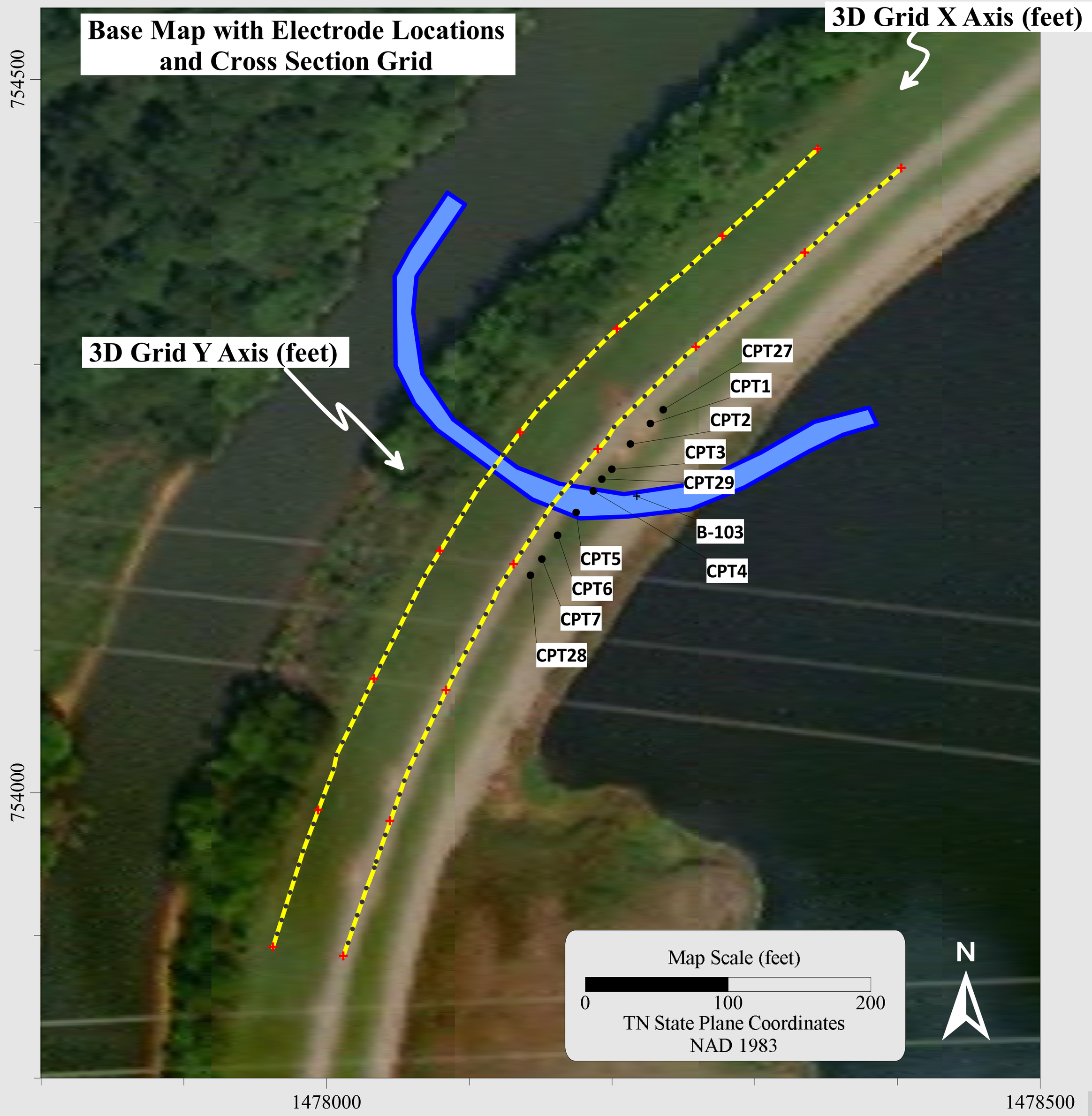
location: TVA Cumberland Fossil Plant, Stewart County, Tennessee

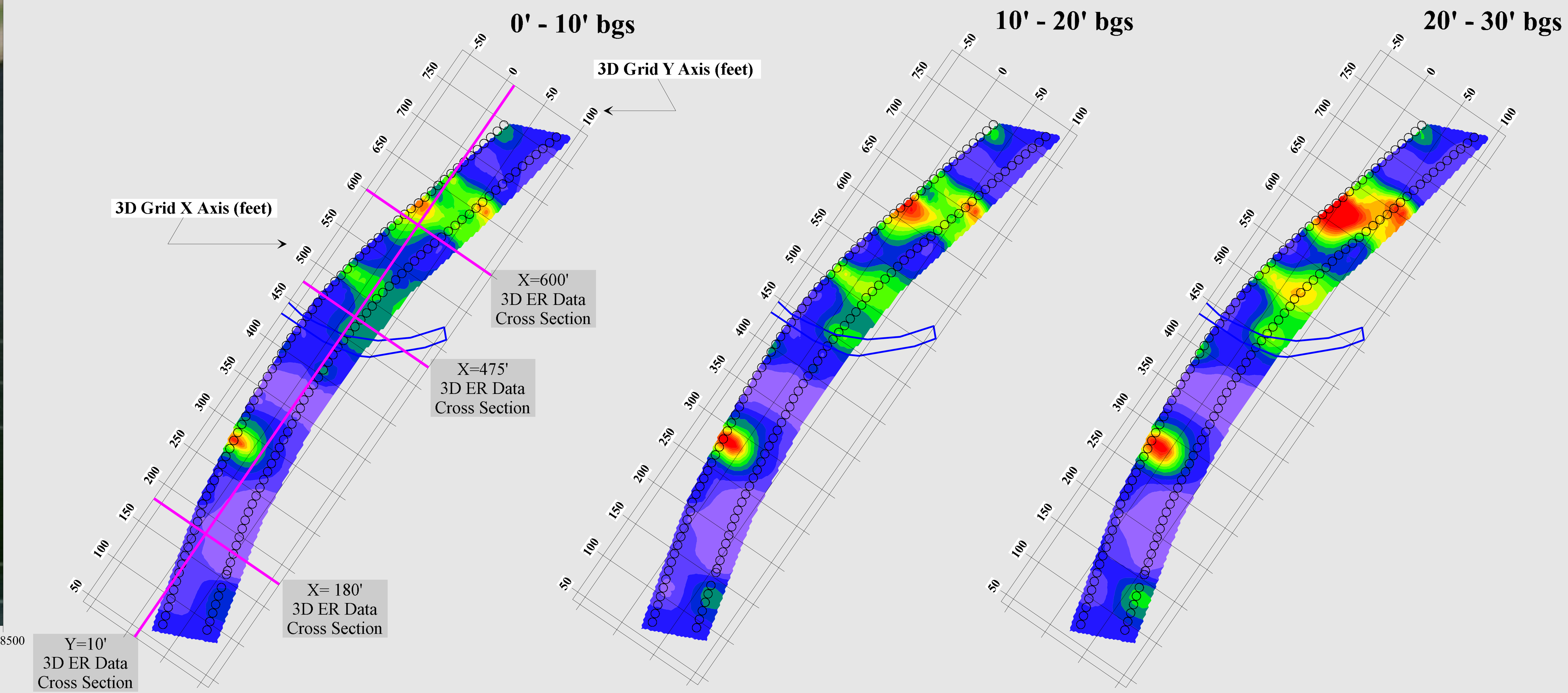
project title: 3D ER/IP Surface Geophysical Survey

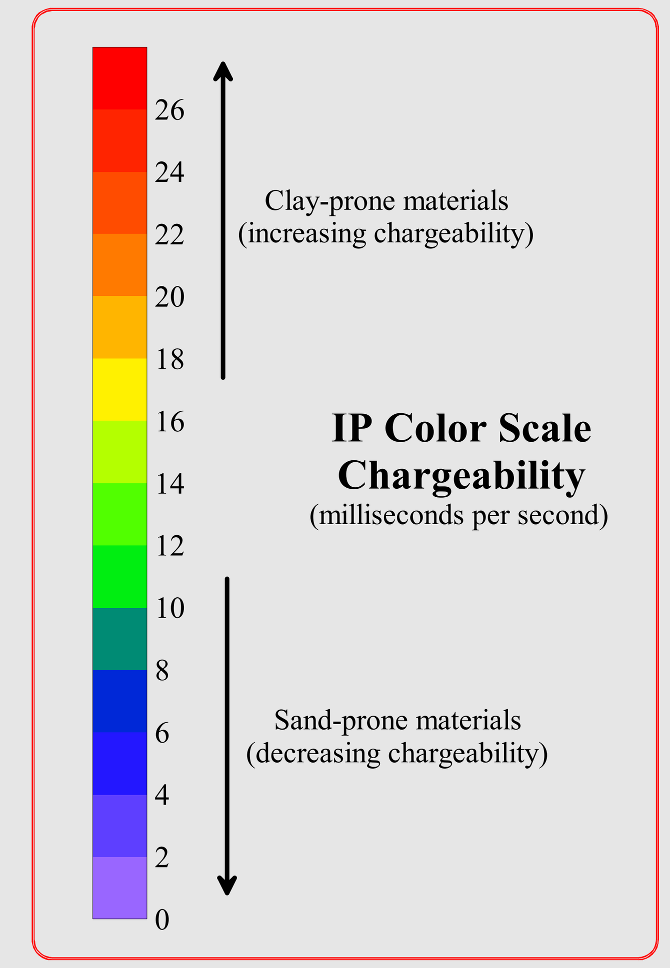
Sheet N1

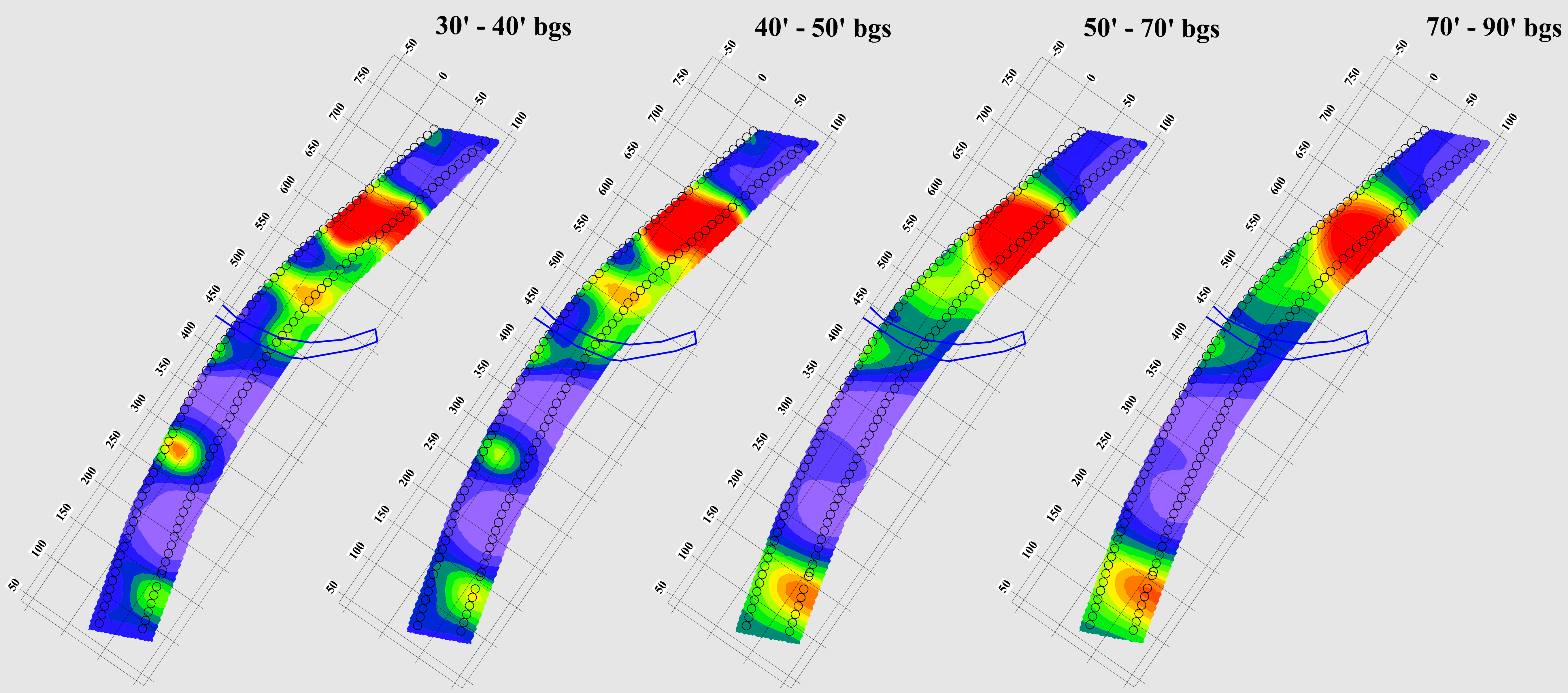
3D IP Depth Slices

Northern Area
3D IP Data
Depth Slices & Profiles

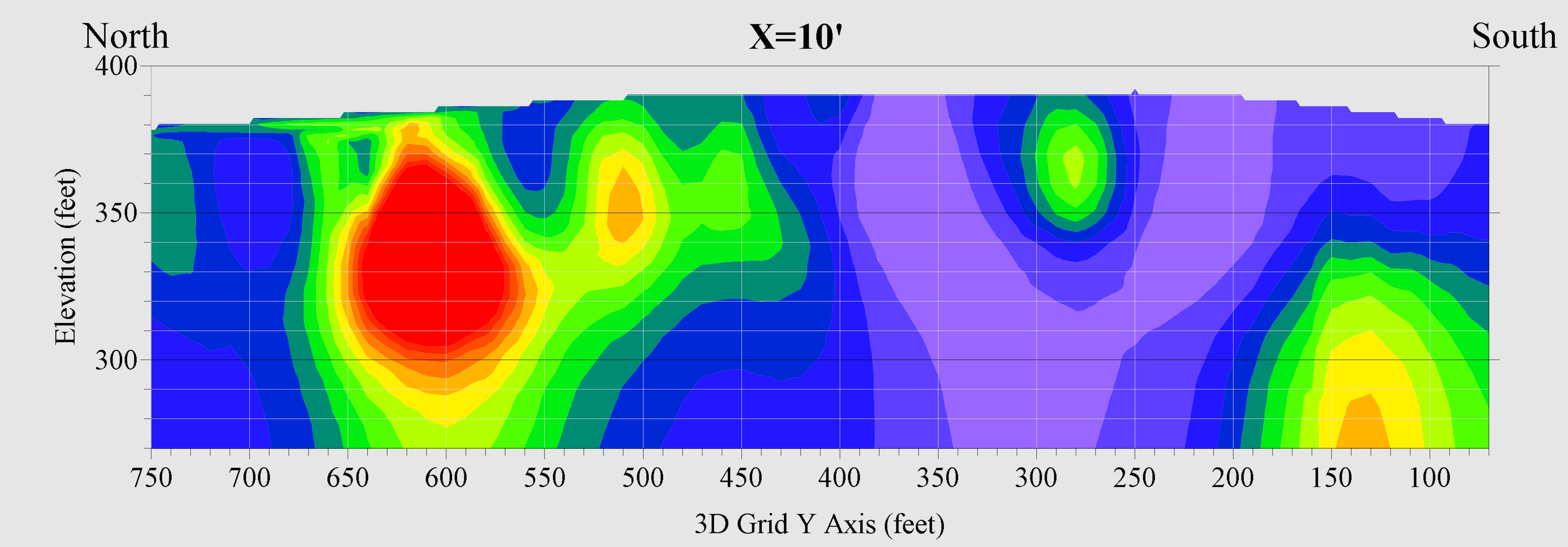


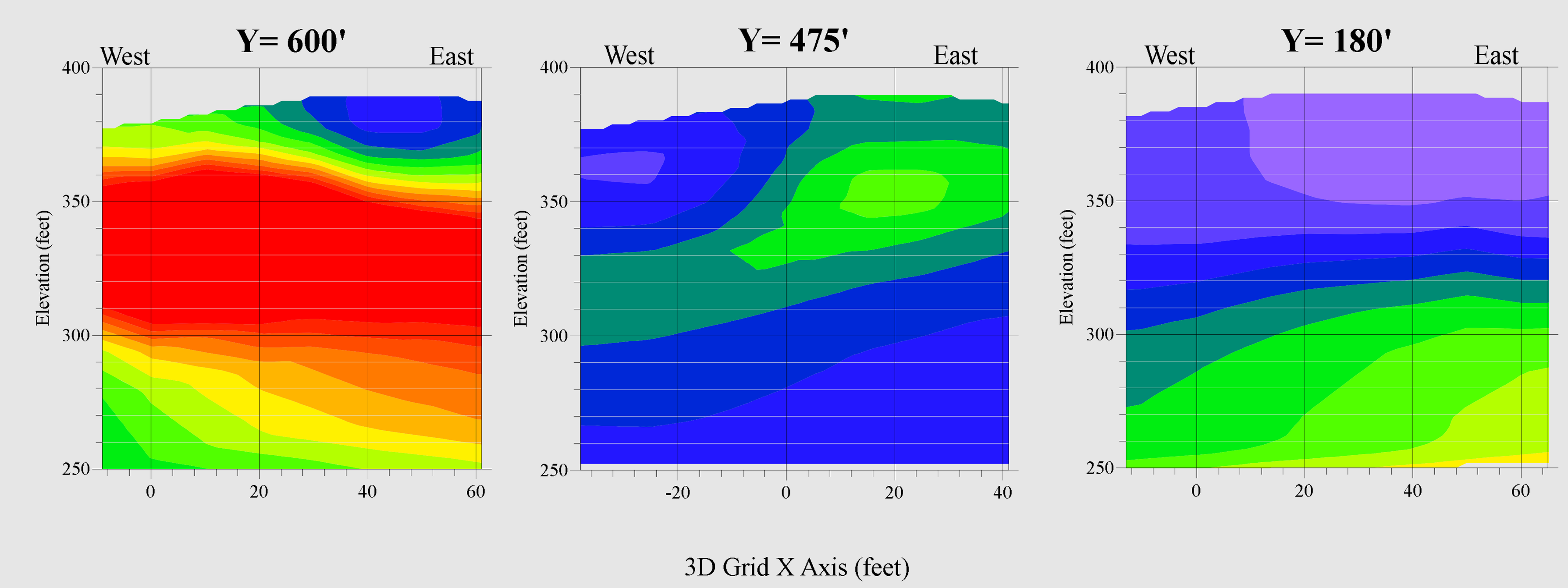






3D IP Profiles





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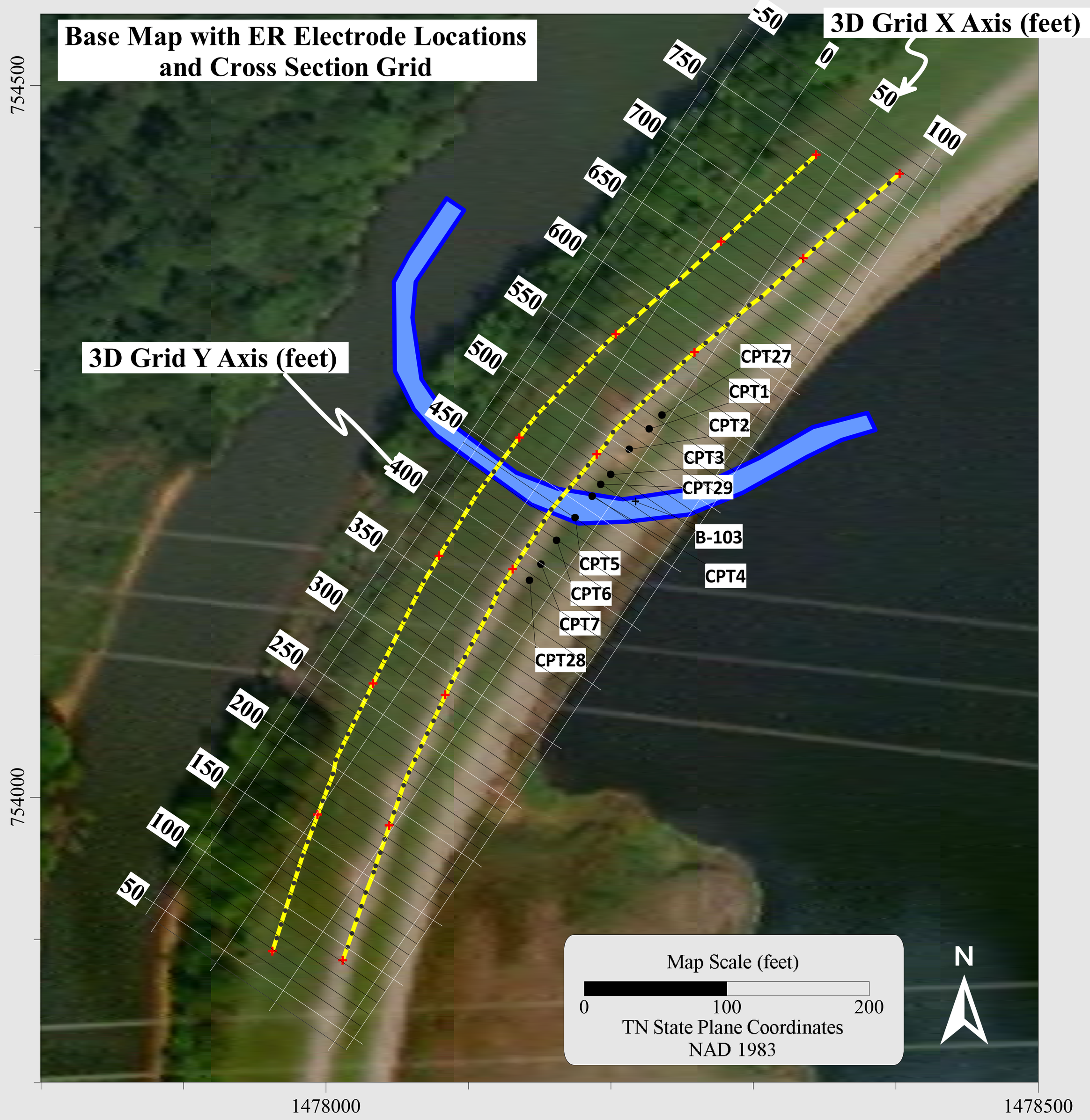
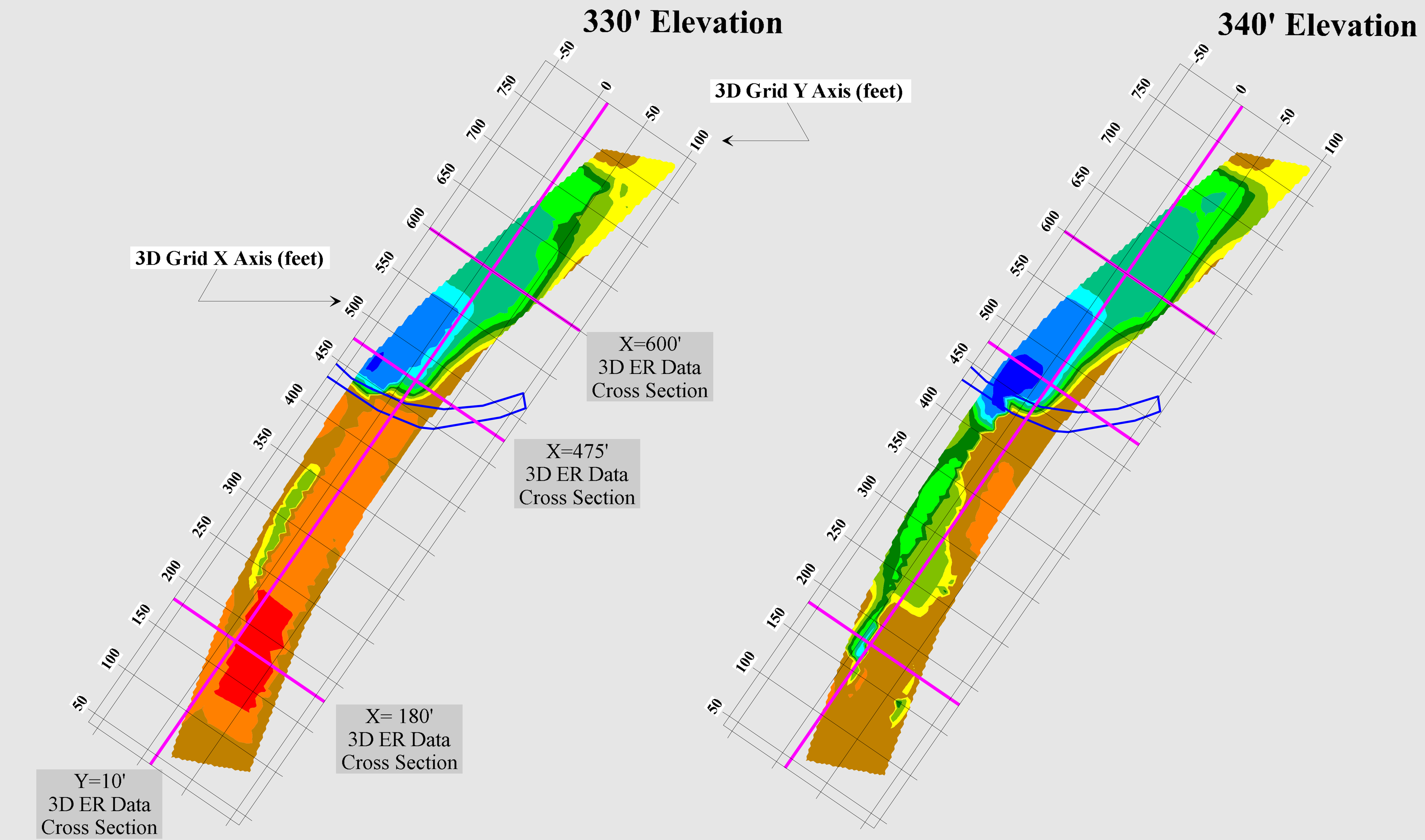
project title 3D ER/IP Surface Geophysical Survey

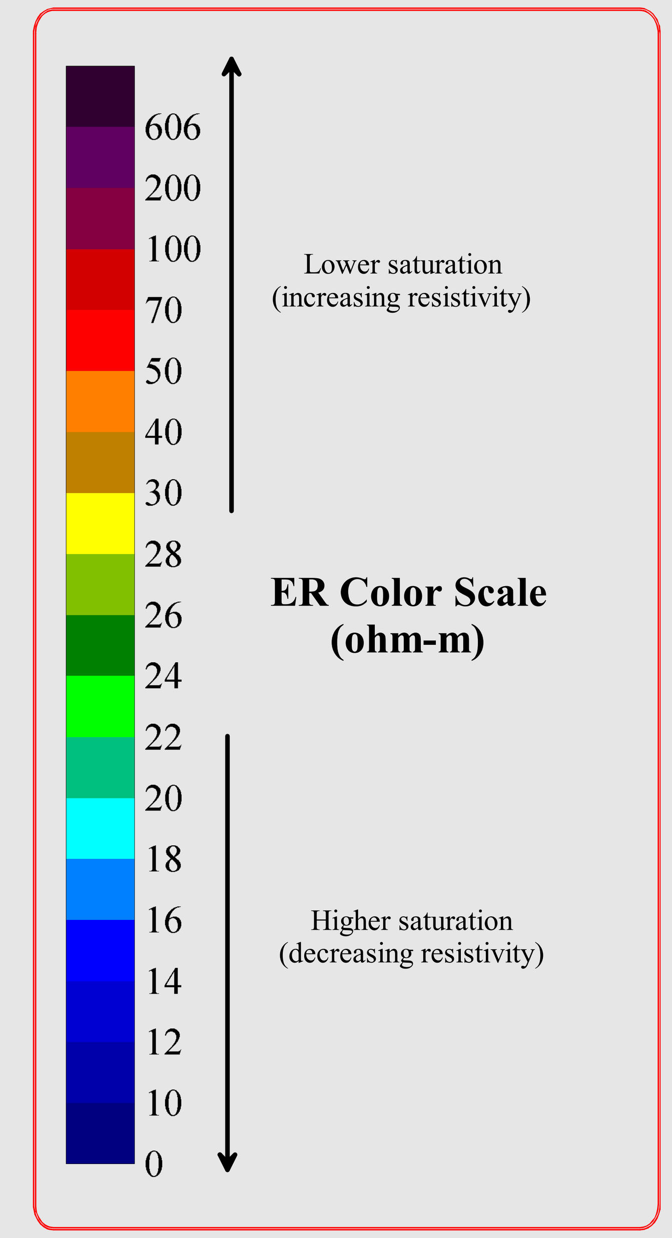
Sheet **N2**

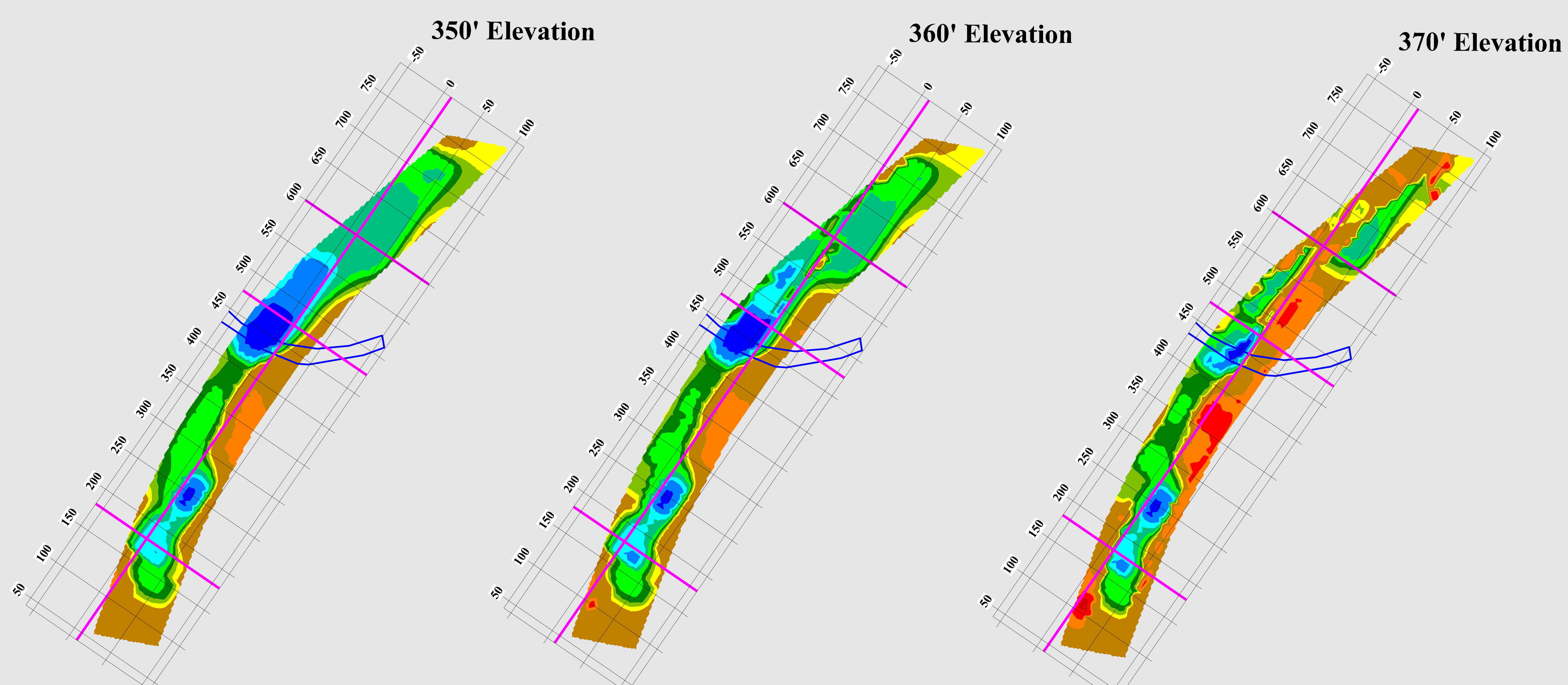
Northern Area
3D ER Data
Elevation Slices & Profiles

3D ER Data - Constant Elevation Slices

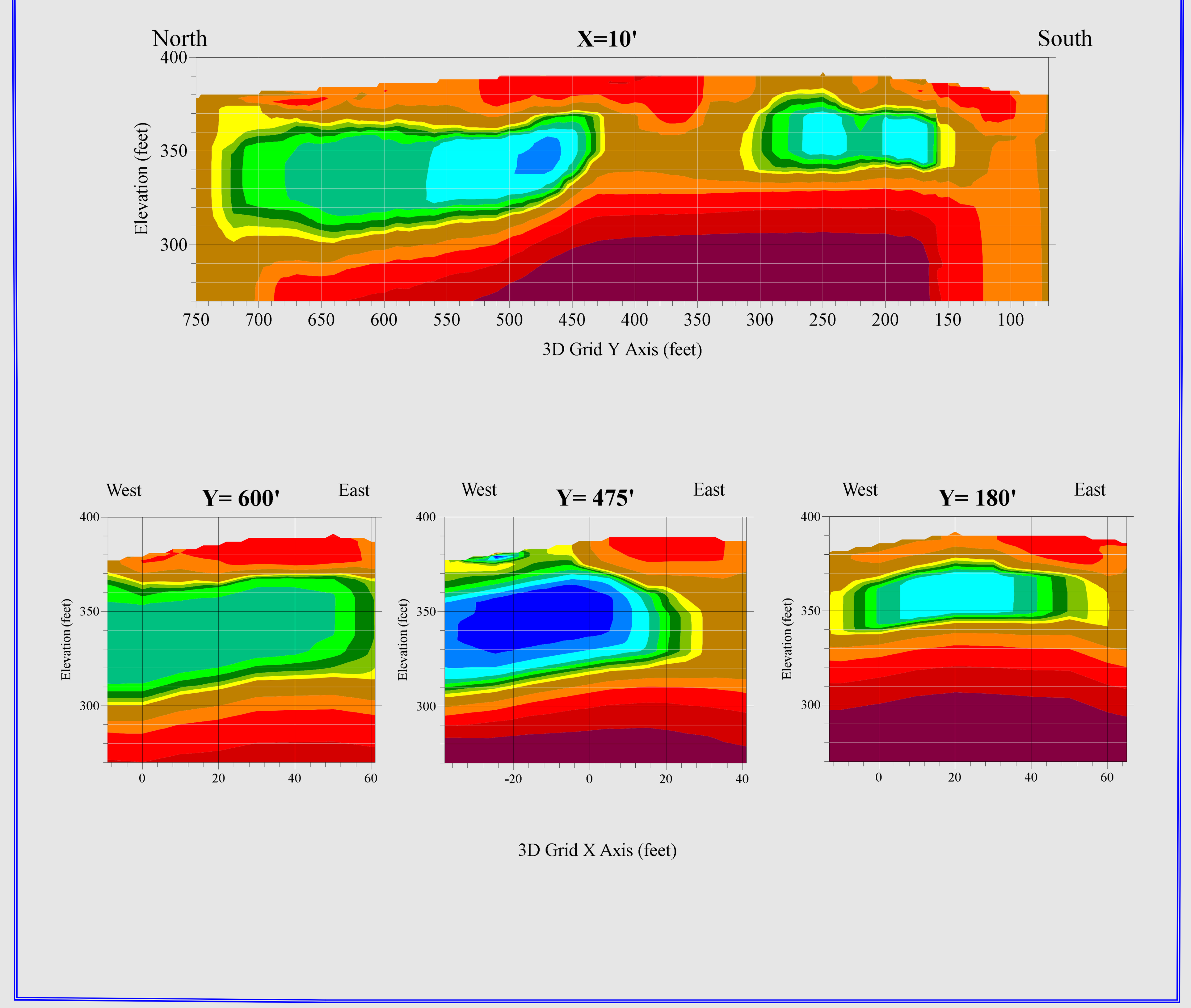








3D ER Profiles



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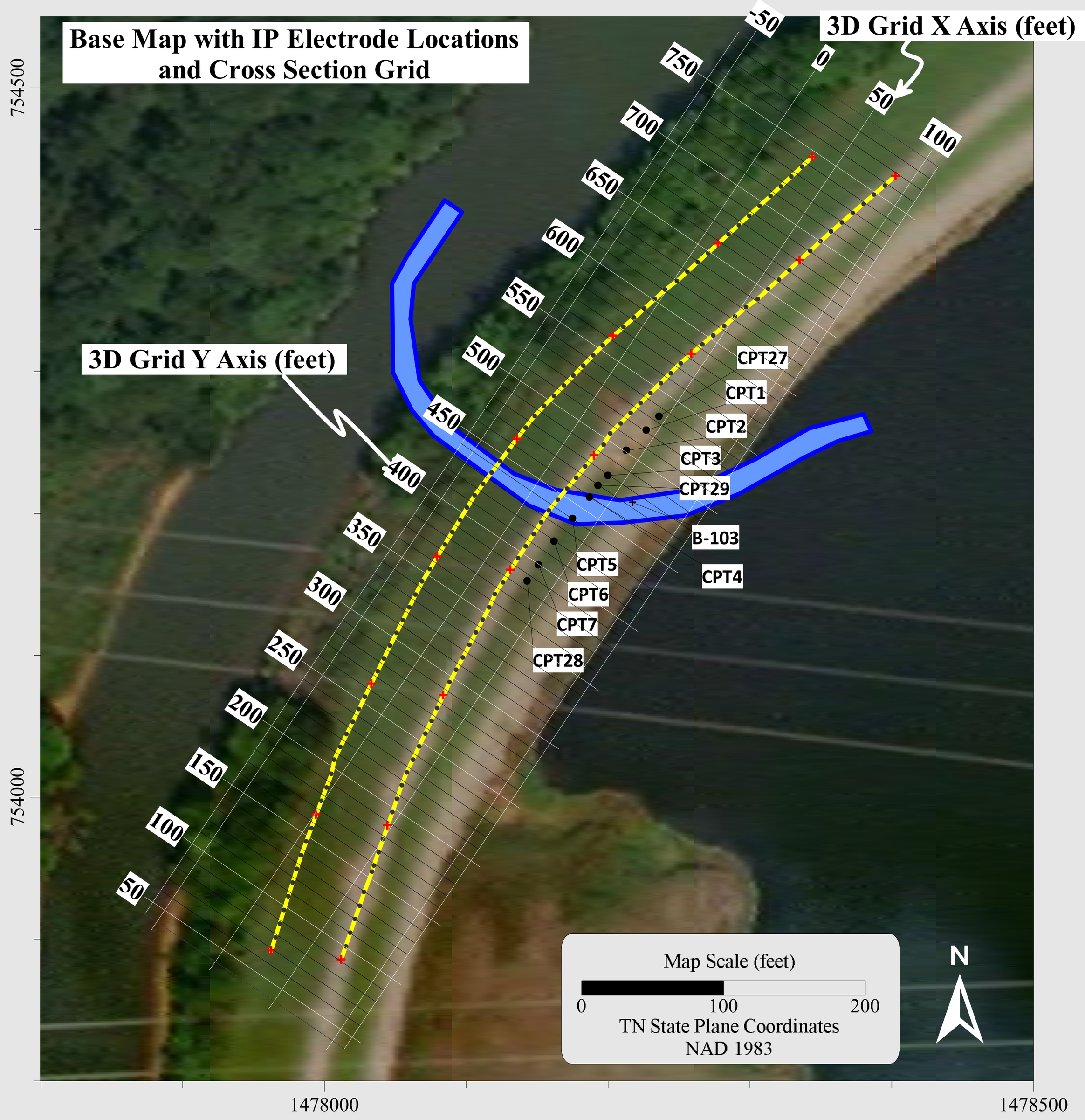
drawing title: **Summary Sheet of Geophysical Survey Results**

location: TVA Cumberland Fossil Plant, Stewart County, Tennessee

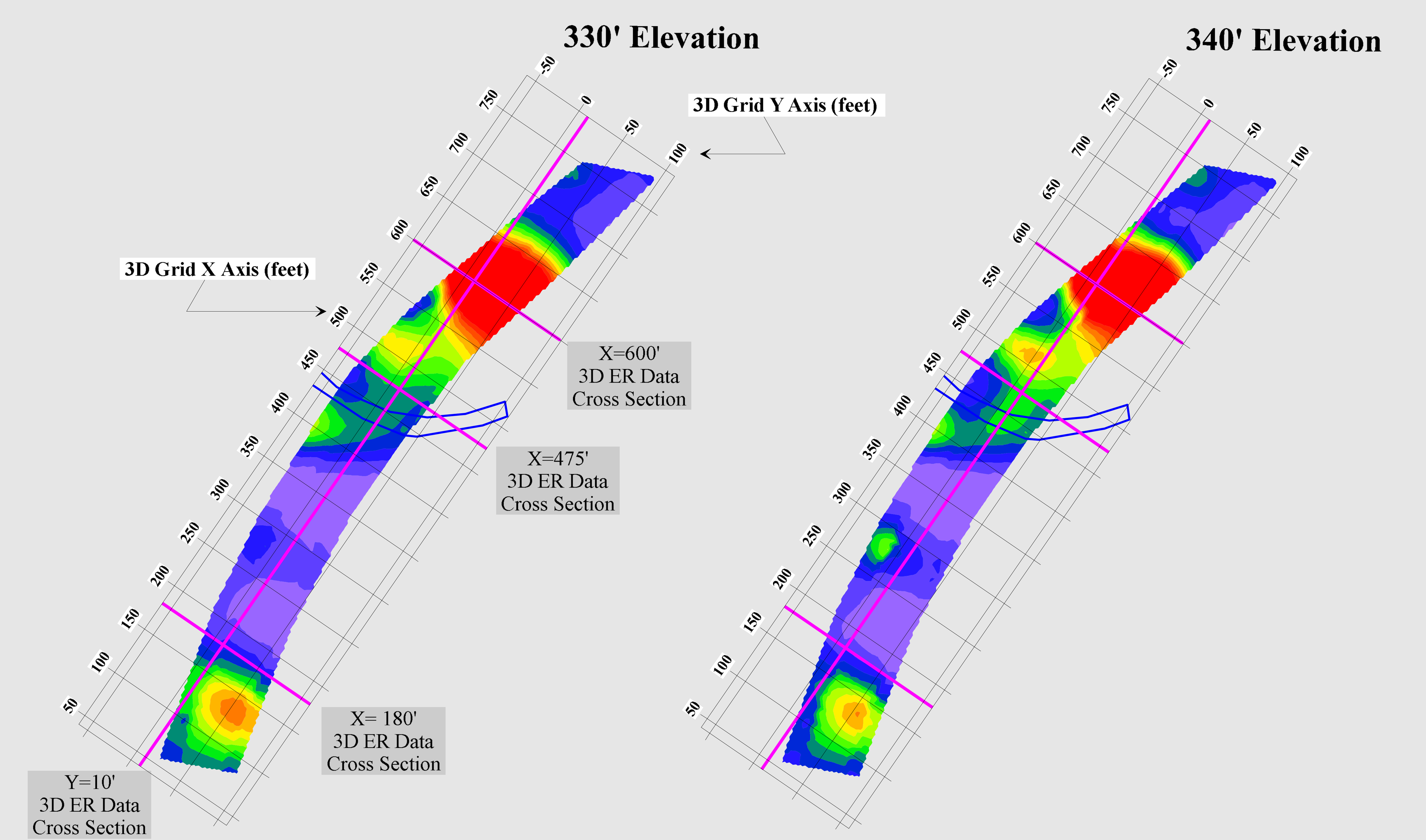
project title: 3D ER/IP Surface Geophysical Survey

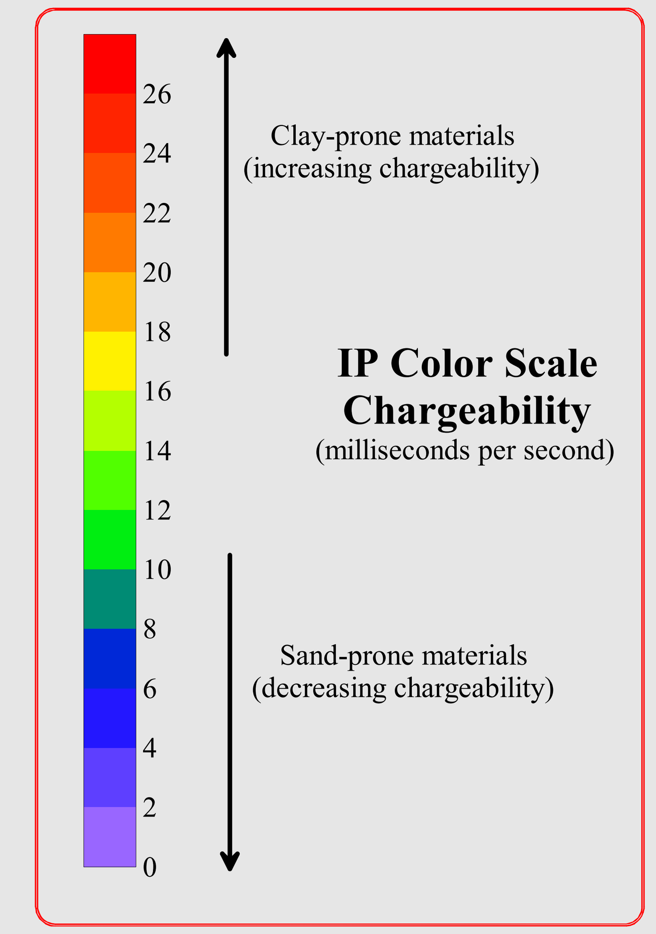
Sheet **N3**

Northern Area
3D IP Data
Elevation Slices & Profiles

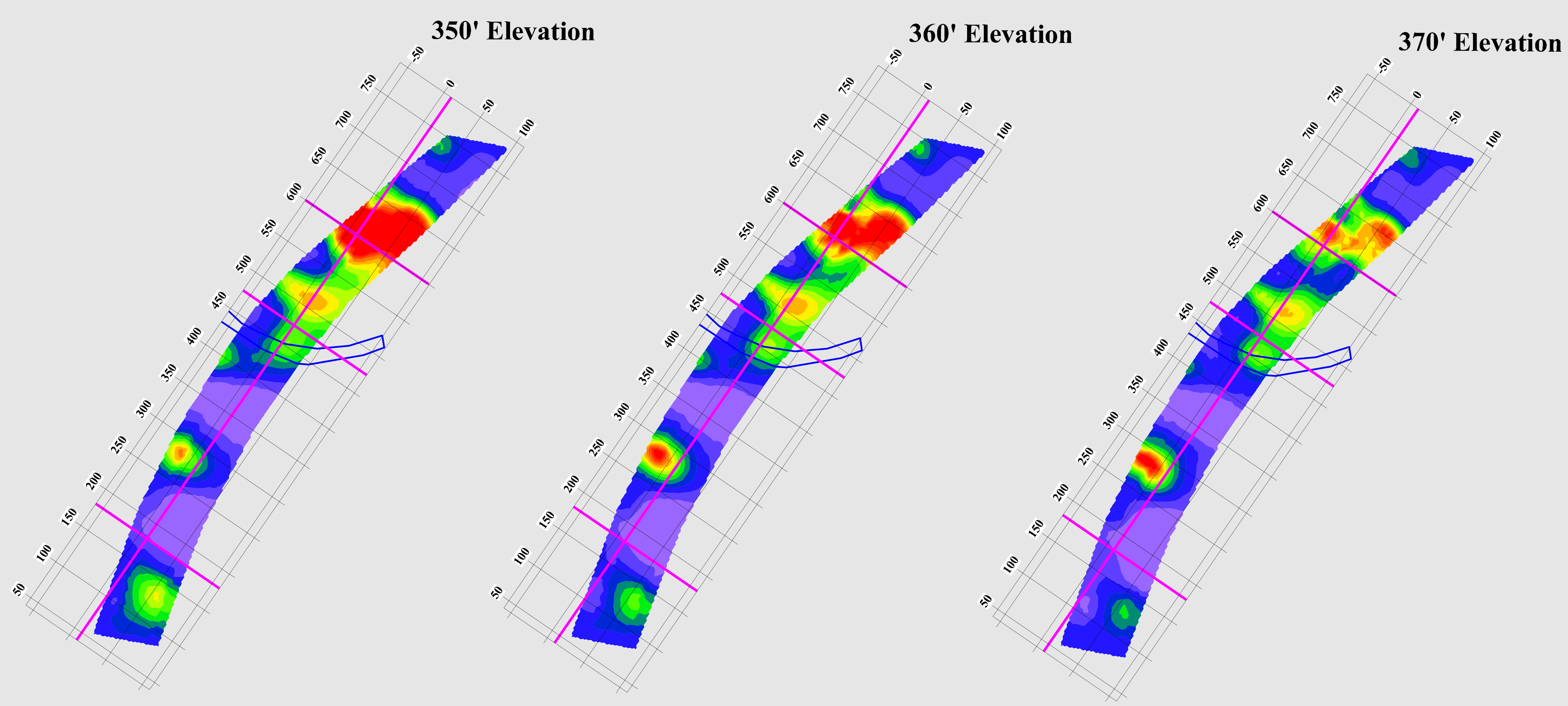


3D IP Data - Constant Elevation Slices

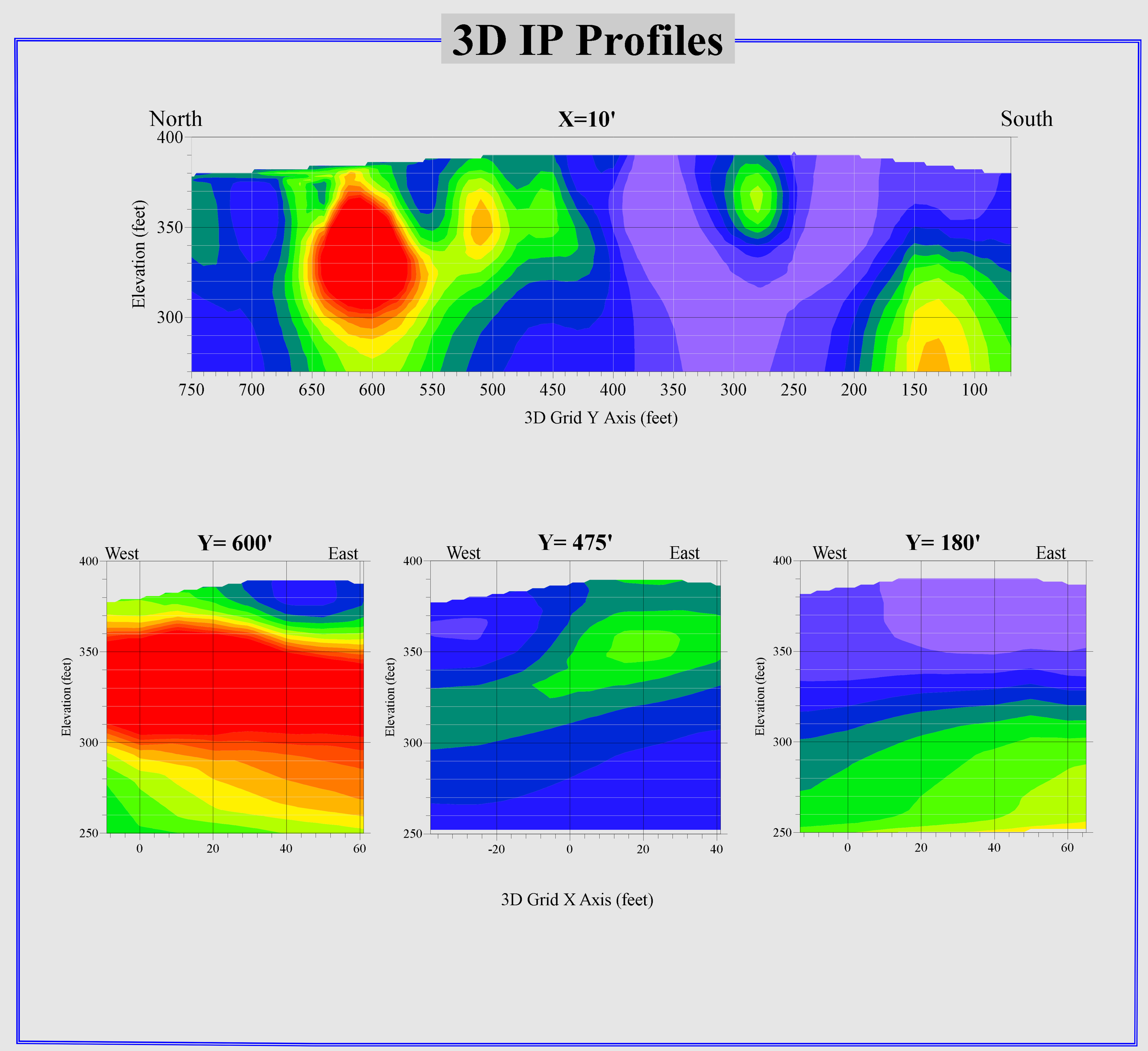




350' - 355'
Approximate Original Stream Elevation



3D IP Profiles



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project title 3D ER/IP Surface Geophysical Survey

location TVA-Cumberland Fossil Plant
Stewart County, Tennessee

Sheet N4

North Area ER, IP & MASW Profiles

No.	Revision	Date	By

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location: TVA Cumberland Fossil Plant, Stewart County, Tennessee

drawing title: Summary Sheet of Geophysical Survey Results

project title: ER, IP, MASW Surface Geophysical Survey

Sheet NA1

ARM GEOPHYSICS Surface & Borehole Services

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project no. 190513

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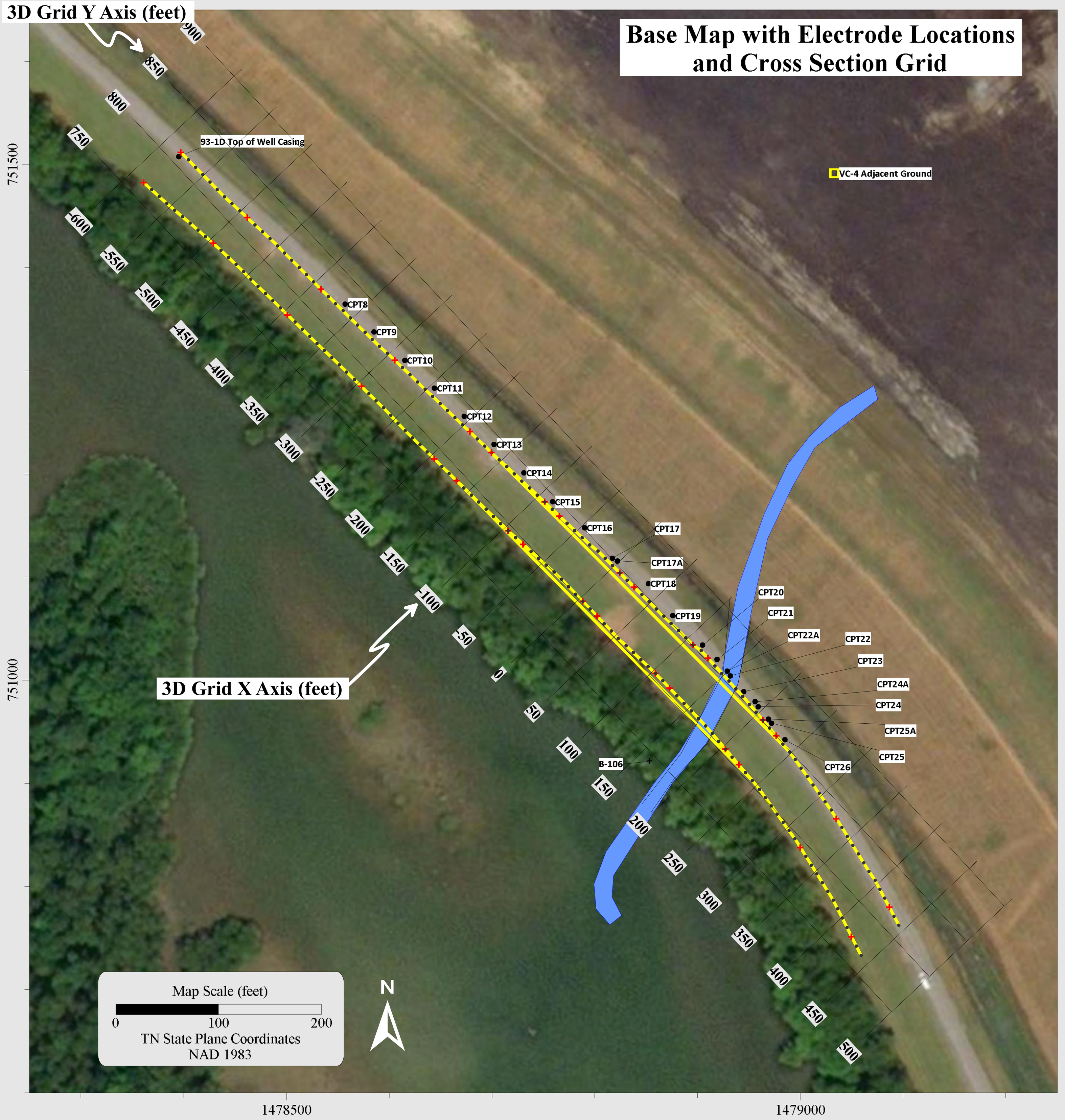
location TVA Cumberland Fossil Plant
Stewart County, Tennessee

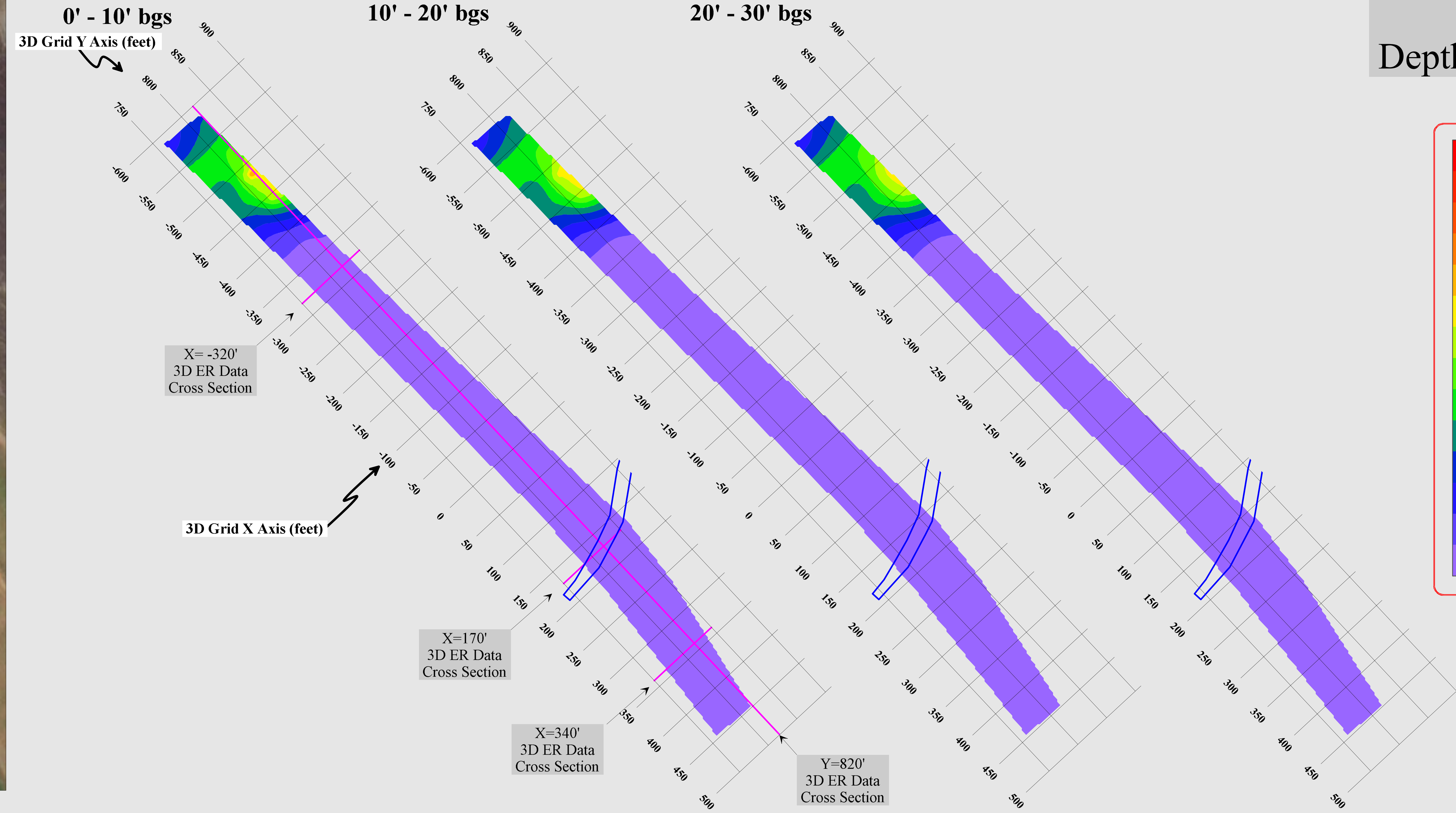
project title 3D ER/IP Surface Geophysical Survey

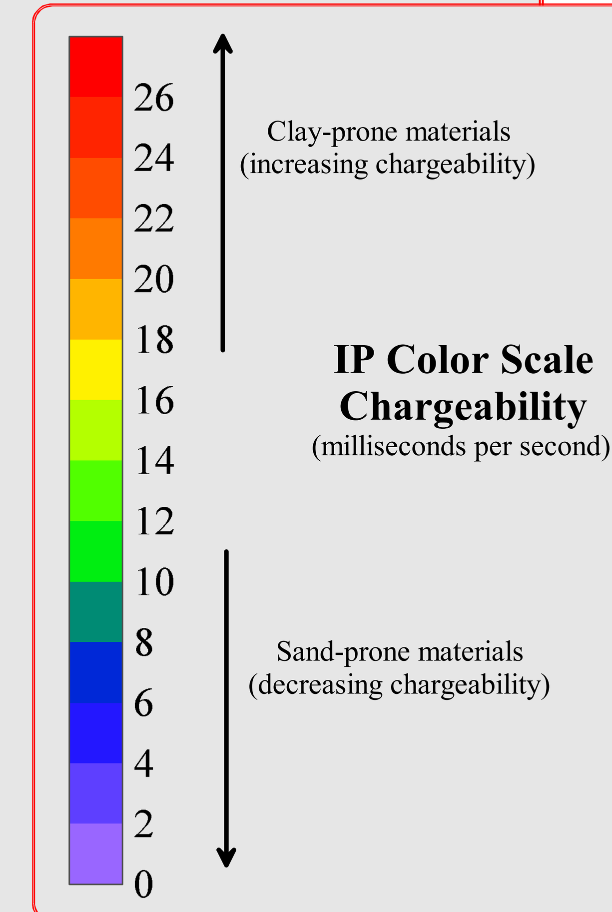
Sheet **S1**

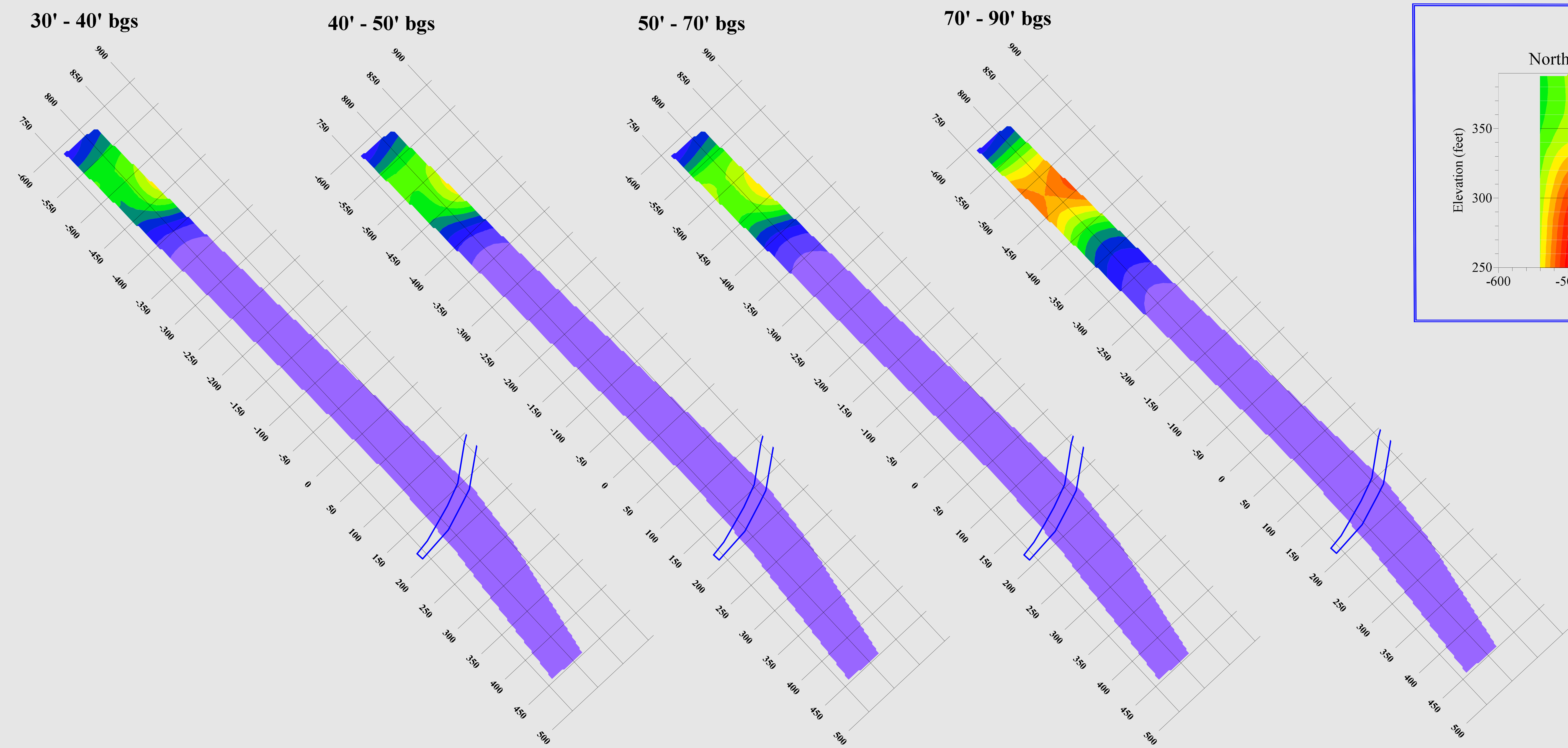
Southern Area
3D IP Data
Depth Slices & Profiles



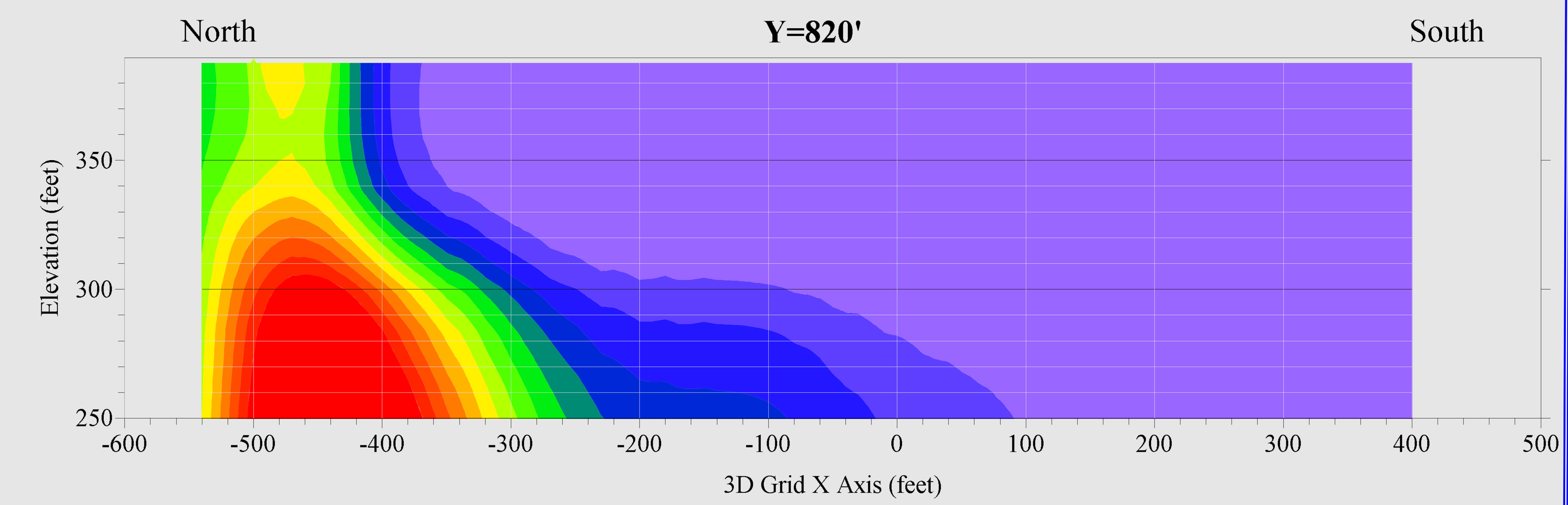
3D IP Depth Slices

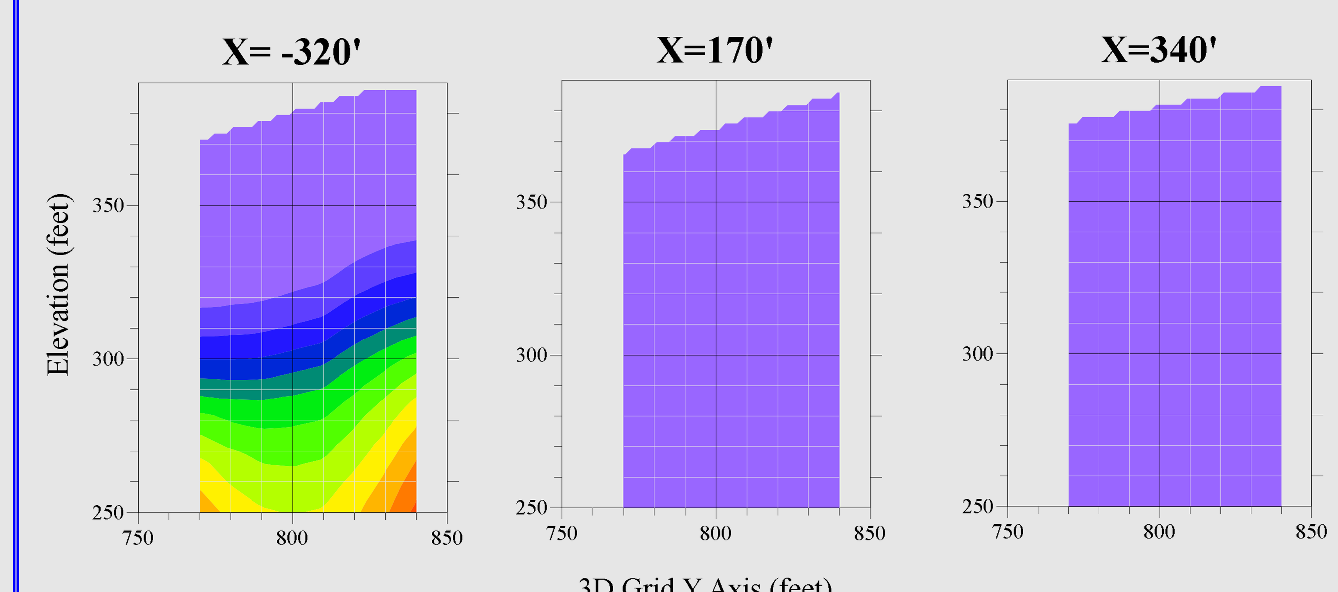






3D IP Data - Cross Sections





ARM GEOPHYSICS Surface & Borehole Services

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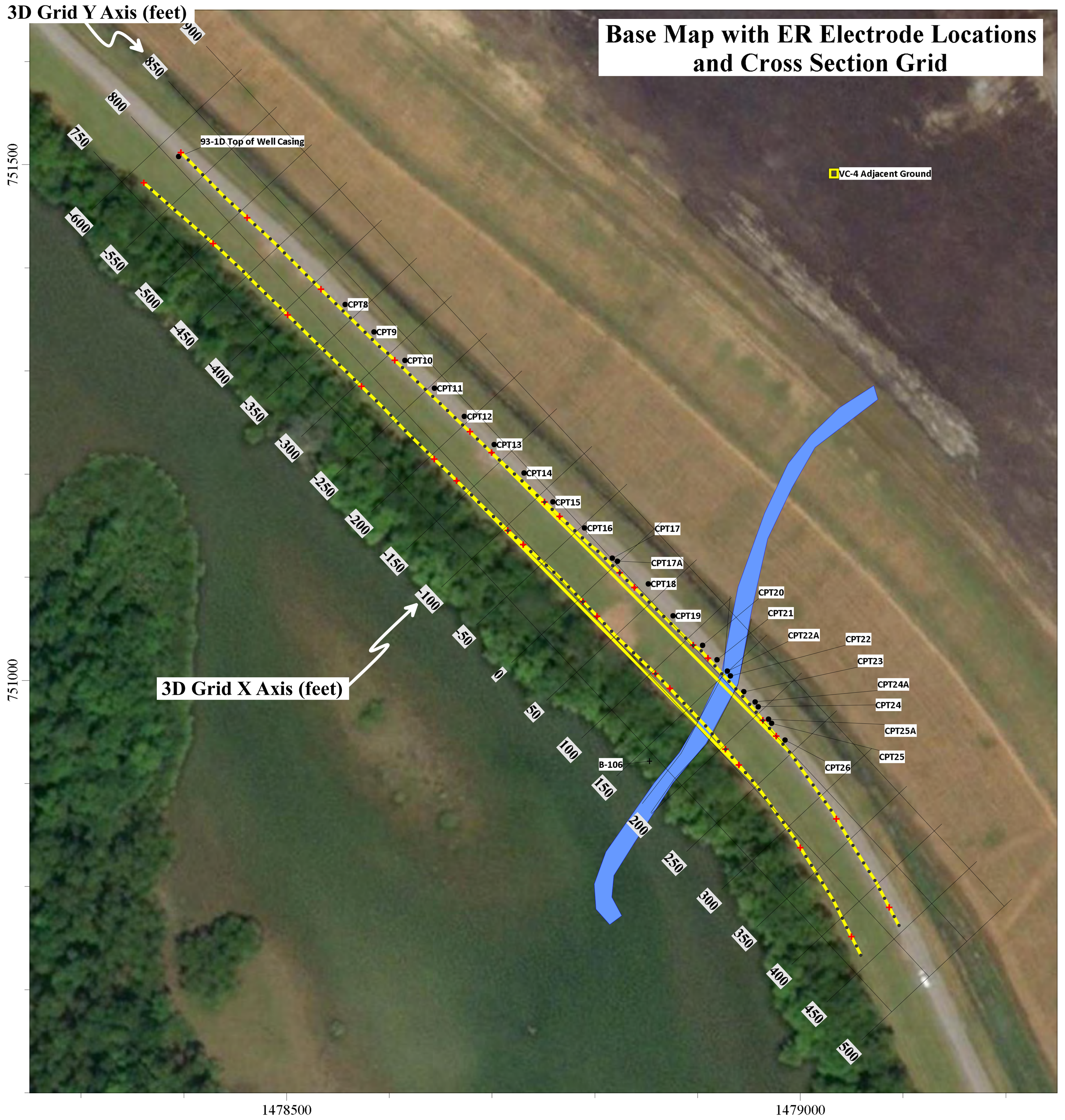
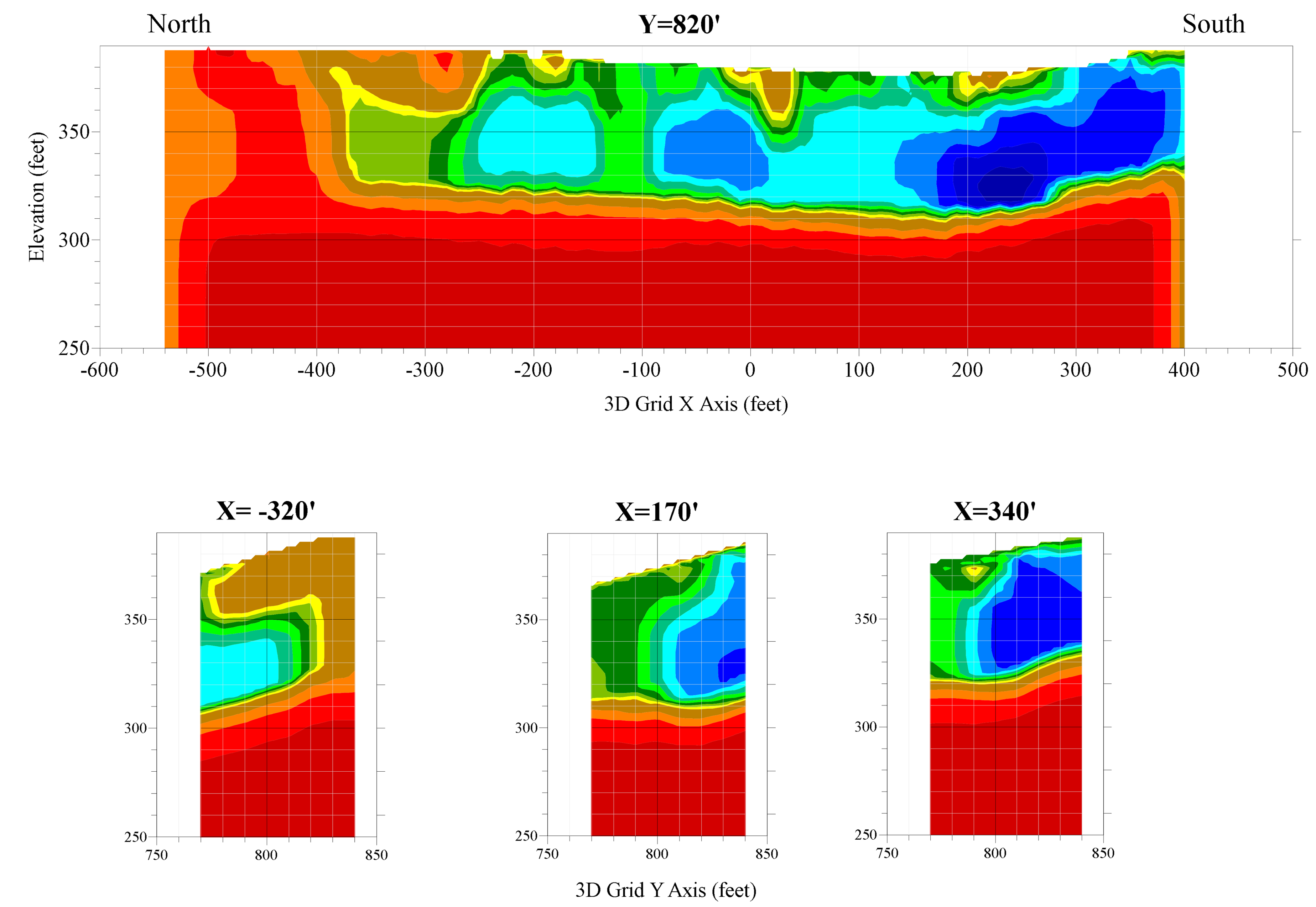
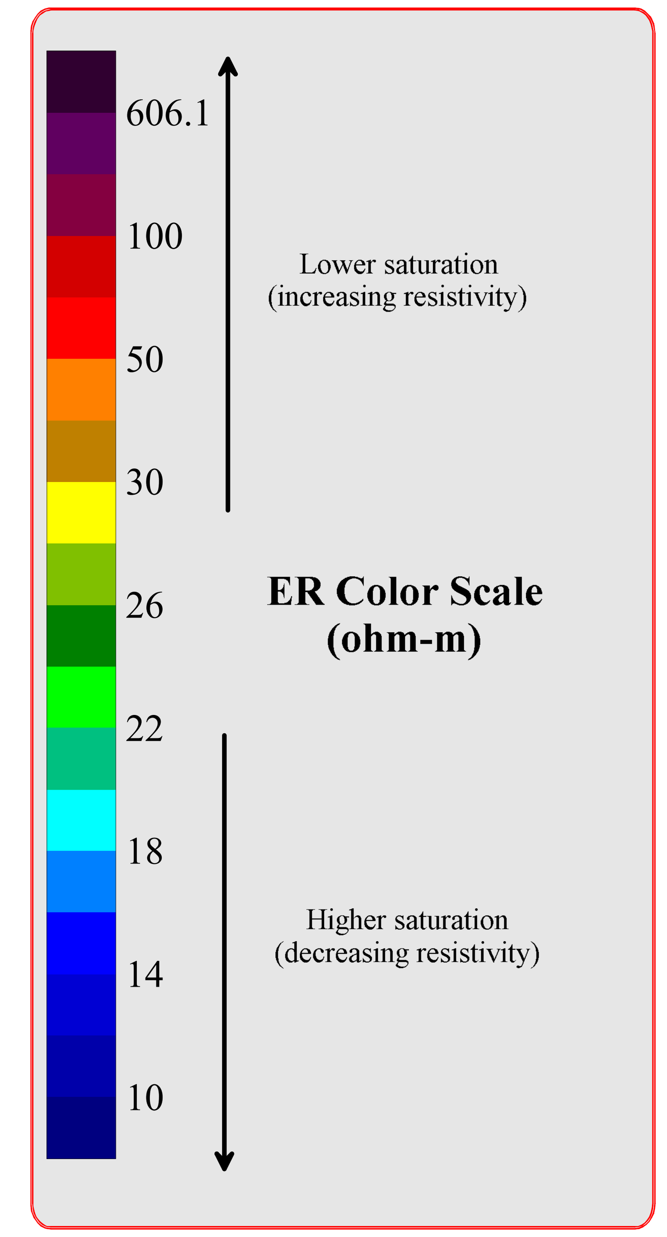
Sheet **S2**

Southern Area
3D ER Data
Depth Slices & Profiles

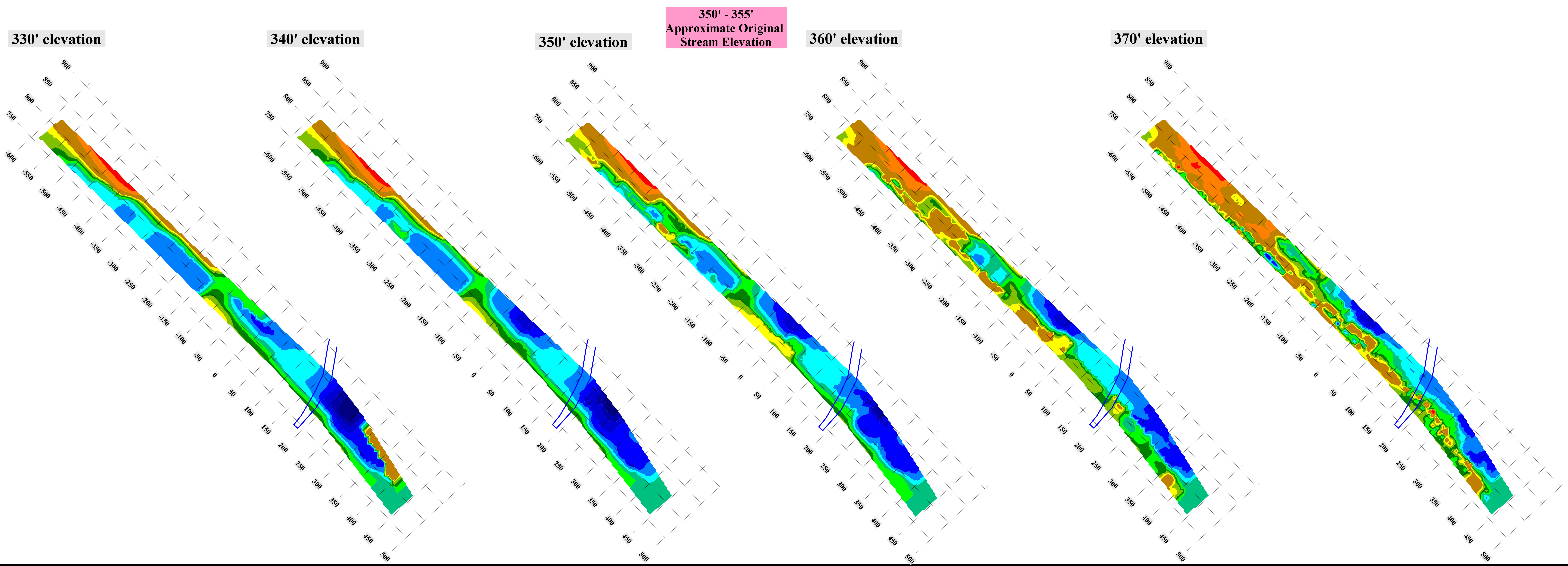


3D ER Data - Cross Sections





3D ER Data - Constant Elevation Slices



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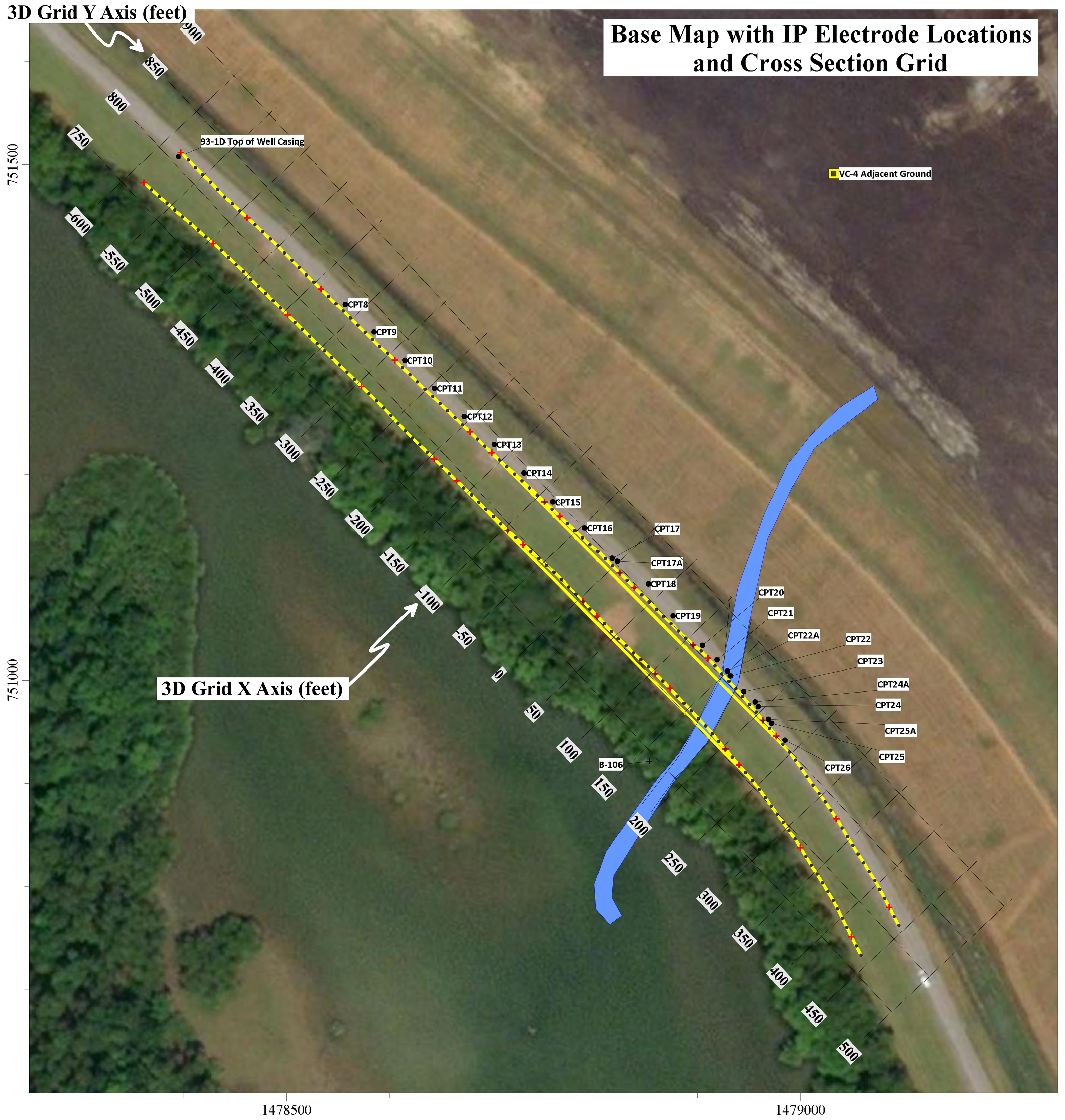
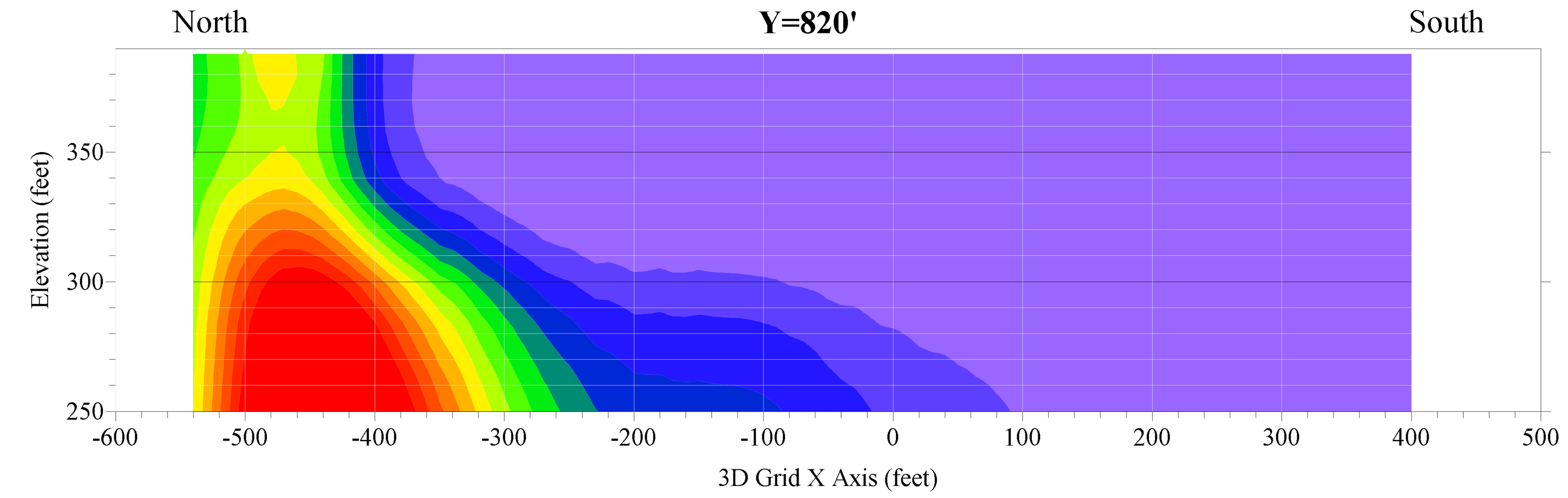
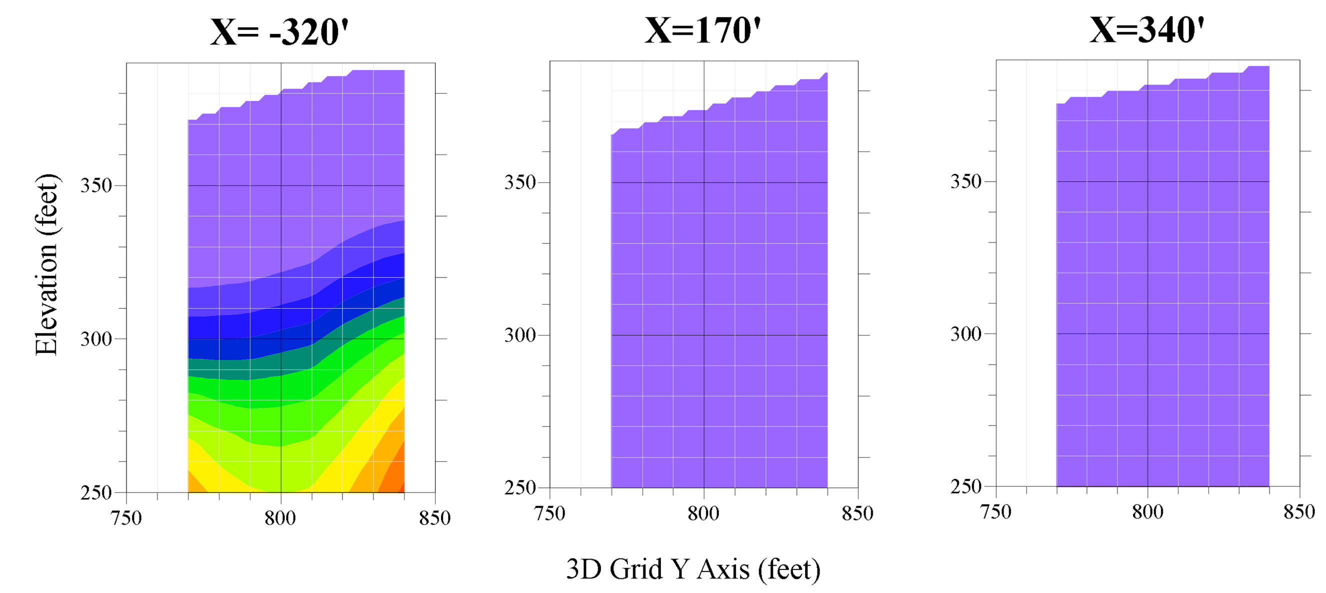
Sheet S3

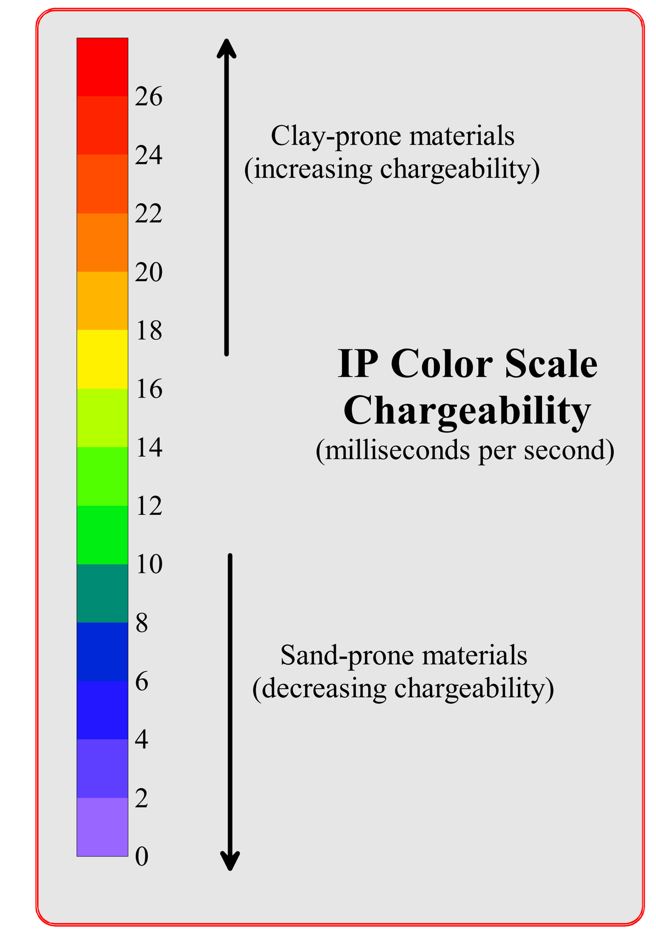
Southern Area
3D IP Data
Elevation Slices & Profiles



3D IP Data - Cross Sections

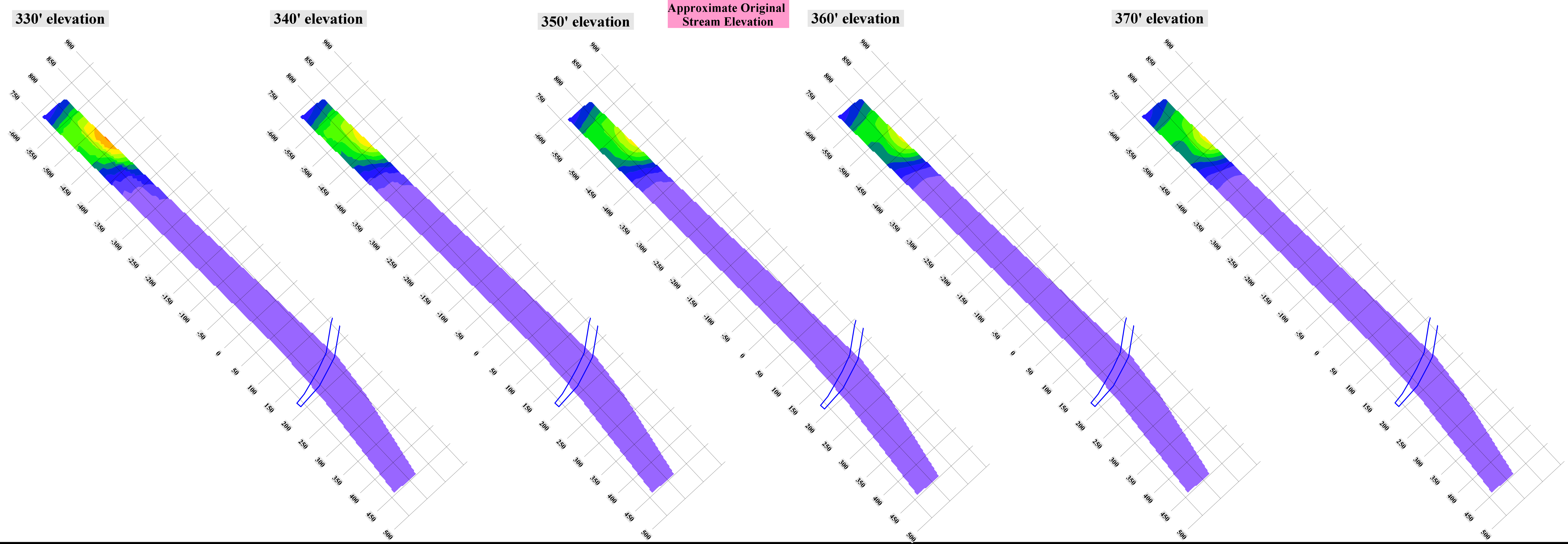






3D IP Data - Constant Elevation Slices

350' - 355'
Approximate Original
Stream Elevation



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project title: 3D ER/IP Surface Geophysical Survey

location: TVA Cumberland Fossil Plant, Stewart County, Tennessee

Sheet S4

Summary Sheet of Geophysical Survey Results

TVA Cumberland Fossil Plant
Stewart County, Tennessee

ER, IP & MASW Surface Geophysical Survey

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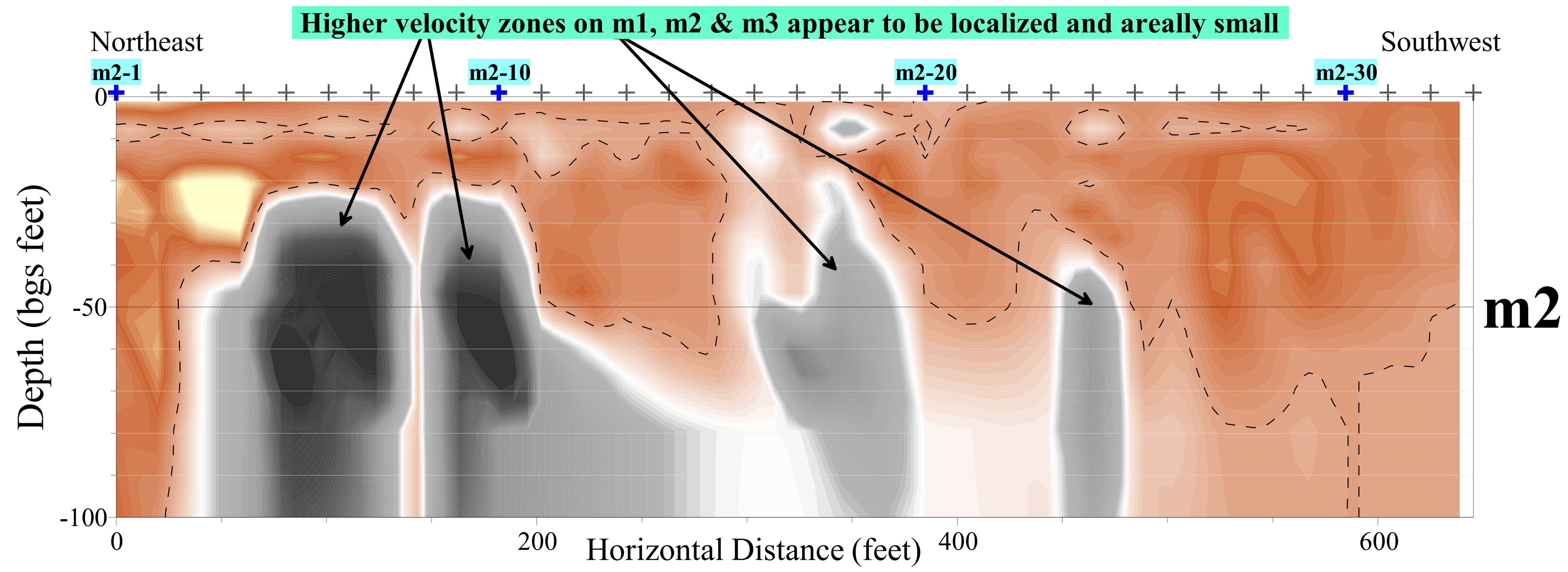
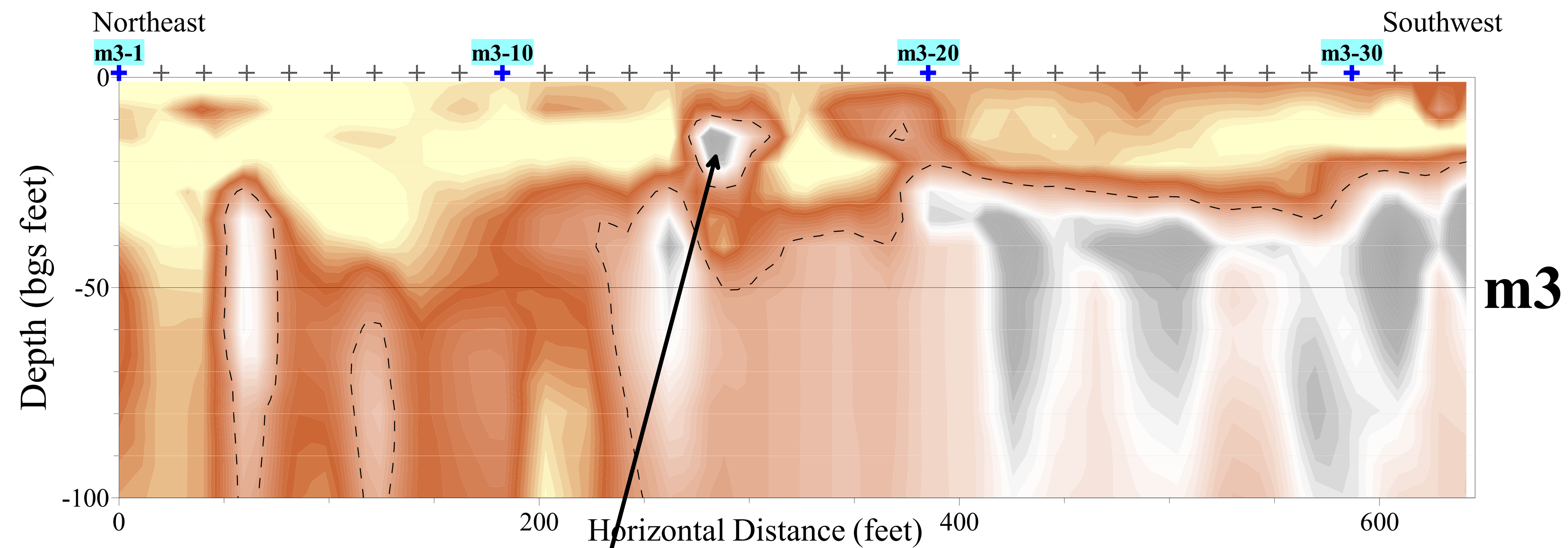
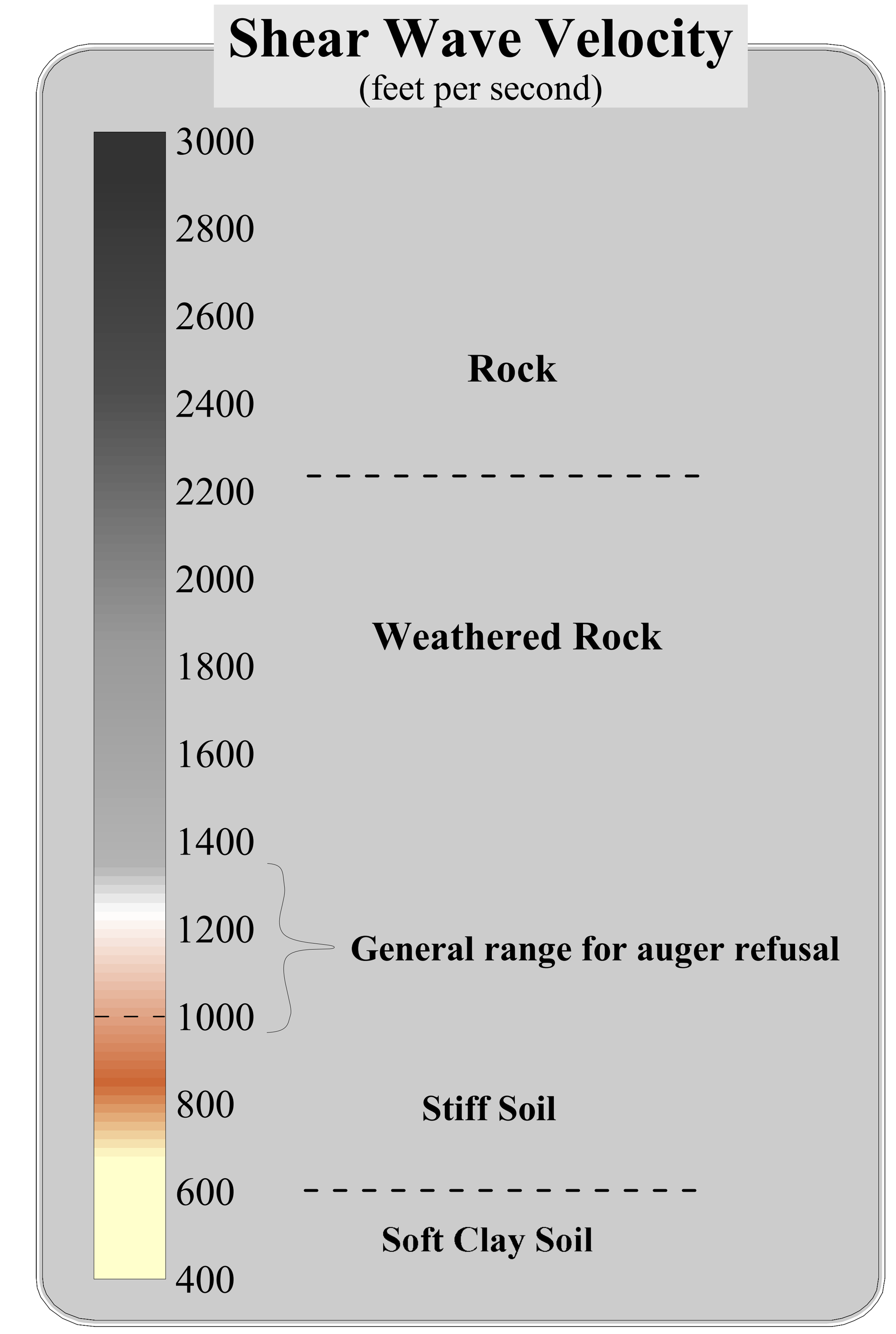
date: October 2019 | project no.: 190513

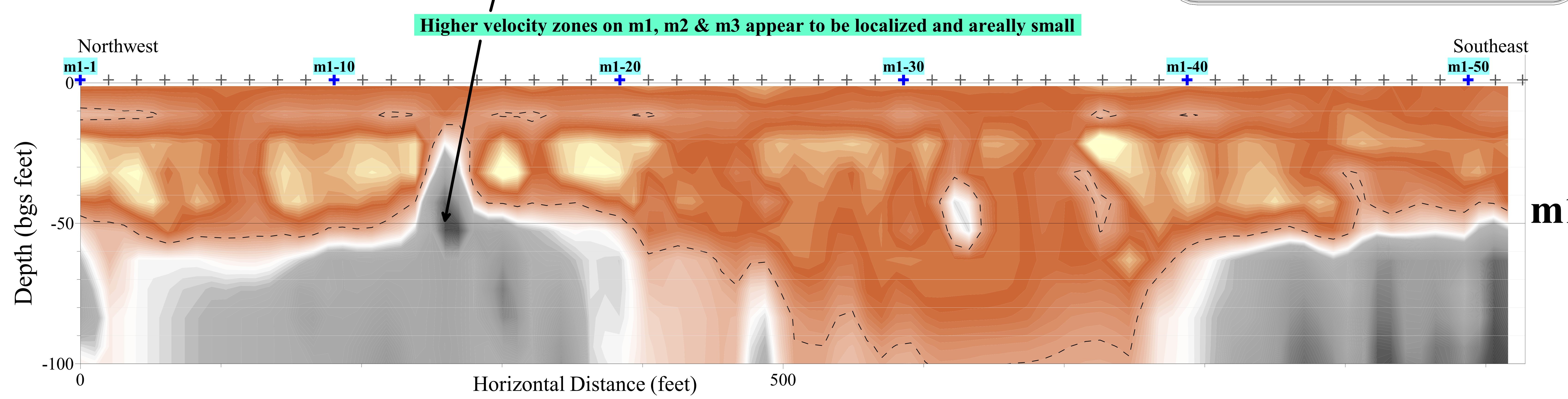
Sheet SA1

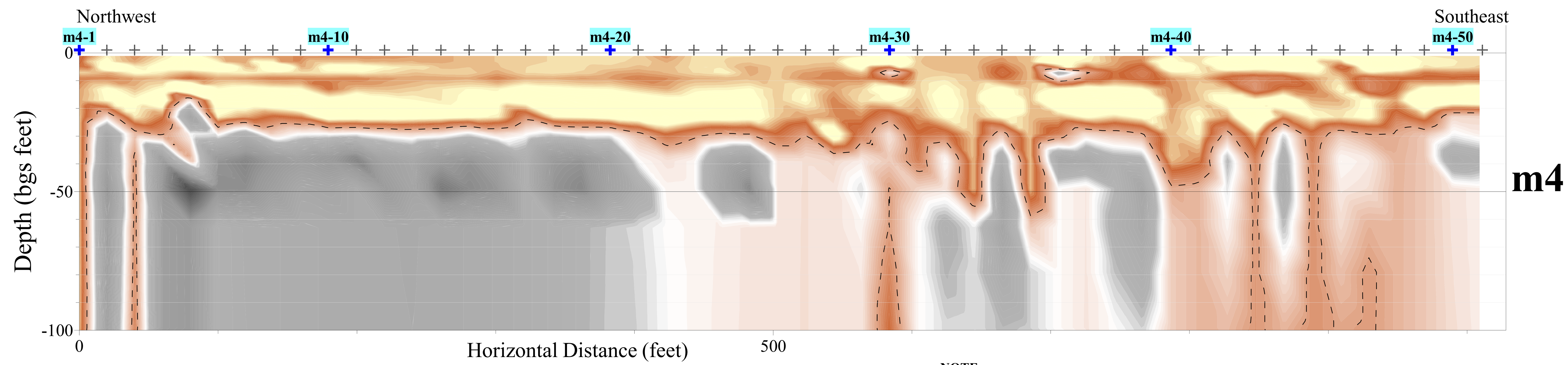
North & South Areas
MASW Profiles











NOTE

The MASW data indicates heterogeneous mixed rock and unconsolidated materials in the subsurface particularly below approximately 20' - 30' bgs. The 1,000 feet per second shear wave velocity is indicated by a dashed contour that approximates auger refusal.

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project title MASW Surface Geophysical Survey

Sheet **M1**

APPENDIX F – GEOTECHNICAL LABORATORY TEST RESULTS

ATTACHMENT F.1

Summary Tables of Geotechnical Laboratory Testing Results

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-TW01	3.5 - 4.5	423.2 - 422.2	8.3
CUF-TW01	8.0 - 9.0	418.7 - 417.7	7.7
CUF-TW01	10.5 - 12.0	416.2 - 414.7	10.8
CUF-TW01	15.0 - 16.5	411.7 - 410.2	19.1
CUF-TW01	19.5 - 21.0	407.2 - 405.7	21.0
CUF-TW01	24.5 - 25.0	402.2 - 401.7	19.2
CUF-TW01	25.8 - 27.0	400.9 - 399.7	37.7
CUF-TW01	30.0 - 31.5	396.7 - 395.2	48.7
CUF-TW01	34.6 - 35.6	392.1 - 391.1	47.9
CUF-TW01	41.3 - 41.7	385.4 - 385.0	40.8
CUF-TW01	41.7 - 42.0	385.0 - 384.7	46.2
CUF-TW01	40.5 - 42.5	386.2 - 384.2	40.8
CUF-TW01	45.5 - 47.0	381.2 - 379.7	45.6
CUF-TW01	53.8 - 54.5	372.9 - 372.2	24.5
CUF-TW01	56.0 - 57.5	370.7 - 369.2	24.1
CUF-TW01	59.8 - 60.3	366.9 - 366.4	28.7
CUF-TW01	61.0 - 62.0	365.7 - 364.7	32.1
CUF-TW01	64.0 - 65.5	362.7 - 361.2	30.5
CUF-TW01	65.5 - 67.0	361.2 - 359.7	33.2
CUF-TW02	3.5 - 4.5	423.5 - 422.5	13.4
CUF-TW02	6.0 - 6.5	421.0 - 420.5	10.3
CUF-TW02	9.0 - 9.8	418.0 - 417.2	13.1
CUF-TW02	13.5 - 15.0	413.5 - 412.0	25.0
CUF-TW02	20.0 - 20.4	407.0 - 406.6	23.7
CUF-TW02	19.5 - 20.7	407.5 - 406.3	23.7
CUF-TW02	20.4 - 20.7	406.6 - 406.3	26.8
CUF-TW02	24.0 - 25.5	403.0 - 401.5	18.9
CUF-TW03	3.5 - 4.5	420.9 - 419.9	12.1
CUF-TW03	6.0 - 6.5	418.4 - 417.9	14.4
CUF-TW03	9.0 - 10.5	415.4 - 413.9	14.6
CUF-TW03	13.5 - 15.0	410.9 - 409.4	12.8
CUF-TW03	18.5 - 19.5	405.9 - 404.9	27.0
CUF-TW03	23.0 - 24.0	401.4 - 400.4	20.4
CUF-TW03	25.5 - 26.5	398.9 - 397.9	43.5
CUF-TW03	29.0 - 29.4	395.4 - 395.0	38.5
CUF-TW03	29.4 - 29.7	395.0 - 394.7	40.5
CUF-TW03	28.5 - 30.5	395.9 - 393.9	38.5
CUF-TW03	33.5 - 35.0	390.9 - 389.4	40.0
CUF-TW03	39.5 - 41.0	384.9 - 383.4	44.3
CUF-TW03	44.0 - 45.5	380.4 - 378.9	43.7
CUF-TW03	50.0 - 51.5	374.4 - 372.9	44.0
CUF-TW03	56.0 - 56.5	368.4 - 367.9	40.1

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-TW03	63.5 - 65.0	360.9 - 359.4	54.3
CUF-TW03	68.9 - 69.3	355.5 - 355.1	19.5
CUF-TW03	69.3 - 69.6	355.1 - 354.8	19.3
CUF-TW03	68.0 - 70.0	356.4 - 354.4	19.5
CUF-TW03	75.0 - 76.5	349.4 - 347.9	20.7
CUF-TW04	4.5 - 6.0	419.5 - 418.0	12.9
CUF-TW04	9.0 - 10.2	415.0 - 413.8	12.3
CUF-TW04	15.0 - 16.4	409.0 - 407.6	21.2
CUF-TW04	18.5 - 19.5	405.5 - 404.5	23.6
CUF-TW04	19.5 - 20.1	404.5 - 403.9	20.5
CUF-TW04	20.0 - 20.8	404.0 - 403.2	18.1
CUF-TW05	4.5 - 6.5	418.0 - 416.0	18.3
CUF-TW05	5.0 - 5.3	417.5 - 417.2	16.5
CUF-TW05	5.3 - 5.7	417.2 - 416.8	18.3
CUF-TW05	8.5 - 9.5	414.0 - 413.0	20.2
CUF-TW05	11.0 - 11.5	411.5 - 411.0	23.7
CUF-TW05	15.5 - 16.5	407.0 - 406.0	22.8
CUF-TW05	18.5 - 20.0	404.0 - 402.5	23.9
CUF-TW05	21.0 - 21.5	401.5 - 401.0	38.7
CUF-TW05	24.5 - 26.0	398.0 - 396.5	41.9
CUF-TW05	29.1 - 29.4	393.4 - 393.1	41.0
CUF-TW05	31.0 - 31.5	391.5 - 391.0	37.7
CUF-TW05	35.5 - 36.5	387.0 - 386.0	50.1
CUF-TW05	38.5 - 40.0	384.0 - 382.5	34.7
CUF-TW05	44.5 - 46.0	378.0 - 376.5	39.4
CUF-TW05	49.0 - 50.5	373.5 - 372.0	50.4
CUF-TW05	53.5 - 55.0	369.0 - 367.5	37.7
CUF-TW05	58.5 - 59.5	364.0 - 363.0	23.9
CUF-TW05	65.5 - 67.5	357.0 - 355.0	29.7
CUF-TW05	66.5 - 66.9	356.0 - 355.6	29.7
CUF-TW05	66.9 - 67.2	355.6 - 355.3	28.9
CUF-TW05	70.5 - 72.0	352.0 - 350.5	36.1
CUF-TW06	0.0 - 1.0	422.0 - 421.0	14.2
CUF-TW06	4.5 - 6.0	417.5 - 416.0	14.9
CUF-TW06	10.5 - 10.9	411.5 - 411.1	20.1
CUF-TW06	10.9 - 11.3	411.1 - 410.7	18.1
CUF-TW06	10.5 - 12.3	411.5 - 409.7	18.1
CUF-TW06	14.5 - 15.5	407.5 - 406.5	32.6
CUF-TW06	19.0 - 20.0	403.0 - 402.0	8.0
CUF-TW07	3.5 - 4.5	434.8 - 433.8	34.0
CUF-TW07	8.0 - 9.0	430.3 - 429.3	25.0
CUF-TW07	13.5 - 15.0	424.8 - 423.3	16.8

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-TW07	18.5 - 19.5	419.8 - 418.8	31.1
CUF-TW07	24.0 - 24.8	414.3 - 413.5	13.1
CUF-TW07	29.0 - 30.0	409.3 - 408.3	20.7
CUF-TW07	33.5 - 34.5	404.8 - 403.8	8.3
CUF-TW07	36.0 - 36.5	402.3 - 401.8	8.1
CUF-TW07	40.5 - 41.5	397.8 - 396.8	7.8
CUF-TW07	43.5 - 45.0	394.8 - 393.3	5.3
CUF-TW07	49.5 - 51.0	388.8 - 387.3	19.8
CUF-TW07	51.0 - 51.5	387.3 - 386.8	20.2
CUF-TW07	54.5 - 55.5	383.8 - 382.8	36.7
CUF-TW07	60.0 - 60.4	378.3 - 377.9	27.6
CUF-TW07	60.4 - 60.9	377.9 - 377.4	31.6
CUF-TW07	60.0 - 62.0	378.3 - 376.3	31.6
CUF-TW07	64.0 - 65.0	374.3 - 373.3	46.0
CUF-TW07	69.5 - 71.0	368.8 - 367.3	20.7
CUF-TW07	73.5 - 74.0	364.8 - 364.3	35.5
CUF-TW07	78.5 - 80.0	359.8 - 358.3	45.8
CUF-TW07	84.5 - 85.0	353.8 - 353.3	57.2
CUF-TW07	89.0 - 90.5	349.3 - 347.8	46.3
CUF-TW07	94.0 - 95.5	344.3 - 342.8	43.1
CUF-TW07	96.2 - 97.0	342.1 - 341.3	34.3
CUF-TW07	98.5 - 99.0	339.8 - 339.3	33.8
CUF-TW07	100.0 - 101.5	338.3 - 336.8	19.7
CUF-TW07	103.0 - 104.5	335.3 - 333.8	26.1
CUF-TW07	108.3 - 109.0	330.0 - 329.3	27.6
CUF-TW07	110.5 - 111.1	327.8 - 327.2	28.9
CUF-TW07	112.0 - 113.0	326.3 - 325.3	18.4
CUF-TW07	115.0 - 116.5	323.3 - 321.8	24.7
CUF-TW07	118.0 - 119.5	320.3 - 318.8	19.4
CUF-TW07	121.0 - 122.5	317.3 - 315.8	20.2
CUF-TW07	124.0 - 125.2	314.3 - 313.1	20.0
CUF-TW08	4.0 - 4.5	434.0 - 433.5	18.5
CUF-TW08	6.0 - 6.5	432.0 - 431.5	20.9
CUF-TW08	9.0 - 9.9	429.0 - 428.1	33.3
CUF-TW08	15.0 - 15.6	423.0 - 422.4	28.6
CUF-TW08	19.5 - 19.9	418.5 - 418.1	20.5
CUF-TW08	24.0 - 24.6	414.0 - 413.4	20.6
CUF-TW08	34.5 - 36.0	403.5 - 402.0	10.2
CUF-TW08	39.0 - 40.5	399.0 - 397.5	8.2
CUF-TW08	43.5 - 44.9	394.5 - 393.1	9.6
CUF-TW08	49.5 - 51.0	388.5 - 387.0	24.1
CUF-TW08	54.0 - 55.5	384.0 - 382.5	32.9

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-TW08	58.5 - 60.0	379.5 - 378.0	33.1
CUF-TW08	63.5 - 64.5	374.5 - 373.5	38.0
CUF-TW08	64.5 - 66.0	373.5 - 372.0	33.7
CUF-TW08	74.0 - 75.5	364.0 - 362.5	45.0
CUF-TW08	78.5 - 80.0	359.5 - 358.0	47.3
CUF-TW08	83.0 - 84.5	355.0 - 353.5	23.2
CUF-TW08	86.5 - 88.0	351.5 - 350.0	24.0
CUF-TW08	88.0 - 90.0	350.0 - 348.0	24.7
CUF-TW08	88.7 - 89.1	349.3 - 348.9	24.7
CUF-TW08	89.1 - 89.5	348.9 - 348.5	24.8
CUF-TW08	91.5 - 93.0	346.5 - 345.0	25.1
CUF-TW08	94.5 - 96.0	343.5 - 342.0	25.7
CUF-TW08	97.5 - 99.0	340.5 - 339.0	26.8
CUF-TW08	100.5 - 102.0	337.5 - 336.0	26.1
CUF-TW08	103.5 - 105.0	334.5 - 333.0	27.1
CUF-TW08	106.5 - 108.0	331.5 - 330.0	24.7
CUF-TW08	109.5 - 110.5	328.5 - 327.5	19.9
CUF-TW08	112.5 - 114.0	325.5 - 324.0	15.2
CUF-TW08	115.5 - 117.0	322.5 - 321.0	17.4
CUF-TW08	118.5 - 120.0	319.5 - 318.0	19.1
CUF-TW08	121.5 - 123.0	316.5 - 315.0	19.9
CUF-TW08	124.5 - 126.0	313.5 - 312.0	19.5
CUF-TW08	127.5 - 127.6	310.5 - 310.4	15.7
CUF-TW09	3.5 - 4.5	438.6 - 437.6	29.4
CUF-TW09	6.0 - 6.5	436.1 - 435.6	25.9
CUF-TW09	9.0 - 9.7	433.1 - 432.4	24.7
CUF-TW09	15.0 - 16.5	427.1 - 425.6	13.4
CUF-TW09	20.0 - 20.9	422.1 - 421.2	24.4
CUF-TW09	24.5 - 26.0	417.6 - 416.1	24.2
CUF-TW09	30.5 - 31.0	411.6 - 411.1	19.6
CUF-TW09	35.0 - 35.5	407.1 - 406.6	25.3
CUF-TW09	38.5 - 39.5	403.6 - 402.6	18.2
CUF-TW09	39.5 - 41.0	402.6 - 401.1	8.6
CUF-TW09	43.0 - 43.6	399.1 - 398.5	13.4
CUF-TW09	47.5 - 48.5	394.6 - 393.6	26.7
CUF-TW09	50.0 - 51.5	392.1 - 390.6	38.0
CUF-TW09	53.5 - 54.5	388.6 - 387.6	37.5
CUF-TW09	55.8 - 56.0	386.3 - 386.1	24.2
CUF-TW09	59.0 - 60.5	383.1 - 381.6	34.4
CUF-TW09	63.5 - 63.8	378.6 - 378.3	25.6
CUF-TW09	63.8 - 64.0	378.3 - 378.1	27.5
CUF-TW09	63.5 - 65.5	378.6 - 376.6	25.6

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-TW09	69.5 - 70.0	372.6 - 372.1	38.6
CUF-TW09	74.5 - 75.0	367.6 - 367.1	33.5
CUF-TW09	79.0 - 79.5	363.1 - 362.6	47.7
CUF-TW09	79.5 - 81.0	362.6 - 361.1	48.7
CUF-TW09	84.0 - 85.5	358.1 - 356.6	46.5
CUF-TW09	88.0 - 88.5	354.1 - 353.6	47.5
CUF-TW09	92.0 - 93.0	350.1 - 349.1	23.7
CUF-TW09	95.1 - 95.6	347.0 - 346.5	24.4
CUF-TW09	95.6 - 95.9	346.5 - 346.2	24.4
CUF-TW09	94.5 - 96.5	347.6 - 345.6	24.4
CUF-TW09	98.5 - 100.0	343.6 - 342.1	24.6
CUF-TW09	102.5 - 104.0	339.6 - 338.1	25.7
CUF-TW09	108.6 - 109.0	333.5 - 333.1	30.1
CUF-TW09	112.5 - 114.0	329.6 - 328.1	25.9
CUF-TW09	117.5 - 119.0	324.6 - 323.1	20.3
CUF-TW09	122.5 - 124.0	319.6 - 318.1	20.6
CUF-TW09	125.0 - 126.5	317.1 - 315.6	22.7
CUF-TW09	130.0 - 131.5	312.1 - 310.6	27.8
CUF-B11	2.5 - 4.0	387.6 - 386.1	8.0
CUF-B11	5.0 - 6.5	385.1 - 383.6	9.1
CUF-B11	10.0 - 11.5	380.1 - 378.6	8.2
CUF-B11	15.0 - 16.5	375.1 - 373.6	8.4
CUF-B11	20.0 - 21.5	370.1 - 368.6	9.7
CUF-B11	25.0 - 26.5	365.1 - 363.6	22.1
CUF-B11	27.5 - 29.0	362.6 - 361.1	20.1
CUF-B11	35.0 - 36.5	355.1 - 353.6	26.0
CUF-B11	37.5 - 39.0	352.6 - 351.1	24.9
CUF-B11	43.5 - 43.9	346.6 - 346.2	25.4
CUF-B11	43.9 - 44.3	346.2 - 345.8	24.4
CUF-B11	42.5 - 44.5	347.6 - 345.6	25.4
CUF-B11	50.0 - 51.5	340.1 - 338.6	24.8
CUF-B11	55.0 - 56.5	335.1 - 333.6	26.8
CUF-B11	62.5 - 64.0	327.6 - 326.1	22.9
CUF-B11	65.0 - 66.5	325.1 - 323.6	23.9
CUF-B11	70.0 - 71.5	320.1 - 318.6	26.1
CUF-B11	75.0 - 76.5	315.1 - 313.6	20.0
CUF-B11	77.5 - 79.0	312.6 - 311.1	18.2
CUF-B11	80.0 - 81.5	310.1 - 308.6	17.9
CUF-B12	5.0 - 6.5	382.4 - 380.9	21.5
CUF-B12	10.0 - 11.5	377.4 - 375.9	19.1
CUF-B12	15.0 - 16.5	372.4 - 370.9	21.7
CUF-B12	17.5 - 19.0	369.9 - 368.4	22.2

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-B12	22.5 - 24.0	364.9 - 363.4	15.6
CUF-B12	27.5 - 29.0	359.9 - 358.4	25.2
CUF-B12	32.5 - 34.0	354.9 - 353.4	38.6
CUF-B12	37.5 - 39.0	349.9 - 348.4	29.8
CUF-B12	42.5 - 44.0	344.9 - 343.4	29.7
CUF-B12	47.5 - 49.0	339.9 - 338.4	35.8
CUF-B13	0.0 - 1.5	394.7 - 393.2	20.5
CUF-B13	5.0 - 6.5	389.7 - 388.2	19.7
CUF-B13	10.0 - 11.5	384.7 - 383.2	16.6
CUF-B13	18.3 - 18.7	376.4 - 376.0	37.2
CUF-B13	18.7 - 19.0	376.0 - 375.7	37.1
CUF-B13	17.5 - 19.5	377.2 - 375.2	37.2
CUF-B13	22.5 - 24.0	372.2 - 370.7	39.5
CUF-B13	50.0 - 55.0	344.7 - 339.7	51.3
CUF-B13	55.0 - 58.5	339.7 - 336.2	39.2
CUF-B13	58.5 - 60.0	336.2 - 334.7	47.1
CUF-B13	65.0 - 66.5	329.7 - 328.2	26.4
CUF-B14	5.0 - 6.5	435.8 - 434.3	31.2
CUF-B14	10.0 - 10.5	430.8 - 430.3	22.2
CUF-B14	20.0 - 20.4	420.8 - 420.4	20.6
CUF-B14	25.0 - 26.2	415.8 - 414.6	24.4
CUF-B14	30.0 - 31.5	410.8 - 409.3	23.9
CUF-B14	35.0 - 36.5	405.8 - 404.3	10.4
CUF-B14	40.4 - 41.9	400.4 - 398.9	22.4
CUF-B14	47.5 - 49.0	393.3 - 391.8	18.1
CUF-B14	55.0 - 56.5	385.8 - 384.3	30.5
CUF-B14	61.6 - 61.9	379.2 - 378.9	57.5
CUF-B14	65.0 - 66.5	375.8 - 374.3	28.5
CUF-B14	67.5 - 69.0, 70.0 - 71.5	373.3 - 371.8, 370.8 - 369.3	25.5
CUF-B14	75.0 - 76.5	365.8 - 364.3	44.1
CUF-B14	81.2 - 81.5	359.6 - 359.3	21.2
CUF-B14	82.5 - 84.0	358.3 - 356.8	19.7
CUF-B14	90.0 - 91.5	350.8 - 349.3	21.2
CUF-B14	97.5 - 99.0	343.3 - 341.8	17.1
CUF-B14	102.5 - 104.0	338.3 - 336.8	25.8
CUF-B14	107.5 - 109.0	333.3 - 331.8	27.4
CUF-B14	112.5 - 114.0	328.3 - 326.8	17.0
CUF-B14	120.0 - 121.5	320.8 - 319.3	18.7
CUF-B15	5.0 - 5.8	433.3 - 432.5	28.5
CUF-B15	10.0 - 10.9	428.3 - 427.4	10.0
CUF-B15	15.3 - 15.6	423.0 - 422.7	23.9

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-B15	20.0 - 21.5	418.3 - 416.8	16.6
CUF-B15	25.0 - 25.4	413.3 - 412.9	16.9
CUF-B15	30.0 - 30.4	408.3 - 407.9	19.2
CUF-B15	35.0 - 36.1	403.3 - 402.2	17.1
CUF-B15	40.0 - 41.2	398.3 - 397.1	20.1
CUF-B15	45.0 - 46.5	393.3 - 391.8	25.0
CUF-B15	50.0 - 51.5	388.3 - 386.8	15.8
CUF-B15	53.5 - 54.0	384.8 - 384.3	6.4
CUF-B15	57.5 - 59.0	380.8 - 379.3	29.9
CUF-B15	62.5 - 64.0	375.8 - 374.3	43.5
CUF-B15	70.0 - 71.5	368.3 - 366.8	39.6
CUF-B15	78.5 - 78.8	359.8 - 359.5	47.4
CUF-B15	82.5 - 84.0	355.8 - 354.3	51.3
CUF-B15	87.5 - 89.0	350.8 - 349.3	43.8
CUF-B15	95.0 - 96.5	343.3 - 341.8	53.7
CUF-B15	97.5 - 99.0	340.8 - 339.3	42.1
CUF-B15	101.1 - 101.5, 102.5 - 103.4	337.2 - 336.8, 335.8 - 334.9	31.4
CUF-B15	105.0 - 106.5	333.3 - 331.8	30.8
CUF-B15	112.5 - 114.0, 115.0 - 116.5, 117.5 - 119.0	325.8 - 324.3, 323.3 - 321.8, 320.8 - 319.3	19.4
CUF-B16	2.5 - 3.8	437.2 - 435.9	28.1
CUF-B16	7.5 - 9.0	432.2 - 430.7	10.3
CUF-B16	12.5 - 14.0	427.2 - 425.7	16.6
CUF-B16	17.5 - 18.0	422.2 - 421.7	18.5
CUF-B16	22.5 - 23.4	417.2 - 416.3	18.5
CUF-B16	27.5 - 28.2	412.2 - 411.5	21.9
CUF-B16	32.5 - 33.3	407.2 - 406.4	20.3
CUF-B16	40.0 - 41.5	399.7 - 398.2	21.6
CUF-B16	47.5 - 48.2	392.2 - 391.5	23.1
CUF-B16	52.5 - 53.5	387.2 - 386.2	22.1
CUF-B16	53.5 - 54.0	386.2 - 385.7	4.6
CUF-B16	55.0 - 56.5	384.7 - 383.2	35.5
CUF-B16	60.3 - 60.7	379.4 - 379.0	34.6
CUF-B16	60.7 - 61.0	379.0 - 378.7	33.6
CUF-B16	60.0 - 62.0	379.7 - 377.7	34.6
CUF-B16	65.0 - 66.5	374.7 - 373.2	49.6
CUF-B16	70.0 - 71.5	369.7 - 368.2	37.5
CUF-B16	75.0 - 76.5	364.7 - 363.2	40.4
CUF-B16	80.0 - 81.5	359.7 - 358.2	34.6
CUF-B16	85.0 - 86.5	354.7 - 353.2	61.1

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-B16	90.0 - 91.5	349.7 - 348.2	46.8
CUF-B16	95.0 - 96.5	344.7 - 343.2	45.0
CUF-B16	99.8 - 100.2	339.9 - 339.5	34.2
CUF-B16	100.2 - 100.5	339.5 - 339.2	32.9
CUF-B16	99.0 - 101.0	340.7 - 338.7	34.2
CUF-B16	101.8 - 102.3	337.9 - 337.4	25.5
CUF-B16	102.5 - 103.0	337.2 - 336.7	35.0
CUF-B16	103.0 - 103.5	336.7 - 336.2	23.9
CUF-B16	105.0 - 106.5	334.7 - 333.2	20.3
CUF-B16	110.0 - 110.8	329.7 - 328.9	25.1
CUF-B16	110.8 - 111.3	328.9 - 328.4	26.5
CUF-B16	112.5 - 113.1	327.2 - 326.6	23.9
CUF-B16	115.0 - 116.5	324.7 - 323.2	16.0
CUF-B16	117.5 - 119.0	322.2 - 320.7	21.0
CUF-B16	120.0 - 121.5	319.7 - 318.2	38.3
CUF-B17	2.5 - 4.0	440.9 - 439.4	18.2
CUF-B17	7.5 - 8.7	435.9 - 434.7	24.2
CUF-B17	15.0 - 15.4	428.4 - 428.0	17.6
CUF-B17	15.0 - 17.0	428.4 - 426.4	17.6
CUF-B17	20.0 - 21.5	423.4 - 421.9	13.8
CUF-B17	25.0 - 25.9	418.4 - 417.5	16.0
CUF-B17	30.0 - 30.9	413.4 - 412.5	20.7
CUF-B17	37.5 - 39.0	405.9 - 404.4	18.4
CUF-B17	42.5 - 43.9	400.9 - 399.5	19.6
CUF-B17	47.5 - 48.4	395.9 - 395.0	24.3
CUF-B17	52.5 - 53.9	390.9 - 389.5	23.3
CUF-B17	55.0 - 56.5	388.4 - 386.9	2.3
CUF-B17	60.0 - 60.4	383.4 - 383.0	22.6
CUF-B17	60.0 - 62.0	383.4 - 381.4	22.6
CUF-B17	65.0 - 66.5	378.4 - 376.9	33.7
CUF-B17	70.0 - 71.5	373.4 - 371.9	51.2
CUF-B17	75.0 - 76.5	368.4 - 366.9	47.8
CUF-B17	77.5 - 79.0	365.9 - 364.4	39.3
CUF-B17	80.0 - 81.5	363.4 - 361.9	57.4
CUF-B17	85.0 - 86.5	358.4 - 356.9	49.3
CUF-B17	90.0 - 91.5	353.4 - 351.9	50.2
CUF-B17	95.0 - 96.5	348.4 - 346.9	48.6
CUF-B17	100.0 - 101.5	343.4 - 341.9	47.7
CUF-B17	102.5 - 104.0	340.9 - 339.4	40.4
CUF-B17	106.0 - 106.5	337.4 - 336.9	27.6
CUF-B17	107.5 - 107.7	335.9 - 335.7	12.7
CUF-B18	2.5 - 4.0	392.5 - 391.0	20.7

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-B18	10.0 - 11.5	385.0 - 383.5	18.6
CUF-B18	17.5 - 19.0	377.5 - 376.0	18.1
CUF-B18	26.3 - 26.6	368.7 - 368.4	47.9
CUF-B18	32.5 - 34.0	362.5 - 361.0	22.7
CUF-B18	37.0 - 38.9	358.0 - 356.1	33.7
CUF-B19	2.5 - 4.0	392.3 - 390.8	21.2
CUF-B19	7.5 - 9.0	387.3 - 385.8	17.8
CUF-B19	15.0 - 16.5	379.8 - 378.3	19.4
CUF-B19	22.5 - 23.5	372.3 - 371.3	52.4
CUF-B19	29.0 - 29.3	365.8 - 365.5	61.6
CUF-B19	30.5 - 31.5	364.3 - 363.3	7.8
CUF-B19	32.5 - 34.0	362.3 - 360.8	21.7
CUF-B19	40.0 - 41.5	354.8 - 353.3	26.2
CUF-B19	42.5 - 44.0	352.3 - 350.8	9.3
CUF-B20	0.0 - 1.5	378.8 - 377.3	18.8
CUF-B20	5.0 - 6.5	373.8 - 372.3	33.3
CUF-B20	8.2 - 9.0	370.6 - 369.8	22.5
CUF-B20	12.2 - 13.0	366.6 - 365.8	21.4
CUF-B20	14.5 - 16.0	364.3 - 362.8	26.5
CUF-B20	17.5 - 19.0	361.3 - 359.8	25.7
CUF-B20	20.5 - 22.0	358.3 - 356.8	27.0
CUF-B20	23.5 - 25.0	355.3 - 353.8	27.9
CUF-B20	26.5 - 28.0	352.3 - 350.8	26.3
CUF-B20	29.5 - 31.0	349.3 - 347.8	29.6
CUF-B20	32.5 - 34.0	346.3 - 344.8	33.0
CUF-B20	35.5 - 37.0	343.3 - 341.8	27.8
CUF-B20	38.5 - 40.0	340.3 - 338.8	31.1
CUF-B20	41.5 - 43.0	337.3 - 335.8	31.5
CUF-B20	44.5 - 46.0	334.3 - 332.8	28.7
CUF-B20	47.5 - 49.0	331.3 - 329.8	31.4
CUF-B20	55.0 - 56.5	323.8 - 322.3	31.4
CUF-B20	65.0 - 66.5	313.8 - 312.3	32.0
CUF-B20	75.0 - 76.4	303.8 - 302.4	47.9
CUF-B21	2.5 - 4.0	376.9 - 375.4	21.2
CUF-B21	5.9 - 6.5	373.5 - 372.9	18.3
CUF-B21	10.0 - 11.5	369.4 - 367.9	18.9
CUF-B21	13.0 - 14.5	366.4 - 364.9	27.9
CUF-B21	16.0 - 17.5	363.4 - 361.9	28.4
CUF-B21	20.5 - 22.0	358.9 - 357.4	27.7
CUF-B21	23.5 - 25.0	355.9 - 354.4	26.9
CUF-B21	26.5 - 28.0	352.9 - 351.4	29.7
CUF-B21	29.5 - 31.0	349.9 - 348.4	28.5

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-B21	32.5 - 34.0	346.9 - 345.4	28.4
CUF-B21	35.5 - 37.0	343.9 - 342.4	34.8
CUF-B21	38.5 - 40.0	340.9 - 339.4	34.1
CUF-B21	41.5 - 43.0	337.9 - 336.4	23.8
CUF-B21	45.0 - 46.0	334.4 - 333.4	18.2
CUF-B21	46.4 - 47.5	333.0 - 331.9	19.2
CUF-B21	49.0 - 50.2	330.4 - 329.2	39.8
CUF-B21	55.0 - 56.5	324.4 - 322.9	34.1
CUF-B21	65.0 - 65.9	314.4 - 313.5	51.0
CUF-B21	73.2 - 74.7	306.2 - 304.7	38.2
CUF-B22	2.5 - 4.0	376.5 - 375.0	17.2
CUF-B22	10.0 - 11.5	369.0 - 367.5	17.2
CUF-B22	13.0 - 14.5	366.0 - 364.5	20.4
CUF-B22	16.0 - 16.7	363.0 - 362.3	28.2
CUF-B22	17.5 - 19.0	361.5 - 360.0	26.3
CUF-B22	22.0 - 23.5	357.0 - 355.5	23.0
CUF-B22	25.0 - 26.5	354.0 - 352.5	26.1
CUF-B22	28.0 - 29.5	351.0 - 349.5	28.3
CUF-B22	31.0 - 32.5	348.0 - 346.5	28.8
CUF-B22	35.5 - 37.0	343.5 - 342.0	22.1
CUF-B22	38.5 - 40.0	340.5 - 339.0	21.4
CUF-B22	41.5 - 43.0	337.5 - 336.0	20.5
CUF-B22	44.5 - 46.0	334.5 - 333.0	22.0
CUF-B22	47.5 - 48.9	331.5 - 330.1	24.0
CUF-B22	55.0 - 56.5	324.0 - 322.5	22.5
CUF-B22	65.0 - 66.5	314.0 - 312.5	36.0
CUF-B22	75.0 - 76.5	304.0 - 302.5	40.2
CUF-B22	85.0 - 85.9	294.0 - 293.1	37.4
CUF-B22	90.0 - 91.5	289.0 - 287.5	46.0
CUF-B22	100.0 - 101.5	279.0 - 277.5	40.5
CUF-B23	5.0 - 6.5	390.3 - 388.8	22.4
CUF-B23	10.0 - 11.5	385.3 - 383.8	23.0
CUF-B23	16.5 - 18.0	378.8 - 377.3	21.7
CUF-B23	19.5 - 21.0	375.8 - 374.3	29.7
CUF-B23	22.5 - 24.0	372.8 - 371.3	21.9
CUF-B23	28.5 - 30.0	366.8 - 365.3	19.9
CUF-B23	31.5 - 33.0	363.8 - 362.3	54.1
CUF-B23	34.5 - 35.7	360.8 - 359.6	47.4
CUF-B23	37.5 - 39.0	357.8 - 356.3	29.4
CUF-B23	40.5 - 41.6	354.8 - 353.7	28.0
CUF-B23	43.5 - 47.9	351.8 - 347.4	24.5
CUF-B23	51.0 - 52.5	344.3 - 342.8	36.0

Table F.1 - Summary of Natural Moisture Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Moisture Content
	ft	ft NGVD29	%
CUF-B23	60.0 - 61.5	335.3 - 333.8	32.4
CUF-B23	65.0 - 66.5	330.3 - 328.8	19.3
CUF-B23	75.0 - 76.5	320.3 - 318.8	20.1
CUF-B23	85.0 - 86.5	310.3 - 308.8	25.2
CUF-B24	5.0 - 6.5	374.9 - 373.4	16.2
CUF-B24	10.0 - 11.5	369.9 - 368.4	26.4
CUF-B24	17.5 - 19.0	362.4 - 360.9	22.4
CUF-B24	21.5 - 22.3	358.4 - 357.6	20.1
CUF-B24	23.0 - 24.5	356.9 - 355.4	13.9
CUF-B24	26.0 - 27.5	353.9 - 352.4	31.6
CUF-B24	27.5 - 29.0	352.4 - 350.9	27.3
CUF-B24	30.5 - 31.1	349.4 - 348.8	23.0
CUF-B24	35.0 - 36.5	344.9 - 343.4	26.4
CUF-B24	38.0 - 39.5	341.9 - 340.4	25.8
CUF-B24	40.6 - 41.0	339.3 - 338.9	25.2
CUF-B24	42.5 - 44.0	337.4 - 335.9	25.1
CUF-B24	45.5 - 47.0	334.4 - 332.9	29.6
CUF-B24	48.5 - 50.0	331.4 - 329.9	26.2
CUF-B24	55.0 - 56.5	324.9 - 323.4	29.3
CUF-B24	60.0 - 61.5	319.9 - 318.4	24.3
CUF-B25	0.0 - 1.5	378.7 - 377.2	19.1
CUF-B25	7.5 - 9.0	371.2 - 369.7	19.5
CUF-B25	12.5 - 14.0	366.2 - 364.7	24.1
CUF-B25	20.0 - 21.5	358.7 - 357.2	23.6
CUF-B25	27.5 - 29.0	351.2 - 349.7	22.5
CUF-B25	30.5 - 32.0	348.2 - 346.7	21.6
CUF-B25	36.5 - 38.0	342.2 - 340.7	33.0
CUF-B25	41.0 - 42.5	337.7 - 336.2	37.7
CUF-B25	46.1 - 47.0	332.6 - 331.7	20.7
CUF-B25	48.5 - 50.0	330.2 - 328.7	26.5
CUF-B25	55.0 - 56.5	323.7 - 322.2	82.3
CUF-B25	61.3 - 61.5	317.4 - 317.2	19.1
CUF-B25	70.0 - 71.5	308.7 - 307.2	43.7
CUF-B25	80.0 - 81.5	298.7 - 297.2	38.8

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

1. Where two results are reported for the same test depth interval, two separate specimens were tested within the interval.
2. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

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Table F.2 - Summary of Fines Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
CUF-TW01	10.5 - 12.0	416.2 - 414.7	96.6
CUF-TW01 & CUF-TW02	25.0 - 25.3, 25.5 - 25.8, 25.5 - 26.2	401.7 - 401.4, 401.2 - 400.9, 401.5 - 400.8	21.8
CUF-TW01	30.0 - 31.5	396.7 - 395.2	73.1
CUF-TW01	41.3 - 41.7	385.4 - 385.0	91.8
CUF-TW01	56.0 - 57.5	370.7 - 369.2	72.9
CUF-TW01	64.0 - 65.5, 65.5 - 67.0	362.7 - 361.2, 361.2 - 359.7	46.2
CUF-TW02	3.5 - 4.5	423.5 - 422.5	94.4
CUF-TW02	20.0 - 20.4	407.0 - 406.6	99.5
CUF-TW03	13.5 - 15.0	410.9 - 409.4	97.3
CUF-TW03 & CUF-TW04	24.0 - 25.5, 23.0 - 24.5	400.4 - 398.9, 401.0 - 399.5	32.4
CUF-TW03	29.0 - 29.4	395.4 - 395.0	89.1
CUF-TW03	44.0 - 45.5	380.4 - 378.9	96.2
CUF-TW03	63.5 - 65.0	360.9 - 359.4	90.3
CUF-TW03	68.9 - 69.3	355.5 - 355.1	86.3
CUF-TW04	4.5 - 6.0	419.5 - 418.0	95.9
CUF-TW04	18.5 - 19.5	405.5 - 404.5	98.3
CUF-TW05	5.3 - 5.7	17.2 - 416.8	95.8
CUF-TW05	15.5 - 16.5	407.0 - 406.0	99.3
CUF-TW05 & CUF-TW06	20.0 - 21.0, 20.0 - 20.6	402.5 - 401.5, 402.0 - 401.4	30.5
CUF-TW05	31.0 - 31.5	391.5 - 391.0	85.2
CUF-TW05	44.5 - 46.0	378.0 - 376.5	96.3
CUF-TW05	58.5 - 59.5	364.0 - 363.0	93.3
CUF-TW05	66.5 - 66.9	356.0 - 355.6	87.5
CUF-TW06	10.9 - 11.3	411.1 - 410.7	97.6
CUF-TW07	13.5 - 15.0	424.8 - 423.3	35.5
CUF-TW07	43.5 - 45.0	394.8 - 393.3	10.2
CUF-TW07	51.0 - 51.5	387.3 - 386.8	24.4
CUF-TW07	60.4 - 60.9	377.9 - 377.4	87.4
CUF-TW07	69.5 - 71.0	368.8 - 367.3	8.7
CUF-TW07	78.5 - 80.0	359.8 - 358.3	96.1
CUF-TW07	96.2 - 97.0	342.1 - 341.3	98.9
CUF-TW07	98.5 - 99.0	339.8 - 339.3	86.6
CUF-TW07	103.0 - 104.5	335.3 - 333.8	9.5
CUF-TW07	110.5 - 111.1	327.8 - 327.2	68.6
CUF-TW07	115.0 - 116.5, 116.5 - 118.0	323.3 - 321.8, 321.8 - 320.3	6.5

Table F.2 - Summary of Fines Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
CUF-TW07	121.0 - 122.5, 122.5 - 124.0, 124.0 - 125.2	317.3 - 315.8, 315.8 - 314.3, 314.3 - 313.1	8.1
CUF-TW08	9.0 - 9.9	429.0 - 428.1	34.8
CUF-TW08	34.5 - 36.0	403.5 - 402.0	10.6
CUF-TW08	49.5 - 51.0	388.5 - 387.0	10.7
CUF-TW08	58.5 - 60.0	379.5 - 378.0	98.0
CUF-TW08	78.5 - 80.0	359.5 - 358.0	97.2
CUF-TW08	83.0 - 84.5	355.0 - 353.5	96.7
CUF-TW08	88.7 - 89.1	349.3 - 348.9	71.7
CUF-TW08	97.5 - 99.0	340.5 - 339.0	93.2
CUF-TW08	100.5 - 102.0	337.5 - 336.0	81.6
CUF-TW08	103.5 - 105.0	334.5 - 333.0	84.3
CUF-TW08	106.5 - 108.0, 108.0 - 109.5	331.5-330.0, 330.0 - 328.5	16.1
CUF-TW08	109.5 - 110.5	328.5 - 327.5	32.0
CUF-TW08	120.0 - 121.5, 121.5 - 123.0, 123.0 - 124.5	318.0 - 316.5, 316.5 - 315.0, 315.0 - 313.5	7.7
CUF-TW09	3.5 - 4.5	438.6 - 437.6	65.7
CUF-TW09	15.0 - 16.5	427.1 - 425.6	24.2
CUF-TW09	24.5 - 26.0	417.6 - 416.1	78.9
CUF-TW09	39.5 - 41.0	402.6 - 401.1	6.5
CUF-TW09	55.8 - 56.0	386.3 - 386.1	98.1
CUF-TW09	63.5 - 63.8	378.6 - 378.3	82.5
CUF-TW09	79.5 - 81.0	362.6 - 361.1	94.7
CUF-TW09	92.0 - 93.0	350.1 - 349.1	98.9
CUF-TW09	95.1 - 95.6	347.0 - 346.5	98.1
CUF-TW09	102.5 - 104.0	339.6 - 338.1	97.4
CUF-TW09	115.0 - 116.5, 117.5 - 119.0	327.1 - 325.6, 324.6 - 323.1	7.8
CUF-TW09	125.0 - 126.5	317.1 - 315.6	36.4
CUF-TW09	130.0 - 131.5	312.1 - 310.6	33.2
CUF-B11	2.5 - 4.0, 5.0 - 6.5	387.6 - 386.1, 385.1 - 383.6	10.0
CUF-B11	20.0 - 21.5	370.1 - 368.6	11.5
CUF-B11	25.0 - 26.5, 27.5 - 29.0	365.1 - 363.6, 362.6 - 361.1	12.5
CUF-B11	35.0 - 36.5, 37.5 - 39.0	355.1 - 353.6, 351.1 - 352.6	13.2
CUF-B11	43.5 - 43.9	346.6 - 346.2	95.2
CUF-B11	55.0 - 56.5	335.1 - 333.6	54.2

Table F.2 - Summary of Fines Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
CUF-B11	62.5 - 64.0, 65.0 - 66.5	327.6 - 326.1, 325.1 - 323.6	11.1
CUF-B11	75.0 - 76.5, 77.5 - 79.0	315.1 - 313.6, 312.6 - 311.1	12.4
CUF-B12	10.0 - 11.5	377.4 - 375.9	91.0
CUF-B12	17.5 - 19.0	369.9 - 368.4	65.6
CUF-B12	27.5 - 29.0	359.9 - 358.4	57.1
CUF-B13	5.0 - 6.5	389.7 - 388.2	57.8
CUF-B13	18.3 - 18.7	376.4 - 376.0	99.6
CUF-B13	55.0 - 58.5	339.7 - 336.2	94.1
CUF-B14	5.0 - 6.5	435.8 - 434.3	55.0
CUF-B14	35.0 - 36.5	405.8 - 404.3	18.4
CUF-B14	46.2 - 46.6	394.6 - 394.2	44.9
CUF-B14	47.5 - 49.0	393.3 - 391.8	50.7
CUF-B14	61.2 - 61.6	379.6 - 379.2	92.4
CUF-B14	67.5 - 69.0, 70.0 - 71.5	373.3 - 371.8, 370.8 - 369.3	11.4
CUF-B14	80.9 - 81.2	359.9 - 359.6	55.9
CUF-B14	82.5 - 84.0	358.3 - 356.8	39.6
CUF-B14	97.5 - 99.0	343.3 - 341.8	25.7
CUF-B14	102.5 - 104.0	338.3 - 336.8	17.8
CUF-B14	112.5 - 114.0	328.3 - 326.8	37.8
CUF-B15	15.0 - 15.3	423.3 - 423.0	68.6
CUF-B15	35.0 - 36.1	403.3 - 402.2	75.0
CUF-B15	50.0 - 51.5	388.3 - 386.8	13.6
CUF-B15	57.5 - 59.0	380.8 - 379.3	96.9
CUF-B15	78.2 - 78.5	360.1 - 359.8	77.7
CUF-B15	95.0 - 96.5	343.3 - 341.8	88.3
CUF-B15	97.5 - 99.0	340.8 - 339.3	64.9
CUF-B15	101.1 - 101.5, 102.5 - 103.4	337.2 -336.8, 335.8 - 334.9	78.3
CUF-B15	105.0 - 106.5	333.3 - 331.8	69.3
CUF-B15	112.5 - 114.0, 115.0 - 116.5, 117.5 - 119.0	325.8 - 324.3, 323.3 - 321.8, 320.8 - 319.3	10.0
CUF-B16	12.5 - 14.0	427.2 - 425.7	88.1
CUF-B16	40.0 - 41.5	399.7 - 398.2	44.9
CUF-B16	53.5 - 54.0	386.2 - 385.7	4.9
CUF-B16	60.3 - 60.7	379.4 - 379-3	86.8
CUF-B16	85.0 - 86.5	354.7 - 353.2	94.5
CUF-B16	99.8 - 100.2	339.9 - 339.5	97.3
CUF-B16	115.0 - 116.5	324.7 - 323.2	10.6
CUF-B16	120.0 - 121.5	319.7 - 318.2	23.2

Table F.2 - Summary of Fines Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
CUF-B17	15.0 - 15.4	428.4 - 428.0	76.3
CUF-B17	37.5 - 39.0	405.9 - 404.4	67.6
CUF-B17	55.0 - 56.5	388.4 - 386.9	7.6
CUF-B17	60.0 - 60.4	383.4 - 383.0	37.3
CUF-B17	85.0 - 86.5	358.4 - 356.9	91.1
CUF-B17	102.5 - 104.0	340.9 - 339.4	77.5
CUF-B17	106.0 - 106.5	337.4 - 336.9	13.5
CUF-B18	10.0 - 11.5	385.0 - 383.5	90.5
CUF-B18	17.5 - 19.0	377.5 - 376.0	34.5
CUF-B18	26.0 - 26.3	369.0 - 368.7	88.1
CUF-B18	38.0 - 38.3	357.0 - 356.7	81.9
CUF-B19	7.5 - 9.0	387.3 - 385.8	95.2
CUF-B19	28.7 - 29.0	366.1 - 365.8	85.5
CUF-B19	30.5 - 31.5	364.3 - 363.3	9.7
CUF-B19	32.5 - 34.0	362.3 - 360.8	90.3
CUF-B19	40.0 - 41.5	354.8 - 353.3	75.3
CUF-B19	42.5 - 44.0	352.3 - 350.8	38.8
CUF-B20	5.0 - 6.5	373.8 - 372.3	57.6
CUF-B20	14.5 - 16.0	364.3 - 362.8	60.8
CUF-B20	26.5 - 28.0	352.3 - 350.8	52.6
CUF-B20	38.5 - 40.0	340.3 - 338.8	96.9
CUF-B20	44.5 - 46.0	334.3 - 332.8	17.9
CUF-B20	55.0 - 56.5	323.8 - 322.3	62.2
CUF-B20	65.0 - 66.5	313.8 - 312.3	62.6
CUF-B21	2.5 - 4.0	376.9 - 375.4	76.8
CUF-B21	10.0 - 11.5	369.4 - 367.9	72.2
CUF-B21	20.5 - 22.0	358.9 - 357.4	80.9
CUF-B21	35.5 - 37.0	343.9 - 342.4	75.0
CUF-B21	41.5 - 43.0	337.9 - 336.4	93.3
CUF-B21	45.0 - 46.0	334.4 - 333.4	44.4
CUF-B21	55.0 - 56.5	324.4 - 322.9	20.7
CUF-B22	2.5 - 4.0	376.5 - 375.0	73.2
CUF-B22	10.0 - 11.5	369.0 - 367.5	75.7
CUF-B22	17.5 - 19.0	361.5 - 360.0	81.6
CUF-B22	22.0 - 23.5	357.0 - 355.5	91.9
CUF-B22	31.0 - 32.5	348.0 - 346.5	93.2
CUF-B22	35.5 - 37.0	343.5 - 342.0	44.9
CUF-B22	55.0 - 56.5	324.0 - 322.5	53.9
CUF-B22	75.0 - 76.5	304.0 - 302.5	60.9
CUF-B22	90.0 - 91.5	289.0 - 287.5	41.1
CUF-B23	5.0 - 6.5	390.3 - 388.8	68.1
CUF-B23	22.5 - 24.0	372.8 - 371.3	53.0

Table F.2 - Summary of Fines Content Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Percent Passing #200 Sieve
	ft	ft NGVD29	%
CUF-B23	31.5 - 33.0	363.8 - 362.3	90.6
CUF-B23	37.5 - 39.0	357.8 - 356.3	63.1
CUF-B23	40.5 - 41.6	354.8 - 353.7	40.8
CUF-B23	43.5 - 47.9	351.8 - 347.4	17.2
CUF-B23	51.0 - 52.5	344.3 - 342.8	88.6
CUF-B23	65.0 - 66.5	330.3 - 328.8	9.9
CUF-B23	85.0 - 86.5	310.3 - 308.8	26.6
CUF-B24	5.0 - 6.5	374.9 - 373.4	56.8
CUF-B24	17.5 - 19.0	362.4 - 360.9	78.1
CUF-B24	23.0 - 24.5	356.9 - 355.4	32.4
CUF-B24	26.0 - 27.5	353.9 - 352.4	40.1
CUF-B24	27.5 - 29.0	352.4 - 350.9	74.8
CUF-B24	30.5 - 31.1	349.4 - 348.8	36.8
CUF-B24	35.0 - 36.5	344.9 - 343.4	98.3
CUF-B24	42.5 - 44.0	337.4 - 335.9	12.8
CUF-B24	48.5 - 50.0	331.4 - 329.9	18.1
CUF-B24	60.0 - 61.5	319.9 - 318.4	11.7
CUF-B25	0.0 - 1.5	378.7 - 377.2	84.8
CUF-B25	12.5 - 14.0	366.2 - 364.7	85.9
CUF-B25	20.0 - 21.5	358.7 - 357.2	77.4
CUF-B25	27.5 - 29.0	351.2 - 349.7	59.1
CUF-B25	36.5 - 38.0	342.2 - 340.7	79.9
CUF-B25	41.0 - 42.5	337.7 - 336.2	19.0
CUF-B25	46.1 - 47.0	332.6 - 331.7	30.8
CUF-B25	48.5 - 50.0	330.2 - 328.7	42.4
CUF-B25	70.0 - 71.5	308.7 - 307.2	98.4

Notes:

ft feet

ID identification

NGVD29 National Geodetic Vertical Datum of 1929

NP non-plastic

1. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

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Table F.3 - Summary of Atterberg Limits Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
CUF-TW01	10.5 - 12.0	416.2 - 414.7	NP	NP
CUF-TW01	30.0 - 31.5	396.7 - 395.2	NP	NP
CUF-TW01	41.3 - 41.7	385.4 - 385.0	NP	NP
CUF-TW01	56.0 - 57.5	370.7 - 369.2	38	20
CUF-TW01	64.0 - 65.5, 65.5 - 67.0	362.7 - 361.2, 361.2 - 359.7	57	37
CUF-TW02	3.5 - 4.5	423.5 - 422.5	NP	NP
CUF-TW02	20.0 - 20.4	407.0 - 406.6	24	5
CUF-TW03	13.5 - 15.0	410.9 - 409.4	NP	NP
CUF-TW03	29.0 - 29.4	395.4 - 395.0	NP	NP
CUF-TW03	44.0 - 45.5	380.4 - 378.9	NP	NP
CUF-TW03	63.5 - 65.0	360.9 - 359.4	NP	NP
CUF-TW03	68.9 - 69.3	355.5 - 355.1	28	12
CUF-TW04	4.5 - 6.0	419.5 - 418.0	NP	NP
CUF-TW04	18.5 - 19.5	405.5 - 404.5	NP	NP
CUF-TW05	5.3 - 5.7	417.2 - 416.8	NP	NP
CUF-TW05	15.5 - 16.5	407.0 - 406.0	NP	NP
CUF-TW05	31.0 - 31.5	391.5 - 391.0	NP	NP
CUF-TW05	44.5 - 46.0	378.0 - 376.5	NP	NP
CUF-TW05	58.5 - 59.5	364.0 - 363.0	42	24
CUF-TW05	66.5 - 66.9	356.0 - 355.6	56	36
CUF-TW06	10.9 - 11.3	411.1 - 410.7	NP	NP
CUF-TW07	13.5 - 15.0	424.8 - 423.3	NP	NP
CUF-TW07	43.5 - 45.0	394.8 - 393.3	NP	NP
CUF-TW07	51.0 - 51.5	387.3 - 386.8	NP	NP
CUF-TW07	60.4 - 60.9	377.9 - 377.4	NP	NP
CUF-TW07	69.5 - 71.0	368.8 - 367.3	NP	NP
CUF-TW07	78.5 - 80.0	359.8 - 358.3	NP	NP
CUF-TW07	96.2 - 97.0	342.1 - 341.3	46	22
CUF-TW07	98.5 - 99.0	339.8 - 339.3	37	16
CUF-TW07	103.0 - 104.5	335.3 - 333.8	NP	NP
CUF-TW07	110.5 - 111.1	327.8 - 327.2	33	12
CUF-TW07	115.0 - 116.5, 116.5 - 118.0	323.3 - 321.8, 321.8 - 320.3	24	3
CUF-TW07	121.0 - 122.5, 122.5 - 124.0, 124.0 - 125.2	317.3 - 315.8, 315.8 - 314.3, 314.3 - 313.1	32	10
CUF-TW08	9.0 - 9.9	429.0 - 428.1	NP	NP
CUF-TW08	34.5 - 36.0	403.5 - 402.0	NP	NP
CUF-TW08	58.5 - 60.0	379.5 - 378.0	NP	NP
CUF-TW08	78.5 - 80.0	359.5 - 358.0	NP	NP
CUF-TW08	83.0 - 84.5	355.0 - 353.5	34	15

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Table F.3 - Summary of Atterberg Limits Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
CUF-TW08	88.7 - 89.1	349.3 - 348.9	38	19
CUF-TW08	97.5 - 99.0	340.5 - 339.0	31	9
CUF-TW08	100.5 - 102.0	337.5 - 336.0	27	7
CUF-TW08	103.5 - 105.0	334.5 - 333.0	28	6
CUF-TW08	106.5 - 108.0, 108.0 - 109.5	331.5 - 330.0, 330.0 - 328.5	NP	NP
CUF-TW08	109.5 - 110.5	328.5 - 327.5	28	8
CUF-TW08	120.0 - 121.5, 121.5 - 123.0, 123.0 - 124.5	318.0 - 316.5, 316.5 - 315.0, 315.0 - 313.5	29	8
CUF-TW09	3.5 - 4.5	438.6 - 437.6	NP	NP
CUF-TW09	15.0 - 16.5	427.1 - 425.6	NP	NP
CUF-TW09	24.5 - 26.0	417.6 - 416.1	NP	NP
CUF-TW09	39.5 - 41.0	402.6 - 401.1	NP	NP
CUF-TW09	55.8 - 56.0	386.3 - 386.1	NP	NP
CUF-TW09	63.5 - 63.8	378.6 - 378.3	NP	NP
CUF-TW09	79.5 - 81.0	362.6 - 361.1	NP	NP
CUF-TW09	92.0 - 93.0	350.1 - 349.1	33	12
CUF-TW09	95.1 - 95.6	347.0 - 346.5	38	18
CUF-TW09	102.5 - 104.0	339.6 - 338.1	35	15
CUF-TW09	115.0 - 116.5, 117.5 - 119.0	327.1 - 325.6, 324.6 - 323.1	26	7
CUF-TW09	125.0 - 126.5	317.1 - 315.6	28	11
CUF-TW09	130.0 - 131.5	312.1 - 310.6	44	26
CUF-B11	43.5 - 43.9	346.6 - 346.2	43	22
CUF-B11	55.0 - 56.5	335.1 - 333.6	27	11
CUF-B12	10.0 - 11.5	377.4 - 375.9	34	17
CUF-B12	17.5 - 19.0	369.9 - 368.4	36	19
CUF-B12	27.5 - 29.0	359.9 - 358.4	43	26
CUF-B13	5.0 - 6.5	389.7 - 388.2	47	31
CUF-B13	18.3 - 18.7	376.4 - 376.0	71	47
CUF-B13	55.0 - 58.5	339.7 - 336.2	39	22
CUF-B14	5.0 - 6.5	435.8 - 434.3	NP	NP
CUF-B14	35.0 - 36.5	405.8 - 404.3	NP	NP
CUF-B14	46.2 - 46.6	394.6 - 394.2	NP	NP
CUF-B14	47.5 - 49.0	393.3 - 391.8	NP	NP
CUF-B14	61.2 - 61.6	379.6 - 379.2	NP	NP
CUF-B14	80.9 - 81.2	359.9 - 359.6	49	33
CUF-B14	82.5 - 84.0	358.3 - 356.8	36	20
CUF-B14	97.5 - 99.0	343.3 - 341.8	35	20
CUF-B14	112.5 - 114.0	328.3 - 326.8	27	7
CUF-B15	57.5 - 59.0	380.8 - 379.3	NP	NP

Table F.3 - Summary of Atterberg Limits Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
CUF-B15	78.2 - 78.5	360.1 - 359.8	NP	NP
CUF-B15	95.0 - 96.5	343.3 - 341.8	NP	NP
CUF-B15	97.5 - 99.0	340.8 - 339.3	NP	NP
CUF-B15	101.1 - 101.5, 102.5 - 103.4	337.2 - 336.8, 335.8 - 334.9	36	12
CUF-B15	105.0 - 106.5	333.3 - 331.8	32	7
CUF-B16	12.5 - 14.0	427.2 - 425.7	NP	NP
CUF-B16	40.0 - 41.5	399.7 - 398.2	NP	NP
CUF-B16	60.3 - 60.7	379.4 - 379.0	NP	NP
CUF-B16	85.0 - 86.5	354.7 - 353.2	NP	NP
CUF-B16	99.8 - 100.2	339.9 - 339.5	52	30
CUF-B16	120.0 - 121.5	319.7 - 318.2	28	13
CUF-B17	15.0 - 15.4	428.4 - 428.0	NP	NP
CUF-B17	37.5 - 39.0	405.9 - 404.4	NP	NP
CUF-B17	60.0 - 60.4	383.4 - 383.0	NP	NP
CUF-B17	85.0 - 86.5	358.4 - 356.9	NP	NP
CUF-B17	102.5 - 104.0	340.9 - 339.4	40	19
CUF-B18	10.0 - 11.5	385.0 - 383.5	42	23
CUF-B18	26.0 - 26.3	369.0 - 368.7	NP	NP
CUF-B18	38.0 - 38.3	357.0 - 356.7	43	25
CUF-B19	7.5 - 9.0	387.3 - 385.8	43	25
CUF-B19	28.7 - 29.0	366.1 - 365.8	NP	NP
CUF-B19	32.5 - 34.0	362.3 - 360.8	33	14
CUF-B19	40.0 - 41.5	354.8 - 353.3	39	26
CUF-B19	42.5 - 44.0	352.3 - 350.8	NP	NP
CUF-B20	5.0 - 6.5	373.8 - 372.3	60	43
CUF-B20	14.5 - 16.0	364.3 - 362.8	52	36
CUF-B20	26.5 - 28.0	352.3 - 350.8	43	28
CUF-B20	38.5 - 40.0	340.3 - 338.8	32	14
CUF-B20	44.5 - 46.0	334.3 - 332.8	NP	NP
CUF-B20	55.0 - 56.5	323.8 - 322.3	57	40
CUF-B20	65.0 - 66.5	313.8 - 312.3	59	42
CUF-B21	2.5 - 4.0	376.9 - 375.4	47	31
CUF-B21	10.0 - 11.5	369.4 - 367.9	38	23
CUF-B21	20.5 - 22.0	358.9 - 357.4	55	38
CUF-B21	35.5 - 37.0	343.9 - 342.4	63	45
CUF-B21	41.5 - 43.0	337.9 - 336.4	28	11
CUF-B21	55.0 - 56.5	324.4 - 322.9	51	32
CUF-B22	2.5 - 4.0	376.5 - 375.0	37	21
CUF-B22	10.0 - 11.5	369.0 - 367.5	38	23
CUF-B22	17.5 - 19.0	361.5 - 360.0	40	23
CUF-B22	22.0 - 23.5	357.0 - 355.5	35	19

Table F.3 - Summary of Atterberg Limits Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Liquid Limit (LL)	Plasticity Index (PI)
	ft	ft NGVD29		
CUF-B22	31.0 - 32.5	348.0 - 346.5	35	17
CUF-B22	35.5 - 37.0	343.5 - 342.0	30	12
CUF-B22	55.0 - 56.5	324.0 - 322.5	37	19
CUF-B22	75.0 - 76.5	304.0 - 302.5	44	26
CUF-B22	90.0 - 91.5	289.0 - 287.5	33	10
CUF-B23	5.0 - 6.5	390.3 - 388.8	49	31
CUF-B23	22.5 - 24.0	372.8 - 371.3	47	31
CUF-B23	31.5 - 33.0	363.8 - 362.3	NP	NP
CUF-B23	37.5 - 39.0	357.8 - 356.3	41	23
CUF-B23	40.5 - 41.6	354.8 - 353.7	56	36
CUF-B23	43.5 - 47.9	351.8 - 347.4	38	21
CUF-B23	51.0 - 52.5	344.3 - 342.8	36	11
CUF-B23	65.0 - 66.5	330.3 - 328.8	NP	NP
CUF-B23	85.0 - 86.5	310.3 - 308.8	34	17
CUF-B24	5.0 - 6.5	374.9 - 373.4	39	20
CUF-B24	17.5 - 19.0	362.4 - 360.9	48	28
CUF-B24	23.0 - 24.5	356.9 - 355.4	33	15
CUF-B24	26.0 - 27.5	353.9 - 352.4	34	15
CUF-B24	27.5 - 29.0	352.4 - 350.9	33	14
CUF-B24	30.5 - 31.1	349.4 - 348.8	31	11
CUF-B24	35.0 - 36.5	344.9 - 343.4	34	15
CUF-B24	42.5 - 44.0	337.4 - 335.9	25	4
CUF-B24	48.5 - 50.0	331.4 - 329.9	29	9
CUF-B24	60.0 - 61.5	319.9 - 318.4	28	8
CUF-B25	0.0 - 1.5	378.7 - 377.2	43	26
CUF-B25	12.5 - 14.0	366.2 - 364.7	45	27
CUF-B25	20.0 - 21.5	358.7 - 357.2	52	33
CUF-B25	27.5 - 29.0	351.2 - 349.7	42	24
CUF-B25	36.5 - 38.0	342.2 - 340.7	32	6
CUF-B25	41.0 - 42.5	337.7 - 336.2	29	4
CUF-B25	46.1 - 47.0	332.6 - 331.7	28	10
CUF-B25	48.5 - 50.0	330.2 - 328.7	31	14
CUF-B25	70.0 - 71.5	308.7 - 307.2	64	44

Notes:

ft	feet	NGVD29	National Geodetic Vertical Datum of 1929
ID	identification	NP	non-plastic

1. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

Table F.4 - Summary of Specific Gravity Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Specific Gravity
	ft	ft NGVD29	
CUF-TW01	10.5 - 12.0	416.2 - 414.7	2.35
CUF-TW01	30.0 - 31.5	396.7 - 395.2	2.54
CUF-TW01	41.3 - 41.7	385.4 - 385.0	2.61
CUF-TW01	41.7 - 42.0	385.0 - 384.7	2.59
CUF-TW01	56.0 - 57.5	370.7 - 369.2	2.65
CUF-TW01	64.0 - 65.5, 65.5 - 67.0	362.7 - 361.2, 361.2 - 359.7	2.67
CUF-TW02	3.5 - 4.5	423.5 - 422.5	2.37
CUF-TW02	20.0 - 20.4	407.0 - 406.6	2.43
CUF-TW02	20.4 - 20.7	406.6 - 406.3	2.44
CUF-TW03	13.5 - 15.0	410.9 - 409.4	2.34
CUF-TW03	29.0 - 29.4	395.4 - 395.0	2.55
CUF-TW03	29.4 - 29.7	395.0 - 394.7	2.56
CUF-TW03	44.0 - 45.5	380.4 - 378.9	2.48
CUF-TW03	63.5 - 65.0	360.9 - 359.4	2.36
CUF-TW03	68.9 - 69.3	355.5 - 355.1	2.67
CUF-TW03	69.3 - 69.6	355.1 - 354.8	2.66
CUF-TW04	4.5 - 6.0	419.5 - 418.0	2.35
CUF-TW04	18.5 - 19.5	405.5 - 404.5	2.36
CUF-TW04	19.5 - 20.1	404.5 - 403.9	2.34
CUF-TW05	5.0 - 5.3	417.5 - 417.2	2.36
CUF-TW05	5.3 - 5.7	417.2 - 416.8	2.38
CUF-TW05	15.5 - 16.5	407.0 - 406.0	2.36
CUF-TW05	29.1 - 29.4	393.4 - 393.1	2.51
CUF-TW05	31.0 - 31.5	391.5 - 391.0	2.54
CUF-TW05	44.5 - 46.0	378.0 - 376.5	2.45
CUF-TW05	58.5 - 59.5	364.0 - 363.0	2.65
CUF-TW05	66.5 - 66.9	356.0 - 355.6	2.70
CUF-TW05	66.9 - 67.2	355.6 - 355.3	2.72
CUF-TW06	10.5 - 10.9	411.5 - 411.1	2.37
CUF-TW06	10.9 - 11.3	411.1 - 410.7	2.35
CUF-TW07	13.5 - 15.0	424.8 - 423.3	2.52
CUF-TW07	43.5 - 45.0	394.8 - 393.3	2.58
CUF-TW07	51.0 - 51.5	387.3 - 386.8	2.54
CUF-TW07	60.0 - 60.4	378.3 - 377.9	2.52
CUF-TW07	60.4 - 60.9	377.9 - 377.4	2.50
CUF-TW07	69.5 - 71.0	368.8 - 367.3	2.57
CUF-TW07	78.5 - 80.0	359.8 - 358.3	2.52
CUF-TW07	96.2 - 97.0	342.1 - 341.3	2.63
CUF-TW07	98.5 - 99.0	339.8 - 339.3	2.65
CUF-TW07	103.0 - 104.5	335.3 - 333.8	2.66
CUF-TW07	110.5 - 111.1	327.8 - 327.2	2.66

Table F.4 - Summary of Specific Gravity Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Specific Gravity
	ft	ft NGVD29	
CUF-TW07	115.0 - 116.5, 116.5 - 118.0	323.3 - 321.8, 321.8 - 320.3	2.65
CUF-TW07	121.0 - 122.5, 122.5 - 124.0, 124.0 - 125.2	317.3 - 315.8, 315.8 - 314.3, 314.3 - 313.1	2.70
CUF-TW08	9.0 - 9.9	429.0 - 428.1	2.63
CUF-TW08	34.5 - 36.0	403.5 - 402.0	2.56
CUF-TW08	49.5 - 51.0	388.5 - 387.0	2.56
CUF-TW08	58.5 - 60.0	379.5 - 378.0	2.52
CUF-TW08	78.5 - 80.0	359.5 - 358.0	2.50
CUF-TW08	83.0 - 84.5	355.0 - 353.5	2.68
CUF-TW08	88.7 - 89.1	349.3 - 348.9	2.67
CUF-TW08	89.1 - 89.5	348.9 - 348.5	2.59
CUF-TW08	97.5 - 99.0	340.5 - 339.0	2.70
CUF-TW08	100.5 - 102.0	337.5 - 336.0	2.67
CUF-TW08	103.5 - 105.0	334.5 - 333.0	2.64
CUF-TW08	106.5 - 108.0, 108.0 - 109.5	331.5 - 330.0, 330.0 - 328.5	2.74
CUF-TW08	109.5 - 110.5	328.5 - 327.5	2.67
CUF-TW08	120.0 - 121.5, 121.5 - 123.0, 123.0 - 124.5	318.0 - 316.5, 316.5 - 315.0, 315.0 - 313.5	2.69
CUF-TW09	3.5 - 4.5	438.6 - 437.6	2.52
CUF-TW09	15.0 - 16.5	427.1 - 425.6	2.67
CUF-TW09	24.5 - 26.0	417.6 - 416.1	2.58
CUF-TW09	39.5 - 41.0	402.6 - 401.1	2.46
CUF-TW09	55.8 - 56.0	386.3 - 386.1	2.36
CUF-TW09	63.5 - 63.8	378.6 - 378.3	2.57
CUF-TW09	63.8 - 64.0	378.3 - 378.1	2.55
CUF-TW09	79.5 - 81.0	362.6 - 361.1	2.51
CUF-TW09	92.0 - 93.0	350.1 - 349.1	2.64
CUF-TW09	95.1 - 95.6	347.0 - 346.5	2.67
CUF-TW09	95.6 - 95.9	346.5 - 346.2	2.68
CUF-TW09	102.5 - 104.0	339.6 - 338.1	2.69
CUF-TW09	115.0 - 116.5, 117.5 - 119.0	327.1 - 325.6, 324.6 - 323.1	2.69
CUF-TW09	125.0 - 126.5	317.1 - 315.6	2.67
CUF-TW09	130.0 - 131.5	312.1 - 310.6	2.73
CUF-B11	2.5 - 4.0, 5.0 - 6.5	387.6 - 386.1, 385.1 - 383.6	2.62
CUF-B11	20.0 - 21.5	370.1 - 368.6	2.68

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Table F.4 - Summary of Specific Gravity Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Specific Gravity
	ft	ft NGVD29	
CUF-B11	25.0 - 26.5, 27.5 - 29.0	365.1 - 363.6, 362.6 - 361.1	2.72
CUF-B11	35.0 - 36.5, 37.5 - 39.0	355.1 - 353.6, 352.6 - 351.1	2.70
CUF-B11	43.5 - 43.9	346.6 - 346.2	2.67
CUF-B11	43.9 - 44.3	346.2 - 345.8	2.68
CUF-B11	55.0 - 56.5	335.1 - 333.6	2.65
CUF-B11	62.5 - 64.0, 65.0 - 66.5	327.6 - 326.1, 325.1 - 323.6	2.65
CUF-B11	75.0 - 76.5, 77.5 - 79.0	315.1 - 313.6, 312.6 - 311.1	2.70
CUF-B12	10.0 - 11.5	377.4 - 375.9	2.65
CUF-B12	17.5 - 19.0	369.9 - 368.4	2.68
CUF-B12	27.5 - 29.0	359.9 - 358.4	2.66
CUF-B13	5.0 - 6.5	389.7 - 388.2	2.69
CUF-B13	18.3 - 18.7	376.4 - 376.0	2.73
CUF-B13	18.7 - 19.0	376.0 - 375.7	2.75
CUF-B13	55.0 - 58.5	339.7 - 336.2	2.67
CUF-B14	5.0 - 6.5	435.8 - 434.3	2.56
CUF-B14	35.0 - 36.5	405.8 - 404.3	2.49
CUF-B14	46.2 - 46.6	394.6 - 394.2	2.59
CUF-B14	47.5 - 49.0	393.3 - 391.8	2.41
CUF-B14	61.2 - 61.6	379.6 - 379.2	2.41
CUF-B14	61.6 - 61.9	379.2 - 378.9	2.41
CUF-B14	67.5 - 69.0, 70.0 - 71.5	373.3 - 371.8, 370.8 - 369.3	2.64
CUF-B14	80.9 - 81.2	359.9 - 359.6	2.70
CUF-B14	81.2 - 81.5	359.6 - 359.3	2.71
CUF-B14	82.5 - 84.0	358.3 - 356.8	2.72
CUF-B14	97.5 - 99.0	343.3 - 341.8	2.72
CUF-B14	102.5 - 104.0	338.3 - 336.8	2.62
CUF-B14	112.5 - 114.0	328.3 - 326.8	2.68
CUF-B15	15.0 - 15.3	423.3 - 423.0	2.68
CUF-B15	15.3 - 15.6	423.0 - 422.7	2.68
CUF-B15	35.0 - 36.1	403.3 - 402.2	2.62
CUF-B15	50.0 - 51.5	388.3 - 386.8	2.65
CUF-B15	57.5 - 59.0	380.8 - 379.3	2.46
CUF-B15	78.2 - 78.5	360.1 - 359.8	2.53
CUF-B15	78.5 - 78.8	359.8 - 359.5	
CUF-B15	95.0 - 96.5	343.3 - 341.8	2.43
CUF-B15	97.5 - 99.0	340.8 - 339.3	2.56
CUF-B15	101.1 - 101.5, 102.5 - 103.4	337.2 - 336.8, 335.8 - 334.9	2.59

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Table F.4 - Summary of Specific Gravity Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	Specific Gravity
	ft	ft NGVD29	
CUF-B15	105.0 - 106.5	333.3 - 331.8	2.61
CUF-B15	112.5 - 114.0, 115.0 - 116.5, 117.5 - 119.0	325.8 - 324.3, 323.3 - 321.8, 319.3 - 320.8	2.66
CUF-B16	12.5 - 14.0	427.2 - 425.7	2.55
CUF-B16	40.0 - 41.5	399.7 - 398.2	2.58
CUF-B16	53.5 - 54.0	386.2 - 385.7	2.65
CUF-B16	60.3 - 60.7	379.4 - 379.0	2.57
CUF-B16	60.7 - 61.0	379.0 - 378.7	2.62
CUF-B16	85.0 - 86.5	354.7 - 353.2	2.45
CUF-B16	99.8 - 100.2	339.9 - 339.5	2.67
CUF-B16	100.2 - 100.5	339.5 - 339.2	2.66
CUF-B16	115.0 - 116.5	324.7 - 323.2	2.67
CUF-B16	120.0 - 121.5	319.7 - 318.2	2.74
CUF-B17	15.0 - 15.4	428.4 - 428.0	2.57
CUF-B17	37.5 - 39.0	405.9 - 404.4	2.61
CUF-B17	55.0 - 56.5	388.4 - 386.9	2.79
CUF-B17	60.0 - 60.4	383.4 - 383.0	2.58
CUF-B17	85.0 - 86.5	358.4 - 356.9	2.45
CUF-B17	102.5 - 104.0	340.9 - 339.4	2.62
CUF-B17	106.0 - 106.5	337.4 - 336.9	2.64
CUF-B18	10.0 - 11.5	385.0 - 383.5	2.74
CUF-B18	26.0 - 26.3	369.0 - 368.7	2.28
CUF-B18	26.3 - 26.6	368.7 - 368.4	2.28
CUF-B18	38.0 - 38.3	357.0 - 356.7	2.64
CUF-B18	37.0 - 38.9	358.0 - 356.1	2.64
CUF-B19	7.5 - 9.0	387.3 - 385.8	2.70
CUF-B19	28.7 - 29.0	366.1 - 365.8	2.42
CUF-B19	29.0 - 29.3	365.8 - 365.5	2.42
CUF-B19	30.5 - 31.5	364.3 - 363.3	2.60
CUF-B19	32.5 - 34.0	362.3 - 360.8	2.65
CUF-B19	40.0 - 41.5	354.8 - 353.3	2.62
CUF-B19	42.5 - 44.0	352.3 - 350.8	2.70

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929

1. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

Table F.5 - Summary of USCS Soil Classification
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
CUF-TW01	10.5 - 12.0	416.2 - 414.7	ML
CUF-TW01	30.0 - 31.5	396.7 - 395.2	ML
CUF-TW01	41.3 - 41.7	385.4 - 385.0	ML
CUF-TW01	56.0 - 57.5	370.7 - 369.2	CL
CUF-TW01	64.0 - 65.5, 65.5 - 67.0	362.7 - 361.2, 361.2 - 359.7	GC
CUF-TW02	3.5 - 4.5	423.5 - 422.5	ML
CUF-TW02	20.0 - 20.4	407.0 - 406.6	CL-ML
CUF-TW03	13.5 - 15.0	410.9 - 409.4	ML
CUF-TW03	29.0 - 29.4	395.4 - 395.0	ML
CUF-TW03	44.0 - 45.5	380.4 - 378.9	ML
CUF-TW03	63.5 - 65.0	360.9 - 359.4	ML
CUF-TW03	68.9 - 69.3	355.5 - 355.1	CL
CUF-TW04	4.5 - 6.0	419.5 - 418.0	ML
CUF-TW04	18.5 - 19.5	405.5 - 404.5	ML
CUF-TW05	5.3 - 5.7	417.3 - 416.8	ML
CUF-TW05	15.5 - 16.5	407.0 - 406.0	ML
CUF-TW05	31.0 - 31.5	391.5 - 391.0	ML
CUF-TW05	44.5 - 46.0	378.0 - 376.5	ML
CUF-TW05	58.5 - 59.5	364.0 - 363.0	CL
CUF-TW05	66.5 - 66.9	356.0 - 355.6	CH
CUF-TW06	10.9 - 11.3	411.1 - 410.7	ML
CUF-TW07	13.5 - 15.0	424.8 - 423.3	SM
CUF-TW07	43.5 - 45.0	394.8 - 393.3	SP-SM
CUF-TW07	51.0 - 51.5	387.3 - 386.8	SM
CUF-TW07	60.4 - 60.9	377.9 - 377.4	ML
CUF-TW07	69.5 - 71.0	368.8 - 367.3	SW-SM
CUF-TW07	78.5 - 80.0	359.8 - 358.3	ML
CUF-TW07	96.2 - 97.0	342.1 - 341.3	CL
CUF-TW07	98.5 - 99.0	339.8 - 339.3	CL
CUF-TW07	103.0 - 104.5	335.3 - 333.8	SP-SM
CUF-TW07	110.5 - 111.1	327.8 - 327.2	CL
CUF-TW07	115.0 - 116.5, 116.5 - 118.0	323.3 - 321.8, 321.8 - 320.3	GW-GM
CUF-TW07	121.0 - 122.5, 122.5 - 124.0, 124.0 - 125.2	317.3 - 315.8, 315.8 - 314.3, 314.3 - 313.1	GP-GC
CUF-TW08	9.0 - 9.9	429.0 - 428.1	SM
CUF-TW08	34.5 - 36.0	403.5 - 402.0	SW-SM
CUF-TW08	58.5 - 60.0	379.5 - 378.0	ML
CUF-TW08	78.5 - 80.0	359.5 - 358.0	ML
CUF-TW08	83.0 - 84.5	355.0 - 353.5	CL

Table F.5 - Summary of USCS Soil Classification
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
CUF-TW08	88.7 - 89.1	349.3 - 348.9	CL
CUF-TW08	97.5 - 99.0	340.5 - 339.0	CL
CUF-TW08	100.5 - 102.0	337.5 - 336.0	CL-ML
CUF-TW08	103.5 - 105.0	334.5 - 333.0	CL-ML
CUF-TW08	106.5 - 108.0, 108.0 - 109.5	331.5 - 330.0, 330.0 - 328.5	SM
CUF-TW08	109.5 - 110.5	328.5 - 327.5	SC
CUF-TW08	120.0 - 121.5, 121.5 - 123.0, 123.0 - 124.5	318.0 - 316.5, 316.5 - 315.0, 315.0 - 313.5	GP-GC
CUF-TW09	3.5 - 4.5	438.6 - 437.6	ML
CUF-TW09	15.0 - 16.5	427.1 - 425.6	SM
CUF-TW09	24.5 - 26.0	417.6 - 416.1	ML
CUF-TW09	39.5 - 41.0	402.6 - 401.1	SW-SM
CUF-TW09	55.8 - 56.0	386.3 - 386.1	ML
CUF-TW09	63.5 - 63.8	378.6 - 378.3	ML
CUF-TW09	79.5 - 81.0	362.6 - 361.1	ML
CUF-TW09	92.0 - 93.0	350.1 - 349.1	CL
CUF-TW09	95.1 - 95.6	347.0 - 346.5	CL
CUF-TW09	102.5 - 104.0	339.6 - 338.1	CL
CUF-TW09	115.0 - 116.5, 117.5 - 119.0	327.1 - 325.6, 324.6 - 323.1	GP-GC
CUF-TW09	125.0 - 126.5	317.1 - 315.6	GC
CUF-TW09	130.0 - 131.5	312.1 - 310.6	SC
CUF-B11	43.5 - 43.9	346.6 - 346.2	CL
CUF-B11	55.0 - 56.5	335.1 - 333.6	CL
CUF-B12	10.0 - 11.5	377.4 - 375.9	CL
CUF-B12	17.5 - 19.0	369.9 - 368.4	CL
CUF-B12	27.5 - 29.0	359.9 - 358.4	CL
CUF-B13	5.0 - 6.5	389.7 - 388.2	CL
CUF-B13	18.3 - 18.7	376.4 - 376.0	CH
CUF-B13	55.0 - 58.5	339.7 - 336.2	CL
CUF-B14	5.0 - 6.5	435.8 - 434.3	ML
CUF-B14	35.0 - 36.5	405.8 - 404.3	SM
CUF-B14	46.2 - 46.6	394.6 - 394.2	SM
CUF-B14	47.5 - 49.0	393.3 - 391.8	ML
CUF-B14	61.2 - 61.6	379.6 - 379.2	ML
CUF-B14	80.9 - 81.2	359.9 - 359.6	CL
CUF-B14	82.5 - 84.0	358.3 - 356.8	GC
CUF-B14	97.5 - 99.0	343.3 - 341.8	GC
CUF-B14	112.5 - 114.0	328.3 - 326.8	SC-SM
CUF-B15	57.5 - 59.0	380.8 - 379.3	ML

Table F.5 - Summary of USCS Soil Classification
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
CUF-B15	78.2 - 78.5	360.1 - 359.8	ML
CUF-B15	95.0 - 96.5	343.3 - 341.8	ML
CUF-B15	97.5 - 99.0	340.8 - 339.3	ML
CUF-B15	101.1 - 101.5, 102.5 - 103.4	337.2 - 336.8, 335.8 - 334.9	CL
CUF-B15	105.0 - 106.5	333.3 - 331.8	ML
CUF-B16	12.5 - 14.0	427.2 - 425.7	ML
CUF-B16	40.0 - 41.5	399.7 - 398.2	SM
CUF-B16	60.3 - 60.7	379.4 - 379.0	ML
CUF-B16	85.0 - 86.5	354.7 - 353.2	ML
CUF-B16	99.8 - 100.2	339.9 - 339.5	CH
CUF-B16	120.0 - 121.5	319.7 - 318.2	GC
CUF-B17	15.0 - 15.4	428.4 - 428.0	ML
CUF-B17	37.5 - 39.0	405.9 - 404.4	ML
CUF-B17	60.0 - 60.4	383.4 - 383.0	GM
CUF-B17	85.0 - 86.5	358.4 - 356.9	ML
CUF-B17	102.5 - 104.0	340.9 - 339.4	CL
CUF-B18	10.0 - 11.5	385.0 - 383.5	CL
CUF-B18	26.0 - 26.3	369.0 - 368.7	ML
CUF-B18	38.0 - 38.3	357.0 - 356.7	CL
CUF-B19	7.5 - 9.0	387.3 - 385.8	CL
CUF-B19	28.7 - 29.0	366.1 - 365.8	ML
CUF-B19	32.5 - 34.0	362.3 - 360.8	CL
CUF-B19	40.0 - 41.5	354.8 - 353.3	CL
CUF-B19	42.5 - 44.0	352.3 - 350.8	SM
CUF-B20	5.0 - 6.5	373.8 - 372.3	CH
CUF-B20	14.5 - 16.0	364.3 - 362.8	CH
CUF-B20	26.5 - 28.0	352.3 - 350.8	CL
CUF-B20	38.5 - 40.0	340.3 - 338.8	CL
CUF-B20	44.5 - 46.0	334.3 - 332.8	SM
CUF-B20	55.0 - 56.5	323.8 - 322.3	CH
CUF-B20	65.0 - 66.5	313.8 - 312.3	CH
CUF-B21	2.5 - 4.0	376.9 - 375.4	CL
CUF-B21	10.0 - 11.5	369.4 - 367.9	CL
CUF-B21	20.5 - 22.0	358.9 - 357.4	CH
CUF-B21	35.5 - 37.0	343.9 - 342.4	
CUF-B21	41.5 - 43.0	337.9 - 336.4	CL
CUF-B21	55.0 - 56.5	324.4 - 322.9	GC
CUF-B22	2.5 - 4.0	376.5 - 375.0	CL
CUF-B22	10.0 - 11.5	369.0 - 367.5	CL
CUF-B22	17.5 - 19.0	361.5 - 360.0	CL
CUF-B22	22.0 - 23.5	357.0 - 355.5	CL

Table F.5 - Summary of USCS Soil Classification
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification
	ft	ft NGVD29	
CUF-B22	31.0 - 32.5	348.0 - 346.5	CL
CUF-B22	35.5 - 37.0	343.5 - 342.0	GC
CUF-B22	55.0 - 56.5	324.0 - 322.5	CL
CUF-B22	75.0 - 76.5	304.0 - 302.5	CL
CUF-B22	90.0 - 91.5	289.0 - 287.5	SC
CUF-B23	5.0 - 6.5	390.3 - 388.8	CL
CUF-B23	22.5 - 24.0	372.8 - 371.3	CL
CUF-B23	31.5 - 33.0	363.8 - 362.3	ML
CUF-B23	37.5 - 39.0	357.8 - 356.3	CL
CUF-B23	40.5 - 41.6	354.8 - 353.7	GC
CUF-B23	43.5 - 47.9	351.8 - 347.4	GC
CUF-B23	51.0 - 52.5	344.3 - 342.8	ML
CUF-B23	65.0 - 66.5	330.3 - 328.8	GW-GM
CUF-B23	85.0 - 86.5	310.3 - 308.8	SC
CUF-B24	5.0 - 6.5	374.9 - 373.4	CL
CUF-B24	17.5 - 19.0	362.4 - 360.9	CL
CUF-B24	23.0 - 24.5	356.9 - 355.4	GC
CUF-B24	26.0 - 27.5	353.9 - 352.4	SC
CUF-B24	27.5 - 29.0	352.4 - 350.9	CL
CUF-B24	30.5 - 31.1	349.4 - 348.8	GC
CUF-B24	35.0 - 36.5	344.9 - 343.4	CL
CUF-B24	42.5 - 44.0	337.4 - 335.9	SC-SM
CUF-B24	48.5 - 50.0	331.4 - 329.9	GC
CUF-B24	60.0 - 61.5	319.9 - 318.4	SP-SC
CUF-B25	0.0 - 1.5	378.7 - 377.2	CL
CUF-B25	12.5 - 14.0	366.2 - 364.7	CL
CUF-B25	20.0 - 21.5	358.7 - 357.2	CH
CUF-B25	27.5 - 29.0	351.2 - 349.7	CL
CUF-B25	36.5 - 38.0	342.2 - 340.7	ML
CUF-B25	41.0 - 42.5	337.7 - 336.2	SM
CUF-B25	46.1 - 47.0	332.6 - 331.7	SC
CUF-B25	48.5 - 50.0	330.2 - 328.7	SC
CUF-B25	70.0 - 71.5	308.7 - 307.2	CH

Notes:

ft	feet
ID	identification
NGVD29	National Geodetic Vertical Datum of 1929
USCS	Unified Soil Classification System

1. Where multiple test intervals are reported for a single result, a composite sample for the intervals was tested.

Stantec

Table F.6 - Summary of Vertical Hydraulic Conductivity Testing
Cumberland Fossil Plant
November 2018 - December 2020

Boring ID	Test Interval Depth	Test Interval Elevation	USCS Classification	Hydraulic Conductivity, Kv
	ft	ft NGVD29		cm/s
CUF-TW01	41.7 - 42.0	385.0 - 384.7	ML	1.29E-06
CUF-TW02	20.4 - 20.7	406.6 - 406.3	CL	2.40E-07
CUF-TW03	29.4 - 29.7	395.0 - 394.7	ML	6.42E-06
CUF-TW03	69.3 - 69.6	355.1 - 354.8	CL	2.19E-08
CUF-TW04	19.5 - 20.1	404.5 - 403.9	ML	4.64E-06
CUF-TW05	5.0 - 5.3	417.5 - 417.2	ML	8.45E-06
CUF-TW05	29.1 - 29.4	393.4 - 393.1	ML	1.64E-06
CUF-TW05	66.9 - 67.2	355.6 - 355.3	CH	2.42E-09
CUF-TW06	10.5 - 10.9	411.5 - 411.1	ML	6.87E-06
CUF-TW07	60.0 - 60.4	378.3 - 377.9	ML	1.30E-06
CUF-TW08	89.1 - 89.5	348.9 - 348.5	CL	5.66E-09
CUF-TW09	63.8 - 64.0	378.3 - 378.1	ML	1.01E-07
CUF-TW09	95.6 - 95.9	346.5 - 346.2	CL	7.64E-09
CUF-B11	43.9 - 44.3	346.2 - 345.8	CL	7.40E-09
CUF-B13	18.7 - 19.0	376.0 - 375.7	CH	1.95E-08
CUF-B14	61.6 - 61.9	379.2 - 378.9	ML	1.02E-05
CUF-B14	81.2 - 81.5	359.6 - 359.3	CL	1.36E-09
CUF-B15	15.3 - 15.6	423.0 - 422.7	ML	1.19E-05
CUF-B15	78.5 - 78.8	359.8 - 359.5	ML	2.96E-05
CUF-B16	60.7 - 61.0	379.0 - 378.7	ML	1.29E-06
CUF-B16	100.2 - 100.5	339.5 - 339.2	CH	5.83E-09
CUF-B17	60.0 - 60.4	383.4 - 383.0	GM	1.20E-06
CUF-B18	26.3 - 26.6	368.7 - 368.4	ML	3.99E-06
CUF-B18	37.0 - 38.9	358.0 - 356.1	CL	1.60E-08
CUF-B19	29.0 - 29.3	365.8 - 365.5	ML	3.37E-05

Notes:

cm/s	centimeters per second	Kv	Vertical Hydraulic Conductivity
ft	feet	NGVD29	National Geodetic Vertical Datum of 1929
ID	identification	USCS	Unified Soil Classification System

ATTACHMENT F.2

Natural Moisture Content Testing Results

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By RC
Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B16-SS02, 2.5'-3.8'	2	1/28/19	Hom	3/8"			No	31.37	127.88	106.71	28.1
CUF-GT-B16-SS04, 7.5'-9.0'	4	1/28/19	Hom	3/8"			No	31.41	141.24	130.94	10.3
CUF-GT-B16-SS06, 12.5'-14.0'	6	1/28/19	Hom	3/8"			No	30.56	93.37	84.45	16.6
CUF-GT-B16-SS08, 17.5'-18.0'	8	1/28/19	Hom	No. 4			No	30.36	117.22	103.65	18.5
CUF-GT-B16-SS10, 22.5'-23.4'	10	1/28/19	Hom	3/8"			No	30.19	104.45	92.84	18.5
CUF-GT-B16-SS12, 27.5'-28.2'	12	1/28/19	Hom	3/8"			No	31.96	140.60	121.06	21.9
CUF-GT-B16-SS14, 32.5'-33.3'	14	1/28/19	Hom	3/8"			No	31.69	146.99	127.54	20.3
CUF-GT-B16-SS17, 40.0'-41.5'	17	1/28/19	Hom	No. 4			No	31.64	86.88	77.06	21.6
CUF-GT-B16-SS19, 47.5'-48.2'	19	1/28/19	Hom	3/8"			No	30.36	141.49	120.60	23.1
CUF-GT-B16-SS21a, 52.5'-53.5'	21	1/28/19	Hom	3/4"			No	30.41	152.95	130.81	22.1
CUF-GT-B16-SS21b, 53.5'-54.0'	22	1/28/19	Hom	1 1/2"			No	30.79	80.68	78.48	4.6
CUF-GT-B16-SS22, 55.0'-56.5'	23	1/28/19	Hom	3/8"			No	31.45	135.89	108.54	35.5
CUF-GT-B16-ST01, 60.0'-62.0'	25	1/28/19	Hom	3/8"			No	30.30	138.22	110.48	34.6
CUF-GT-B16-SS25, 65.0'-66.5'	27	1/28/19	Hom	3/8"			No	29.78	146.97	108.09	49.6
CUF-GT-B16-SS27, 70.0'-71.5'	29	1/28/19	Hom	No. 4			No	32.37	137.87	109.10	37.5
CUF-GT-B16-SS29, 75.0'-76.5'	31	1/28/19	Hom	3/4"			No	30.10	138.48	107.28	40.4
CUF-GT-B16-SS31, 80.0'-81.5'	33	1/28/19	Hom	3/8"			No	30.12	137.35	109.76	34.6
CUF-GT-B16-SS33, 85.0'-86.5'	35	1/28/19	Hom	No. 10			Yes	30.12	90.19	67.40	61.1
CUF-GT-B16-SS35, 90.0'-91.5'	37	1/28/19	Hom	No. 4			No	31.60	133.12	100.76	46.8
CUF-GT-B16-SS37, 95.0'-96.5'	39	1/28/19	Hom	No. 4			No	31.78	137.93	105.01	45.0
CUF-GT-B16-ST02, 99.0'-101.0'	41	1/28/19	Hom	No. 4			No	30.28	124.31	100.37	34.2
CUF-GT-B16-SS39b, 101.8'-102.3'	43	1/28/19	Hom	1 1/2"			No	30.09	156.05	130.47	25.5
CUF-GT-B16-SS40a, 102.5'-103.0'	44	1/28/19	Hom	3/4"			No	29.60	129.91	103.92	35.0
CUF-GT-B16-SS40b, 103.0'-103.5'	45	1/28/19	Hom	1 1/2"			No	31.02	159.34	134.61	23.9
CUF-GT-B16-SS41, 105.0'-106.5'	46	1/28/19	Hom	1 1/2"			No	30.40	164.65	142.00	20.3
CUF-GT-B16-SS42a, 110.0'-110.8'	48	1/28/19	Hom	1 1/2"			No	30.10	138.95	117.13	25.1
CUF-GT-B16-SS42b, 110.8'-111.3'	49	1/28/19	Hom	1 1/2"			No	32.08	149.92	125.24	26.5
CUF-GT-B16-SS43a, 112.5'-113.1'	50	1/28/19	Hom	3/4"			No	30.33	160.07	135.04	23.9

Stantec

Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By RC

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Test Method ASTM

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B16-SS44, 115.0'-116.5'	52	1/28/19	Hom	3/4"			No	30.12	93.93	85.12	16.0
CUF-GT-B16-SS45, 117.5'-119.0'	53	1/28/19	Hom	1 1/2"			No	29.85	154.49	132.83	21.0
CUF-GT-B16-SS46, 120.0'-121.5'	54	1/28/19	Hom	1 1/2"			No	30.07	80.88	66.81	38.3
CUF-GT-B17-SS02, 2.5'-4.0'	57	1/28/19	Hom	3/4"			No	30.31	125.42	110.78	18.2
CUF-GT-B17-SS04, 7.5'-8.7'	59	1/28/19	Hom	3/8"			No	31.45	135.71	115.40	24.2
CUF-GT-B17-ST01, 15.0'-17.0'	62	1/28/19	Hom	3/4"			No	30.43	112.82	100.47	17.6
CUF-GT-B17-SS08, 20.0'-21.5'	64	1/28/19	Hom	No. 4			No	29.95	123.29	111.98	13.8
CUF-GT-B17-SS10, 25.0'-25.9'	66	1/28/19	Hom	No. 4			No	30.38	115.37	103.64	16.0
CUF-GT-B17-SS12, 30.0'-30.9'	68	1/28/19	Hom	3/4"			No	30.88	119.62	104.39	20.7
CUF-GT-B17-SS15, 37.5'-39.0'	71	1/28/19	Hom	No. 10			Yes	31.67	73.29	66.83	18.4
CUF-GT-B17-SS17, 42.5'-43.9'	73	1/28/19	Hom	3/8"			No	31.47	149.62	130.28	19.6
CUF-GT-B17-SS19, 47.5'-48.4'	75	1/28/19	Hom	3/8"			No	29.93	136.36	115.57	24.3
CUF-GT-B17-SS21, 52.5'-53.9'	77	1/28/19	Hom	3/8"			No	31.94	146.16	124.56	23.3
CUF-GT-B17-SS22, 55.0'-56.5'	78	1/28/19	Hom	1 1/2"			No	32.21	92.84	91.48	2.3
CUF-GT-B17-ST02, 60.0'-62.0'	80	1/28/19	Hom	1 1/2"			No	30.54	113.52	98.20	22.6
CUF-GT-B17-SS25, 65.0'-66.5'	82	1/28/19	Hom	3/4"			No	31.18	153.45	122.65	33.7
CUF-GT-B17-SS27, 70.0'-71.5'	84	1/28/19	Hom	3/8"			No	31.89	133.58	99.14	51.2
CUF-GT-B17-SS29, 75.0'-76.5'	86	1/28/19	Hom	3/8"			No	30.25	136.30	101.99	47.8
CUF-GT-B17-SS30, 77.5'-79.0'	87	1/28/19	Hom	3/8"			No	31.48	127.01	100.07	39.3
CUF-GT-B17-SS31, 80.0'-81.5'	88	1/28/19	Hom	No. 4			No	29.86	124.12	89.74	57.4
CUF-GT-B17-SS33, 85.0'-86.5'	90	1/28/19	Hom	No. 10			Yes	30.98	66.42	54.71	49.3
CUF-GT-B17-SS35, 90.0'-91.5'	92	1/28/19	Hom	No. 4			No	31.33	141.64	104.77	50.2
CUF-GT-B17-SS37, 95.0'-96.5'	94	1/28/19	Hom	No. 4			No	29.77	117.30	88.68	48.6
CUF-GT-B17-SS39, 100.0'-101.5'	96	1/28/19	Hom	No. 4			No	32.03	131.97	99.68	47.7
CUF-GT-B17-SS40, 102.5'-104.0'	97	1/28/19	Hom	3/8"			No	30.62	82.57	67.61	40.4
CUF-GT-B17-SS41b, 106.0'-106.5'	99	1/28/19	Hom	3/4"			No	31.80	53.18	48.56	27.6
CUF-GT-B17-SS42, 107.5'-107.7'	100	1/28/19	Hom	1 1/2"			No	31.51	130.13	119.04	12.7

Comments

Reviewed By RJ

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Moisture Content of Soil

ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By CM
Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-TW07-SS03b, 3.5'-4.5'	102	2/21/19	Dist	No. 10			Yes	29.84	119.94	97.07	34.0
CUF-GT-TW07-SS06b, 8.0'-9.0'	104	2/21/19	Dist	No. 4			No	29.86	137.72	116.13	25.0
CUF-GT-TW07-SS10, 13.5'-15.0'	107	2/21/19	Dist	3/4"			No	31.27	80.37	73.30	16.8
CUF-GT-TW07-SS13b, 18.5'-19.5'	109	2/21/19	Dist	No. 4			No	30.04	116.78	96.20	31.1
CUF-GT-TW07-SS17, 24.0'-24.8'	111	2/21/19	Dist	No. 4			No	31.74	130.98	119.50	13.1
CUF-GT-TW07-SS20b, 29.0'-30.0'	113	2/21/19	Dist	No. 4			No	30.50	144.87	125.22	20.7
CUF-GT-TW07-SS23b, 33.5'-34.5'	115	2/21/19	Dist	3/8"			No	30.57	99.62	94.34	8.3
CUF-GT-TW07-SS25a, 36.0'-36.5'	117	2/21/19	Dist	3/4"			No	31.56	95.76	90.97	8.1
CUF-GT-TW07-SS27a, 40.5'-41.5'	119	2/21/19	Dist	3/8"			No	30.90	104.38	99.08	7.8
CUF-GT-TW07-SS29, 43.5'-45.0'	120	2/21/19	Dist	3/8"			No	31.55	101.22	97.71	5.3
CUF-GT-TW07-SS33, 49.5'-51.0'	123	2/21/19	Dist	1 1/2"			No	30.58	110.99	97.71	19.8
CUF-GT-TW07-SS34a, 51.0'-51.5'	124	2/21/19	Dist	3/8"			No	30.18	102.83	90.63	20.2
CUF-GT-TW07-SS36b, 54.5'-55.5'	125	2/21/19	Dist	No. 4			No	31.20	115.15	92.61	36.7
CUF-GT-TW07-ST02, 60.0'-62.0'	128	2/21/19	Hom	1 1/2"			No	26.10	121.61	98.66	31.6
CUF-GT-TW07-SS41b, 64.0'-65.0'	129	2/21/19	Dist	No. 10			Yes	32.06	103.17	80.76	46.0
CUF-GT-TW07-SS45, 69.5'-71.0'	132	2/21/19	Dist	3/4"			No	31.74	123.56	107.79	20.7
CUF-GT-TW07-SS47b, 73.5'-74.0'	134	2/21/19	Dist	3/4"			No	30.64	129.09	103.32	35.5
CUF-GT-TW07-SS51, 78.5'-80.0'	137	2/21/19	Dist	No. 4			No	29.98	76.01	61.56	45.8
CUF-GT-TW07-SS55a, 84.5'-85.0'	139	2/21/19	Dist	No. 10			Yes	29.96	92.99	70.06	57.2
CUF-GT-TW07-SS58, 89.0'-90.5'	142	2/21/19	Dist	No. 10			Yes	31.44	96.48	75.91	46.3
CUF-GT-TW07-SS61, 94.0'-95.5'	144	2/21/19	Dist	No. 10			Yes	30.02	97.14	76.94	43.1
CUF-GT-TW07-SS62b, 96.2'-97.0'	146	2/21/19	Dist	No. 10			Yes	31.37	111.75	91.20	34.3
CUF-GT-TW07-SS63a, 98.5'-99.0'	147	2/21/19	Dist	3/8"			No	31.65	93.93	78.20	33.8
CUF-GT-TW07-SS64, 100.0'-101.5'	149	2/21/19	Dist	3/4"			No	29.94	132.43	115.53	19.7
CUF-GT-TW07-SS66, 103.0'-104.5'	151	2/21/19	Dist	1 1/2"			No	31.31	66.66	59.34	26.1
CUF-GT-TW07-SS68b, 107.0'-107.5' Organics	154	2/21/19									
CUF-GT-TW07-SS69b, 108.3'-109.0'	156	2/21/19	Dist	No. 4			No	31.39	147.07	122.07	27.6
CUF-GT-TW07-SS71a, 110.5'-111.1'	159	2/21/19	Dist	3/4"			No	31.50	119.09	99.46	28.9

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Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By CM
Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-TW07-SS72a, 112.0'-113.0'	161	2/21/19	Dist	1 1/2"			No	31.12	133.70	117.74	18.4
CUF-GT-TW07-SS74, 115.0'-116.5'	165	2/21/19	Dist	1 1/2"			No	30.03	73.86	65.18	24.7
CUF-GT-TW07-SS76, 118.0'-119.5'	167	2/21/19	Dist	1 1/2"			No	31.11	115.62	101.87	19.4
CUF-GT-TW07-SS78, 121.0'-122.5'	169	2/21/19	Dist	1 1/2"			No	30.98	89.65	79.80	20.2
CUF-GT-TW07-SS80, 124.0'-125.2'	171	2/21/19	Dist	1 1/2"			No	29.71	117.06	102.52	20.0
CUF-GT-TW08-SS03b, 4.0'-4.5'	173	2/21/19	Dist	3/4"			No	21.02	77.09	68.33	18.5
CUF-GT-TW08-SS05a, 6.0'-6.5'	175	2/21/19	Dist	3/4"			No	21.30	81.40	71.00	20.9
CUF-GT-TW08-SS07, 9.0'-9.9'	176	2/21/19	Dist	1 1/2"			No	21.68	53.11	45.26	33.3
CUF-GT-TW08-SS11, 15.0'-15.6'	177	2/21/19	Dist	1 1/2"			No	21.39	71.37	60.26	28.6
CUF-GT-TW08-SS14, 19.5'-19.9'	178	2/21/19	Dist	3/4"			No	21.61	62.06	55.19	20.5
CUF-GT-TW08-SS17, 24.0'-24.6'	179	2/21/19	Dist	1 1/2"			No	22.16	56.51	50.65	20.6
CUF-GT-TW08-SS24, 34.5'-36.0'	180	2/21/19	Dist	3/4"			No	21.03	60.28	56.64	10.2
CUF-GT-TW08-SS27, 39.0'-40.5'	182	2/21/19	Dist	3/4"			No	20.73	77.10	72.82	8.2
CUF-GT-TW08-SS30, 43.5'-44.9'	184	2/21/19	Dist	3/4"			No	21.24	66.39	62.42	9.6
CUF-GT-TW08-SS34, 49.5'-51.0'	187	2/21/19	Dist	1 1/2"			No	21.09	67.74	58.68	24.1
CUF-GT-TW08-SS37, 54.0'-55.5'	188	2/21/19	Dist	No. 10			Yes	22.26	76.22	62.85	32.9
CUF-GT-TW08-SS40, 58.5'-60.0'	190	2/21/19	Dist	No. 4			No	21.13	85.25	69.30	33.1
CUF-GT-TW08-SS43b, 63.5'-64.5'	192	2/21/19	Dist	No. 10			Yes	21.24	63.06	51.54	38.0
CUF-GT-TW08-SS44, 64.5'-66.0'	193	2/21/19	Dist	No. 10			Yes	22.35	115.22	91.79	33.7
CUF-GT-TW08-SS49, 74.0'-75.5'	194	2/21/19	Dist	1 1/2"			No	21.32	71.10	55.64	45.0
CUF-GT-TW08-SS52, 78.5'-80.0'	195	2/21/19	Dist	No. 10			Yes	22.32	72.09	56.11	47.3
CUF-GT-TW08-SS55, 83.0'-84.5'	197	2/21/19	Dist	No. 10			Yes	21.17	80.28	69.15	23.2
CUF-GT-TW08-SS56, 86.5'-88.0'	198	2/21/19	Dist	No. 4			No	20.71	84.24	71.94	24.0
CUF-GT-TW08-ST03, 88.0'-90.0'	199	2/21/19	Hom	3/8"			No	17.25	77.17	65.29	24.7
CUF-GT-TW08-SS58, 91.5'-93.0'	201	2/21/19	Dist	3/4"			No	21.56	87.62	74.38	25.1
CUF-GT-TW08-SS60, 94.5'-96.0'	203	2/21/19	Dist	3/8"			No	21.24	92.06	77.58	25.7
CUF-GT-TW08-SS62, 97.5'-99.0'	205	2/21/19	Dist	No. 4			No	21.24	87.98	73.87	26.8
CUF-GT-TW08-SS64, 100.5'-102.0'	207	2/21/19	Dist	No. 10			Yes	21.13	73.76	62.87	26.1

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Moisture Content of Soil

ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209

Tested By CM

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-TW08-SS66, 103.5'-105.0'	209	2/21/19	Dist	No. 10			Yes	21.30	81.35	68.56	27.1
CUF-GT-TW08-SS68, 106.5'-108.0'	211	2/21/19	Dist	3/4"			No	21.47	76.36	65.49	24.7
CUF-GT-TW08-SS70a, 109.5'-110.5'	213	2/21/19	Dist	1 1/2"			No	21.06	72.86	64.26	19.9
CUF-GT-TW08-SS72, 112.5'-114.0'	216	2/21/19	Dist	1 1/2"			No	21.62	74.70	67.71	15.2
CUF-GT-TW08-SS74, 115.5'-117.0'	218	2/21/19	Dist	1 1/2"			No	21.41	87.77	77.95	17.4
CUF-GT-TW08-SS76, 118.5'-120.0'	220	2/21/19	Dist	3/4"			No	21.22	70.20	62.35	19.1
CUF-GT-TW08-SS78, 121.5'-123.0'	222	2/21/19	Dist	3/4"			No	20.85	52.90	47.57	19.9
CUF-GT-TW08-SS80, 124.5'-126.0'	224	2/21/19	Dist	1 1/2"			No	21.17	77.38	68.20	19.5
CUF-GT-TW08-SS82, 127.5'-127.6'	226	2/21/19	Dist	3/4"			No	20.97	64.72	58.77	15.7

Comments

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Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-TW09-SS03b, 3.5'-4.5'	228	3/27/19	Hom	3/8"			No	21.33	107.86	88.19	29.4
CUF-GT-TW09-SS05a, 6.0'-6.5'	230	3/27/19	Hom	No. 10			Yes	21.15	98.14	82.30	25.9
CUF-GT-TW09-SS07, 9.0'-9.7'	232	3/27/19	Len	No. 4			No	20.96	98.75	83.36	24.7
CUF-GT-TW09-SS11, 15.0'-16.5'	234	3/27/19	Len	1 1/2"			No	21.21	98.01	88.92	13.4
CUF-GT-TW09-SS14, 20.0'-20.9'	236	3/27/19	Hom	No. 10			Yes	22.18	106.15	89.70	24.4
CUF-GT-TW09-SS17, 24.5'-26.0'	237	3/27/19	Hom	No. 10			Yes	20.89	117.63	98.79	24.2
CUF-GT-TW09-SS21, 30.5'-31.0'	238	3/27/19	Hom	No. 10			Yes	21.30	109.32	94.91	19.6
CUF-GT-TW09-SS24a, 35.0'-35.5'	240	3/27/19	Hom	No. 10			Yes	21.27	121.30	101.12	25.3
CUF-GT-TW09-SS26b, 38.5'-39.5'	242	3/27/19	Len	3/8"			No	20.95	105.10	92.12	18.2
CUF-GT-TW09-SS27, 39.5'-41.0'	243	3/27/19	Hom	3/4"			No	20.68	97.39	91.29	8.6
CUF-GT-TW09-SS29b, 43.0'-43.6'	244	3/27/19	Hom	3/4"			No	21.46	96.90	87.96	13.4
CUF-GT-TW09-SS32b, 47.5'-48.5'	246	3/27/19	Hom	3/4"			No	21.15	112.67	93.36	26.7
CUF-GT-TW09-SS34, 50.0'-51.5'	248	3/27/19	Hom	3/8"			No	21.01	136.50	104.68	38.0
CUF-GT-TW09-SS36b, 53.5'-54.5'	249	3/27/19	Hom	No. 10			Yes	20.64	142.18	109.02	37.5
CUF-GT-TW09-SS37b, 55.8'-56.0' 60° C	251	3/27/19	Hom	No. 10			Yes	21.19	116.38	97.86	24.2
CUF-GT-TW09-SS40, 59.0'-60.5'	252	3/27/19	Hom	3/4"			No	21.02	131.29	103.08	34.4
CUF-GT-TW09-ST01, 63.5'-65.5'	254	3/27/19	Hom	3/8"			No	21.40	92.89	78.33	25.6
CUF-GT-TW09-SS45b, 69.5'-70.0'	256	3/27/19	Hom	No. 10			Yes	21.31	137.07	104.86	38.6
CUF-GT-TW09-SS47b, 74.5'-75.0'	257	3/27/19	Hom	No. 10			Yes	21.17	141.22	111.07	33.5
CUF-GT-TW09-SS50b, 79.0'-79.5'	259	3/27/19	Hom	No. 10			Yes	21.60	130.87	95.58	47.7
CUF-GT-TW09-SS51, 79.5'-81.0'	260	3/27/19	Hom	No. 10			Yes	21.11	114.89	84.17	48.7
CUF-GT-TW09-SS54, 84.0'-85.5'	262	3/27/19	Hom	No. 10			Yes	20.79	131.94	96.68	46.5
CUF-GT-TW09-SS56b, 88.0'-88.5'	263	3/27/19	Hom	No. 10			Yes	22.30	134.61	98.44	47.5
CUF-GT-TW09-SS59, 92.0'-93.0'	266	3/27/19	Hom	No. 10			Yes	21.40	123.57	103.97	23.7
CUF-GT-TW09-ST03, 94.5'-96.5'	268	3/27/19	Hom	3/8"			No	20.88	102.21	86.24	24.4
CUF-GT-TW09-SS62, 98.5'-100.0'	270	3/27/19	Hom	No. 10			Yes	21.08	129.82	108.38	24.6
CUF-GT-TW09-SS64, 102.5'-104.0'	272	3/27/19	Hom	3/8"			No	21.07	123.61	102.63	25.7
CUF-GT-TW09-SS66b, 108.6'-109.0'	275	3/27/19	Len	3/4"			No	22.16	129.18	104.40	30.1

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Moisture Content of Soil

ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209

Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded		Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
					Amount	Size					
CUF-GT-TW09-SS68, 112.5'-114.0'	277	3/27/19	Hom	1 1/2"			No	21.10	134.49	111.14	25.9
CUF-GT-TW09-SS70, 117.5'-119.0'	279	3/27/19	Hom	1 1/2"			No	21.24	123.26	106.03	20.3
CUF-GT-TW09-SS72, 122.5'-124.0'	281	3/27/19	Len	1 1/2"			No	22.05	134.00	114.87	20.6
CUF-GT-TW09-SS73, 125.0'-126.5'	282	3/27/19	Len	1 1/2"			No	20.95	109.68	93.27	22.7
CUF-GT-TW09-SS75, 130.0'-131.5'	284	3/27/19	Dist	1 1/2"			No	21.13	135.84	110.87	27.8

Comments

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Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB
Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source		Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-TW01-SS03bG, 3.5'-4.5'	60° C	287	4/30/19	Len	3/4"			No	21.24	97.83	91.93	8.3
CUF-GT-TW01-SS06bG, 8.0'-9.0'	60° C	289	4/30/19	Hom	No. 10			Yes	21.36	94.48	89.23	7.7
CUF-GT-TW01-SS08G, 10.5'-12.0'	60° C	291	4/30/19	Hom	No. 4			No	21.17	94.13	87.04	10.8
CUF-GT-TW01-SS11G, 15.0'-16.5'	60° C	293	4/30/19	Hom	No. 10			Yes	21.10	105.54	91.97	19.1
CUF-GT-TW01-SS14G, 19.5'-21.0'	60° C	295	4/30/19	Dist	No. 10			Yes	21.17	109.74	94.37	21.0
CUF-GT-TW01-SS17bG, 24.5'-25.0'	60° C	297	4/30/19	Hom	No. 10			Yes	21.07	115.04	99.88	19.2
CUF-GT-TW01-SS18bG, 25.8'-27.0'		301	4/30/19	Hom	No. 10			Yes	20.99	107.79	84.01	37.7
CUF-GT-TW01-SS21G, 30.0'-31.5'		303	4/30/19	Hom	3/8"			No	21.27	109.95	80.91	48.7
CUF-GT-TW01-SS24aG, 34.6'-35.6'		306	4/30/19	Hom	No. 10			Yes	21.06	100.50	74.76	47.9
CUF-GT-TW01-ST02, 40.5'-42.5'		309	4/30/19	Hom	No. 4			No	21.22	106.67	81.91	40.8
CUF-GT-TW01-SS30G, 45.5'-47.0'		311	4/30/19	Hom	No. 10			Yes	21.36	125.72	93.02	45.6
CUF-GT-TW01-SS35bG, 53.8'-54.5'		314	4/30/19	Hom	No. 10			Yes	20.69	139.36	116.00	24.5
CUF-GT-TW01-SS37G, 56.0'-57.5'		317	4/30/19	Hom	3/8"			No	21.96	110.80	93.55	24.1
CUF-GT-TW01-SS38aG, 59.8'-60.3'		318	4/30/19	Hom	No. 10			Yes	19.92	126.12	102.46	28.7
CUF-GT-TW01-SS39aG, 61.0'-62.0'		320	4/30/19	Len	3/4"			No	21.93	85.83	70.30	32.1
CUF-GT-TW01-SS41G, 64.0'-65.5'		324	4/30/19	Len	3/4"			No	20.92	118.38	95.62	30.5
CUF-GT-TW01-SS42G, 65.5'-67.0'		325	4/30/19	Len	3/4"			No	21.56	135.79	107.29	33.2
CUF-GT-TW02-SS03bG, 3.5'-4.5'	60° C	328	4/30/19	Dist	No. 4			No	20.79	71.88	65.84	13.4
CUF-GT-TW02-SS04aG, 6.0'-6.5'	60° C	330	4/30/19	Hom	No. 10			Yes	21.62	90.95	84.50	10.3
CUF-GT-TW02-SS06G, 9.0'-9.8'	60° C	332	4/30/19	Hom	No. 10			Yes	21.99	90.83	82.84	13.1
CUF-GT-TW02-SS09G, 13.5'-15.0'	60° C	333	4/30/19	Dist	No. 10			Yes	21.43	121.44	101.42	25.0
CUF-GT-TW02-ST02, 19.5'-20.7'	60° C	336	4/30/19	Hom	No. 4			No	21.00	86.26	73.74	23.7
CUF-GT-TW02-SS15G, 24.0'-25.5'	60° C	338	4/30/19	Hom	No. 10			Yes	20.99	101.11	88.38	18.9
CUF-GT-TW03-SS03bG, 3.5'-4.5'	60° C	342	4/30/19	Dist	3/8"			No	21.04	95.15	87.14	12.1
CUF-GT-TW03-SS05aG, 6.0'-6.5'	60° C	344	4/30/19	Hom	No. 10			Yes	21.11	89.31	80.75	14.4
CUF-GT-TW03-SS07G, 9.0'-10.5'	60° C	346	4/30/19	Hom	No. 10			Yes	21.11	90.77	81.90	14.6
CUF-GT-TW03-SS10G, 13.5'-15.0'	60° C	348	4/30/19	Hom	No. 10			Yes	21.31	93.90	85.68	12.8
CUF-GT-TW03-SS13bG, 18.5'-19.5'	60° C	350	4/30/19	Hom	No. 10			Yes	21.17	113.28	93.71	27.0

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Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB
Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source		Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-TW03-SS16bG, 23.0'-24.0'	60° C	352	4/30/19	Dist	No. 10			Yes	20.88	108.77	93.87	20.4
CUF-GT-TW03-SS18aG, 25.5'-26.5'		355	5/1/19	Hom	No. 10			Yes	21.09	100.66	76.55	43.5
CUF-GT-TW03-ST01, 28.5'-30.5'		356	5/1/19	Hom	1 1/2"			No	21.95	72.24	58.26	38.5
CUF-GT-TW03-SS22G, 33.5'-35.0'		358	5/1/19	Hom	No. 4			No	21.06	135.28	102.62	40.0
CUF-GT-TW03-SS26G, 39.5'-41.0'		361	6/25/19	Dist	No. 10			Yes	31.76	186.46	138.98	44.3
CUF-GT-TW03-SS29G, 44.0'-45.5'		362	5/1/19	Hom	No. 10			Yes	21.51	130.22	97.18	43.7
CUF-GT-TW03-SS33G, 50.0'-51.5'		364	5/1/19	Dist	3/4"			No	22.00	96.06	73.43	44.0
CUF-GT-TW03-SS37aG, 56.0'-56.5'		367	5/1/19	Hom	No. 4			No	20.97	113.98	87.34	40.1
CUF-GT-TW03-SS42G, 63.5'-65.0'		369	5/1/19	Hom	No. 10			Yes	19.70	116.36	82.36	54.3
CUF-GT-TW03-ST02, 68.0'-70.0'	60° C	372	5/1/19	Hom	3/8"			No	20.44	94.50	82.42	19.5
CUF-GT-TW03-SS47G, 75.0'-76.5'		375	5/1/19	Len	3/8"			No	21.19	116.01	99.72	20.7
CUF-GT-TW04-SS04G, 4.5'-6.0'	60° C	379	5/1/19	Dist	3/8"			No	21.02	89.38	81.55	12.9
CUF-GT-TW04-SS07G, 9.0'-10.2'	60° C	380	5/1/19	Hom	3/8"			No	21.27	99.18	90.63	12.3
CUF-GT-TW04-SS11G, 15.0'-16.4'	60° C	382	5/1/19	Hom	No. 10			Yes	21.28	101.81	87.70	21.2
CUF-GT-TW04-SS13bG, 18.5'-19.5'	60° C	383	5/1/19	Hom	No. 10			Yes	20.89	99.84	84.77	23.6
CUF-GT-TW04-SS14G, 20.0'-20.8'	60° C	385	5/1/19	Dist	No. 10			Yes	21.15	97.20	85.56	18.1
CUF-GT-TW05-ST01, 4.5'-6.5'	60° C	390	5/1/19	Hom	3/4"			No	21.97	89.70	79.23	18.3
CUF-GT-TW05-SS05bG, 8.5'-9.5'	60° C	391	5/1/19	Str	No. 10			Yes	20.91	94.63	82.24	20.2
CUF-GT-TW05-SS07aG, 11.0'-11.5'	60° C	393	5/1/19	Str	No. 10			Yes	21.24	99.45	84.45	23.7
CUF-GT-TW05-SS10aG, 15.5'-16.5'	60° C	396	5/1/19	Str	No. 10			Yes	21.20	101.44	86.54	22.8
CUF-GT-TW05-SS12G, 18.5'-20.0'	60° C	397	5/1/19	Str	No. 10			Yes	20.97	109.92	92.78	23.9
CUF-GT-TW05-SS13bG, 21.0'-21.5'		400	5/1/19	Hom	No. 10			Yes	22.19	97.41	76.41	38.7
CUF-GT-TW05-SS16G, 24.5'-26.0'		402	5/1/19	Hom	No. 10			Yes	21.96	92.95	71.98	41.9
CUF-GT-TW05-SS19aG, 31.0'-31.5'		406	5/1/19	Hom	3/8"			No	30.82	140.39	110.39	37.7
CUF-GT-TW05-SS22aG, 35.5'-36.5'		408	5/1/19	Hom	No. 10			Yes	30.47	141.12	104.17	50.1
CUF-GT-TW05-SS24G, 38.5'-40.0'		409	5/1/19	Hom	No. 10			Yes	30.73	199.34	155.91	34.7
CUF-GT-TW05-SS28G, 44.5'-46.0'		411	5/1/19	Hom	No. 10			Yes	31.18	145.84	113.45	39.4
CUF-GT-TW05-SS31G, 49.0'-50.5'		412	5/1/19	Hom	No. 10			Yes	30.23	152.04	111.24	50.4

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Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Test Method ASTM

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source		Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-TW05-SS34G, 53.5'-55.0'		414	5/1/19	Dist	3/4"			No	30.25	158.94	123.72	37.7
CUF-GT-TW05-SS37bG, 58.5'-59.5'		416	5/1/19	Dist	3/4"			No	31.71	114.51	98.52	23.9
CUF-GT-TW05-ST04, 65.5'-67.5'		419	5/1/19	Hom	3/8"			No	20.97	100.88	82.60	29.7
CUF-GT-TW05-SS41G, 70.5'-72.0'		421	5/1/19	Dist	No. 4			No	31.85	124.91	100.22	36.1
CUF-GT-TW06-SS01aG, 0.0'-1.0'	60° C	423	5/1/19	Str	3/8"			No	20.97	98.68	89.00	14.2
CUF-GT-TW06-SS04G, 4.5'-6.0'	60° C	425	5/1/19	Str	No. 10			Yes	21.41	93.91	84.51	14.9
CUF-GT-TW06-ST01, 10.5'-12.3'	60° C	429	5/1/19	Hom	No. 4			No	21.23	88.53	78.23	18.1
CUF-GT-TW06-SS09bG, 14.5'-15.5'	60° C	430	5/1/19	Dist	No. 10			Yes	21.29	122.29	97.44	32.6
CUF-GT-TW06-SS12bG, 19.0'-20.0'	60° C	432	5/1/19	Hom	3"			No	21.17	96.32	90.78	8.0
CUF-GT-B11-SS02G, 2.5'-4.0'		437	5/2/19	Hom	3/4"			No	30.20	116.51	110.10	8.0
CUF-GT-B11-SS03G, 5.0'-6.5'		438	5/2/19	Hom	3/4"			No	30.61	103.75	97.68	9.1
CUF-GT-B11-SS05G, 10.0'-11.5'		441	5/2/19	Hom	1 1/2"			No	31.16	134.36	126.56	8.2
CUF-GT-B11-SS07G, 15.0'-16.5'		443	5/2/19	Hom	3/4"			No	31.84	116.31	109.76	8.4
CUF-GT-B11-SS09G, 20.0'-21.5'		445	5/2/19	Hom	3/4"			No	30.00	121.38	113.27	9.7
CUF-GT-B11-SS11G, 25.0'-26.5'		448	5/2/19	Hom	3/4"			No	31.76	173.94	148.25	22.1
CUF-GT-B11-SS12G, 27.5'-29.0'		449	5/2/19	Hom	1 1/2"			No	30.97	140.45	122.10	20.1
CUF-GT-B11-SS15G, 35.0'-36.5'		453	5/2/19	Dist	3/4"			No	30.69	141.61	118.69	26.0
CUF-GT-B11-SS16G, 37.5'-39.0'		454	5/2/19	Dist	3/4"			No	30.74	131.86	111.68	24.9
CUF-GT-B11-ST01, 42.5'-44.5'		456	5/2/19	Hom	No. 10			Yes	21.28	104.32	87.48	25.4
CUF-GT-B11-SS20G, 50.0'-51.5'		459	5/2/19	Dist	No. 10			Yes	30.72	154.59	129.98	24.8
CUF-GT-B11-SS22G, 55.0'-56.5'		462	5/2/19	Hom	3/8"			No	31.56	146.69	122.35	26.8
CUF-GT-B11-SS25G, 62.5'-64.0'		466	5/2/19	Dist	1 1/2"			No	31.55	138.05	118.18	22.9
CUF-GT-B11-SS26G, 65.0'-66.5'		467	5/2/19	Dist	3/4"			No	30.62	139.05	118.13	23.9
CUF-GT-B11-SS28G, 70.0'-71.5'		469	5/2/19	Dist	1 1/2"			No	31.51	149.62	125.18	26.1
CUF-GT-B11-SS30G, 75.0'-76.5'		472	5/2/19	Dist	1 1/2"			No	31.20	140.80	122.55	20.0
CUF-GT-B11-SS31G, 77.5'-79.0'		473	5/2/19	Dist	1 1/2"			No	30.15	135.23	119.05	18.2
CUF-GT-B11-SS32G, 80.0'-81.5'		474	5/2/19	Dist	1 1/2"			No	30.02	167.59	146.68	17.9
CUF-GT-B12-SS03G, 5.0'-6.5'		478	5/2/19	Len	1 1/2"			No	31.64	126.24	109.47	21.5

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Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Test Method ASTM

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B12-SS05G, 10.0'-11.5'	480	5/2/19	Len	3/4"			No	31.45	112.46	99.49	19.1
CUF-GT-B12-SS07G, 15.0'-16.5'	482	5/2/19	Len	No. 4			No	31.60	114.64	99.83	21.7
CUF-GT-B12-SS08G, 17.5'-19.0'	483	5/2/19	Len	1 1/2"			No	30.46	129.14	111.18	22.2
CUF-GT-B12-SS10G, 22.5'-24.0'	486	5/2/19	Len	3/8"			No	31.52	151.34	135.17	15.6
CUF-GT-B12-SS12G, 27.5'-29.0'	488	5/2/19	Len	1 1/2"			No	31.48	91.04	79.06	25.2
CUF-GT-B12-SS14G, 32.5'-34.0'	490	5/2/19	Hom	No. 4			No	31.47	123.36	97.75	38.6
CUF-GT-B12-SS16G, 37.5'-39.0'	492	5/2/19	Hom	No. 10			Yes	30.01	128.68	106.00	29.8
CUF-GT-B12-SS18G, 42.5'-44.0'	494	5/2/19	Hom	No. 4			No	30.01	154.27	125.83	29.7
CUF-GT-B12-SS20G, 47.5'-49.0'	496	5/2/19	Dist	3/8"			No	31.40	154.74	122.25	35.8
CUF-GT-B13-SS01G, 0.0'-1.5'	498	5/2/19	Len	3/4"			No	30.62	134.89	117.14	20.5
CUF-GT-B13-SS02G, 5.0'-6.5'	500	5/2/19	Len	3/4"			No	30.23	118.08	103.60	19.7
CUF-GT-B13-SS04G, 10.0'-11.5'	502	5/2/19	Len	3/4"			No	29.88	109.15	97.89	16.6
CUF-GT-B13-ST02, 17.5'-19.5'	505	5/2/19	Hom	No. 10			Yes	26.57	129.35	101.50	37.2
CUF-GT-B13-SS08G, 22.5'-24.0'	507	5/2/19	Len	No. 10			Yes	31.80	167.27	128.93	39.5
CUF-GT-B13-SS10G, 50.0'-55.0'	510	5/2/19	Dist	3/8"			No	32.20	192.09	137.90	51.3
CUF-GT-B13-SS11aG, 55.0'-58.5'	511	5/2/19	Dist	3/4"			No	31.98	144.92	113.13	39.2
CUF-GT-B13-SS11bG, 58.5'-60.0'	512	5/2/19	Dist	No. 10			Yes	31.31	196.29	143.47	47.1
CUF-GT-B13-SS13G, 65.0'-66.5'	514	5/2/19	Dist	1 1/2"			No	31.52	165.40	137.40	26.4

Comments

Reviewed By RJ

Stantec

Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B14-SS03G, 5.0'-6.5'	547	6/6/19	Dist	3/4"			No	21.13	103.45	83.87	31.2
CUF-GT-B14-SS05G, 10.0'-10.5'	549	6/6/19	Dist	3/8"			No	21.34	78.40	68.02	22.2
CUF-GT-B14-SS09G, 20.0'-20.4'	553	6/6/19	Dist	3/4"			No	21.00	95.58	82.84	20.6
CUF-GT-B14-SS11G, 25.0'-26.2'	555	6/6/19	Dist	3/4"			No	21.21	100.24	84.74	24.4
CUF-GT-B14-SS13G, 30.0'-31.5'	557	6/6/19	Hom	3/4"			No	21.04	113.91	95.97	23.9
CUF-GT-B14-SS15G, 35.0'-36.5'	559	6/6/19	Dist	3/4"			No	21.23	97.14	89.99	10.4
CUF-GT-B14-SS17G, 40.4'-41.9'	561	6/6/19	Hom	3/4"			No	21.02	115.41	98.15	22.4
CUF-GT-B14-SS19G, 47.5'-49.0'	564	6/6/19	Hom	3/4"			No	21.14	114.12	99.89	18.1
CUF-GT-B14-SS22G, 55.0'-56.5'	567	6/6/19	Hom	3/4"			No	20.79	149.73	119.61	30.5
CUF-GT-B14-SS25G, 65.0'-66.5'	571	6/6/19	Hom	3/4"			No	21.05	119.04	97.33	28.5
CUF-GT-B14-SS26G, 67.5'-69.0' & SS27G, 70.0'-71.5'	572	6/6/19	Dist	1 1/2"			No	21.04	128.74	106.87	25.5
CUF-GT-B14-SS29G, 75.0'-76.5'	576	6/6/19	Hom	3/4"			No	21.15	123.07	91.88	44.1
CUF-GT-B14-SS31G, 82.5'-84.0'	579	6/6/19	Len	1 1/2"	1	1 1/2"	No	21.01	117.45	101.59	19.7
CUF-GT-B14-SS34G, 90.0'-91.5'	582	6/6/19	Len	3/4"			No	21.20	139.25	118.63	21.2
CUF-GT-B14-SS36G, 97.5'-99.0'	584	6/6/19	Len	1 1/2"	2	1 1/2"	No	20.91	106.88	94.35	17.1
CUF-GT-B14-SS38G, 102.5'-104.0'	587	6/6/19	Dist	3/4"			No	21.98	108.07	90.41	25.8
CUF-GT-B14-SS40G, 107.5'-109.0'	589	6/6/19	Dist	3/4"			No	20.79	141.50	115.57	27.4
CUF-GT-B14-SS42G, 112.5'-114.0'	592	6/6/19	Dist	1 1/2"	1	1 1/2"	No	20.76	118.27	104.08	17.0
CUF-GT-B14-SS45G, 120.0'-121.5'	596	6/6/19	Dist	3/4"			No	20.61	125.55	109.05	18.7
CUF-GT-B15-SS03G, 5.0'-5.8'	600	6/6/19	Hom	3/4"			No	20.29	104.98	86.18	28.5
CUF-GT-B15-SS05G, 10.0'-10.9'	602	6/6/19	Hom	1 1/2"	1	1 1/2"	No	21.33	100.97	93.74	10.0
CUF-GT-B15-SS08G, 20.0'-21.5'	606	6/6/19	Hom	No. 4			No	21.61	102.71	91.16	16.6
CUF-GT-B15-SS10G, 25.0'-25.4'	608	6/6/19	Hom	No. 10			Yes	22.03	102.00	90.45	16.9
CUF-GT-B15-SS12G, 30.0'-30.4'	610	6/6/19	Hom	No. 10			Yes	21.69	106.02	92.45	19.2
CUF-GT-B15-SS14G, 35.0'-36.1'	612	6/6/19	Hom	No. 10			Yes	22.18	108.02	95.49	17.1
CUF-GT-B15-SS16G, 40.0'-41.2'	614	6/6/19	Hom	3/8"			No	21.91	110.58	95.74	20.1
CUF-GT-B15-SS18G, 45.0'-46.5'	616	6/6/19	Hom	3/8"			No	20.38	108.33	90.73	25.0
CUF-GT-B15-SS20G, 50.0'-51.5'	618	6/6/19	Dist	1 1/2"	1	1 1/2"	No	21.66	92.73	83.05	15.8

Stantec

Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB
Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B15-SS21bG, 53.5'-54.0'	620	6/10/19	Dist	1 1/2"			No	30.06	148.91	141.75	6.4
CUF-GT-B15-SS23G, 57.5'-59.0'	622	6/6/19	Hom	No. 10			Yes	21.63	125.24	101.37	29.9
CUF-GT-B15-SS25G, 62.5'-64.0'	624	6/6/19	Hom	No. 10			Yes	21.02	134.07	99.82	43.5
CUF-GT-B15-SS28G, 70.0'-71.5'	627	6/6/19	Hom	No. 10			Yes	22.15	131.84	100.72	39.6
CUF-GT-B15-SS32G, 82.5'-84.0'	632	6/6/19	Hom	No. 10			Yes	21.24	126.97	91.10	51.3
CUF-GT-B15-SS34G, 87.5'-89.0'	634	6/6/19	Hom	No. 10			Yes	20.69	130.43	97.02	43.8
CUF-GT-B15-SS37G, 95.0'-96.5'	637	6/6/19	Hom	No. 10			Yes	20.98	104.57	75.36	53.7
CUF-GT-B15-SS38G, 97.5'-99.0'	638	6/6/19	Dist	No. 10			Yes	21.51	105.98	80.97	42.1
CUF-GT-B15-SS39bG, 101.1'-101.5' & SS40aG, 102.5'-103.4'	640	6/6/19	Dist	3/8"			No	21.10	75.95	62.85	31.4
CUF-GT-B15-SS41G, 105.0'-106.5'	644	6/6/19	Dist	3/4"			No	22.01	101.73	82.98	30.8
CUF-GT-B15-SS43G, 112.5'-114.0' & SS44G, 115.0'-116.5' & SS45G, 117.5'-119.0'	649	6/6/19	Dist	1 1/2"	2	1 1/2"	No	31.59	199.25	172.05	19.4
CUF-GT-B18-SS02G, 2.5'-4.0'	657	6/6/19	Len	1 1/2"	1	1 1/2"	No	21.21	97.08	84.06	20.7
CUF-GT-B18-SS05G, 10.0'-11.5'	660	6/6/19	Len	3/4"			No	21.60	85.51	75.47	18.6
CUF-GT-B18-SS07G, 17.5'-19.0'	663	6/6/19	Dist	1 1/2"	1	1 1/2"	No	20.98	90.75	80.05	18.1
CUF-GT-B18-SS12G, 32.5'-34.0'	670	6/6/19	Dist	No. 10			Yes	21.11	108.29	92.16	22.7
CUF-GT-B19-SS02G, 2.5'-4.0'	675	6/6/19	Len	No. 4			No	20.80	115.96	99.34	21.2
CUF-GT-B19-SS04G, 7.5'-9.0'	677	6/6/19	Len	3/8"			No	20.88	88.15	77.97	17.8
CUF-GT-B19-SS06G, 15.0'-16.5'	680	6/6/19	Len	1 1/2"	1	1 1/2"	No	21.79	107.69	93.76	19.4
CUF-GT-B19-SS09aG, 22.5'-23.5'	683	6/6/19	Hom	No. 10			Yes	21.45	124.23	88.90	52.4
CUF-GT-B19-SS11bG, 30.5'-31.5'	688	6/6/19	Dist	1 1/2"	2	1 1/2"	No	21.10	103.13	97.16	7.8
CUF-GT-B19-SS12G, 32.5'-34.0'	689	6/6/19	Hom	3/8"			No	20.70	96.44	82.95	21.7
CUF-GT-B19-SS14G, 40.0'-41.5'	691	6/6/19	Len	3/8"			No	22.08	114.91	95.66	26.2
CUF-GT-B19-SS15G, 42.5'-44.0'	692	6/6/19	Len	1 1/2"	1	1 1/2"	No	21.36	106.76	99.50	9.3

Comments

Reviewed By RJ

Template: tmp_mc_input.xlsm
Version: 20170216
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 07/25/2019

Stantec

Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Test Method ASTM

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B20-SS01G, 0.0'-1.5'	693	8/31/20	Len	1 1/2"	1	1 1/2"	No	21.22	67.37	60.07	18.8
CUF-GT-B20-SS03G, 5.0'-6.5'	695	8/31/20	Len	3/4"			No	21.25	122.22	97.01	33.3
CUF-GT-B20-SS04bG, 8.2'-9.0'	697	8/31/20	Len	3/8"			No	20.99	96.28	82.47	22.5
CUF-GT-B20-SS06bG, 12.2'-13.0'	700	8/31/20	Len	1 1/2"	1	1 1/2"	No	21.30	110.51	94.76	21.4
CUF-GT-B20-SS08G, 14.5'-16.0'	702	8/31/20	Len	3/4"	2	3/4"	No	21.20	104.39	86.94	26.5
CUF-GT-B20-SS10G, 17.5'-19.0'	704	8/31/20	Len	1 1/2"	1	1 1/2"	No	21.33	120.57	100.30	25.7
CUF-GT-B20-SS12G, 20.5'-22.0'	706	8/31/20	Len	3/4"			No	20.94	114.17	94.37	27.0
CUF-GT-B20-SS14G, 23.5'-25.0'	708	8/31/20	Len	1 1/2"	1	1 1/2"	No	21.20	142.63	116.13	27.9
CUF-GT-B20-SS16G, 26.5'-28.0'	710	8/31/20	Dist	3/4"	2	3/4"	No	21.36	160.42	131.49	26.3
CUF-GT-B20-SS18G, 29.5'-31.0'	712	8/31/20	Dist	3/4"			No	20.79	119.51	96.94	29.6
CUF-GT-B20-SS20G, 32.5'-34.0'	714	8/31/20	Dist	3/4"			No	20.57	138.52	109.28	33.0
CUF-GT-B20-SS22G, 35.5'-37.0'	716	8/31/20	Dist	3/4"			No	20.82	134.90	110.06	27.8
CUF-GT-B20-SS24G, 38.5'-40.0'	718	8/31/20	Dist	No. 4			Yes	21.32	152.83	121.60	31.1
CUF-GT-B20-SS26G, 41.5'-43.0'	720	8/31/20	Hom	No. 10			Yes	21.00	152.52	121.02	31.5
CUF-GT-B20-SS28G, 44.5'-46.0'	722	8/31/20	Dist	3/4"			No	21.10	147.48	119.31	28.7
CUF-GT-B20-SS30G, 47.5'-49.0'	724	8/31/20	Dist	3/4"			No	20.99	136.04	108.52	31.4
CUF-GT-B20-SS32G, 55.0'-56.5'	726	8/31/20	Dist	3/4"	2	3/4"	No	21.22	128.84	103.11	31.4
CUF-GT-B20-SS34G, 65.0'-66.5'	728	8/31/20	Dist	1 1/2"	3	1 1/2"	No	21.06	128.95	102.79	32.0
CUF-GT-B20-SS36G, 75.0'-76.4'	730	8/31/20	Dist	3/4"			No	21.00	134.79	97.92	47.9
CUF-GT-B21-SS02G, 2.5'-4.0'	732	8/31/20	Len	1 1/2"	2	1 1/2"	No	21.14	100.82	86.86	21.2
CUF-GT-B21-SS03bG, 5.9'-6.5'	734	8/31/20	Lam	3/4"	3	3/4"	No	21.12	108.45	94.95	18.3
CUF-GT-B21-SS05G, 10.0'-11.5'	736	8/31/20	Len	1 1/2"	1	1 1/2"	No	21.06	116.42	101.23	18.9
CUF-GT-B21-SS07G, 13.0'-14.5'	738	8/31/20	Len	1 1/2"	2	1 1/2"	No	20.79	134.12	109.42	27.9
CUF-GT-B21-SS09G, 16.0'-17.5'	740	8/31/20	Dist	3/8"			No	21.05	121.83	99.51	28.4
CUF-GT-B21-SS12G, 20.5'-22.0'	743	8/31/20	Len	1 1/2"	1	1 1/2"	No	21.04	124.65	102.20	27.7
CUF-GT-B21-SS14G, 23.5'-25.0'	745	9/1/20	Len	3/4"			No	21.16	110.34	91.45	26.9
CUF-GT-B21-SS16G, 26.5'-28.0'	747	9/1/20	Len	3/4"			No	21.39	124.21	100.66	29.7
CUF-GT-B21-SS18G, 29.5'-31.0'	749	9/1/20	Len	3/4"			No	20.77	113.74	93.13	28.5
CUF-GT-B21-SS20G, 32.5'-34.0'	751	9/1/20	Len	1 1/2"	1	1 1/2"	No	20.92	145.70	118.09	28.4

Stantec

Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By DB
Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B21-SS22G, 35.5'-37.0'	753	9/1/20	Hom	1 1/2"			No	20.88	132.00	103.34	34.8
CUF-GT-B21-SS24G, 38.5'-40.0'	755	9/1/20	Len	3/4"			No	20.98	120.31	95.04	34.1
CUF-GT-B21-SS26G, 41.5'-43.0'	758	9/1/20	Len	No. 10			Yes	21.23	147.11	122.88	23.8
CUF-GT-B21-SS28bG, 45.0'-46.0'	761	9/1/20	Dist	1 1/2"			No	21.23	78.43	69.62	18.2
CUF-GT-B21-SS29bG, 46.4'-47.5'	763	9/1/20	Dist	1 1/2"	1	1 1/2"	No	20.95	143.18	123.47	19.2
CUF-GT-B21-SS31G, 49.0'-50.2'	765	9/1/20	Dist	1 1/2"	2	1 1/2"	No	21.05	136.33	103.53	39.8
CUF-GT-B21-SS32G, 55.0'-56.5'	766	9/1/20	Dist	1 1/2"	4	1 1/2"	No	20.98	149.99	117.22	34.1
CUF-GT-B21-SS34G, 65.0'-65.9'	768	9/1/20	Dist	No. 4			No	21.34	126.37	90.88	51.0
CUF-GT-B21-SS36G, 73.2'-74.7'	770	9/1/20	Hom	3/4"			No	21.15	146.78	112.08	38.2
CUF-GT-B22-SS02G, 2.5'-4.0'	772	9/1/20	Len	3/4"			No	21.00	108.99	96.06	17.2
CUF-GT-B22-SS05G, 10.0'-11.5'	774	9/1/20	Len	1 1/2"	1	1 1/2"	No	21.05	103.71	91.55	17.2
CUF-GT-B22-SS07G, 13.0'-14.5'	776	9/1/20	Len	1 1/2"	1	1 1/2"	No	21.16	105.45	91.17	20.4
CUF-GT-B22-SS09aG, 16.0'-16.7'	778	9/1/20	Len	1 1/2"	1	1 1/2"	No	20.92	121.47	99.33	28.2
CUF-GT-B22-SS10G, 17.5'-19.0'	780	9/1/20	Len	1 1/2"	1	1 1/2"	No	21.28	166.03	135.90	26.3
CUF-GT-B22-SS13G, 22.0'-23.5'	783	9/1/20	Dist	3/8"			No	20.82	126.57	106.78	23.0
CUF-GT-B22-SS15G, 25.0'-26.5'	785	9/1/20	Hom	No. 10			Yes	21.21	153.00	125.76	26.1
CUF-GT-B22-SS17G, 28.0'-29.5'	787	9/1/20	Hom	No. 10			Yes	21.18	142.71	115.87	28.3
CUF-GT-B22-SS19G, 31.0'-32.5'	789	9/1/20	Hom	3/4"			No	21.44	157.36	126.94	28.8
CUF-GT-B22-SS22G, 35.5'-37.0'	792	9/1/20	Len	1 1/2"	1	1 1/2"	No	20.74	146.45	123.71	22.1
CUF-GT-B22-SS24G, 38.5'-40.0'	794	9/1/20	Len	1 1/2"	2	1 1/2"	No	20.58	124.13	105.88	21.4
CUF-GT-B22-SS26G, 41.5'-43.0'	796	9/1/20	Len	1 1/2"	2	1 1/2"	No	21.25	136.88	117.24	20.5
CUF-GT-B22-SS28G, 44.5'-46.0'	798	9/1/20	Len	1 1/2"	2	1 1/2"	No	20.90	137.05	116.10	22.0
CUF-GT-B22-SS30G, 47.5'-48.9'	800	9/1/20	Len	1 1/2"	3	1 1/2"	No	21.21	129.38	108.46	24.0
CUF-GT-B22-SS33G, 55.0'-56.5'	803	9/1/20	Len	1 1/2"	1	1 1/2"	No	21.27	128.04	108.40	22.5
CUF-GT-B22-SS35G, 65.0'-66.5'	805	9/1/20	Dist	3/4"			No	21.17	148.26	114.64	36.0
CUF-GT-B22-SS37G, 75.0'-76.5'	807	9/1/20	Dist	1 1/2"	2	1 1/2"	No	21.55	144.65	109.34	40.2
CUF-GT-B22-SS39aG, 85.0'-85.9'	809	9/1/20	Hom	3/4"			No	20.96	133.20	102.62	37.4
CUF-GT-B22-SS40G, 90.0'-91.5'	811	9/1/20	Dist	1 1/2"	2	1 1/2"	No	21.20	116.68	86.59	46.0
CUF-GT-B22-SS42G, 100.0'-101.5'	813	9/1/20	Dist	3"	2	3"	No	21.65	147.70	111.35	40.5

Comments

Reviewed By RJ

Stantec

Moisture Content of Soil
ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By TRH

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B24-SS03G, 5.0'-6.5'	817	11/13/20	Str	3/4"			No	21.33	71.84	64.81	16.2
CUF-GT-B24-SS05G, 10.0'-11.5'	819	11/13/20	Hom	3/8"			No	22.12	78.10	66.40	26.4
CUF-GT-B24-SS08G, 17.5'-19.0'	822	11/13/20	Str	3/4"			No	20.90	71.28	62.05	22.4
CUF-GT-B24-SS10aG, 21.5'-22.3'	824	11/13/20	Hom	No. 4			No	21.05	80.55	70.61	20.1
CUF-GT-B24-SS11G, 23.0'-24.5'	826	11/13/20	Dist	1 1/2"			No	21.17	66.64	61.10	13.9
CUF-GT-B24-SS13G, 26.0'-27.5'	828	11/13/20	Dist	3/4"			No	21.17	100.60	81.54	31.6
CUF-GT-B24-SS14G, 27.5'-29.0'	829	11/13/20	Hom	No. 4			No	21.16	84.07	70.59	27.3
CUF-GT-B24-SS16aG, 30.5'-31.1'	831	11/13/20	Dist	3/4"			No	21.33	66.38	57.97	23.0
CUF-GT-B24-SS19G, 35.0'-36.5'	835	11/13/20	Hom	No. 10			Yes	21.44	94.21	79.02	26.4
CUF-GT-B24-SS21G, 38.0'-39.5'	837	11/13/20	Hom	No. 10			Yes	21.26	98.62	82.74	25.8
CUF-GT-B24-SS22bG, 40.6'-41.0'	839	11/13/20	Dist	1 1/2"			No	21.32	80.13	68.29	25.2
CUF-GT-B24-SS24G, 42.5'-44.0'	841	11/13/20	Dist	3/4"			No	20.90	76.98	65.74	25.1
CUF-GT-B24-SS26G, 45.5'-47.0'	843	11/13/20	Dist	1 1/2"			No	21.23	84.64	70.14	29.6
CUF-GT-B24-SS28G, 48.5'-50.0'	846	11/13/20	Dist	1 1/2"			No	21.14	61.93	53.46	26.2
CUF-GT-B24-SS29G, 55.0'-56.5'	847	11/13/20	Dist	3/4"			No	21.15	113.78	92.78	29.3
CUF-GT-B24-SS30G, 60.0'-61.5'	848	11/13/20	Dist	1 1/2"			No	19.72	74.32	63.65	24.3
CUF-GT-B25-SS01G, 0.0'-1.5'	852	11/13/20	Hom	3/4"			No	21.17	65.57	58.44	19.1
CUF-GT-B25-SS04G, 7.5'-9.0'	855	11/13/20	Dist	3/8"			No	21.36	69.16	61.36	19.5
CUF-GT-B25-SS06G, 12.5'-14.0'	857	11/13/20	Hom	3/4"			No	21.35	79.47	68.18	24.1
CUF-GT-B25-SS09G, 20.0'-21.5'	860	11/13/20	Dist	3/4"			No	20.35	72.53	62.55	23.6
CUF-GT-B25-SS12G, 27.5'-29.0'	862	11/13/20	Lam	3/4"			No	21.01	82.19	70.97	22.5
CUF-GT-B25-SS14G, 30.5'-32.0'	864	11/13/20	Dist	3/4"			No	21.27	74.69	65.19	21.6
CUF-GT-B25-SS18G, 36.5'-38.0'	869	11/13/20	Dist	3/8"			No	20.90	81.16	66.21	33.0
CUF-GT-B25-SS21G, 41.0'-42.5'	873	11/13/20	Dist	1 1/2"			No	21.49	75.57	60.75	37.7
CUF-GT-B25-SS24bG, 46.1'-47.0'	878	11/13/20	Dist	1 1/2"			No	21.13	72.19	63.45	20.7
CUF-GT-B25-SS26G, 48.5'-50.0'	881	11/13/20	Dist	1 1/2"			No	20.96	85.01	71.60	26.5
CUF-GT-B25-SS27G, 55.0'-56.5'	882	11/13/20	Dist	No. 4			No	20.30	98.78	63.36	82.3
CUF-GT-B25-SS28bG, 61.3'-61.5'	884	11/13/20	Dist	3/4"			No	22.07	72.48	64.39	19.1

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name CUF TDEC Order

Project Number 175568209
Tested By TRH
Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
CUF-GT-B25-SS30G, 70.0'-71.5'	885	11/13/20	Hom	3/8"			No	21.41	70.41	55.52	43.7
CUF-GT-B25-SS32G, 80.0'-81.5'	887	11/13/20	Hom	No. 10			Yes	21.19	83.99	66.45	38.8
CUF-GT-B23-SS03G, 5.0'-6.5'	892	11/16/20	Dist	3/4"			No	21.28	61.69	54.29	22.4
CUF-GT-B23-SS05G, 10.0'-11.5'	894	11/16/20	Dist	3/8"			No	21.07	93.69	80.12	23.0
CUF-GT-B23-SS08G, 16.5'-18.0'	897	11/16/20	Dist	3/4"			No	21.21	79.02	68.70	21.7
CUF-GT-B23-SS10G, 19.5'-21.0'	899	11/16/20	Dist	3/8"			No	21.01	102.26	83.64	29.7
CUF-GT-B23-SS12G, 22.5'-24.0'	901	11/16/20	Dist	1 1/2"			No	20.79	57.55	50.95	21.9
CUF-GT-B23-SS16G, 28.5'-30.0'	905	11/16/20	Dist	3/8"			No	21.29	82.67	72.49	19.9
CUF-GT-B23-SS18G, 31.5'-33.0'	907	11/16/20	Dist	3/8"			No	21.23	73.64	55.25	54.1
CUF-GT-B23-SS20aG, 34.5'-35.7'	909	11/16/20	Dist	No. 10			Yes	21.20	97.47	72.96	47.4
CUF-GT-B23-SS22G, 37.5'-39.0'	912	11/16/20	Dist	1 1/2"			No	20.95	58.86	50.24	29.4
CUF-GT-B23-SS24G, 40.5'-41.6'	914	11/16/20	Dist	1 1/2"			No	21.07	59.47	51.08	28.0
CUF-GT-B23-SS26G, SS27G, SS28G, 43.5'-47.9'	918	11/16/20	Dist	1 1/2"			No	21.18	56.51	49.56	24.5
CUF-GT-B23-SS31G, 51.0'-52.5'	921	11/16/20	Dist	3/8"			No	21.07	57.23	47.66	36.0
CUF-GT-B23-SS34G, 60.0'-61.5'	924	11/16/20	Dist	No. 10			Yes	21.27	85.31	69.63	32.4
CUF-GT-B23-SS35G, 65.0'-66.5'	925	11/16/20	Dist	1 1/2"			No	20.94	48.25	43.83	19.3
CUF-GT-B23-SS37G, 75.0'-76.5'	927	11/16/20	Dist	3/4"			No	21.14	99.31	86.25	20.1
CUF-GT-B23-SS39G, 85.0'-86.5'	929	11/16/20	Dist	1 1/2"			No	21.33	63.23	54.79	25.2

Comments

Reviewed By RJ

ATTACHMENT F.3

Soil Classification Testing Results

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B16-SS06, 12.5'-14.0'
Lab ID: 6

Sample Type: SS
Date Received: 1-22-19
Date Reported: 2-6-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 16.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.8
No. 40	0.425	97.4
No. 200	0.075	88.1
	0.02	46.9
	0.005	12.0
	0.002	3.7
estimated	0.001	0.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.1	0.2
Coarse Sand	0.1	2.4
Medium Sand	2.4	---
Fine Sand	9.3	9.3
Silt	76.1	84.4
Clay	12.0	3.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.55

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B16-SS06, 12.5'-14.0'	Lab ID	6

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.55

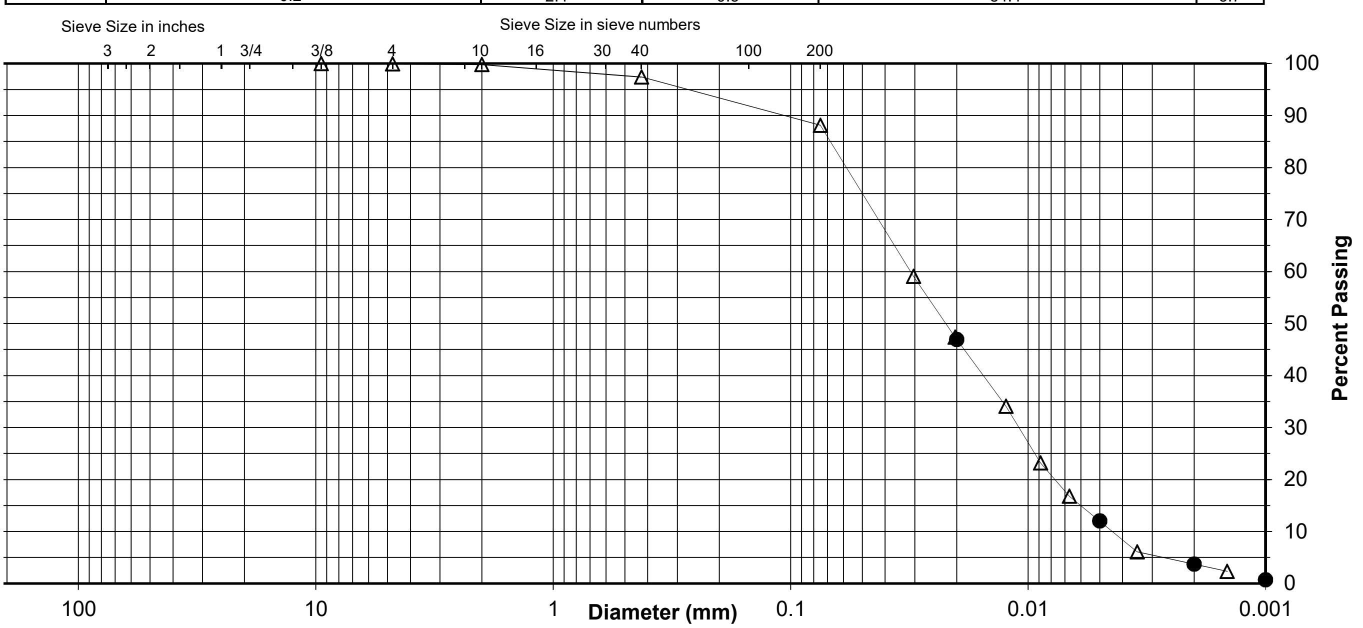
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	97.4
No. 200	88.1
0.02 mm	46.9
0.005 mm	12.0
0.002 mm	3.7
0.001 mm	0.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.1	2.4	9.3	76.1	12.0

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.2	2.4	9.3	84.4	3.7



Comments ______

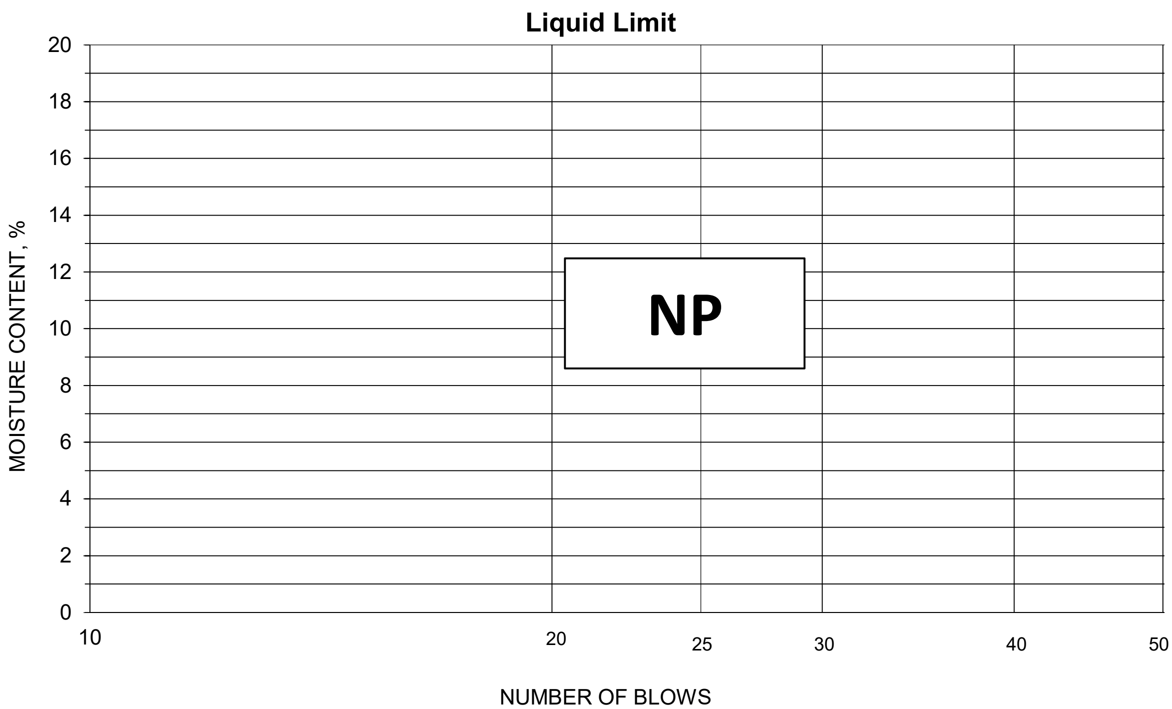
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B16-SS06, 12.5'-14.0'	Lab ID	6
		% + No. 40	3
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	01-29-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B16-SS17, 40.0'-41.5'	Lab ID	17
Sample Type	SS	Date Received	1-22-19
		Date Reported	2-6-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 21.6

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	98.4
No. 40	0.425	62.5
No. 200	0.075	44.9
	0.02	23.6
	0.005	7.1
	0.002	2.8
estimated	0.001	1.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	1.6
Coarse Sand	1.6	35.9
Medium Sand	35.9	---
Fine Sand	17.6	17.6
Silt	37.8	42.1
Clay	7.1	2.8

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.58

Classification
Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B16-SS17, 40.0'-41.5'
Project Number: 175568209
Lab ID: 17

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	98.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.58

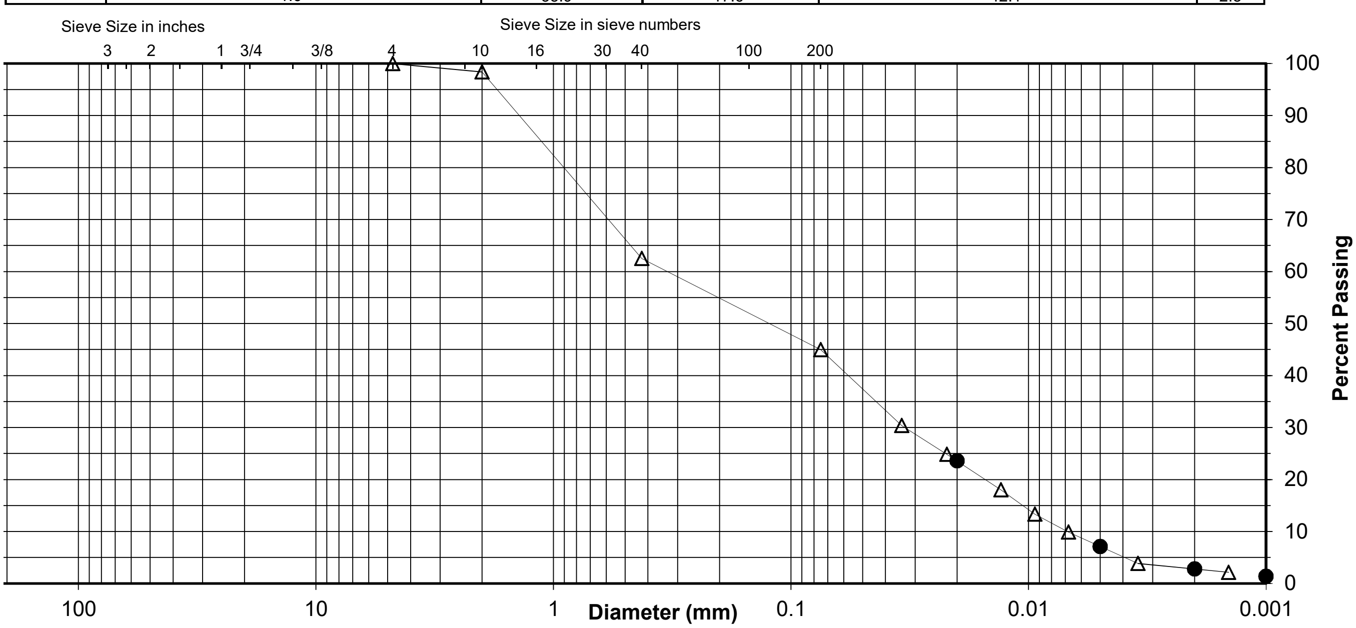
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	62.5
No. 200	44.9
0.02 mm	23.6
0.005 mm	7.1
0.002 mm	2.8
0.001 mm	1.4

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	1.6	35.9	17.6	37.8	7.1

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	1.6	35.9	17.6	42.1	2.8



Comments

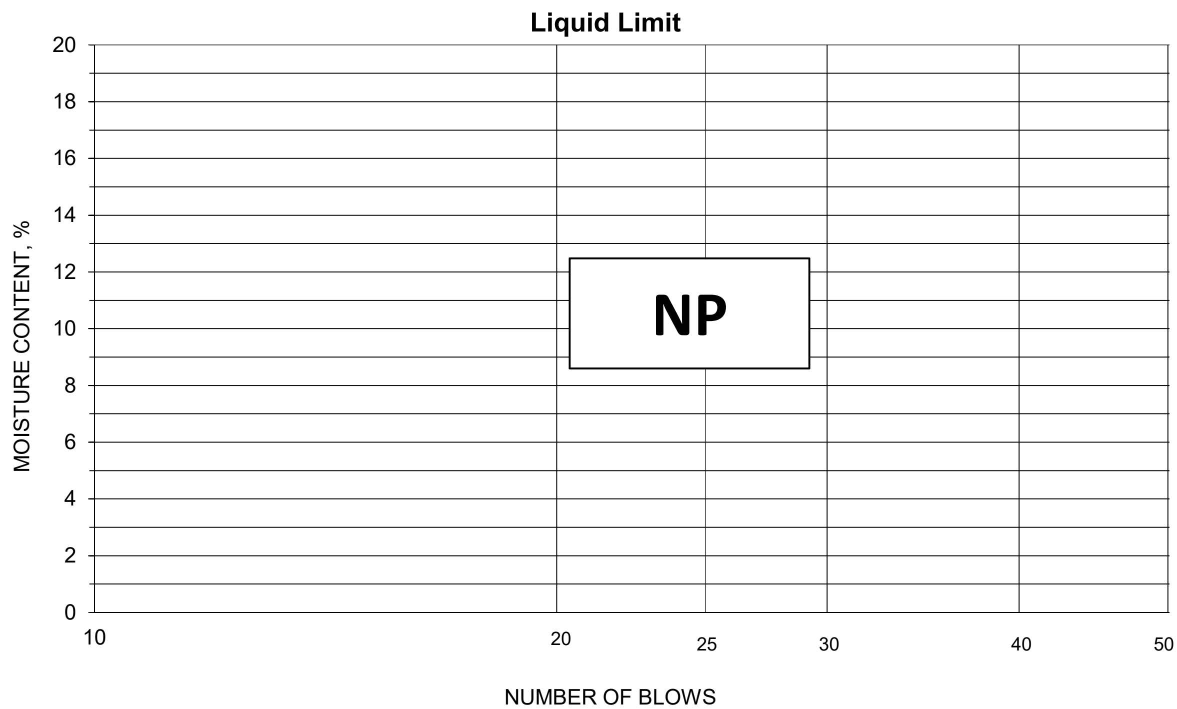
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B16-SS17, 40.0'-41.5'	Lab ID	17
		% + No. 40	38
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	01-29-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B16-SS21b, 53.5'-54.0'	Lab ID	22

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	91.0
3/8"	66.7
No. 4	47.0
No. 10	29.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.65

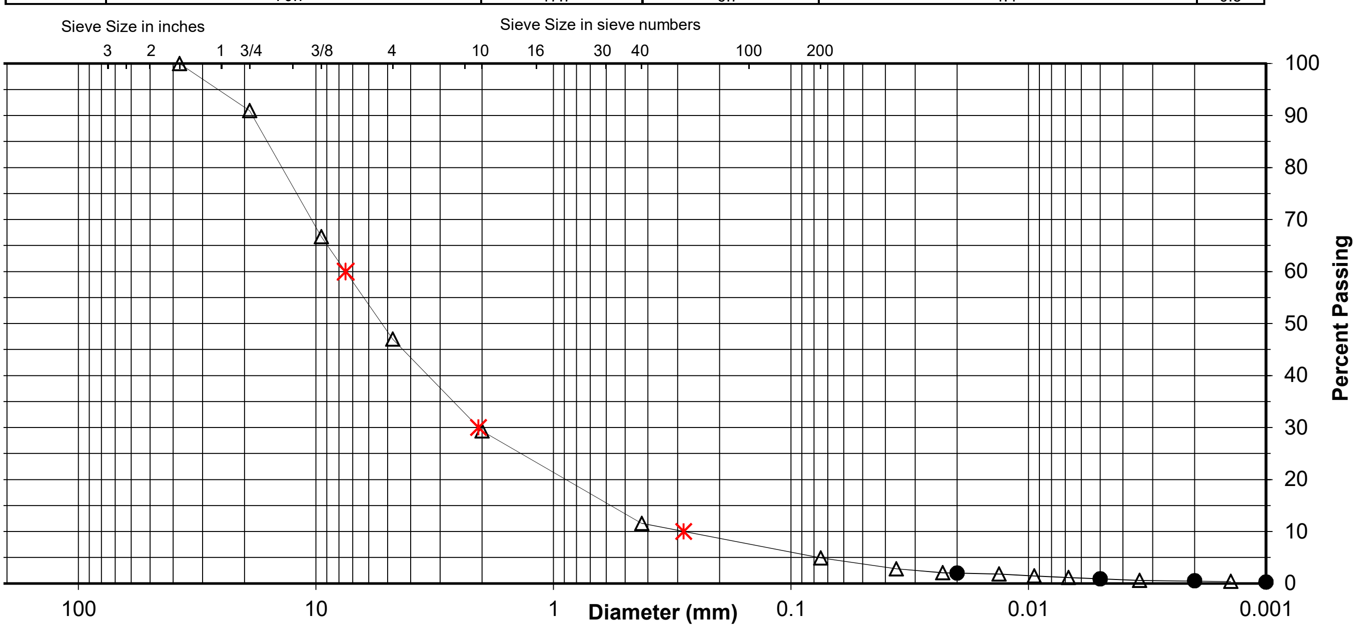
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	11.6
No. 200	4.9
0.02 mm	2.0
0.005 mm	0.9
0.002 mm	0.5
0.001 mm	0.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	9.0	44.0	17.7	17.7	6.7	4.0	0.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	70.7	17.7	6.7	4.4	0.5



Comments ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B16-ST01, 60.3'-60.7'
Lab ID: 25

Sample Type: ST
Date Received: 1-22-19
Date Reported: 2-6-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 34.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.6
No. 10	2	97.8
No. 40	0.425	93.5
No. 200	0.075	86.8
	0.02	58.3
	0.005	22.4
	0.002	8.6
estimated	0.001	1.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.4	2.2
Coarse Sand	1.8	4.3
Medium Sand	4.3	---
Fine Sand	6.7	6.7
Silt	64.4	78.2
Clay	22.4	8.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.57

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B16-ST01, 60.3'-60.7'	Lab ID	25

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.6
No. 10	97.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.57

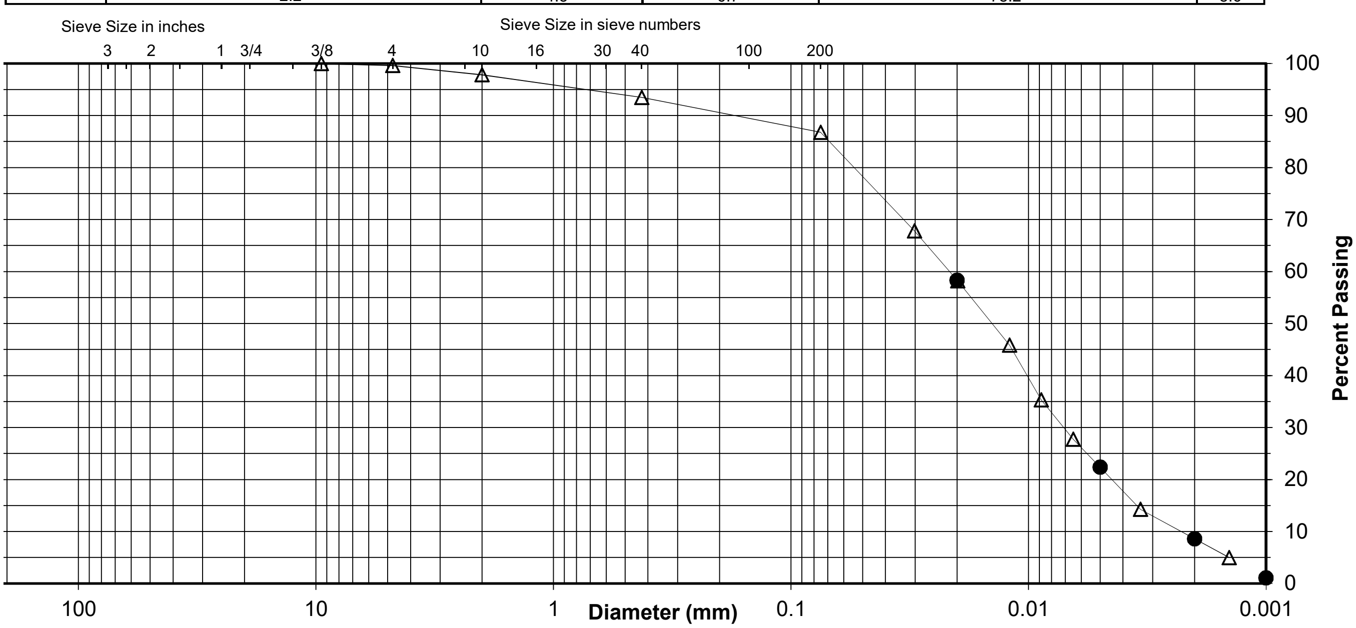
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	93.5
No. 200	86.8
0.02 mm	58.3
0.005 mm	22.4
0.002 mm	8.6
0.001 mm	1.1

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.4	1.8	4.3	6.7	64.4	22.4

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	2.2	4.3	6.7	78.2	8.6



Comments ______

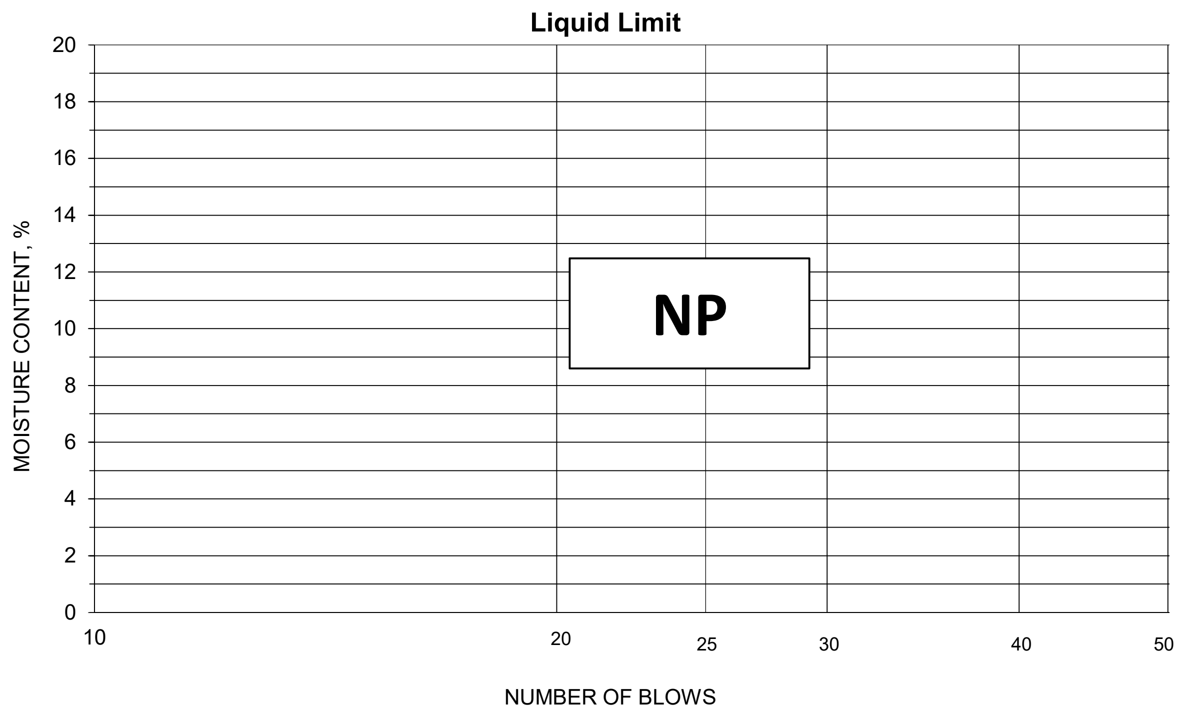
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B16-ST01, 60.3'-60.7'	Lab ID	25
		% + No. 40	7
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	02-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B16-SS33, 85.0'-86.5'	Lab ID	35
Sample Type	SS	Date Received	1-22-19
		Date Reported	2-6-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 61.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	94.5
	0.02	58.6
	0.005	19.4
	0.002	7.1
estimated	0.001	1.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	5.4	5.4
Silt	75.1	87.4
Clay	19.4	7.1

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.45

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B16-SS33, 85.0'-86.5'
Lab ID: 35

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.45

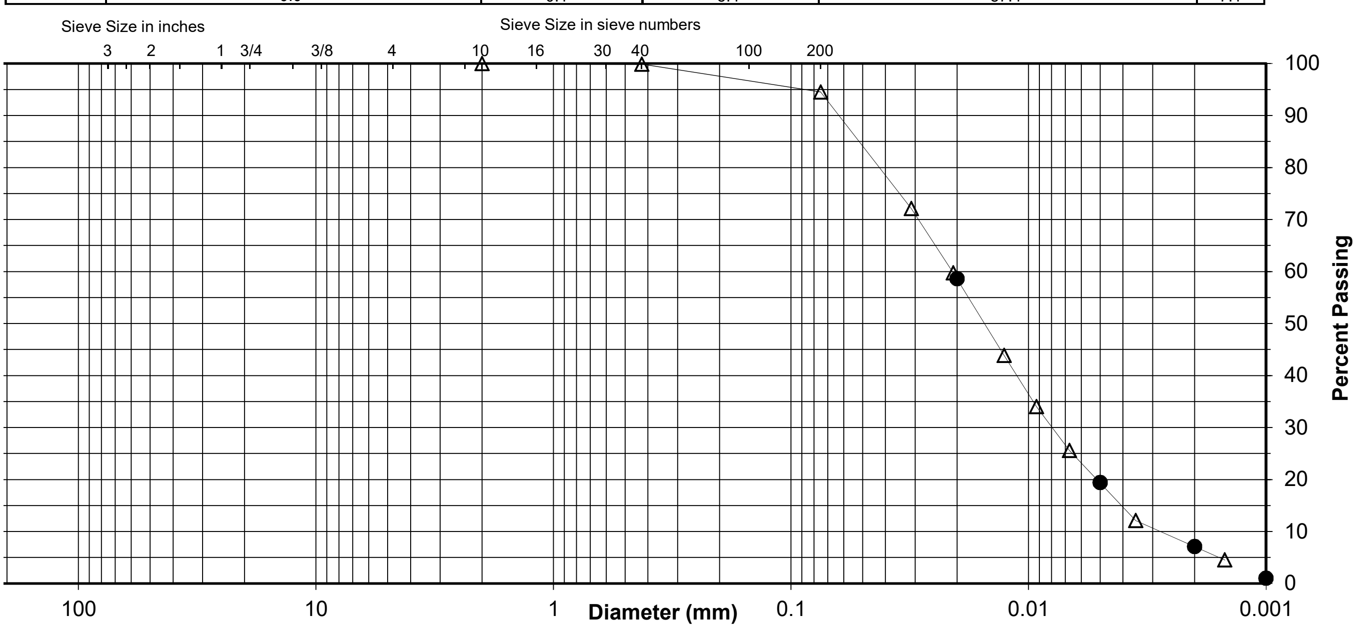
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	94.5
0.02 mm	58.6
0.005 mm	19.4
0.002 mm	7.1
0.001 mm	1.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.1	5.4	75.1	19.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.1	5.4	87.4	7.1



Comments ______

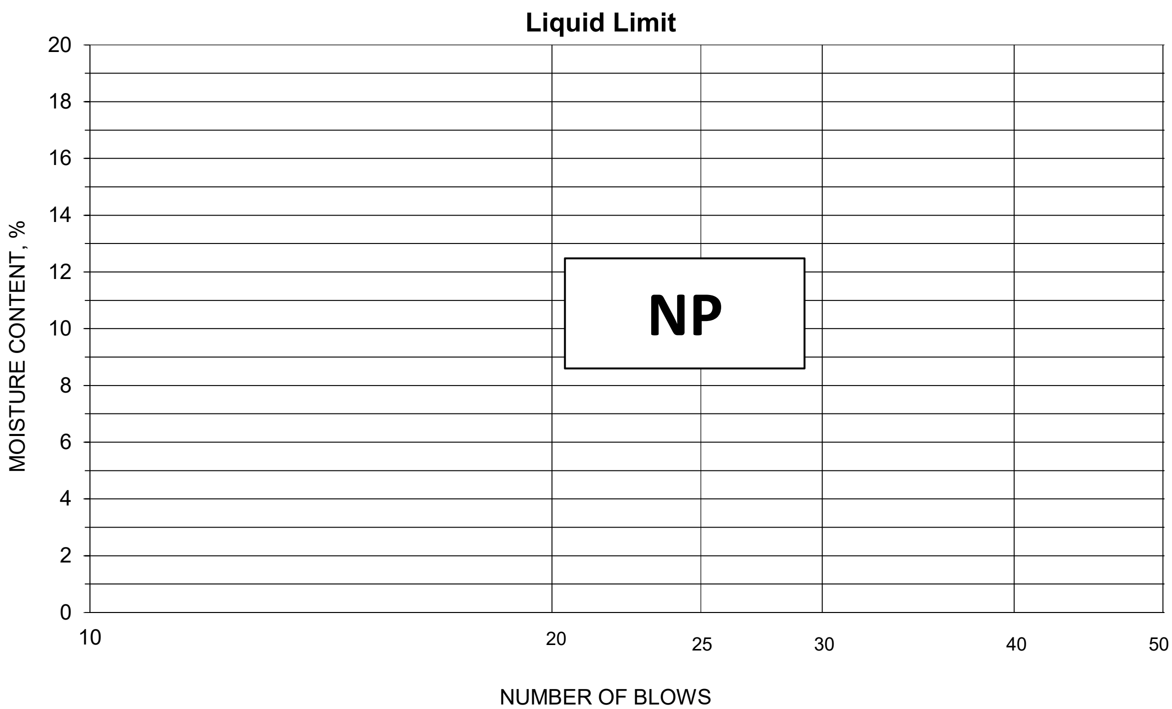
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B16-SS33, 85.0'-86.5'	Lab ID	35
		% + No. 40	0
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	01-29-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

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Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 02/07/2019

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B16-ST02, 99.8'-100.2'
Lab ID: 41

Sample Type: ST
Date Received: 1-22-19
Date Reported: 2-6-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 34.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	97.5
No. 40	0.425	97.4
No. 200	0.075	97.3
	0.02	90.1
	0.005	64.8
	0.002	45.2
estimated	0.001	31.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	2.5
Coarse Sand	2.5	0.1
Medium Sand	0.1	---
Fine Sand	0.1	0.1
Silt	32.5	52.1
Clay	64.8	45.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 52
Plastic Limit: 22
Plasticity Index: 30
Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification

Unified Group Symbol: CH
Group Name: Fat clay

AASHTO Classification: A-7-6 (33)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B16-ST02, 99.8'-100.2'
Lab ID: 41

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Soft

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	97.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.67

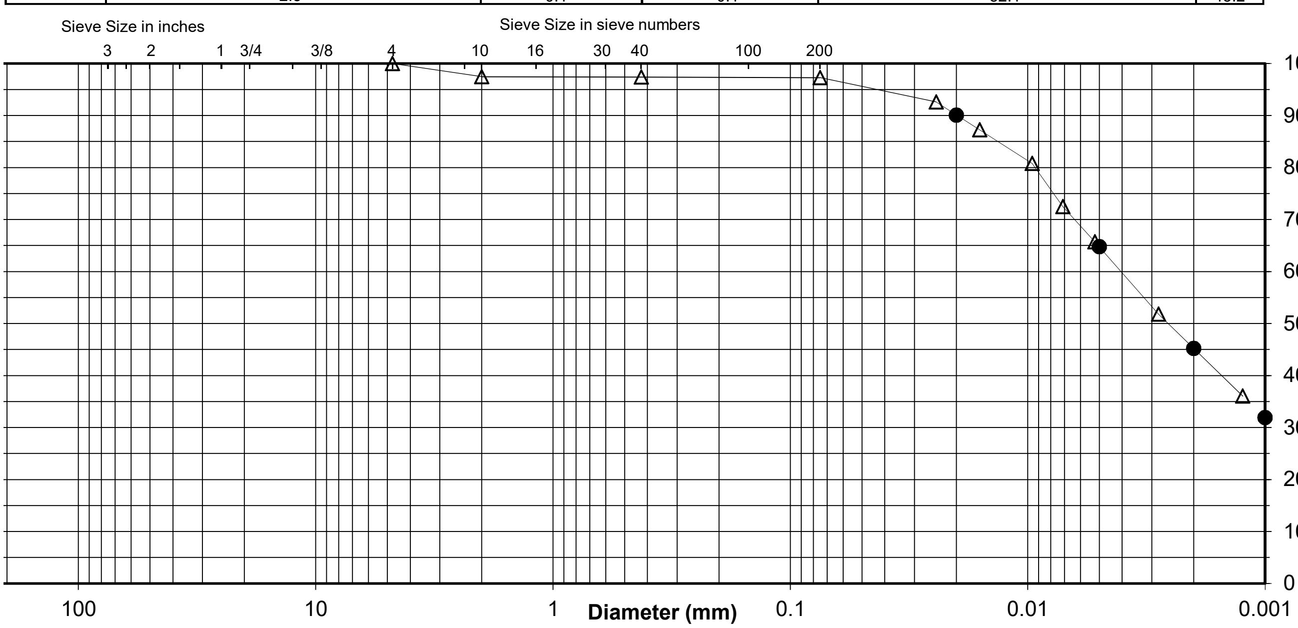
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	97.4
No. 200	97.3
0.02 mm	90.1
0.005 mm	64.8
0.002 mm	45.2
0.001 mm	31.9

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	2.5	0.1	0.1	32.5	64.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	2.5	0.1	0.1	52.1	45.2



Comments ______

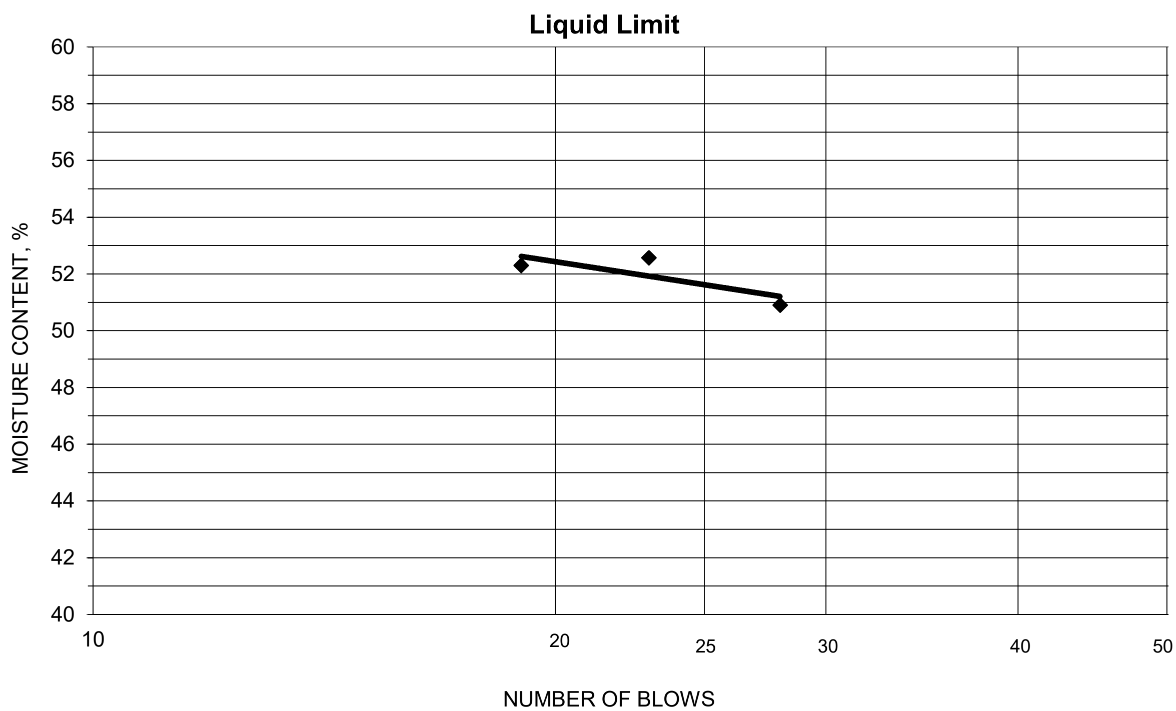
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B16-ST02, 99.8'-100.2'	Lab ID	41
		% + No. 40	3
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	02-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.24	15.68	10.65	28	50.9	
18.07	15.61	10.93	23	52.6	
18.60	15.98	10.97	19	52.3	52



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.72	19.07	11.59	22.1	22	30
20.84	19.15	11.41	21.8		

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B16-SS44, 115.0'-116.5'	Lab ID	52

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	68.0
No. 4	47.3
No. 10	31.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

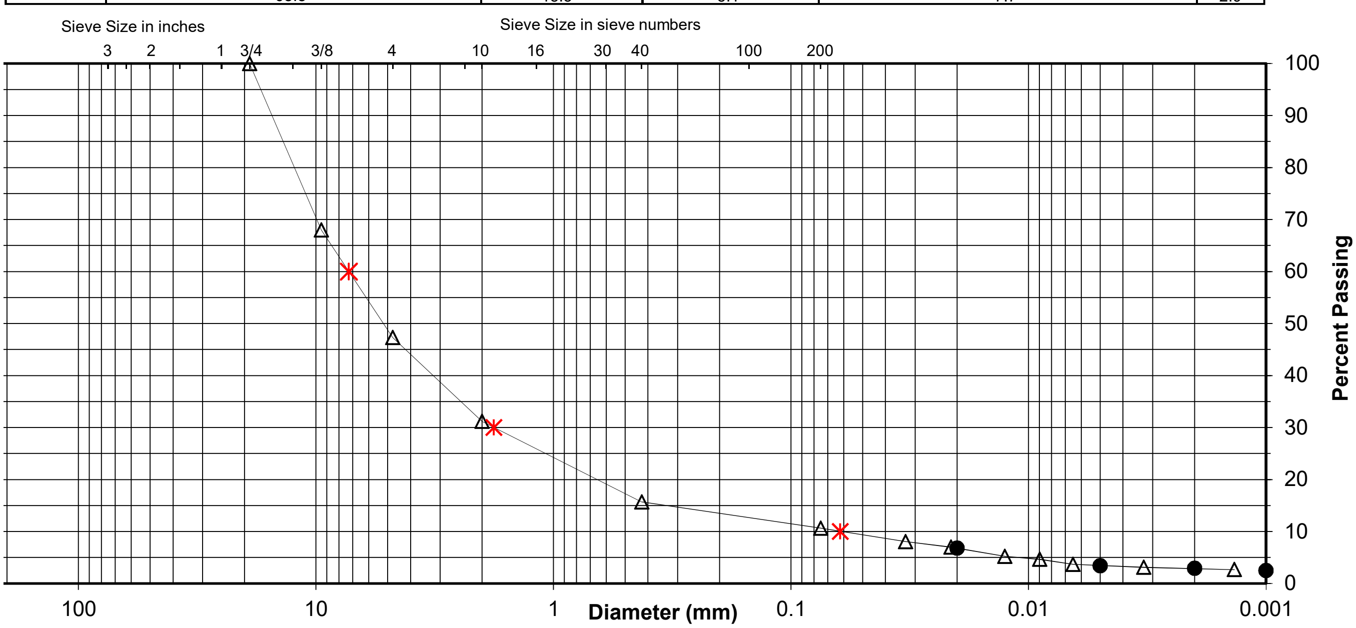
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	15.7
No. 200	10.6
0.02 mm	6.8
0.005 mm	3.4
0.002 mm	2.9
0.001 mm	2.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	52.7	16.1	15.5	5.1	7.2	3.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	68.8	15.5	5.1	7.7	2.9



Comments ____________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B16-SS46, 120.0'-121.5'
Lab ID: 54

Sample Type: SS
Date Received: 1-22-19
Date Reported: 2-6-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 38.3

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	93.4
3/8"	9.5	77.3
No. 4	4.75	59.2
No. 10	2	38.1
No. 40	0.425	26.6
No. 200	0.075	23.2
	0.02	17.8
	0.005	12.5
	0.002	11.0
estimated	0.001	10.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	40.8	61.9
Coarse Sand	21.1	11.5
Medium Sand	11.5	---
Fine Sand	3.4	3.4
Silt	10.7	12.2
Clay	12.5	11.0

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 28
Plastic Limit: 15
Plasticity Index: 13
Activity Index: 1.2

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.74

Classification
Unified Group Symbol: GC
Group Name: Clayey gravel with sand

AASHTO Classification: A-2-6 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B16-SS46, 120.0'-121.5'	Lab ID	54

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	93.4
3/8"	77.3
No. 4	59.2
No. 10	38.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.74

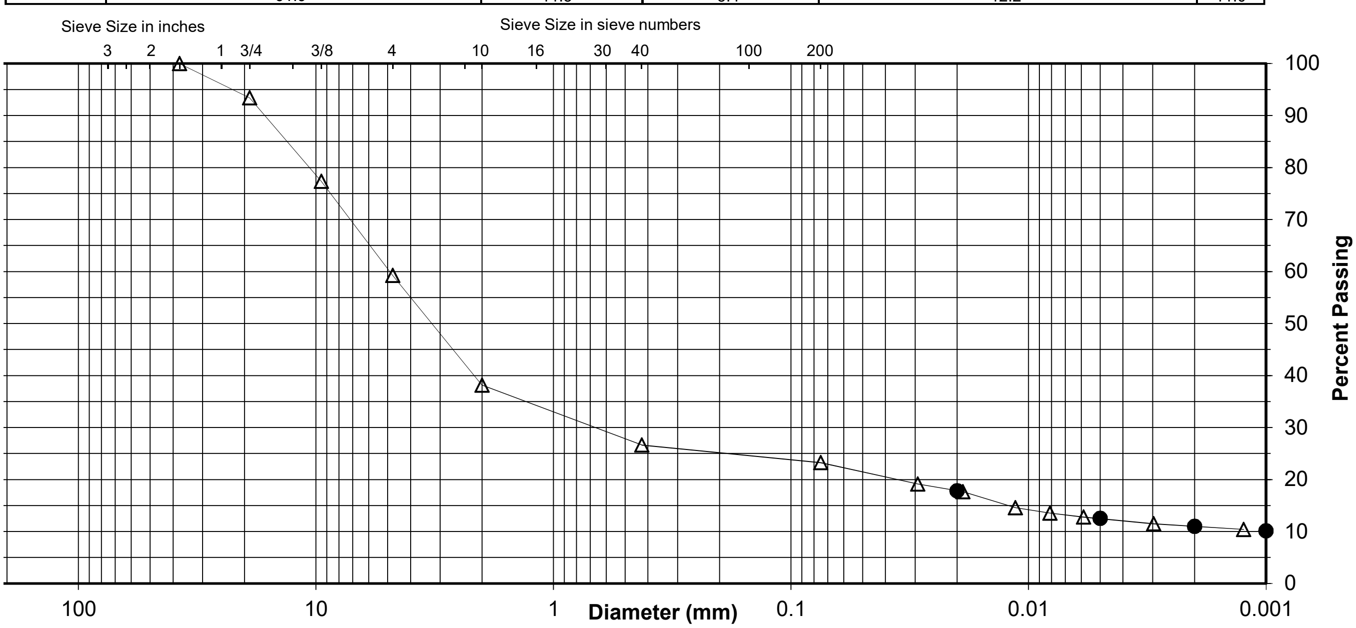
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	26.6
No. 200	23.2
0.02 mm	17.8
0.005 mm	12.5
0.002 mm	11.0
0.001 mm	10.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	6.6	34.2	21.1	11.5	3.4	10.7	12.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	61.9	11.5	3.4	12.2	11.0



Comments

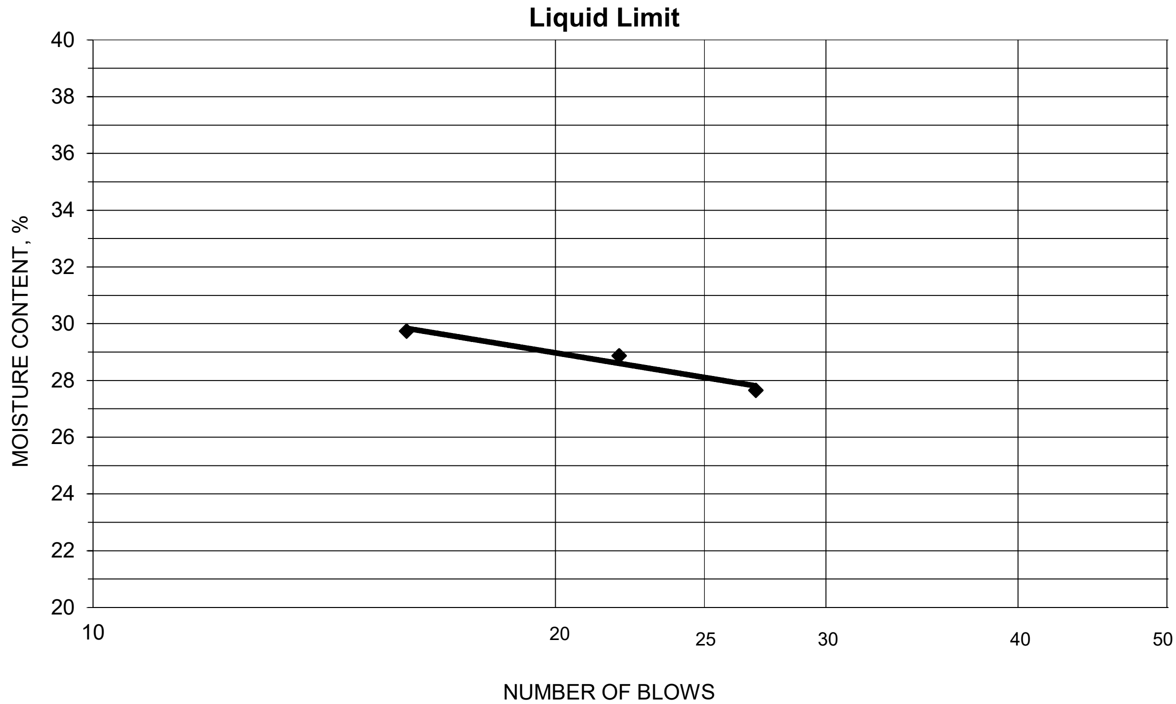
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B16-SS46, 120.0'-121.5'	Lab ID	54
		% + No. 40	73
Tested By	KG	Test Method	ASTM D 4318 Method A
		Date Received	01-22-2019
Test Date	02-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.87	17.15	10.93	27	27.7	28
19.25	17.40	10.99	22	28.9	
21.31	18.94	10.97	16	29.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.90	18.81	11.71	15.4	15	13
18.33	17.43	11.44	15.0		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B17-ST01, 15.0'-15.4'	Lab ID	62
Sample Type	ST	Date Received	1-22-19
		Date Reported	2-6-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 17.6

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.5
No. 4	4.75	99.4
No. 10	2	98.0
No. 40	0.425	88.2
No. 200	0.075	76.3
	0.02	36.6
	0.005	8.7
	0.002	3.0
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.6	2.0
Coarse Sand	1.4	9.8
Medium Sand	9.8	---
Fine Sand	11.9	11.9
Silt	67.6	73.3
Clay	8.7	3.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.57

Classification

Unified Group Symbol: ML
Group Name: Silt with sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B17-ST01, 15.0'-15.4'	Lab ID	62

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Soft

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.5
No. 4	99.4
No. 10	98.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.57

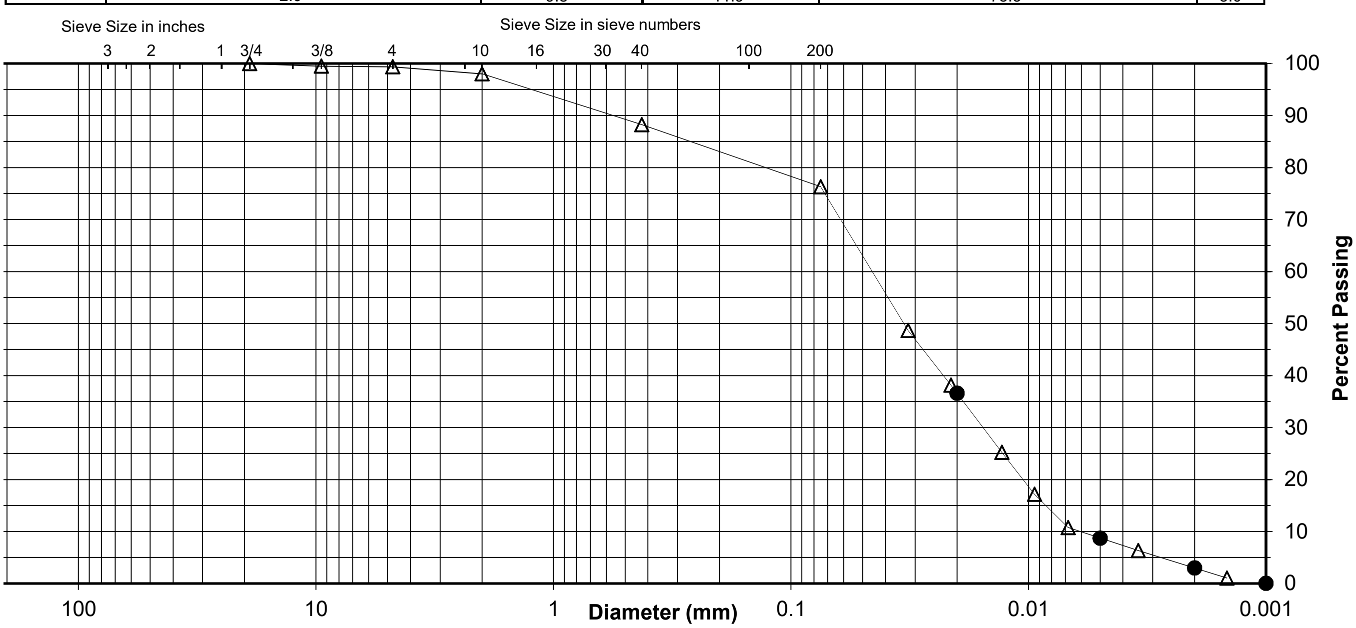
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	88.2
No. 200	76.3
0.02 mm	36.6
0.005 mm	8.7
0.002 mm	3.0
0.001 mm	0.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.6	1.4	9.8	11.9	67.6	8.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	2.0	9.8	11.9	73.3	3.0



Comments ______

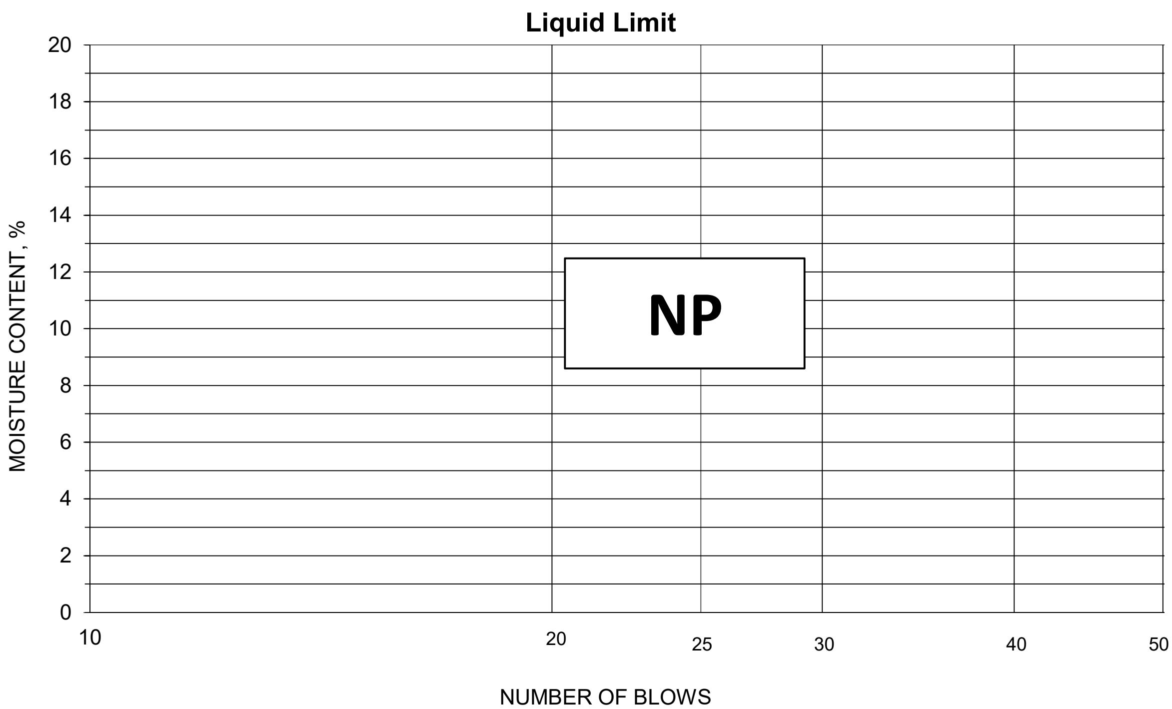
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-B17-ST01, 15.0'-15.4'			Lab ID	62
				% + No. 40	12
Tested By	KG	Test Method	ASTM D 4318 Method A	Date Received	01-22-2019
Test Date	01-29-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B17-SS15, 37.5'-39.0'
Lab ID: 71
Sample Type: SS
Date Received: 1-22-19
Date Reported: 2-6-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 18.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	82.3
No. 200	0.075	67.6
	0.02	35.8
	0.005	11.5
	0.002	4.4
estimated	0.001	1.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	17.7
Medium Sand	17.7	---
Fine Sand	14.7	14.7
Silt	56.1	63.2
Clay	11.5	4.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.61

Classification

Unified Group Symbol: ML
Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B17-SS15, 37.5'-39.0'

Project Number: 175568209
Lab ID: 71

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.61

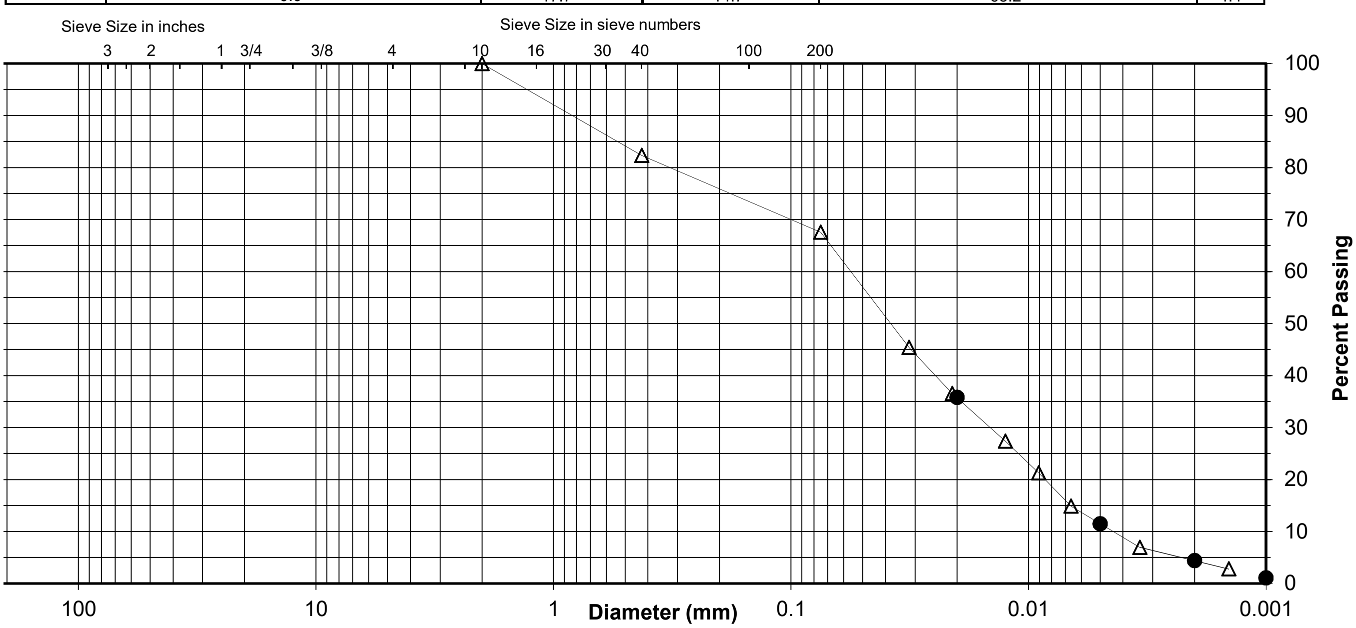
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	82.3
No. 200	67.6
0.02 mm	35.8
0.005 mm	11.5
0.002 mm	4.4
0.001 mm	1.1

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	17.7	14.7	56.1	11.5

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	17.7	14.7	63.2	4.4



Comments ______

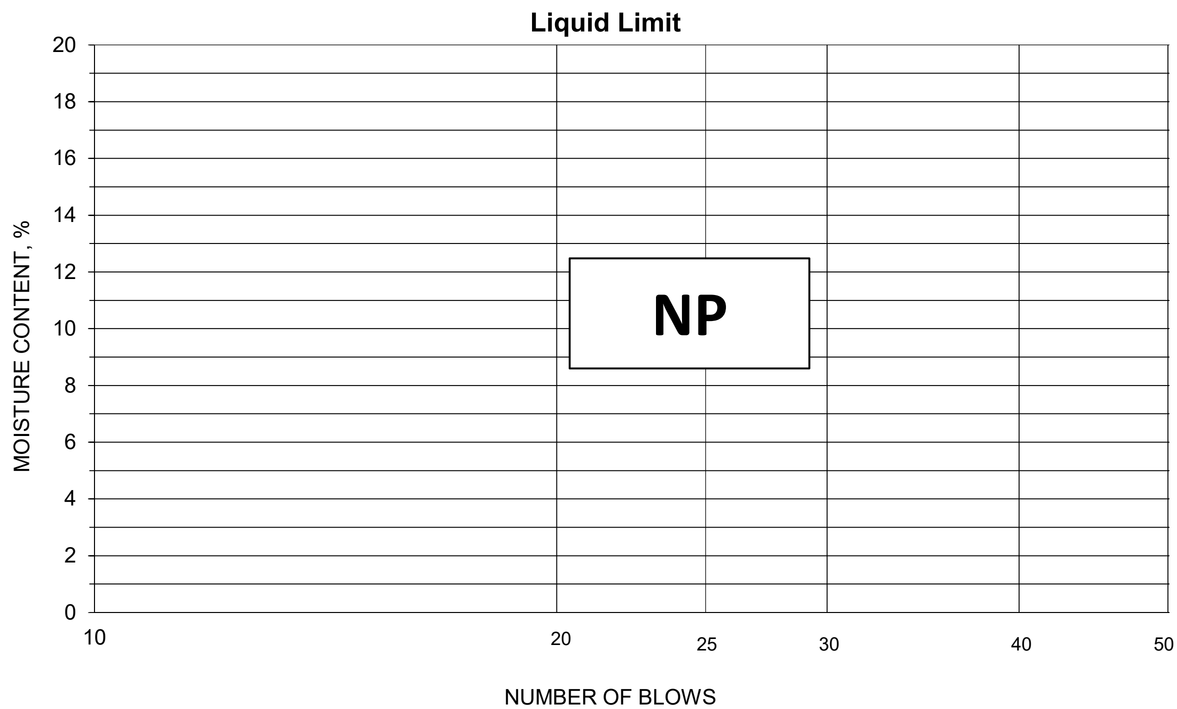
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B17-SS15, 37.5'-39.0'	Lab ID	71
		% + No. 40	18
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	01-29-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B17-SS22, 55.0'-56.5'
Project Number: 175568209
Lab ID: 78

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	81.1
3/8"	57.0
No. 4	39.3
No. 10	26.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

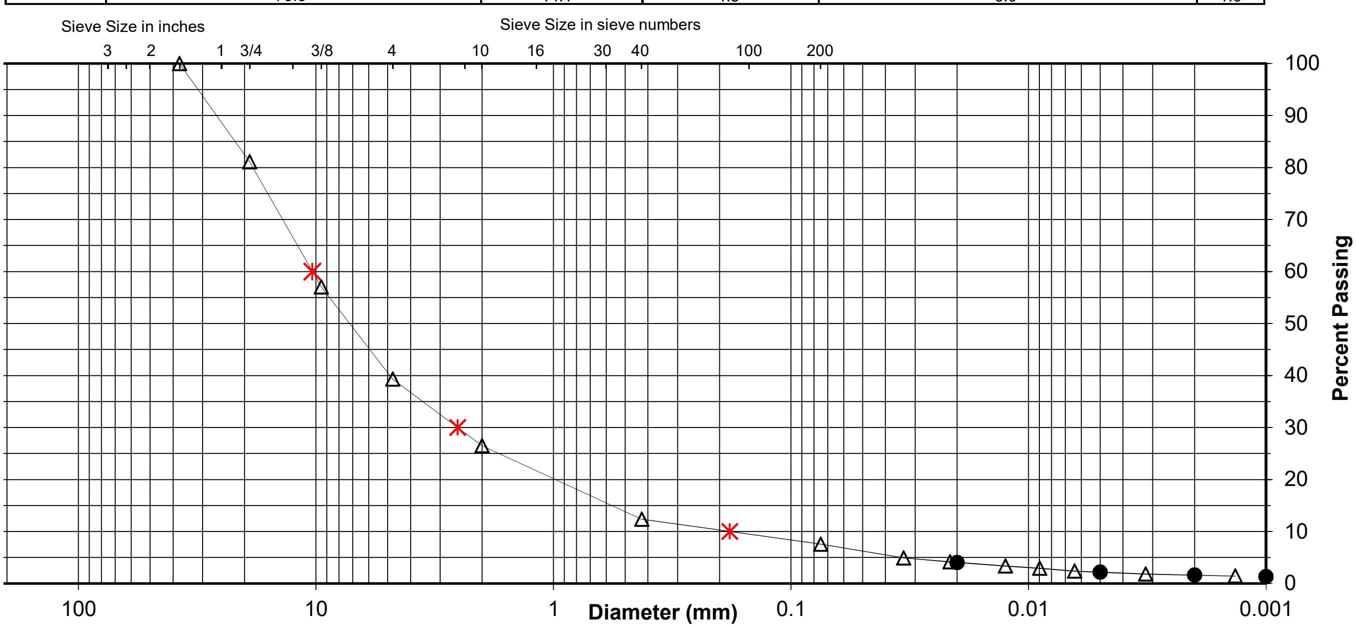
Specific Gravity: 2.79

Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	12.4
No. 200	7.6
0.02 mm	4.0
0.005 mm	2.2
0.002 mm	1.6
0.001 mm	1.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	18.9	41.8	12.8	14.1	4.8	5.4	2.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	73.5			14.1	4.8	6.0	1.6



Comments ______

Reviewed By RJ

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Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 02/07/2019

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order — Project Number: 175568209
Source: CUF-GT-B17-ST02, 60.0'-60.4' — Lab ID: 80

Sample Type: ST — Date Received: 1-22-19
Date Reported: 2-6-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 22.6

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	70.2
3/8"	9.5	62.0
No. 4	4.75	52.8
No. 10	2	47.0
No. 40	0.425	38.0
No. 200	0.075	37.3
	0.02	14.3
	0.005	5.4
	0.002	1.9
estimated	0.001	0.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	47.2	53.0
Coarse Sand	5.8	9.0
Medium Sand	9.0	---
Fine Sand	0.7	0.7
Silt	31.9	35.4
Clay	5.4	1.9

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.58

Classification
Unified Group Symbol: GM
Group Name: Silty gravel with sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B17-ST02, 60.0'-60.4'	Lab ID	80

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 02-01-2019
Date Received: 01-22-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	70.2
3/8"	62.0
No. 4	52.8
No. 10	47.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.58

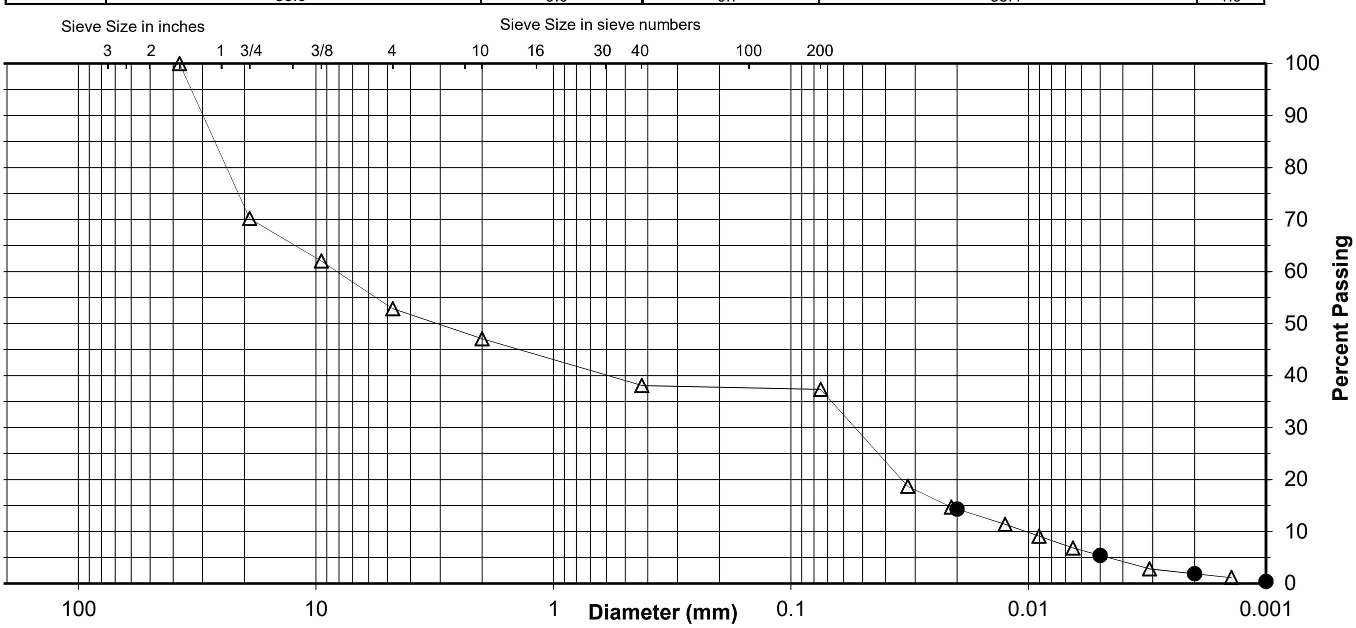
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	38.0
No. 200	37.3
0.02 mm	14.3
0.005 mm	5.4
0.002 mm	1.9
0.001 mm	0.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	29.8	17.4	5.8	9.0	0.7	31.9	5.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	53.0	9.0	0.7	35.4	1.9



Comments ______

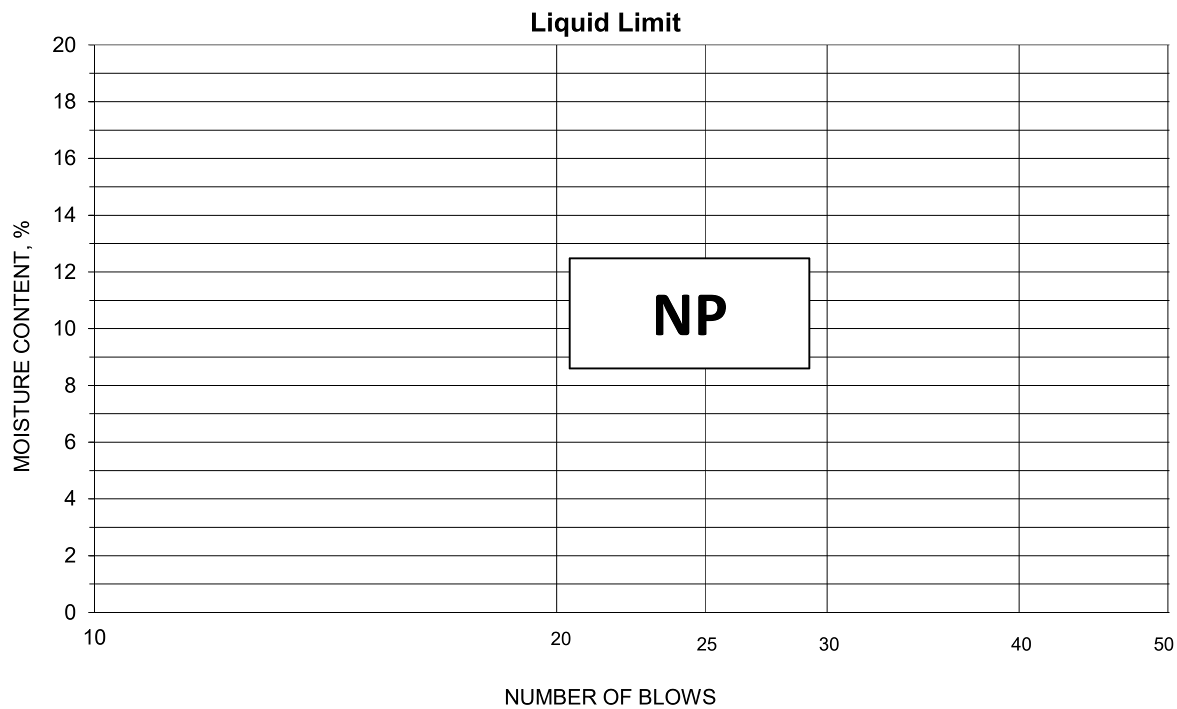
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B17-ST02, 60.0'-60.4'	Lab ID	80
		% + No. 40	62
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	02-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B17-SS33, 85.0'-86.5'
Lab ID: 90

Sample Type: SS
Date Received: 1-22-19
Date Reported: 2-6-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 49.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	91.1
	0.02	53.3
	0.005	16.6
	0.002	6.3
estimated	0.001	1.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	8.8	8.8
Silt	74.5	84.8
Clay	16.6	6.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.45

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B17-SS33, 85.0'-86.5'
Lab ID: 90

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.45

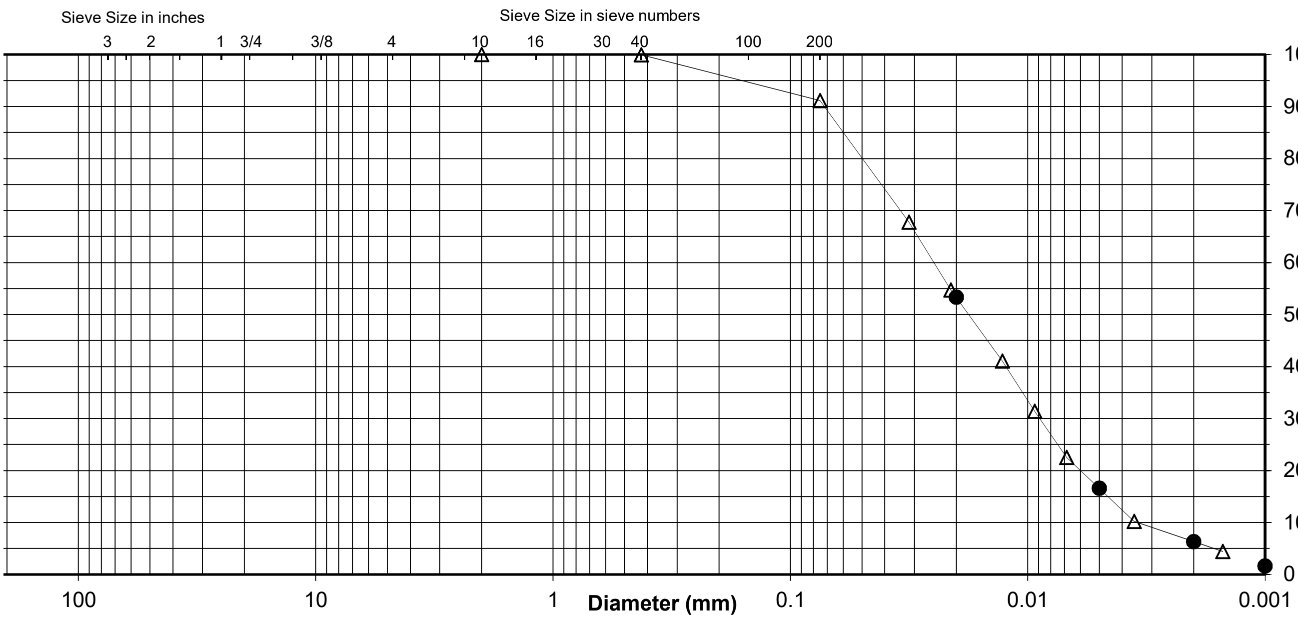
Dispersed using: Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	99.9
No. 200	91.1
0.02 mm	53.3
0.005 mm	16.6
0.002 mm	6.3
0.001 mm	1.6

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.1	8.8	74.5	16.6

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.1	8.8	84.8	6.3



Comments ____________________

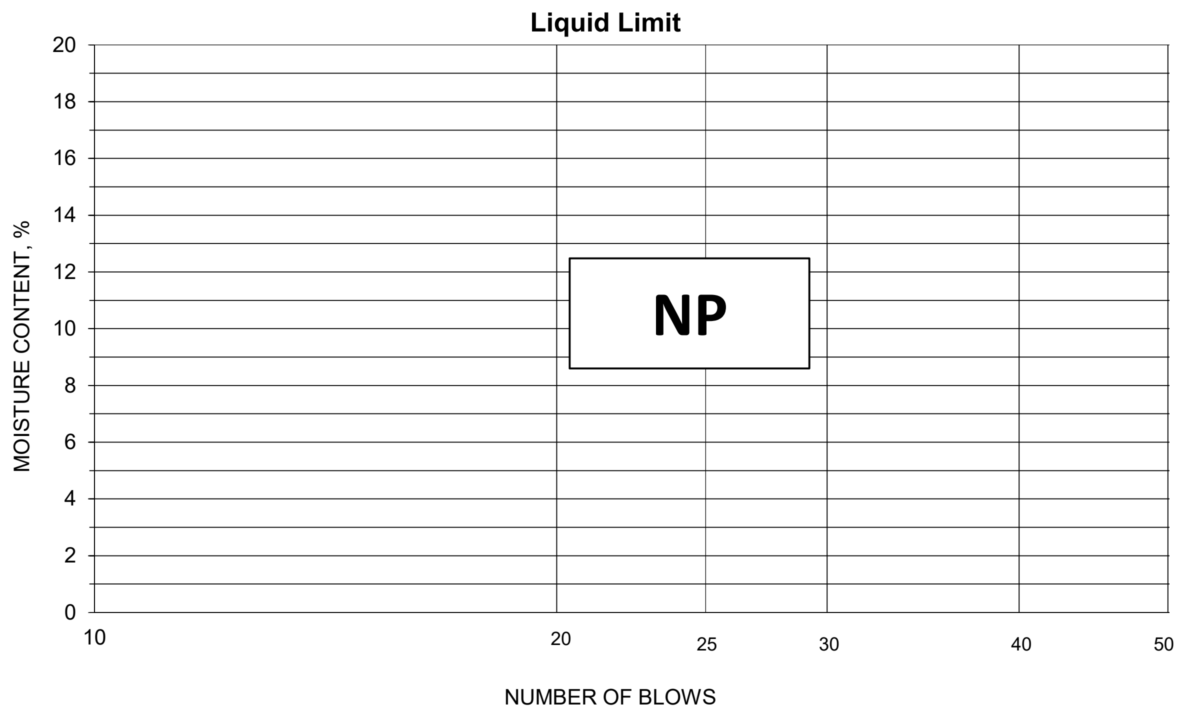
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B17-SS33, 85.0'-86.5'	Lab ID	90
		% + No. 40	0
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	01-29-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B17-SS40, 102.5'-104.0'
Lab ID: 97

Sample Type: SS
Date Received: 1-22-19
Date Reported: 2-6-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 40.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.0
No. 10	2	94.9
No. 40	0.425	81.6
No. 200	0.075	77.5
	0.02	62.1
	0.005	32.8
	0.002	21.3
estimated	0.001	13.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.0	5.1
Coarse Sand	4.1	13.3
Medium Sand	13.3	---
Fine Sand	4.1	4.1
Silt	44.7	56.2
Clay	32.8	21.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 40
Plastic Limit: 21
Plasticity Index: 19
Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.62

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-6 (14)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B17-SS40, 102.5'-104.0'	Lab ID	97

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.0
No. 10	94.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.62

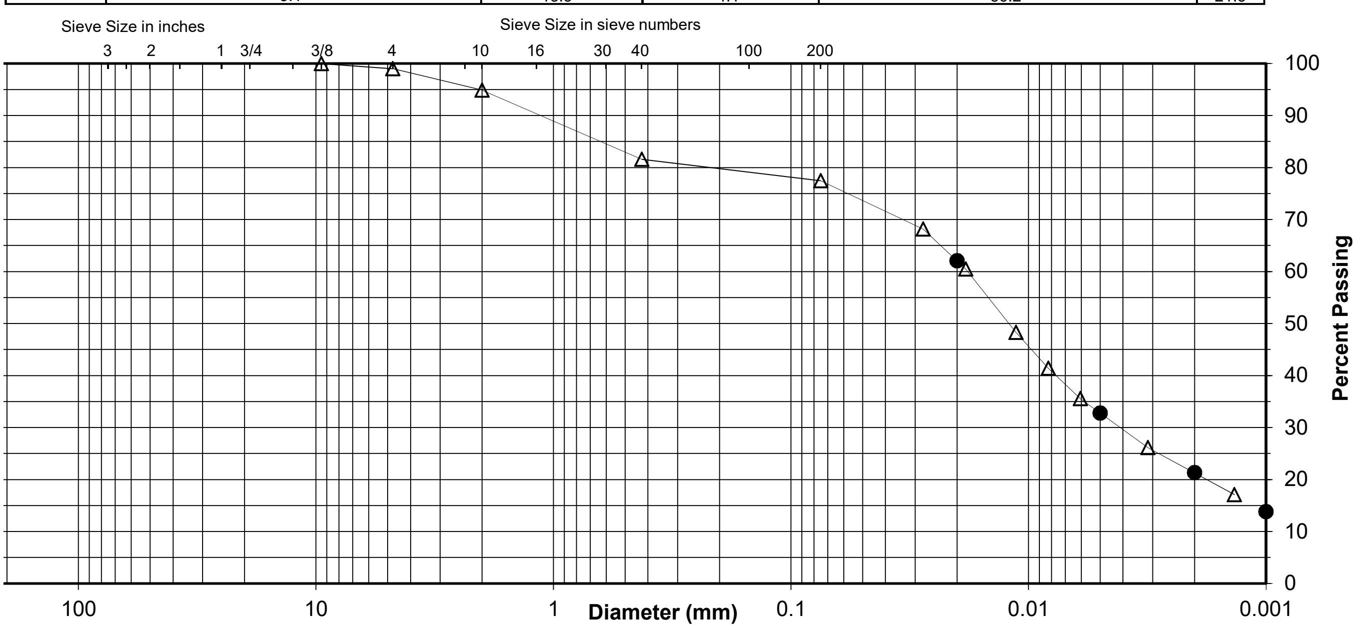
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	81.6
No. 200	77.5
0.02 mm	62.1
0.005 mm	32.8
0.002 mm	21.3
0.001 mm	13.8

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	1.0	4.1	13.3	4.1	44.7	32.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	5.1	13.3	4.1	56.2	21.3



Comments ______________________

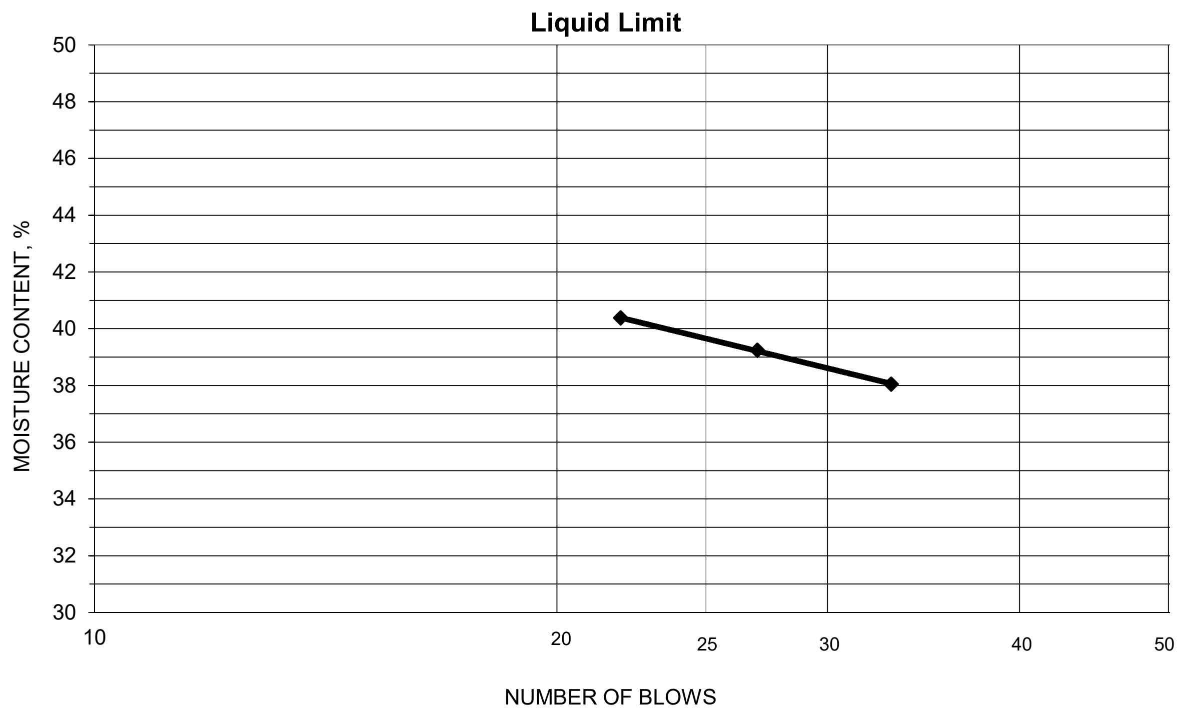
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B17-SS40, 102.5'-104.0'	Lab ID	97
		% + No. 40	18
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	01-22-2019		
Test Date	02-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.77	15.86	10.84	33	38.0	40
18.25	16.28	11.26	27	39.2	
18.62	16.46	11.11	22	40.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
21.98	20.19	11.55	20.7	21	19
20.79	19.20	11.50	20.6		

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B17-SS41b, 106.0'-106.5'	Lab ID	99

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 01-29-2019
Date Received: 01-22-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.9
No. 4	94.7
No. 10	84.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.64

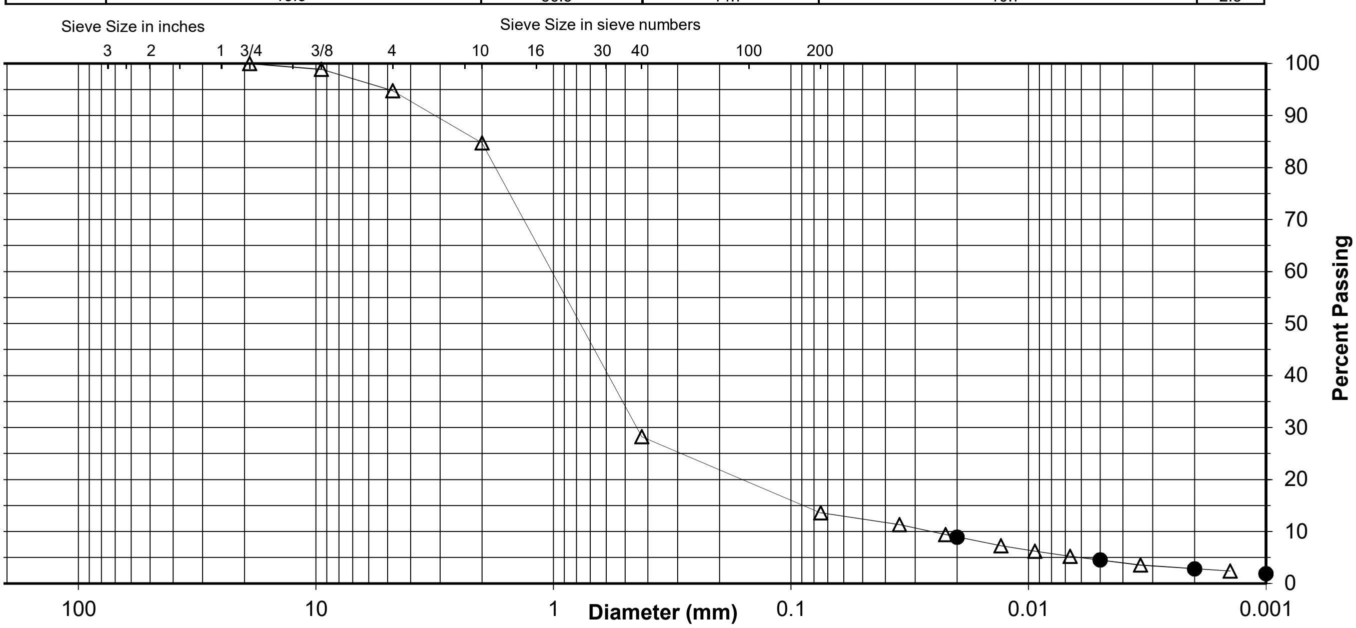
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	28.2
No. 200	13.5
0.02 mm	8.9
0.005 mm	4.5
0.002 mm	2.8
0.001 mm	1.9

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	5.3	10.0	56.5	14.7	9.0	4.5

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	15.3	56.5	14.7	10.7	2.8



Comments ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS10, 13.5'-15.0'
Lab ID: 107

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-12-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 16.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.1
No. 4	4.75	93.3
No. 10	2	79.6
No. 40	0.425	55.7
No. 200	0.075	35.5
	0.02	14.6
	0.005	4.2
	0.002	2.4
estimated	0.001	2.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	6.7	20.4
Coarse Sand	13.7	23.9
Medium Sand	23.9	---
Fine Sand	20.2	20.2
Silt	31.3	33.1
Clay	4.2	2.4

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.52

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS10, 13.5'-15.0'	Lab ID	107

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.1
No. 4	93.3
No. 10	79.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.52

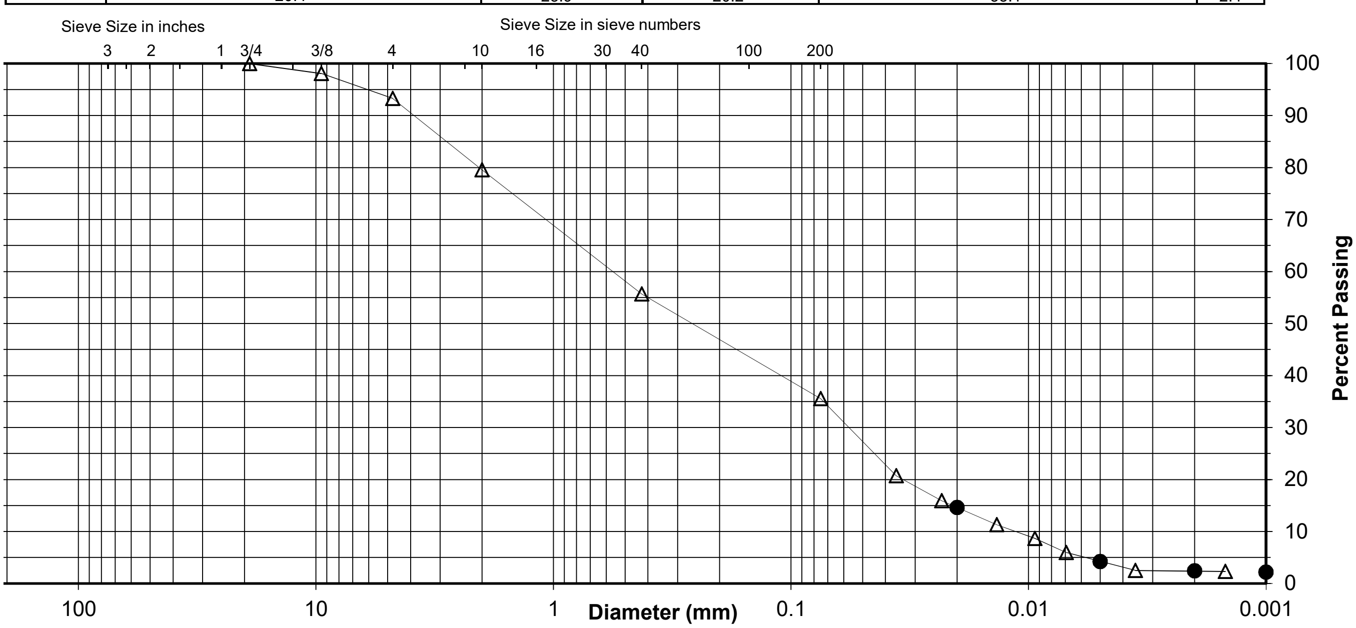
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	55.7
No. 200	35.5
0.02 mm	14.6
0.005 mm	4.2
0.002 mm	2.4
0.001 mm	2.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	6.7	13.7	23.9	20.2	31.3	4.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	20.4	23.9	20.2	33.1	2.4



Comments ______________________

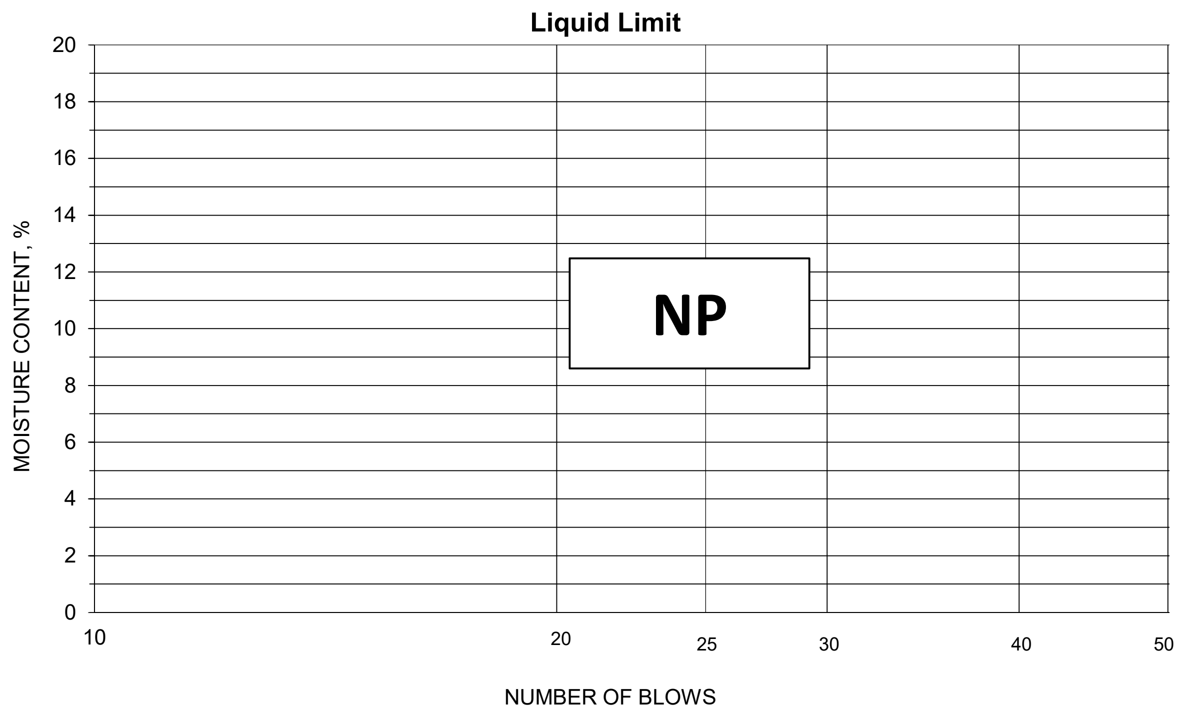
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS10, 13.5'-15.0'	Lab ID	107
		% + No. 40	44
Tested By	CM	Test Method	ASTM D 4318 Method A
Test Date	02-27-2019	Prepared	Dry
Date Received	02-12-2019		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS29, 43.5'-45.0'	Lab ID	120
Sample Type	SS	Date Received	2-12-19
		Date Reported	3-12-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 5.3

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	95.6
No. 4	4.75	75.3
No. 10	2	54.4
No. 40	0.425	31.0
No. 200	0.075	10.2
	0.02	1.9
	0.005	0.2
	0.002	0.1
estimated	0.001	0.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	24.7	45.6
Coarse Sand	20.9	23.4
Medium Sand	23.4	---
Fine Sand	20.8	20.8
Silt	10.0	10.1
Clay	0.2	0.1

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.58

Classification
Unified Group Symbol: SP-SM
Group Name: Poorly graded sand with silt and gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS29, 43.5'-45.0'	Lab ID	120

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: KG
Test Date: 02-25-2019
Date Received: 02-12-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	95.6
No. 4	75.3
No. 10	54.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.58

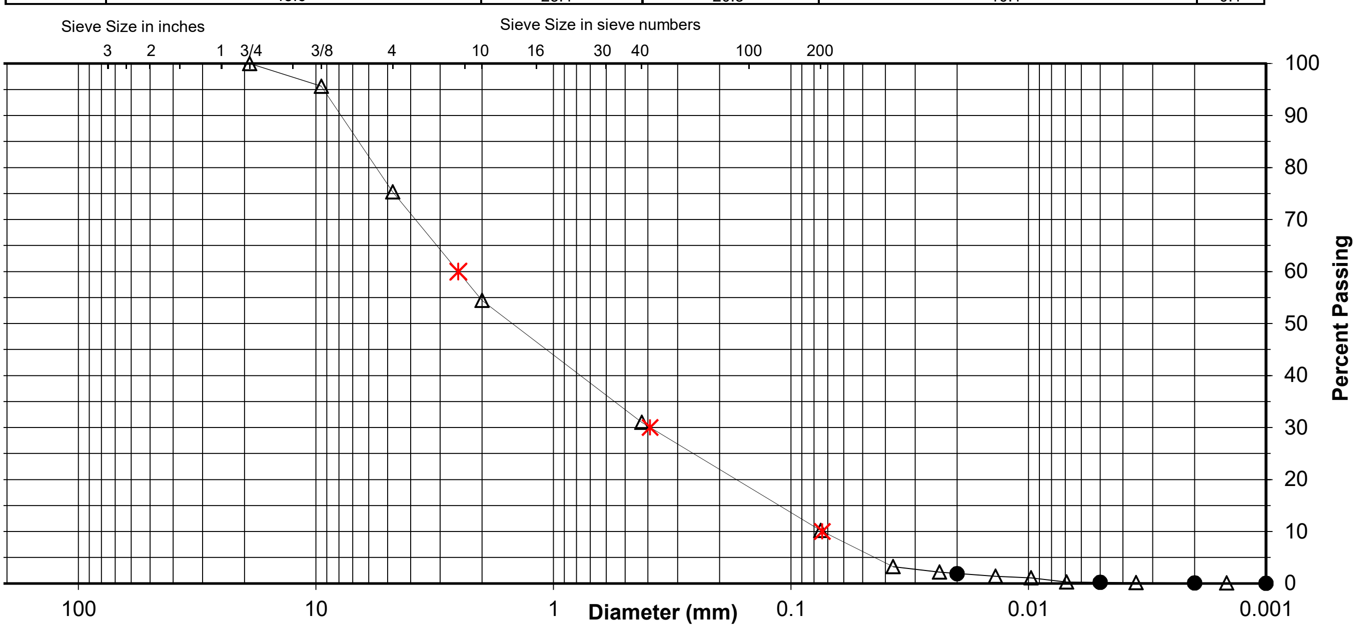
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	31.0
No. 200	10.2
0.02 mm	1.9
0.005 mm	0.2
0.002 mm	0.1
0.001 mm	0.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	24.7	20.9	23.4	20.8	10.0	0.2

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	45.6	23.4	20.8	10.1	0.1



Comments ______

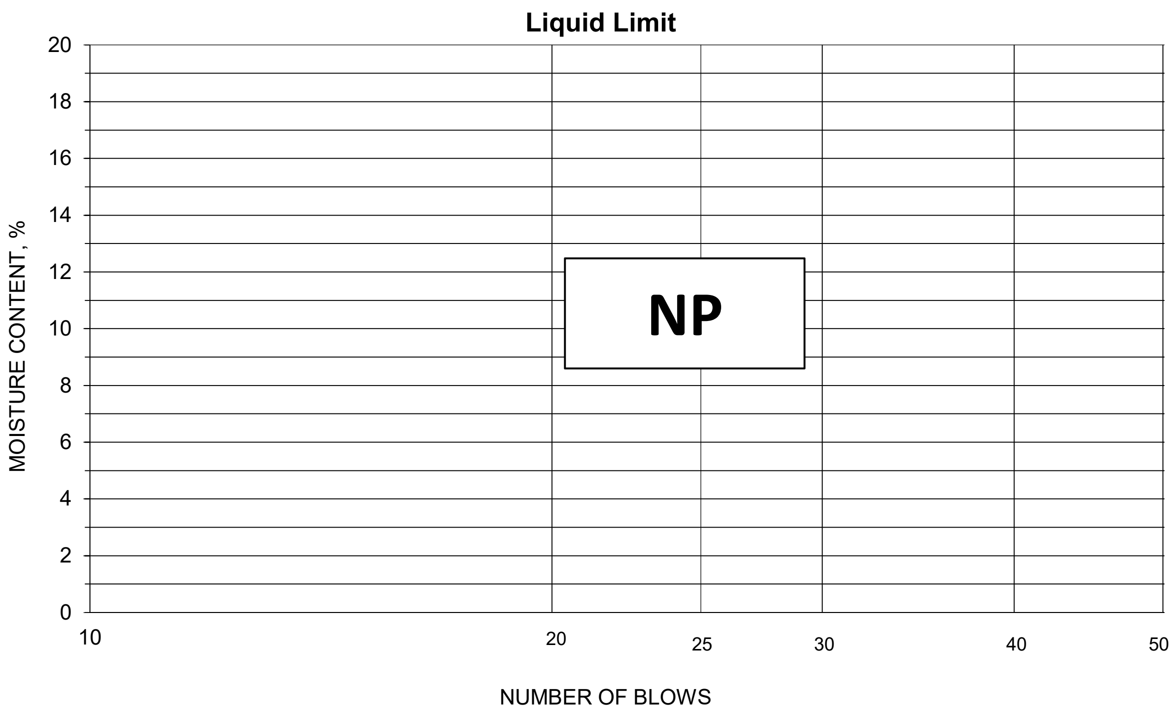
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS29, 43.5'-45.0'	Lab ID	120
		% + No. 40	69
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	02-25-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS34a, 51.0'-51.5'	Lab ID	124
Sample Type	SS	Date Received	2-12-19
		Date Reported	3-19-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 20.2

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	97.7
No. 4	4.75	90.2
No. 10	2	79.7
No. 40	0.425	43.1
No. 200	0.075	24.4
	0.02	12.4
	0.005	5.8
	0.002	4.4
estimated	0.001	3.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	9.8	20.3
Coarse Sand	10.5	36.6
Medium Sand	36.6	---
Fine Sand	18.7	18.7
Silt	18.6	20.0
Clay	5.8	4.4

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.54

Classification
Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS34a, 51.0'-51.5'
Lab ID: 124

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	97.7
No. 4	90.2
No. 10	79.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.54

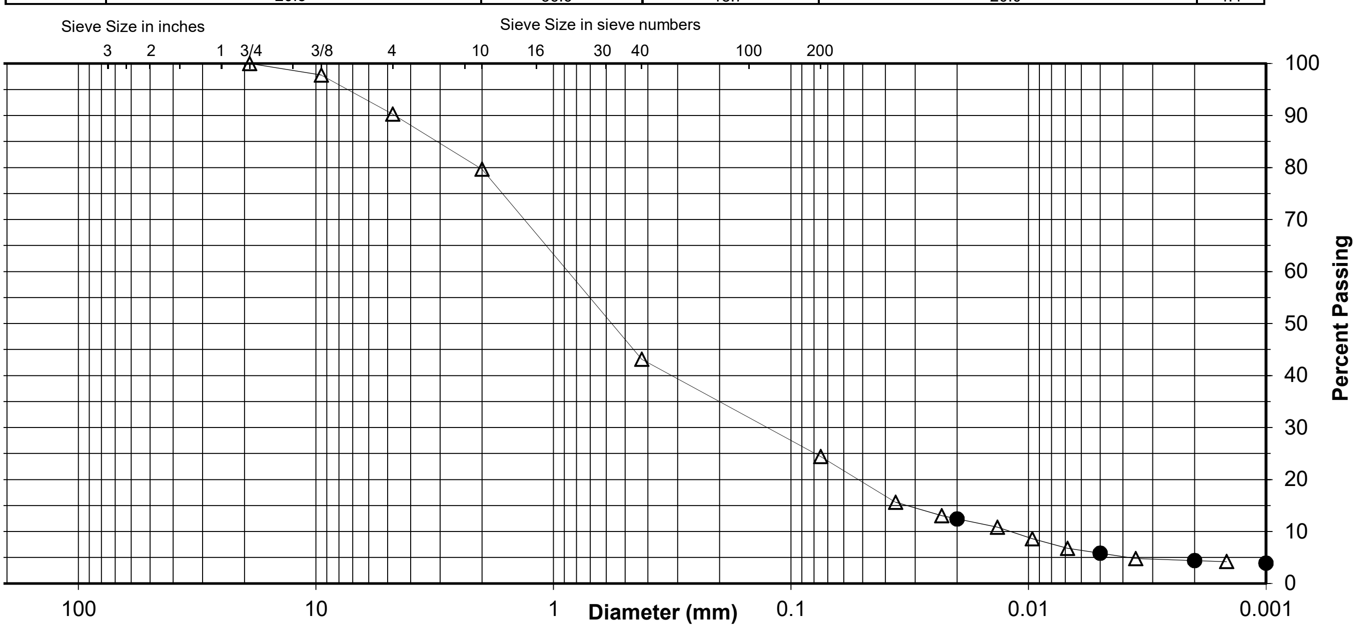
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	43.1
No. 200	24.4
0.02 mm	12.4
0.005 mm	5.8
0.002 mm	4.4
0.001 mm	3.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	9.8	10.5	36.6	18.7	18.6	5.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	20.3	36.6	18.7	20.0	4.4



Comments ______

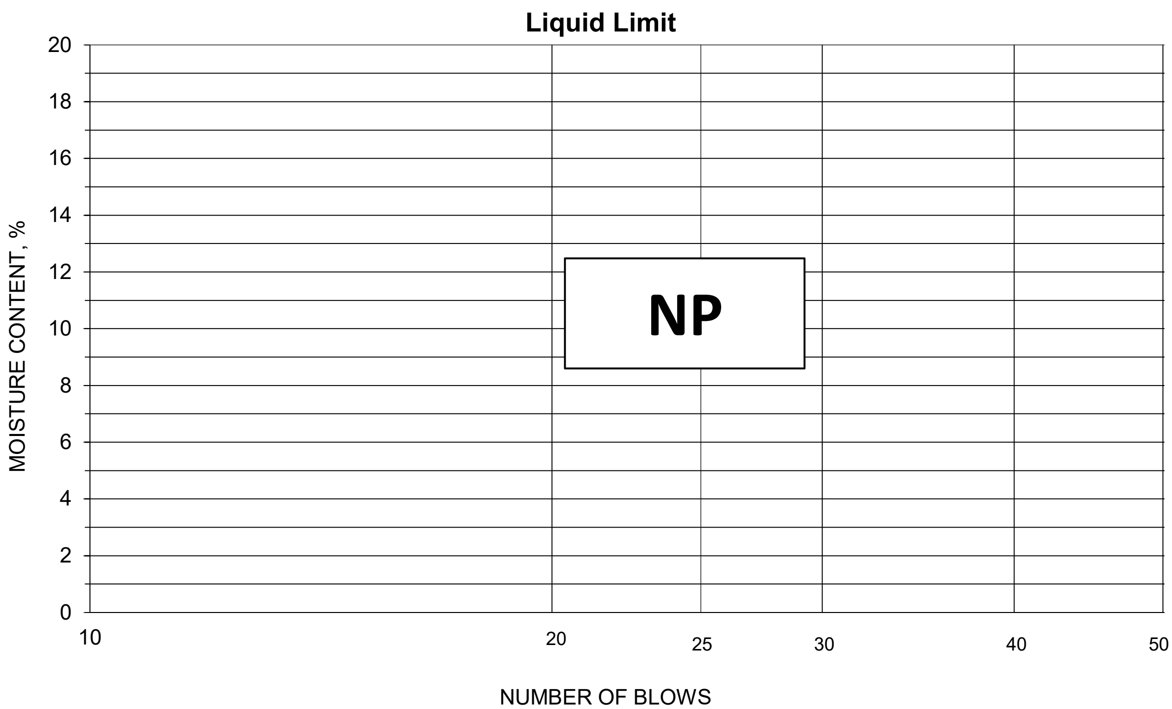
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS34a, 51.0'-51.5'	Lab ID	124
		% + No. 40	57
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	02-27-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-ST02, 60.4'-60.9'	Lab ID	128
Sample Type	ST	Date Received	2-12-19
		Date Reported	3-20-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 31.6

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.9
3/8"	9.5	96.9
No. 4	4.75	96.3
No. 10	2	95.2
No. 40	0.425	94.3
No. 200	0.075	87.4
	0.02	53.0
	0.005	21.0
	0.002	8.0
estimated	0.001	1.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	3.7	4.8
Coarse Sand	1.1	0.9
Medium Sand	0.9	---
Fine Sand	6.9	6.9
Silt	66.4	79.4
Clay	21.0	8.0

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.50

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-ST02, 60.4'-60.9'	Lab ID	128

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: KG
Test Date: 02-22-2019
Date Received: 02-12-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.9
3/8"	96.9
No. 4	96.3
No. 10	95.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.5

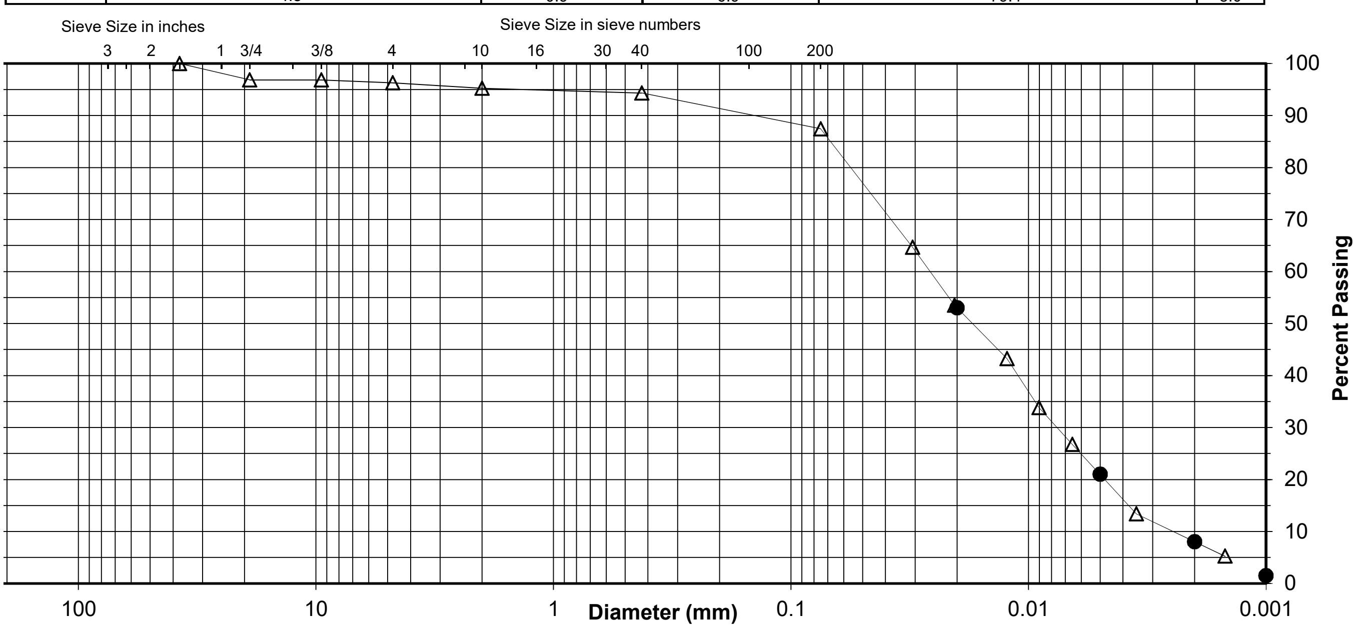
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	94.3
No. 200	87.4
0.02 mm	53.0
0.005 mm	21.0
0.002 mm	8.0
0.001 mm	1.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.1	0.6	1.1	0.9	6.9	66.4	21.0

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	4.8	0.9	6.9	79.4	8.0



Comments ____________

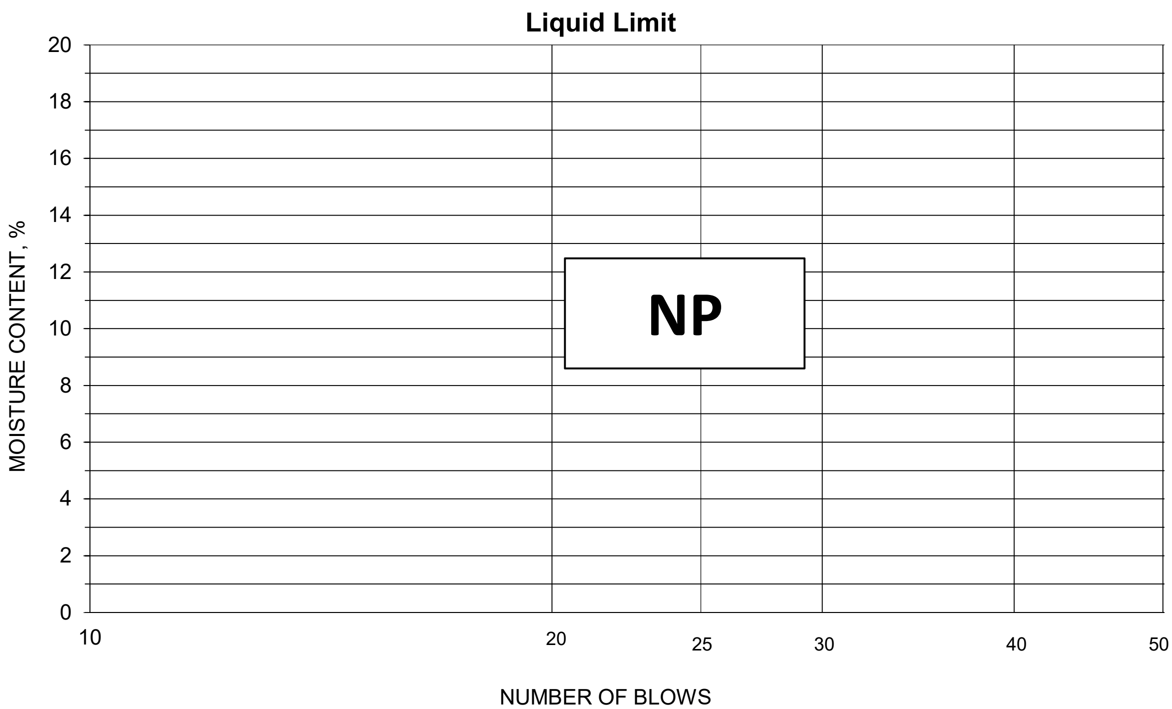
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-ST02, 60.4'-60.9'	Lab ID	128
		% + No. 40	6
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS45, 69.5'-71.0'	Lab ID	132
Sample Type	SS	Date Received	2-12-19
		Date Reported	3-20-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 20.7

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	93.6
No. 4	4.75	75.7
No. 10	2	52.3
No. 40	0.425	23.3
No. 200	0.075	8.7
	0.02	3.3
	0.005	1.2
	0.002	0.8
estimated	0.001	0.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	24.3	47.7
Coarse Sand	23.4	29.0
Medium Sand	29.0	---
Fine Sand	14.6	14.6
Silt	7.5	7.9
Clay	1.2	0.8

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.57

Classification
Unified Group Symbol: SW-SM
Group Name: Well-graded sand with silt and gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS45, 69.5'-71.0'	Lab ID	132

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	93.6
No. 4	75.7
No. 10	52.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.57

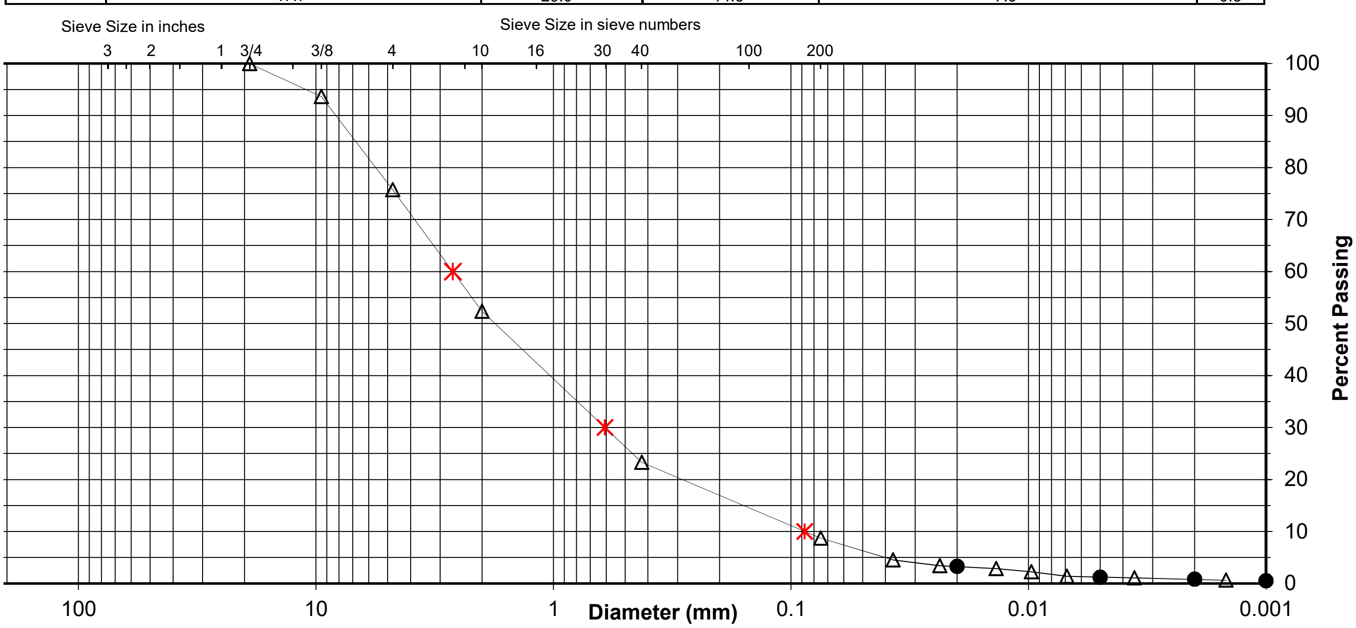
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	23.3
No. 200	8.7
0.02 mm	3.3
0.005 mm	1.2
0.002 mm	0.8
0.001 mm	0.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	24.3	23.4	29.0	14.6	7.5	1.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	47.7	29.0	14.6	7.9	0.8



Comments ______

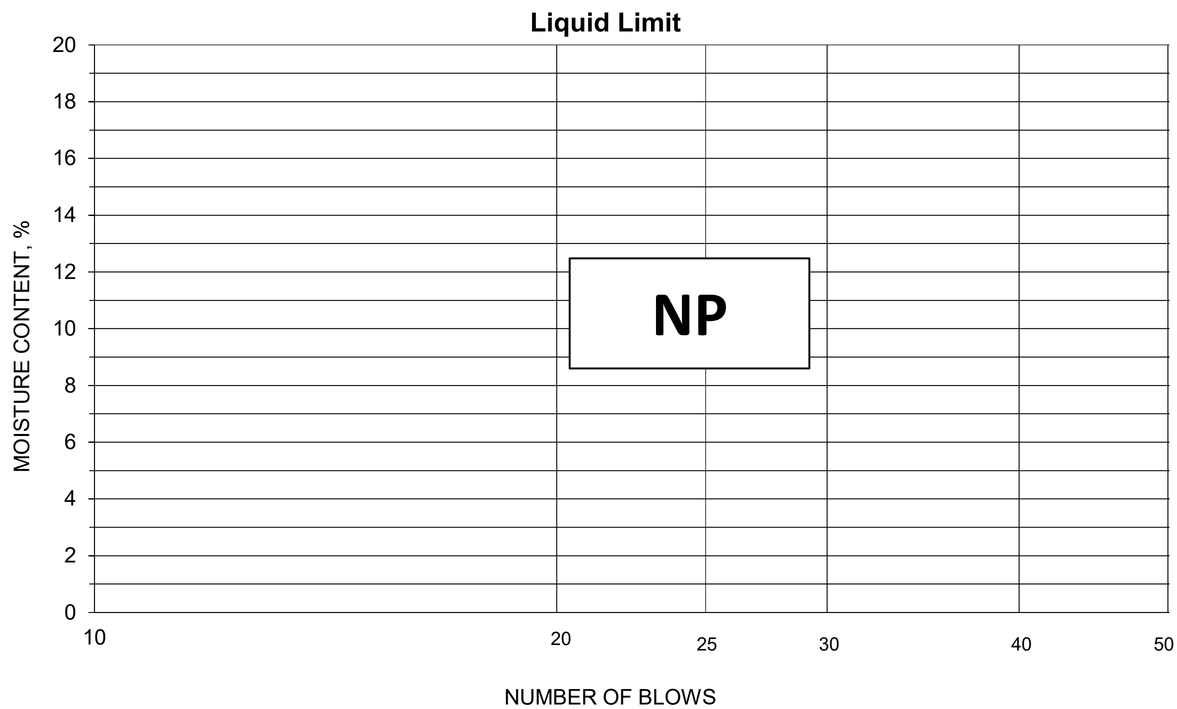
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW07-SS45, 69.5'-71.0'			Lab ID	132
				% + No. 40	77
Tested By	CM	Test Method	ASTM D 4318 Method A	Date Received	02-12-2019
Test Date	02-26-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

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Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 03/21/2019

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS51, 78.5'-80.0'	Lab ID	137
Sample Type	SS	Date Received	2-12-19
		Date Reported	3-20-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 45.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.8
No. 200	0.075	96.1
	0.02	62.2
	0.005	22.5
	0.002	8.4
estimated	0.001	1.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.1
Medium Sand	0.1	---
Fine Sand	3.7	3.7
Silt	73.6	87.7
Clay	22.5	8.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.52

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS51, 78.5'-80.0'	Lab ID	137

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: KG
Test Date: 02-22-2019
Date Received: 02-12-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.52

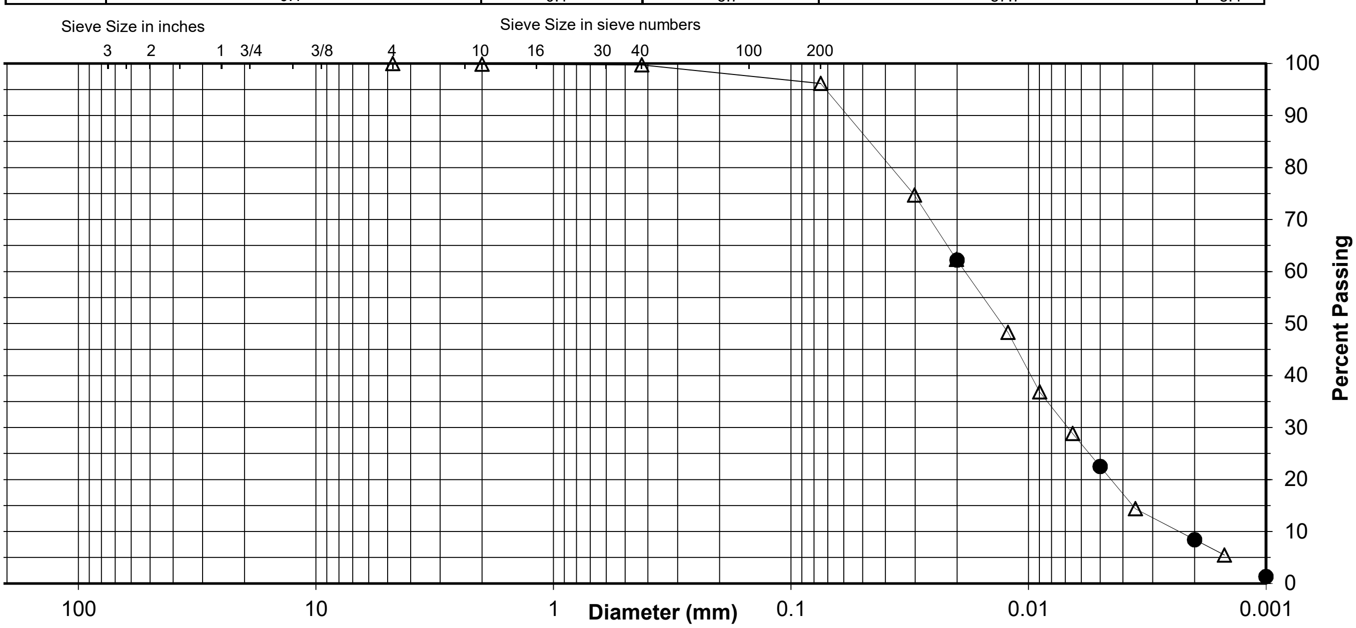
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	99.8
No. 200	96.1
0.02 mm	62.2
0.005 mm	22.5
0.002 mm	8.4
0.001 mm	1.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	0.1	3.7	73.6	22.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.1	0.1	3.7	87.7	8.4



Comments ______

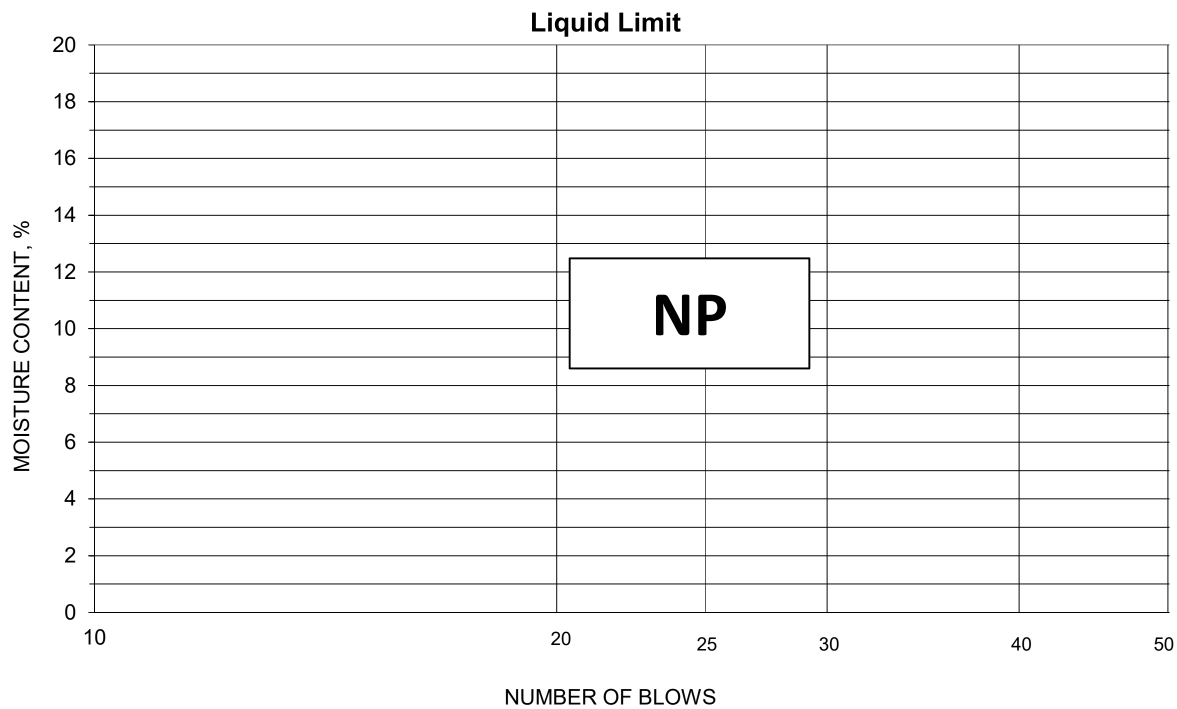
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS51, 78.5'-80.0'	Lab ID	137
		% + No. 40	0
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS62b, 96.2'-97.0'
Lab ID: 146

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-20-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 34.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	98.9
	0.02	88.4
	0.005	57.2
	0.002	37.2
estimated	0.001	25.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	0.9	0.9
Silt	41.7	61.7
Clay	57.2	37.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 46
Plastic Limit: 24
Plasticity Index: 22
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.63

Classification

Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-7-6 (25)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS62b, 96.2'-97.0'
Lab ID: 146

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.63

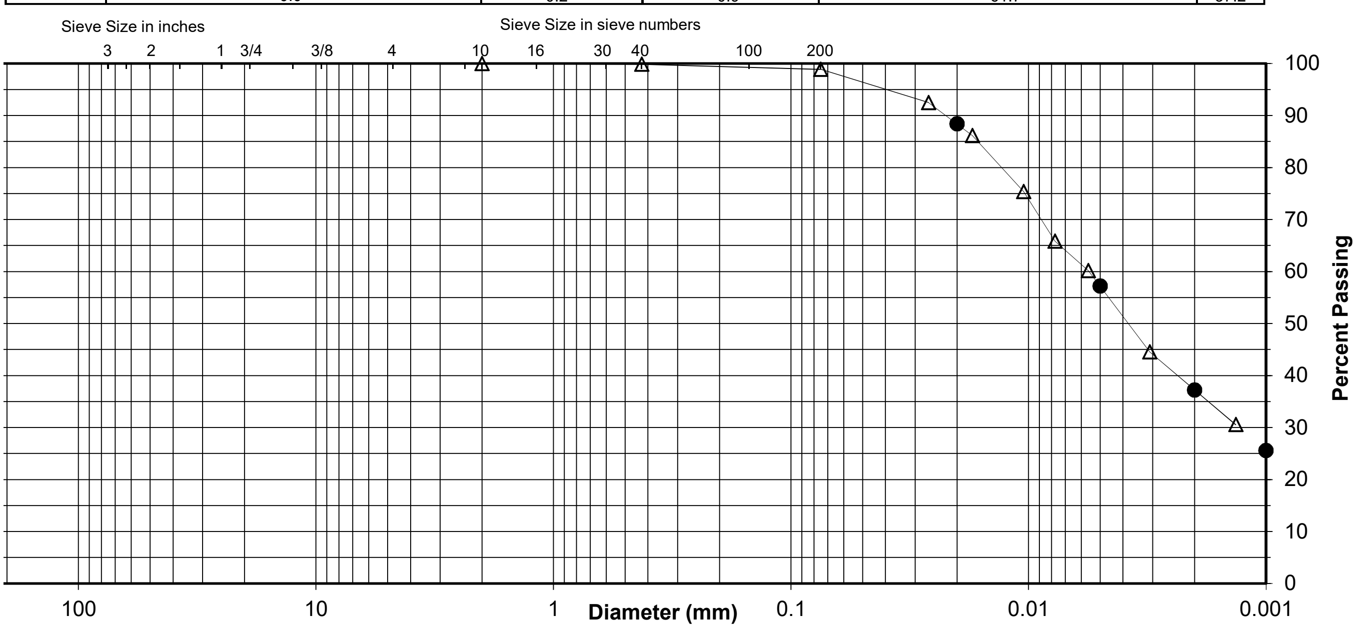
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	98.9
0.02 mm	88.4
0.005 mm	57.2
0.002 mm	37.2
0.001 mm	25.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.2	0.9	41.7	57.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.2	0.9	61.7	37.2



Comments:

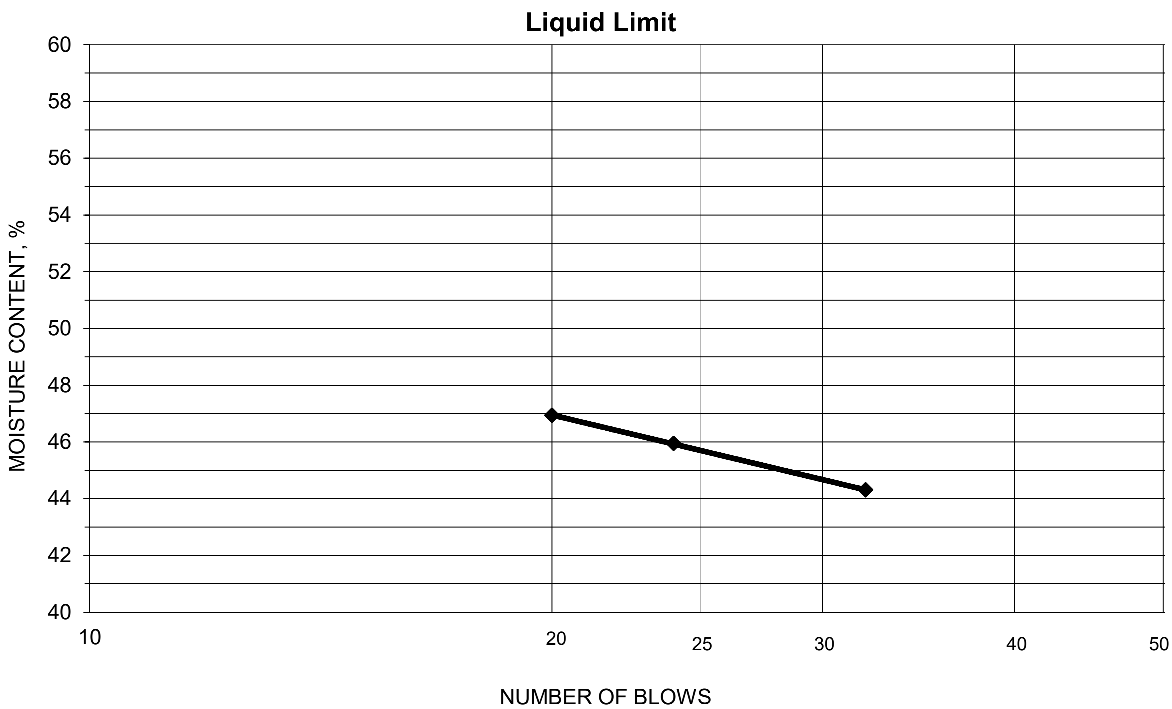
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS62b, 96.2'-97.0'	Lab ID	146
		% + No. 40	0
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.24	18.09	10.98	32	44.3	46
20.89	17.83	11.17	24	45.9	
20.52	17.53	11.16	20	46.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.49	18.74	11.49	24.1	24	22
19.14	17.64	11.39	24.0		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS63a, 98.5'-99.0'
Lab ID: 147

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-20-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 33.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	89.5
No. 40	0.425	88.3
No. 200	0.075	86.6
	0.02	71.6
	0.005	43.1
	0.002	29.2
estimated	0.001	20.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.2	10.5
Coarse Sand	10.3	1.2
Medium Sand	1.2	---
Fine Sand	1.7	1.7
Silt	43.5	57.4
Clay	43.1	29.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 37
Plastic Limit: 21
Plasticity Index: 16
Activity Index: 0.5

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.65

Classification

Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-6 (14)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS63a, 98.5'-99.0'	Lab ID	147

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: KG
Test Date: 02-25-2019
Date Received: 02-12-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	89.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.65

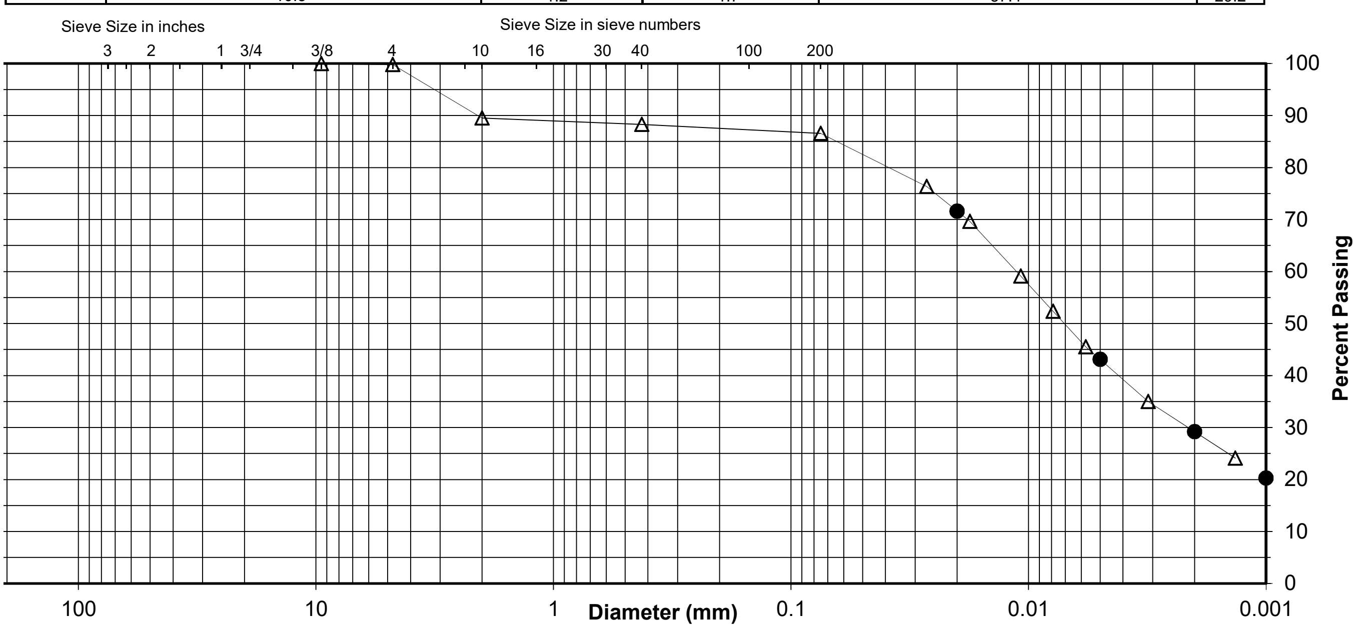
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	88.3
No. 200	86.6
0.02 mm	71.6
0.005 mm	43.1
0.002 mm	29.2
0.001 mm	20.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.2	10.3	1.2	1.7	43.5	43.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	10.5	1.2	1.7	57.4	29.2



Comments ______________________

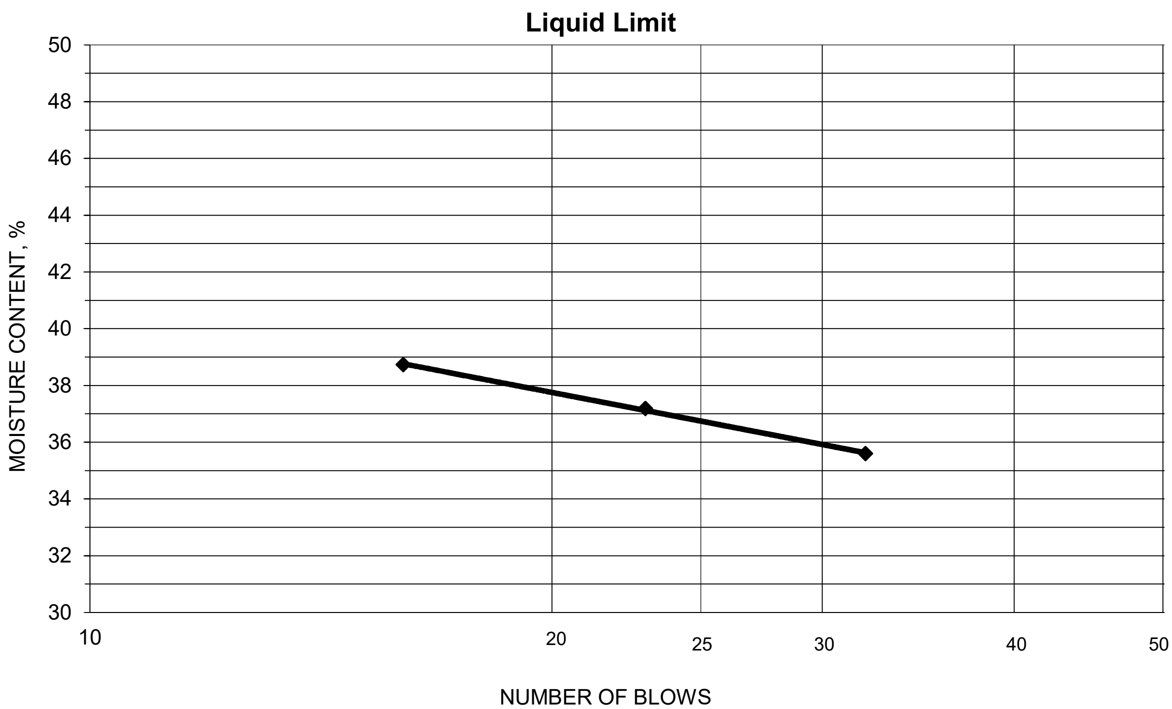
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS63a, 98.5'-99.0'	Lab ID	147
		% + No. 40	12
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.38	18.65	10.98	32	35.6	37
20.84	18.17	10.99	23	37.2	
21.07	18.32	11.22	16	38.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.61	18.23	11.67	21.0	21	16
19.44	18.08	11.45	20.5		

Remarks:

Reviewed By RJ

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Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 03/21/2019

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS66, 103.0'-104.5'
Lab ID: 151

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-20-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 26.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.5
3/8"	9.5	81.7
No. 4	4.75	61.4
No. 10	2	36.4
No. 40	0.425	15.8
No. 200	0.075	9.5
	0.02	5.9
	0.005	2.3
	0.002	1.7
estimated	0.001	1.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	38.6	63.6
Coarse Sand	25.0	20.6
Medium Sand	20.6	---
Fine Sand	6.3	6.3
Silt	7.2	7.8
Clay	2.3	1.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.66

Classification

Unified Group Symbol: SP-SM
Group Name: Poorly graded sand with silt and gravel

AASHTO Classification: A-1-a (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS66, 103.0'-104.5'	Lab ID	151

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 03-01-2019
Date Received: 02-12-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.5
3/8"	81.7
No. 4	61.4
No. 10	36.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

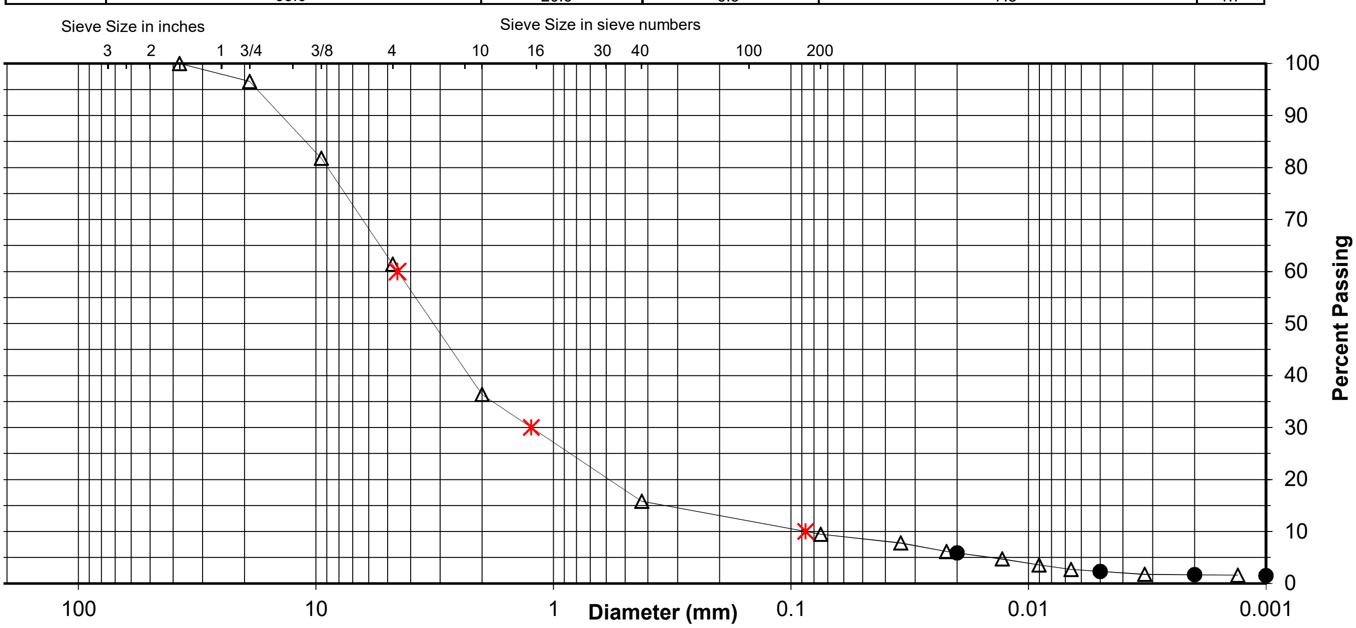
Specific Gravity: 2.66

Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	15.8
No. 200	9.5
0.02 mm	5.9
0.005 mm	2.3
0.002 mm	1.7
0.001 mm	1.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.5	35.1	25.0	20.6	6.3	7.2	2.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	63.6			20.6	6.3	7.8	1.7



Comments ______

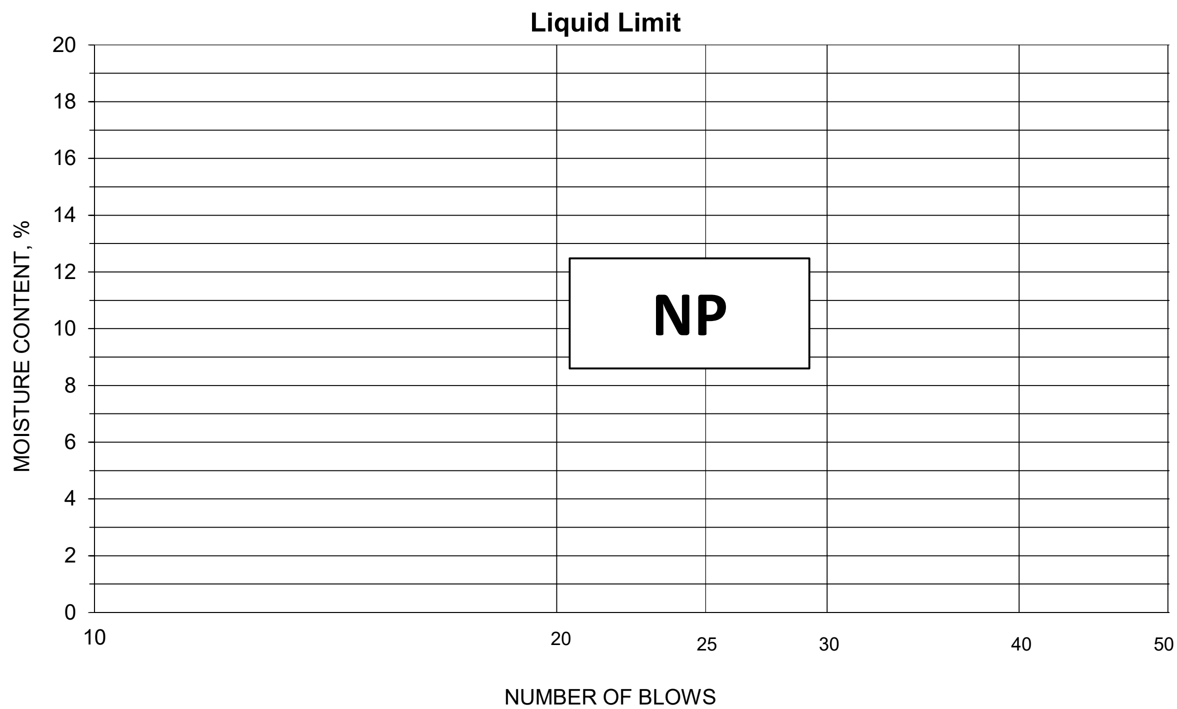
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS66, 103.0'-104.5'	Lab ID	151
		% + No. 40	84
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS71a, 110.5'-111.1'
Lab ID: 159

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 28.9

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.7
No. 4	4.75	97.4
No. 10	2	71.8
No. 40	0.425	70.8
No. 200	0.075	68.6
	0.02	51.2
	0.005	23.7
	0.002	16.4
estimated	0.001	13.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	2.6	28.2
Coarse Sand	25.6	1.0
Medium Sand	1.0	---
Fine Sand	2.2	2.2
Silt	44.9	52.2
Clay	23.7	16.4

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 33
Plastic Limit: 21
Plasticity Index: 12
Activity Index: 0.7

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.66

Classification
Unified Group Symbol: CL
Group Name: Sandy lean clay

AASHTO Classification: A-6 (7)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS71a, 110.5'-111.1'
Lab ID: 159

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: KG
Test Date: 02-25-2019
Date Received: 02-12-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.7
No. 4	97.4
No. 10	71.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.66

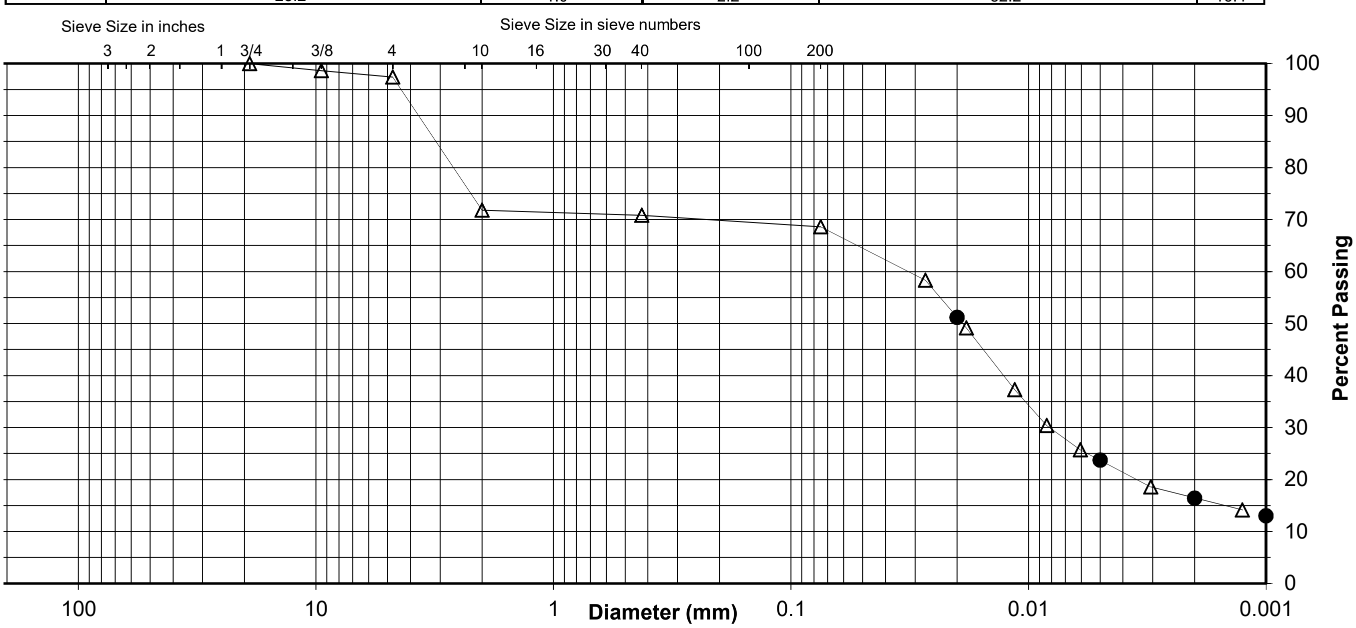
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	70.8
No. 200	68.6
0.02 mm	51.2
0.005 mm	23.7
0.002 mm	16.4
0.001 mm	13.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.6	25.6	1.0	2.2	44.9	23.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	28.2	1.0	2.2	52.2	16.4



Comments ____

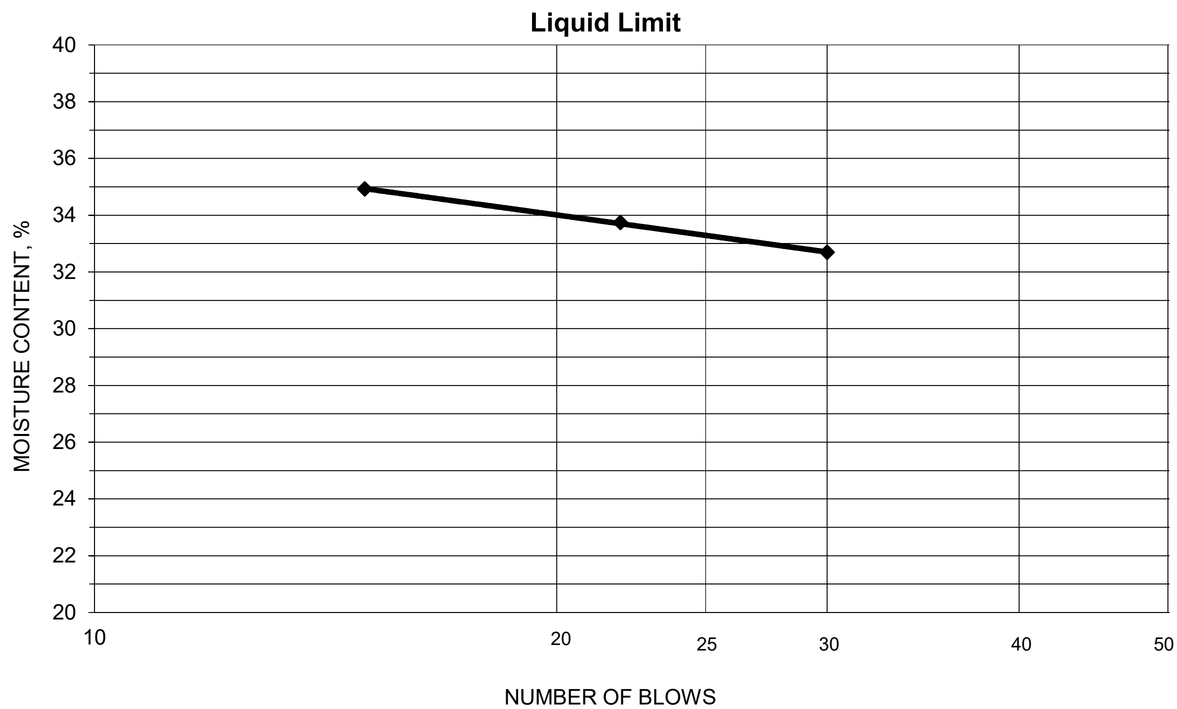
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS71a, 110.5'-111.1'	Lab ID	159
		% + No. 40	29
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.39	18.04	10.85	30	32.7	33
20.16	17.92	11.28	22	33.7	
19.94	17.67	11.17	15	34.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.87	17.61	11.46	20.5	21	12
18.56	17.34	11.47	20.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS74, 115.0'-116.5' & SS75, 116.5'-118.0'
Lab ID: 165/166

Sample Type: SPT Composite
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
3"	75	100.0
1 1/2"	37.5	95.4
3/4"	19	72.5
3/8"	9.5	52.5
No. 4	4.75	37.1
No. 10	2	25.1
No. 40	0.425	10.1
No. 200	0.075	6.5
	0.02	4.4
	0.005	2.6
	0.002	2.2
estimated	0.001	1.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	62.9	74.9
Coarse Sand	12.0	15.0
Medium Sand	15.0	---
Fine Sand	3.6	3.6
Silt	3.9	4.3
Clay	2.6	2.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 24
Plastic Limit: 21
Plasticity Index: 3
Activity Index: 1.4

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.65

Classification

Unified Group Symbol: GW-GM
Group Name: Well-graded gravel with silt and sand

AASHTO Classification: A-1-a (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW07-SS74, 115.0'-116.5' & SS75, 116.5'-118.0'	Lab ID	165/166

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 03-01-2019
Date Received: 02-12-2019

Maximum Particle size: 3" Sieve

Sieve Size	% Passing
3"	100.0
1 1/2"	95.4
3/4"	72.5
3/8"	52.5
No. 4	37.1
No. 10	25.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.65

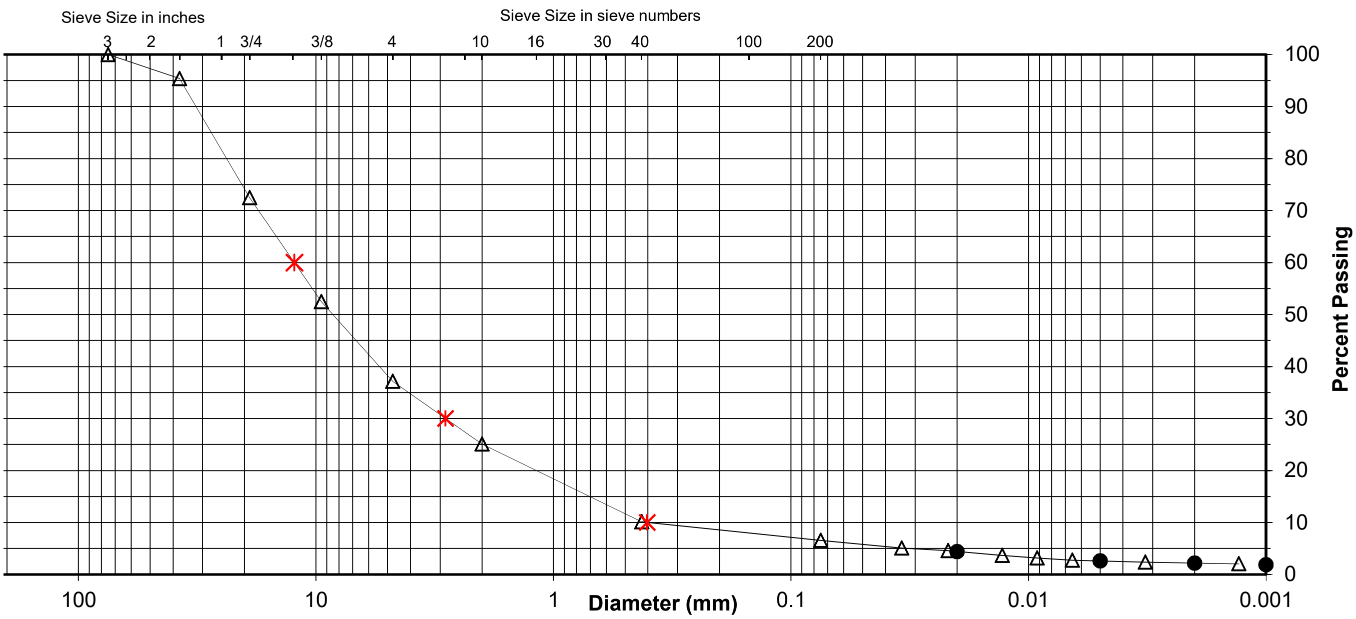
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	10.1
No. 200	6.5
0.02 mm	4.4
0.005 mm	2.6
0.002 mm	2.2
0.001 mm	1.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	27.5	35.4	12.0	15.0	3.6	3.9	2.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	74.9	15.0	3.6	4.3	2.2



Comments ______

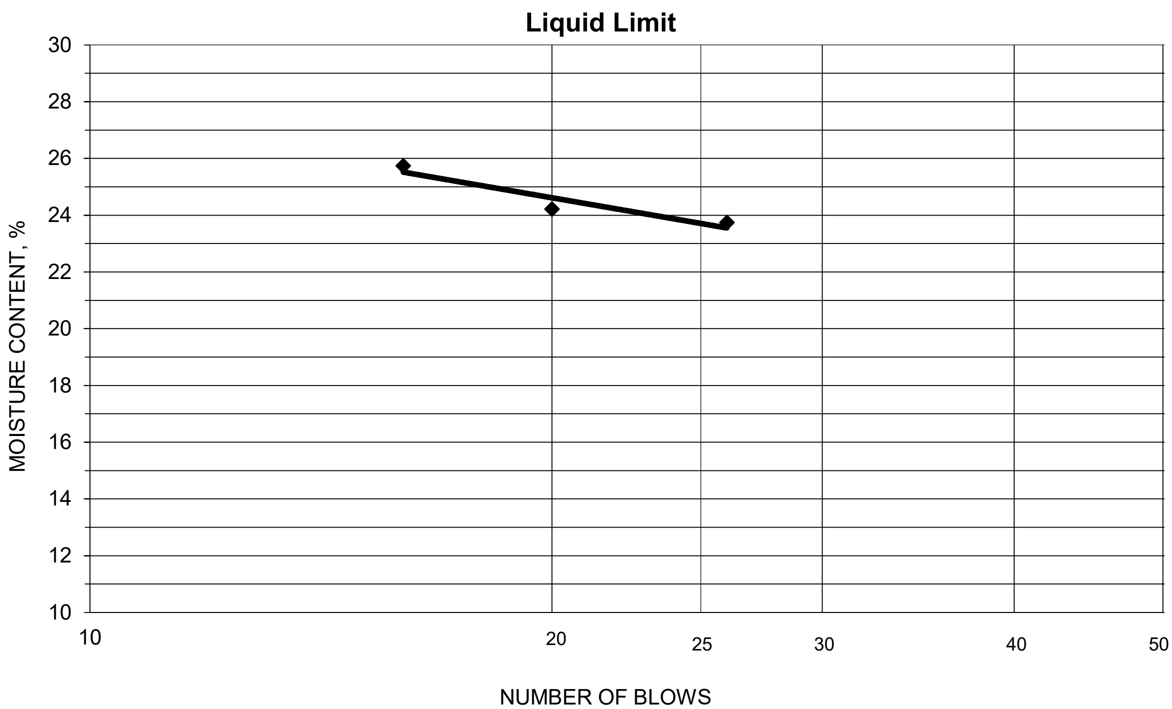
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS74, 115.0'-116.5' & SS75, 116.5'-118.0'	Lab ID	165/166
		% + No. 40	90
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
23.83	21.39	11.11	26	23.7	24
22.61	20.37	11.12	20	24.2	
22.81	20.36	10.84	16	25.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.83	18.37	11.27	20.6	21	3
21.42	19.61	10.89	20.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS78, 121.0'-122.5' & SS79, 122.5'-124.0' & SS80, 124.0'-125.2'
Lab ID: 169/170/171
Sample Type: SPT Composite
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	84.1
3/8"	9.5	60.8
No. 4	4.75	42.0
No. 10	2	25.1
No. 40	0.425	12.4
No. 200	0.075	8.1
	0.02	5.5
	0.005	3.8
	0.002	3.4
estimated	0.001	3.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	58.0	74.9
Coarse Sand	16.9	12.7
Medium Sand	12.7	---
Fine Sand	4.3	4.3
Silt	4.3	4.7
Clay	3.8	3.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 32
Plastic Limit: 22
Plasticity Index: 10
Activity Index: 2.9

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: GP-GC
Group Name: Poorly graded gravel with clay and sand (or silty clay and sand)
AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW07-SS78, 121.0'-122.5' & SS79, 122.5'-124.0' & SS80, 124.0'-125.2'
Lab ID: 169/170/171

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: KG
Test Date: 02-25-2019
Date Received: 02-12-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	84.1
3/8"	60.8
No. 4	42.0
No. 10	25.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

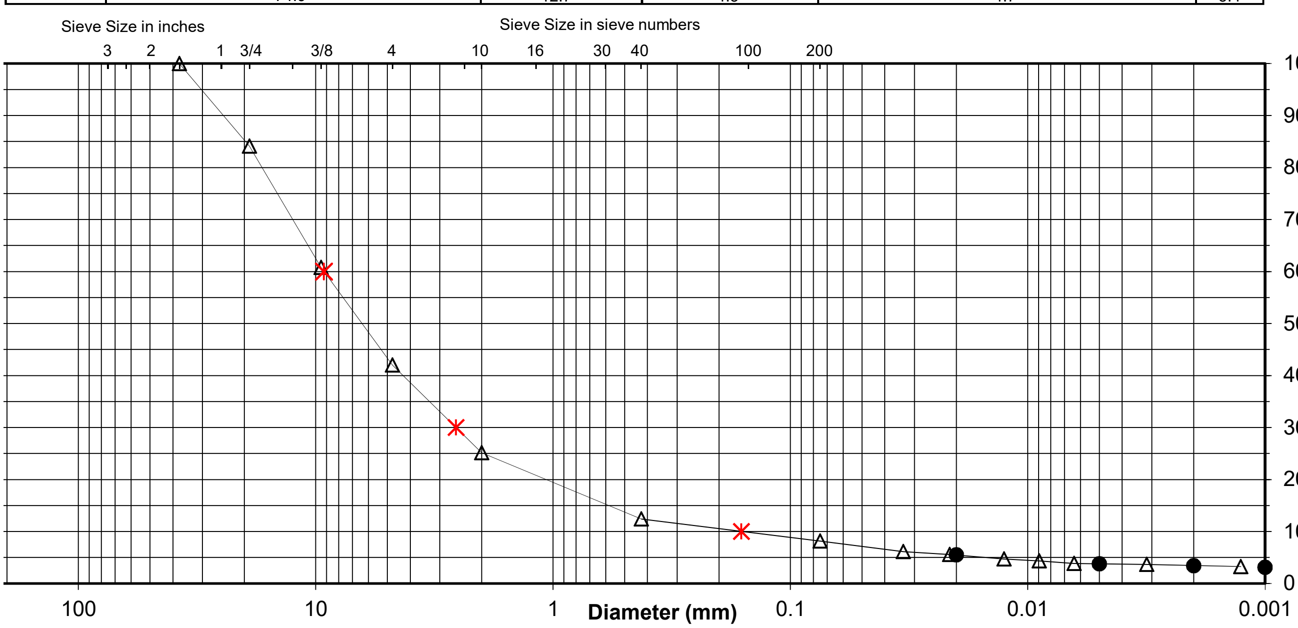
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	12.4
No. 200	8.1
0.02 mm	5.5
0.005 mm	3.8
0.002 mm	3.4
0.001 mm	3.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	15.9	42.1	16.9	12.7	4.3	4.3	3.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	74.9	12.7	4.3	4.7	3.4



Comments ______

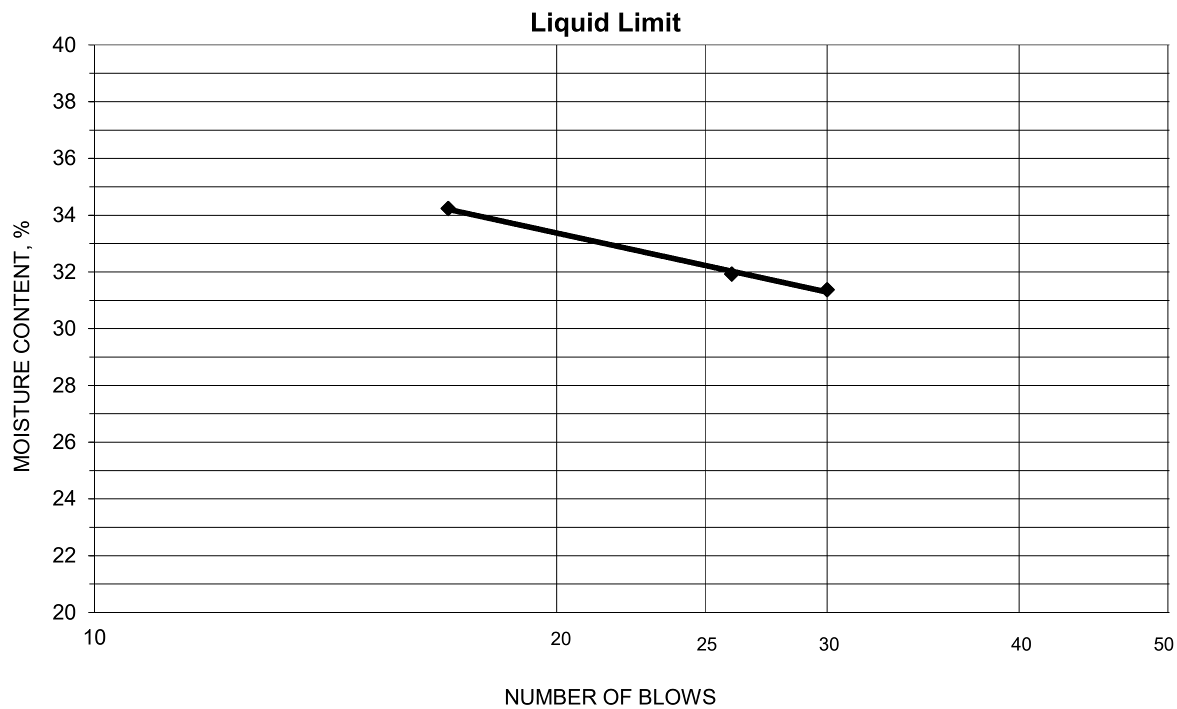
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW07-SS78, 121.0'-122.5' & SS79, 122.5'-124.0' &	Lab ID	169/170/171
	SS80, 124.0'-125.2'	% + No. 40	88
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
22.59	19.87	11.20	30	31.4	
21.89	19.26	11.02	26	31.9	
22.54	19.75	11.60	17	34.2	32



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.69	19.03	11.41	21.8	22	10
22.19	20.17	10.83	21.6		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS07, 9.0'-9.9'	Lab ID	176
Sample Type	SS	Date Received	2-12-19
		Date Reported	3-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 33.3

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	95.3
3/8"	9.5	93.2
No. 4	4.75	92.3
No. 10	2	87.9
No. 40	0.425	54.3
No. 200	0.075	34.8
	0.02	14.1
	0.005	3.4
	0.002	1.9
estimated	0.001	1.7

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	7.7	12.1
Coarse Sand	4.4	33.6
Medium Sand	33.6	---
Fine Sand	19.5	19.5
Silt	31.4	32.9
Clay	3.4	1.9

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.63

Classification

Unified Group Symbol: SM

Group Name: Silty sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS07, 9.0'-9.9'	Lab ID	176

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	95.3
3/8"	93.2
No. 4	92.3
No. 10	87.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.63

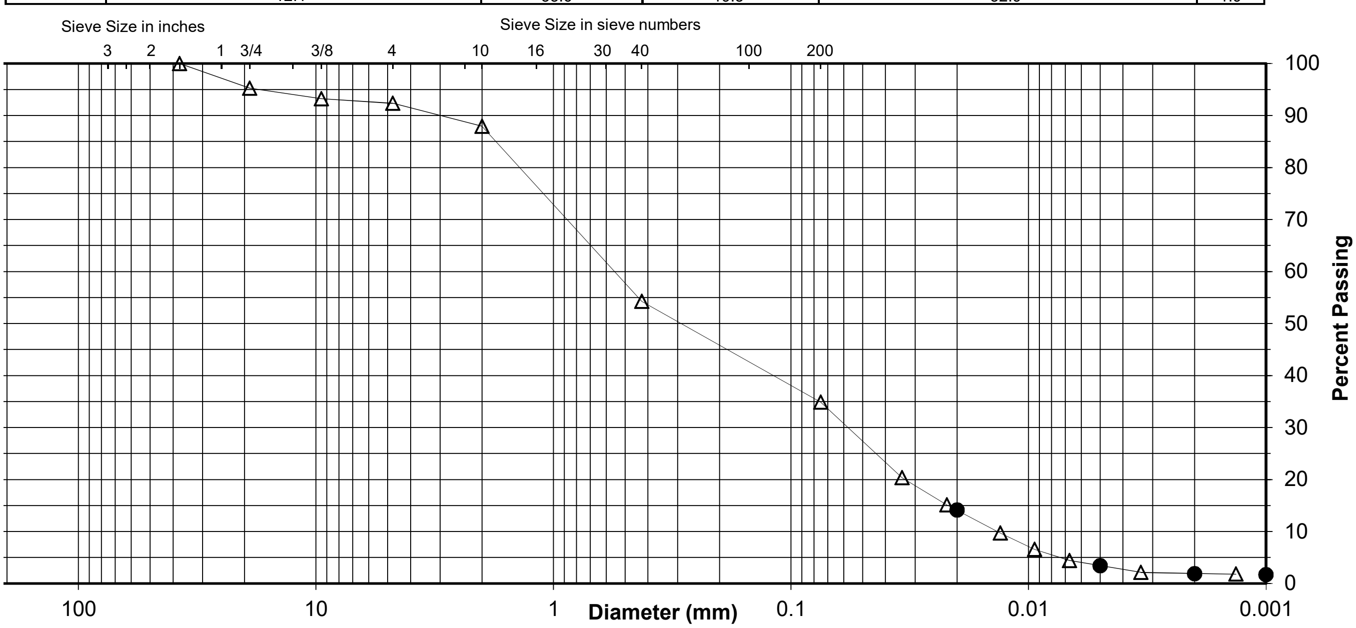
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	54.3
No. 200	34.8
0.02 mm	14.1
0.005 mm	3.4
0.002 mm	1.9
0.001 mm	1.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	4.7	3.0	4.4	33.6	19.5	31.4	3.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	12.1	33.6	19.5	32.9	1.9



Comments ____________________

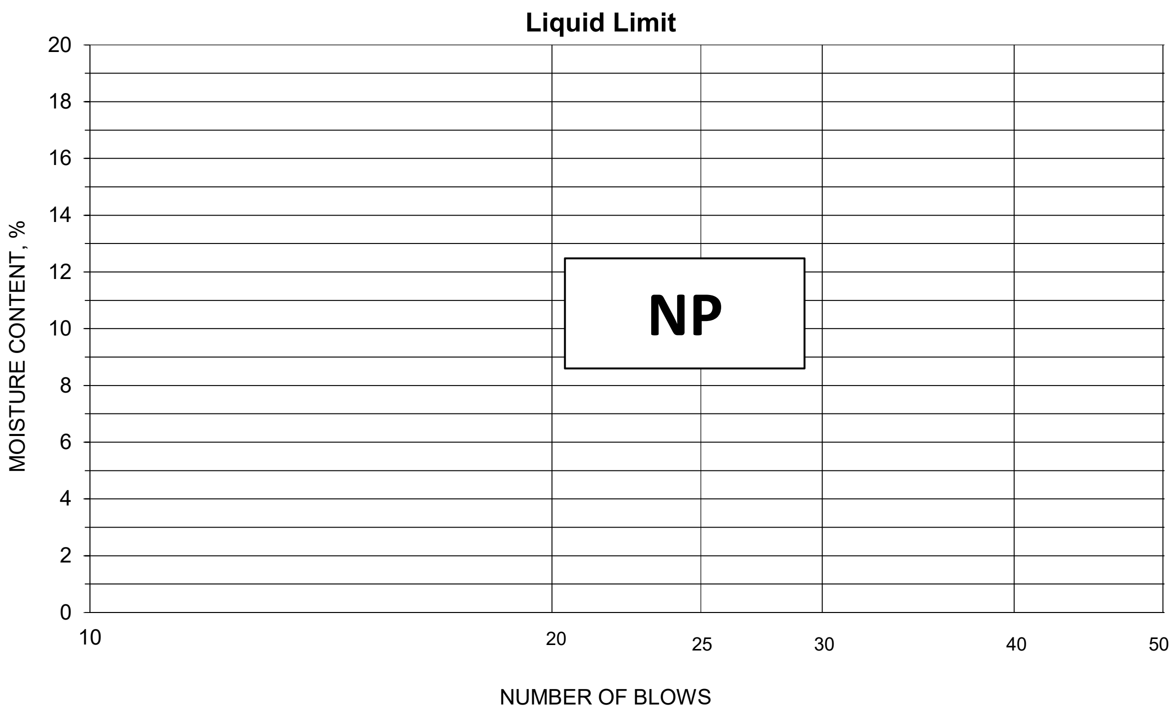
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS07, 9.0'-9.9'	Lab ID	176
		% + No. 40	46
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	02-27-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW08-SS24, 34.5'-36.0'
Lab ID: 180

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 10.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.2
No. 4	4.75	77.0
No. 10	2	56.5
No. 40	0.425	25.8
No. 200	0.075	10.6
	0.02	2.0
	0.005	0.5
	0.002	0.3
estimated	0.001	0.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	23.0	43.5
Coarse Sand	20.5	30.7
Medium Sand	30.7	---
Fine Sand	15.2	15.2
Silt	10.1	10.3
Clay	0.5	0.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.56

Classification

Unified Group Symbol: SW-SM
Group Name: Well-graded sand with silt and gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By: RJ

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Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 03/21/2019

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS24, 34.5'-36.0'	Lab ID	180

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.2
No. 4	77.0
No. 10	56.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.56

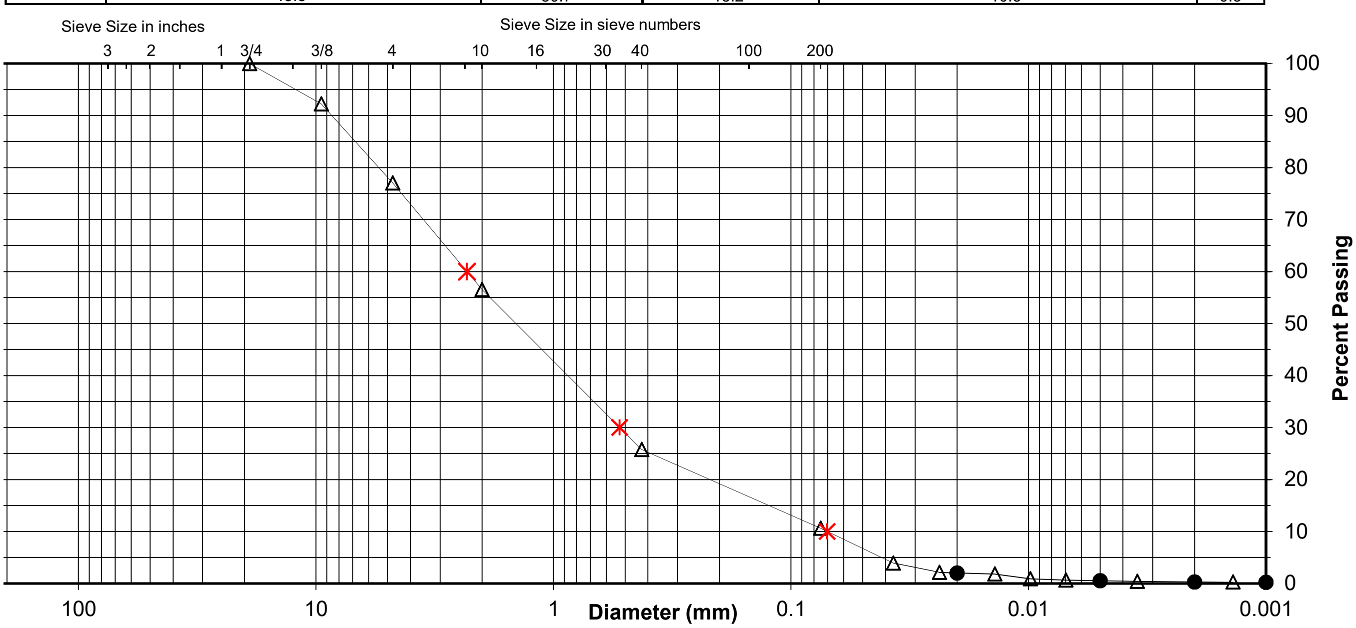
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	25.8
No. 200	10.6
0.02 mm	2.0
0.005 mm	0.5
0.002 mm	0.3
0.001 mm	0.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	23.0	20.5	30.7	15.2	10.1	0.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	43.5	30.7	15.2	10.3	0.3



Comments ______

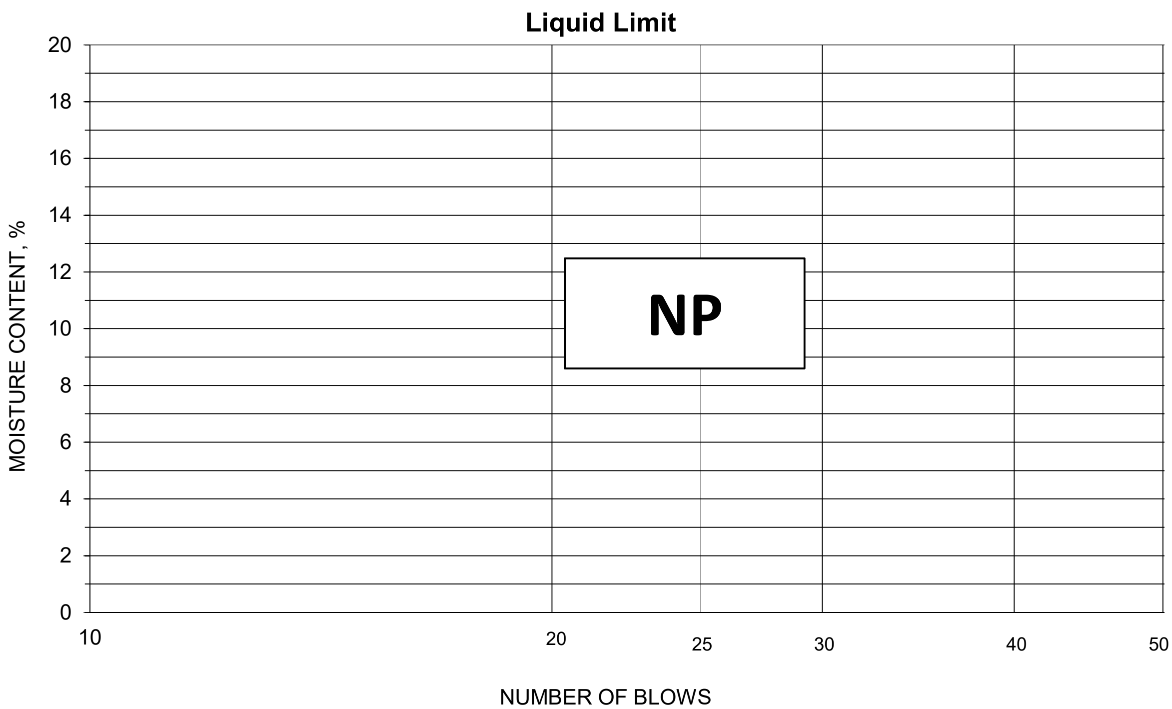
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS24, 34.5'-36.0'	Lab ID	180
		% + No. 40	74
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	02-27-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS34, 49.5'-51.0'	Lab ID	187

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	92.8
3/8"	87.8
No. 4	74.8
No. 10	53.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.56

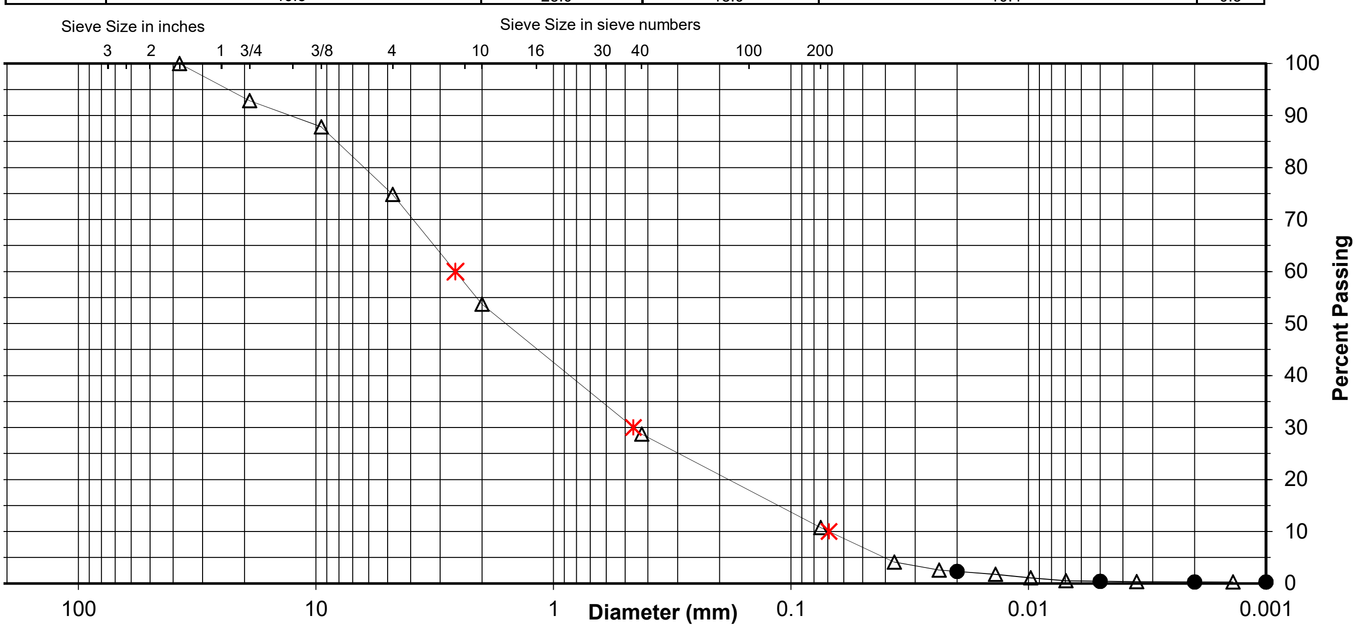
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	28.7
No. 200	10.7
0.02 mm	2.3
0.005 mm	0.4
0.002 mm	0.3
0.001 mm	0.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	7.2	18.0	21.1	25.0	18.0	10.3	0.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	46.3	25.0	18.0	10.4	0.3



Comments ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW08-SS40, 58.5'-60.0'
Lab ID: 190

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 33.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.9
No. 200	0.075	98.0
	0.02	66.9
	0.005	27.2
	0.002	10.2
estimated	0.001	1.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.0
Medium Sand	0.0	---
Fine Sand	1.9	1.9
Silt	70.8	87.8
Clay	27.2	10.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.52

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS40, 58.5'-60.0'	Lab ID	190

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded
Particle Hardness: Hard and Durable

Tested By: KG
Test Date: 02-25-2019
Date Received: 02-12-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.52

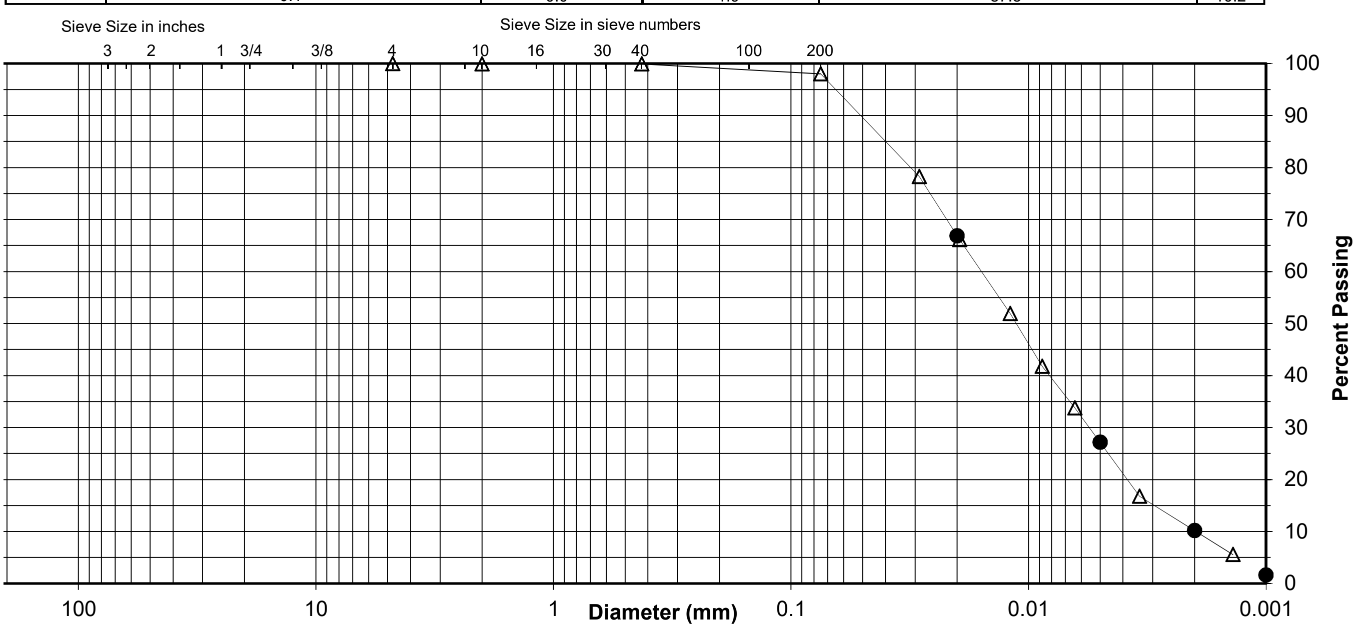
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	98.0
0.02 mm	66.9
0.005 mm	27.2
0.002 mm	10.2
0.001 mm	1.6

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.1	0.0	1.9	70.8	27.2

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.1	0.0	1.9	87.8	10.2



Comments ______

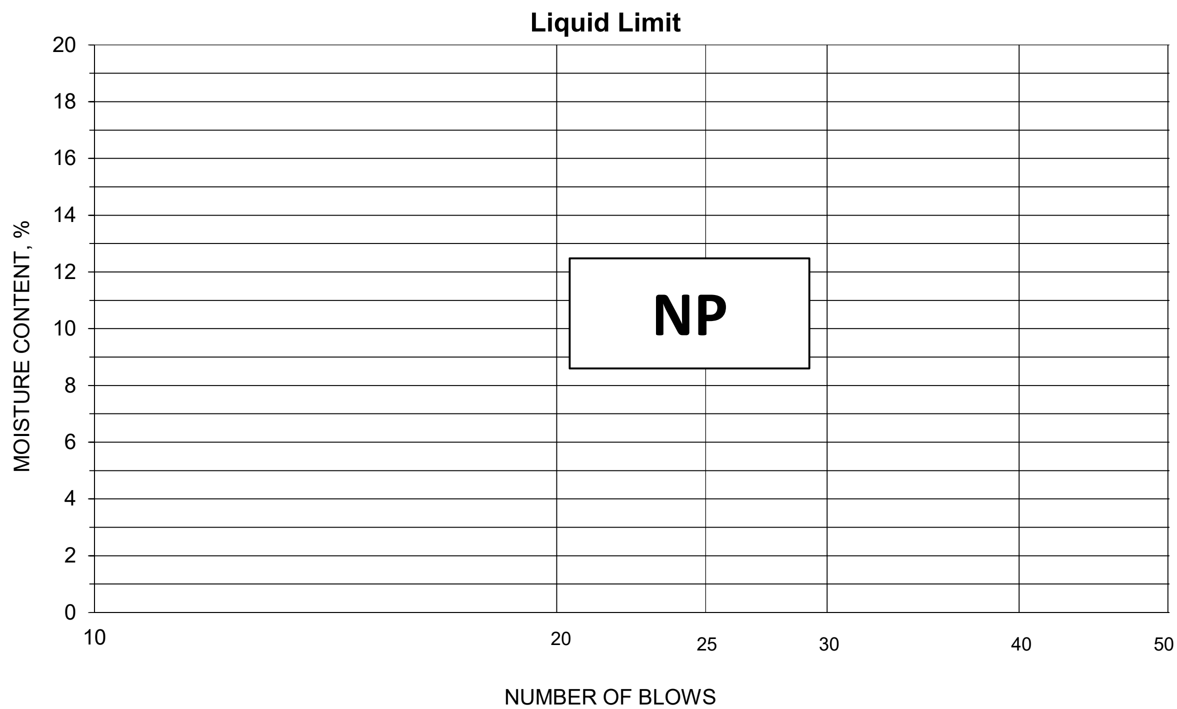
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS40, 58.5'-60.0'	Lab ID	190
		% + No. 40	0
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW08-SS52, 78.5'-80.0'
Lab ID: 195

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 47.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	100.0
No. 200	0.075	97.2
	0.02	65.7
	0.005	25.5
	0.002	9.6
estimated	0.001	3.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.0
Medium Sand	0.0	---
Fine Sand	2.8	2.8
Silt	71.7	87.6
Clay	25.5	9.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.50

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS52, 78.5'-80.0'	Lab ID	195

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.5

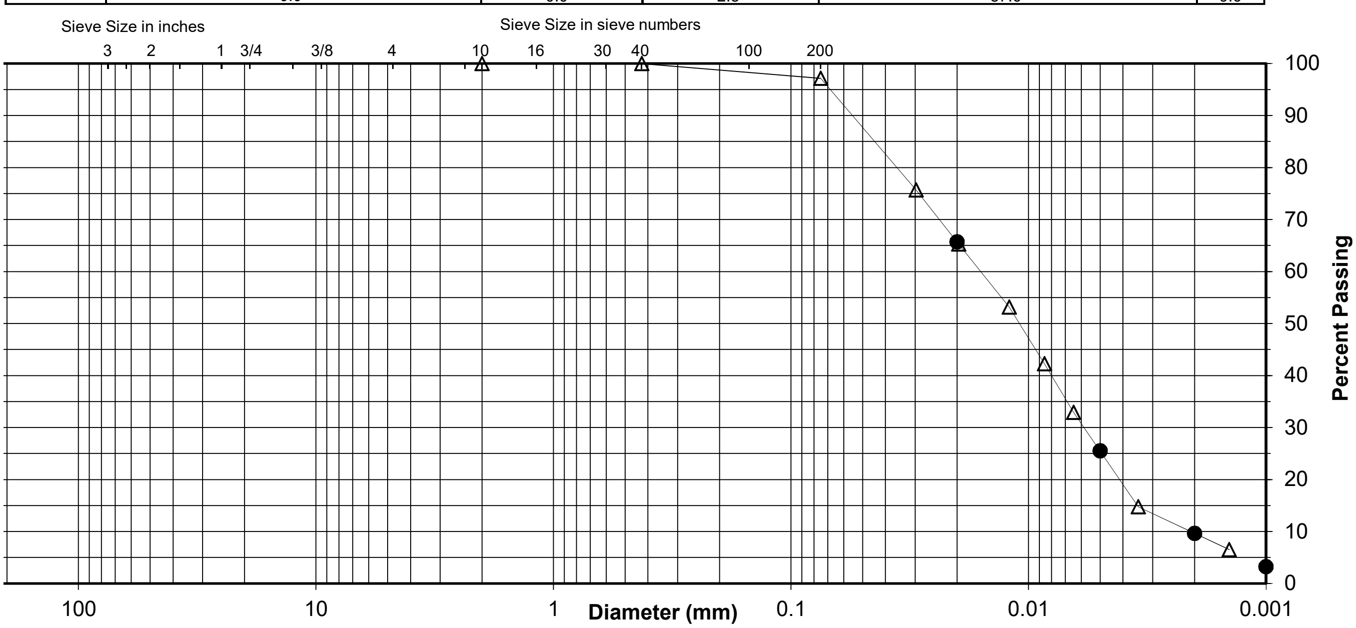
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	100.0
No. 200	97.2
0.02 mm	65.7
0.005 mm	25.5
0.002 mm	9.6
0.001 mm	3.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.0	2.8	71.7	25.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.0	2.8	87.6	9.6



Comments

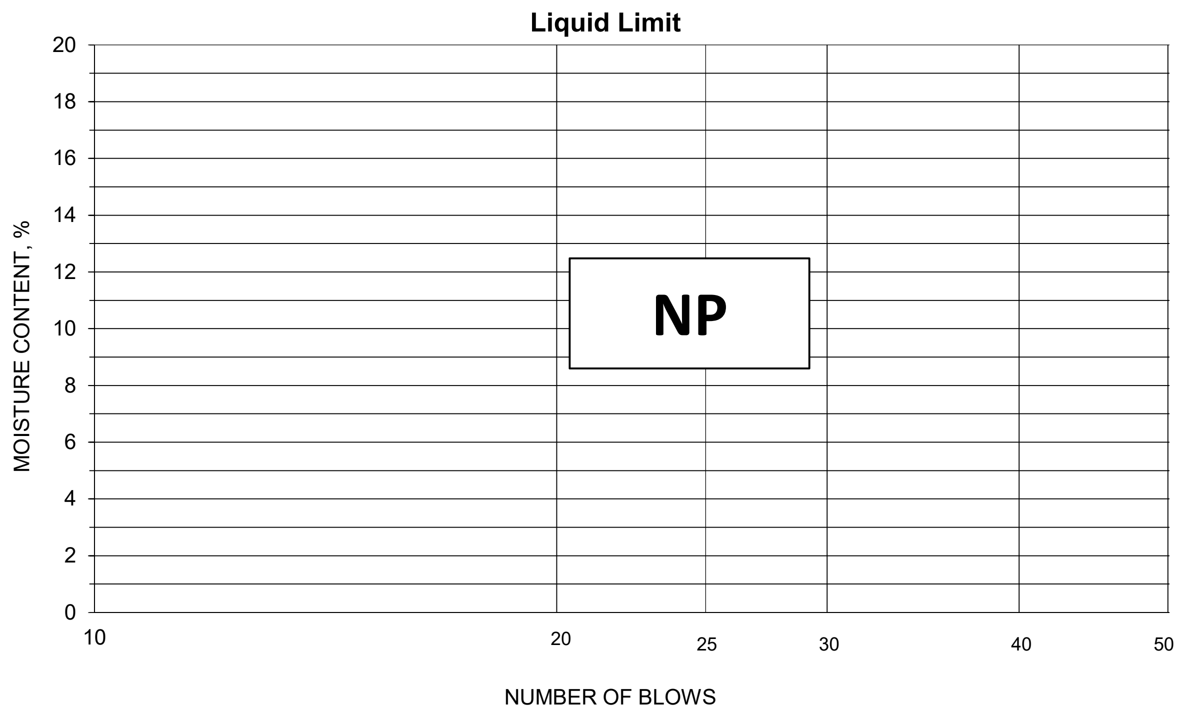
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS52, 78.5'-80.0'	Lab ID	195
		% + No. 40	0
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS55, 83.0'-84.5'	Lab ID	197
Sample Type	SS	Date Received	2-12-19
		Date Reported	3-21-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 23.2

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	98.4
No. 200	0.075	96.7
	0.02	84.1
	0.005	49.4
	0.002	33.0
estimated	0.001	25.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.6
Medium Sand	1.6	---
Fine Sand	1.7	1.7
Silt	47.3	63.7
Clay	49.4	33.0

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 34
Plastic Limit: 19
Plasticity Index: 15
Activity Index: 0.5

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.68

Classification
Unified Group Symbol: CL
Group Name: Lean clay
AASHTO Classification: A-6 (15)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW08-SS55, 83.0'-84.5'
Lab ID: 197

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: CM
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.68

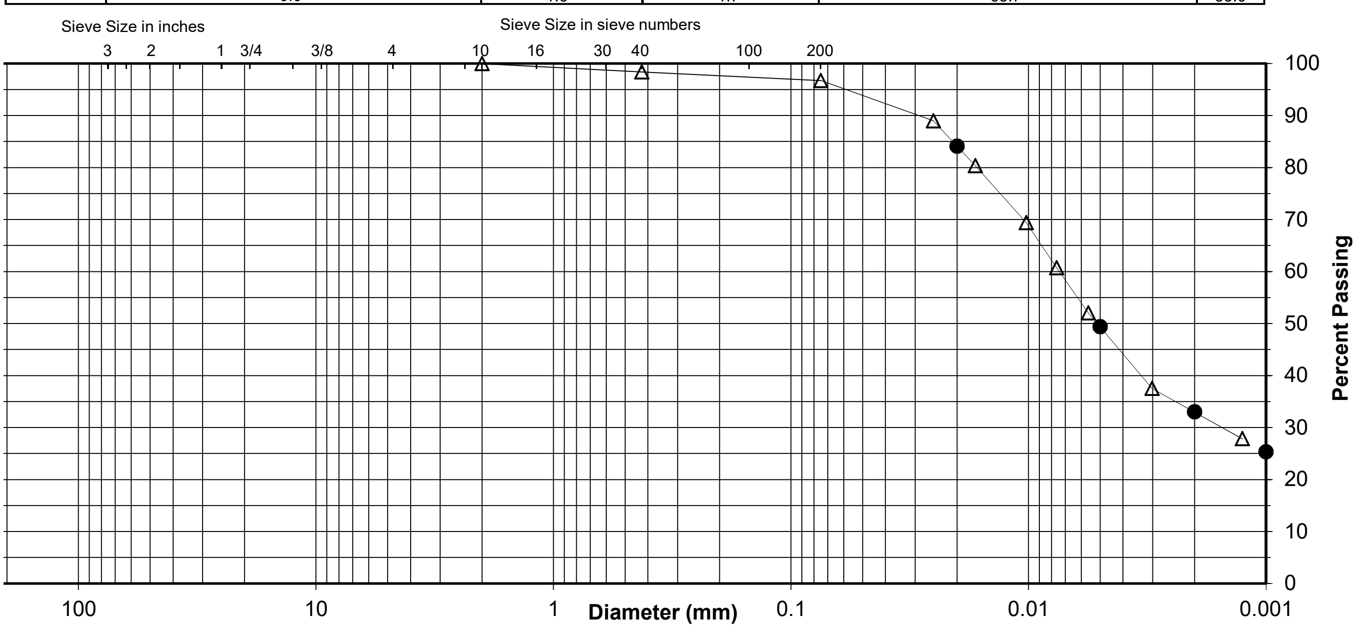
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.4
No. 200	96.7
0.02 mm	84.1
0.005 mm	49.4
0.002 mm	33.0
0.001 mm	25.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.6	1.7	47.3	49.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	1.6	1.7	63.7	33.0



Comments

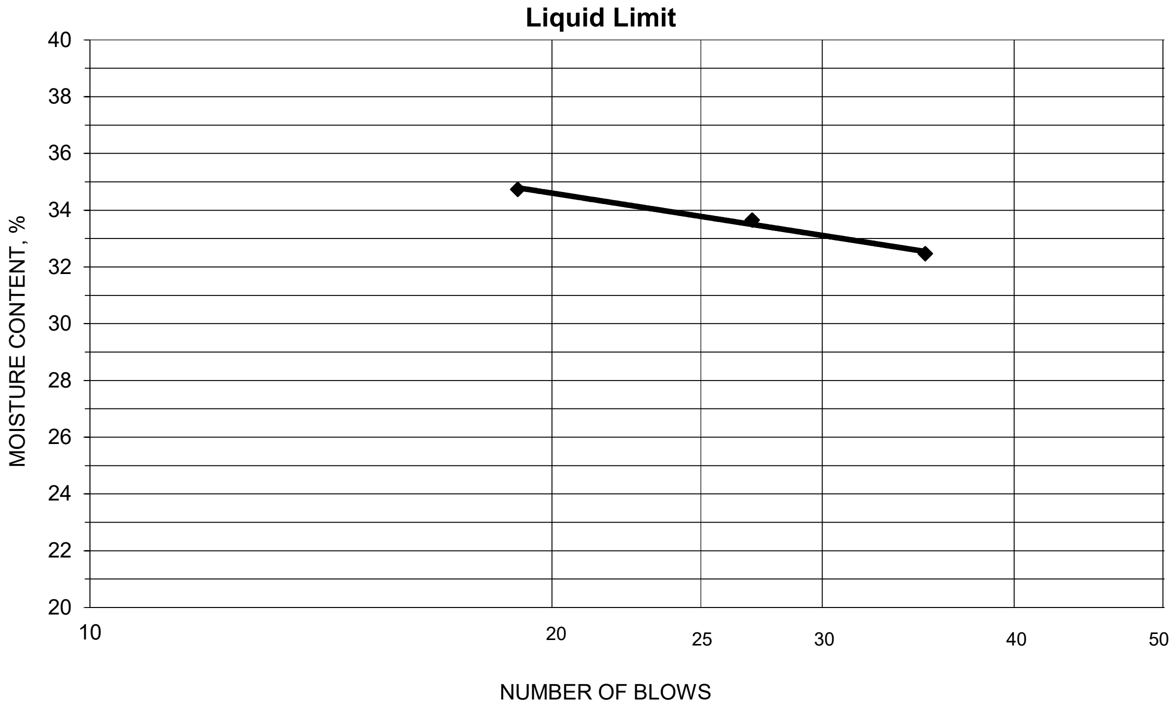
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS55, 83.0'-84.5'	Lab ID	197
		% + No. 40	2
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.53	19.04	11.37	35	32.5	34
21.32	18.78	11.23	27	33.6	
21.52	18.95	11.55	19	34.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.10	18.64	11.16	19.5	19	15
20.06	18.60	10.94	19.1		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-ST03, 88.7'-89.1'	Lab ID	199
Sample Type	ST	Date Received	2-12-19
		Date Reported	3-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 24.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.2
No. 10	2	75.7
No. 40	0.425	73.5
No. 200	0.075	71.7
	0.02	61.1
	0.005	36.8
	0.002	25.9
estimated	0.001	20.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.8	24.3
Coarse Sand	23.5	2.2
Medium Sand	2.2	---
Fine Sand	1.8	1.8
Silt	34.9	45.8
Clay	36.8	25.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 38
Plastic Limit: 19
Plasticity Index: 19
Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-6 (12)

Comments:

Reviewed By RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Reported By: RJ
Report Date: 03/21/2019

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW08-ST03, 88.7'-89.1'
Lab ID: 199

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded
Particle Hardness: Hard and Durable

Tested By: KG
Test Date: 02-22-2019
Date Received: 02-12-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.2
No. 10	75.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

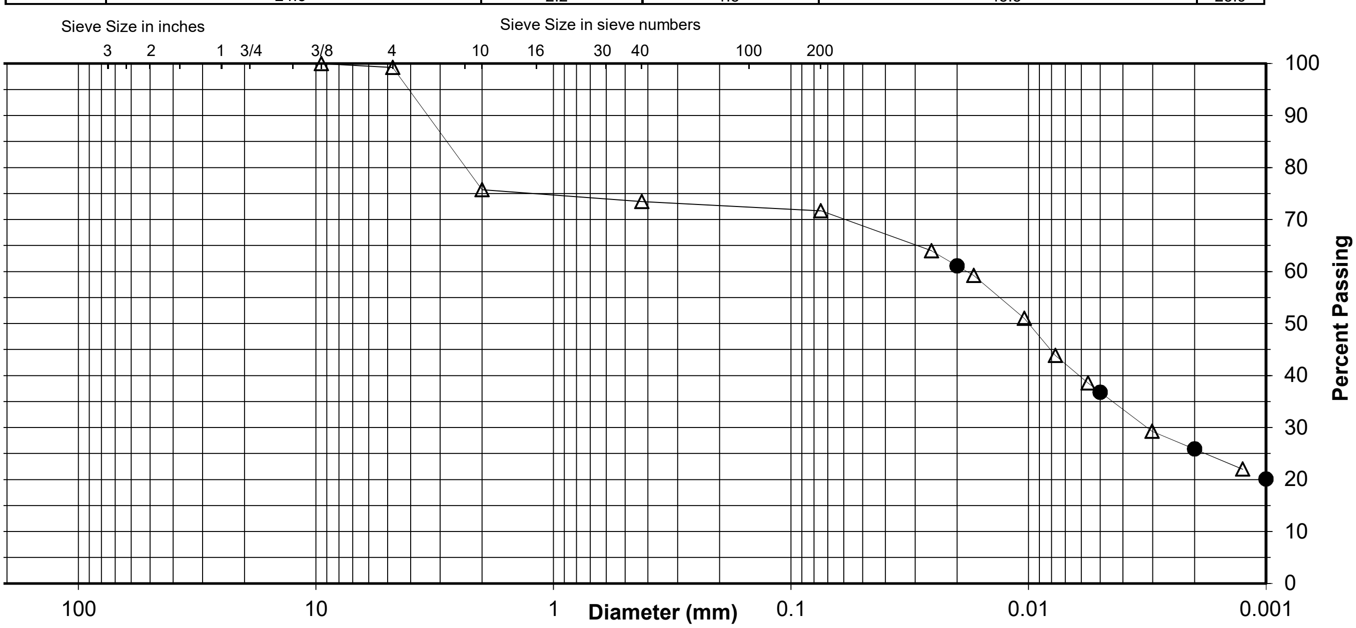
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	73.5
No. 200	71.7
0.02 mm	61.1
0.005 mm	36.8
0.002 mm	25.9
0.001 mm	20.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.8	23.5	2.2	1.8	34.9	36.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	24.3	2.2	1.8	45.8	25.9



Comments ______

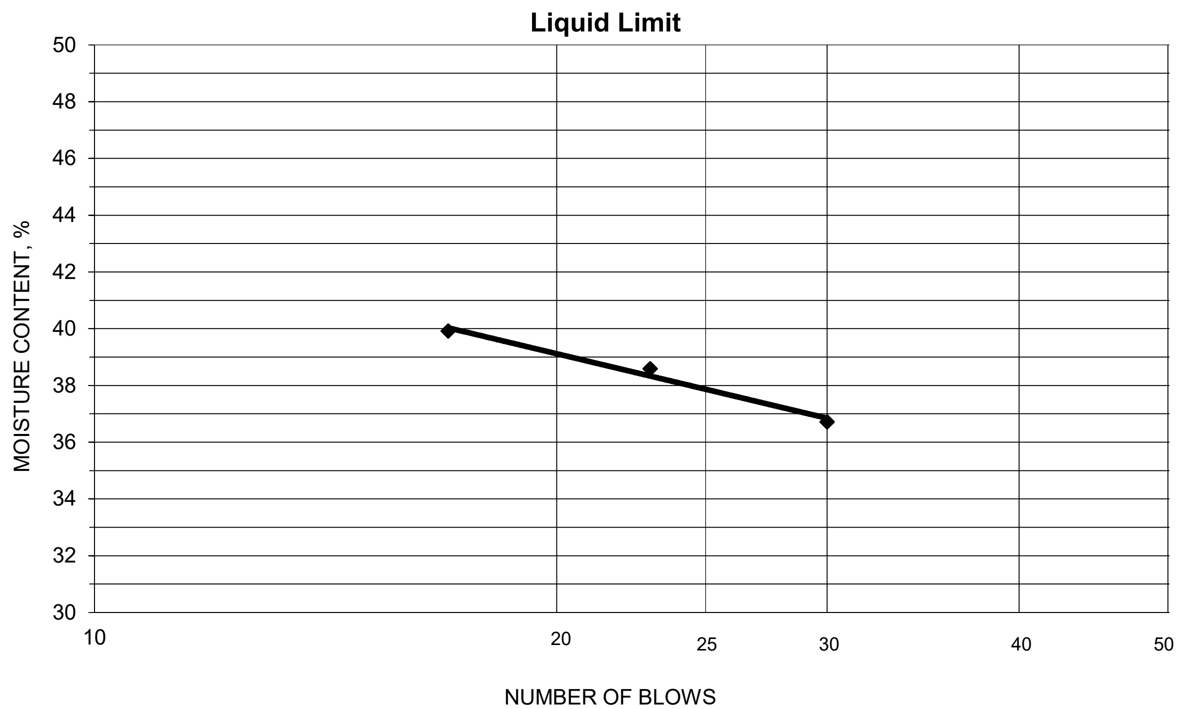
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-ST03, 88.7'-89.1'	Lab ID	199
		% + No. 40	27
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.43	18.75	11.45	30	36.7	38
21.47	18.75	11.70	23	38.6	
20.78	17.99	11.00	17	39.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.62	18.20	10.94	19.6	19	19
18.87	17.60	11.01	19.3		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS62, 97.5'-99.0'	Lab ID	205
Sample Type	SS	Date Received	2-12-19
		Date Reported	3-21-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 26.8

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.5
No. 200	0.075	93.2
	0.02	57.3
	0.005	24.2
	0.002	18.8
estimated	0.001	16.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.5
Medium Sand	0.5	---
Fine Sand	6.3	6.3
Silt	69.0	74.4
Clay	24.2	18.8

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 31
Plastic Limit: 22
Plasticity Index: 9
Activity Index: 0.5

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-4 (8)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS62, 97.5'-99.0'	Lab ID	205

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: MP
Test Date: 02-27-2019
Date Received: 02-12-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

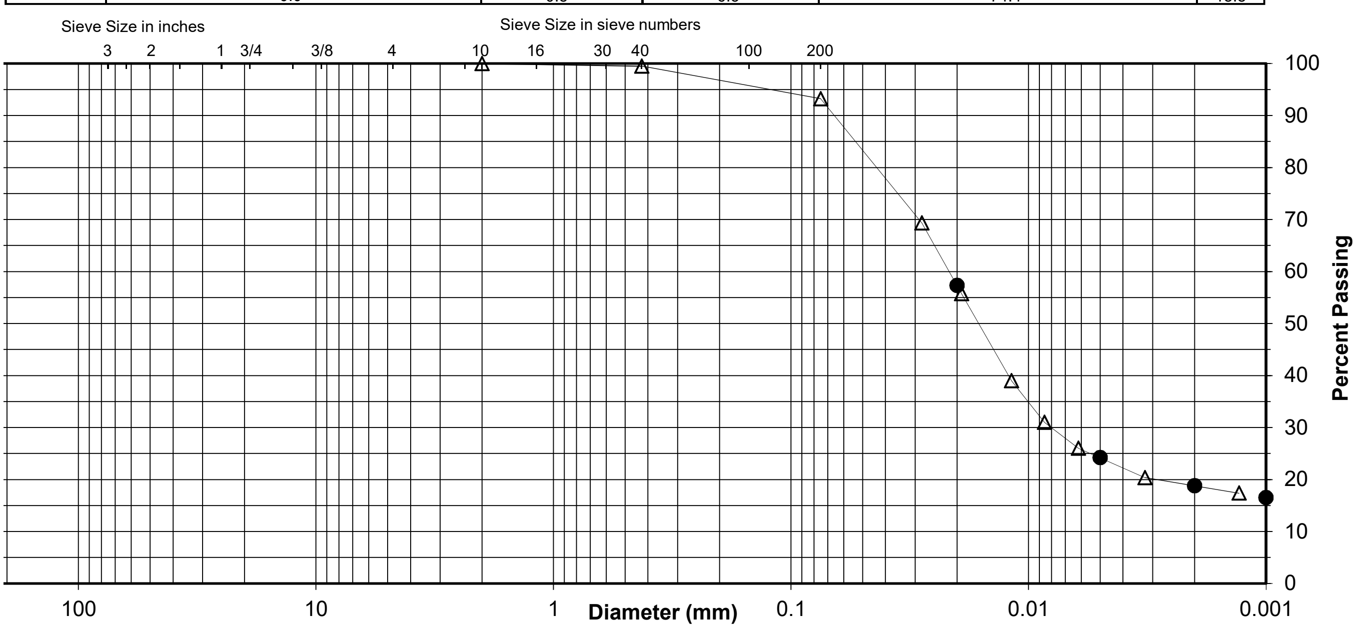
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	99.5
No. 200	93.2
0.02 mm	57.3
0.005 mm	24.2
0.002 mm	18.8
0.001 mm	16.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.5	6.3	69.0	24.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.5	6.3	74.4	18.8



Comments ______

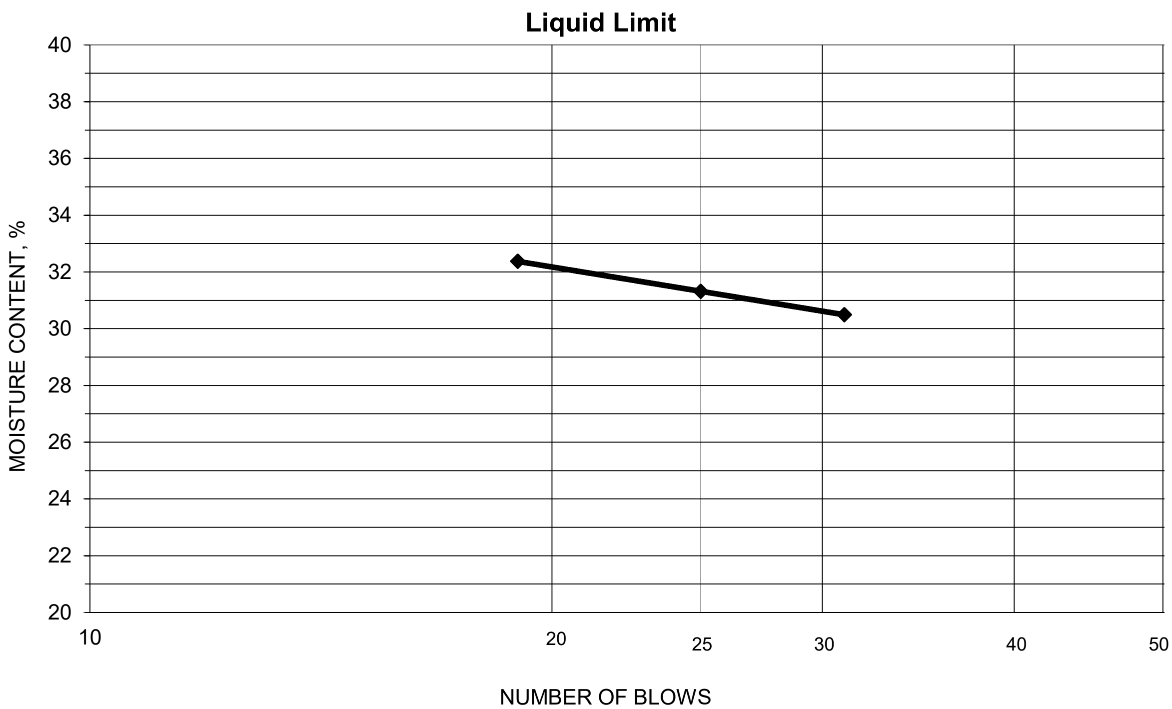
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS62, 97.5'-99.0'	Lab ID	205
		% + No. 40	0
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
22.23	19.58	10.89	31	30.5	31
22.18	19.49	10.90	25	31.3	
21.77	19.18	11.18	19	32.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.68	18.91	10.97	22.3	22	9
20.76	19.00	10.87	21.6		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW08-SS64, 100.5'-102.0'
Lab ID: 207
Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 26.1

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.7
No. 200	0.075	81.6
	0.02	47.0
	0.005	19.8
	0.002	16.0
estimated	0.001	14.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.3
Medium Sand	0.3	---
Fine Sand	18.1	18.1
Silt	61.8	65.6
Clay	19.8	16.0

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 27
Plastic Limit: 20
Plasticity Index: 7
Activity Index: 0.4

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification
Unified Group Symbol: CL-ML
Group Name: Silty clay with sand

AASHTO Classification: A-4 (4)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS64, 100.5'-102.0'	Lab ID	207

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: MP
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

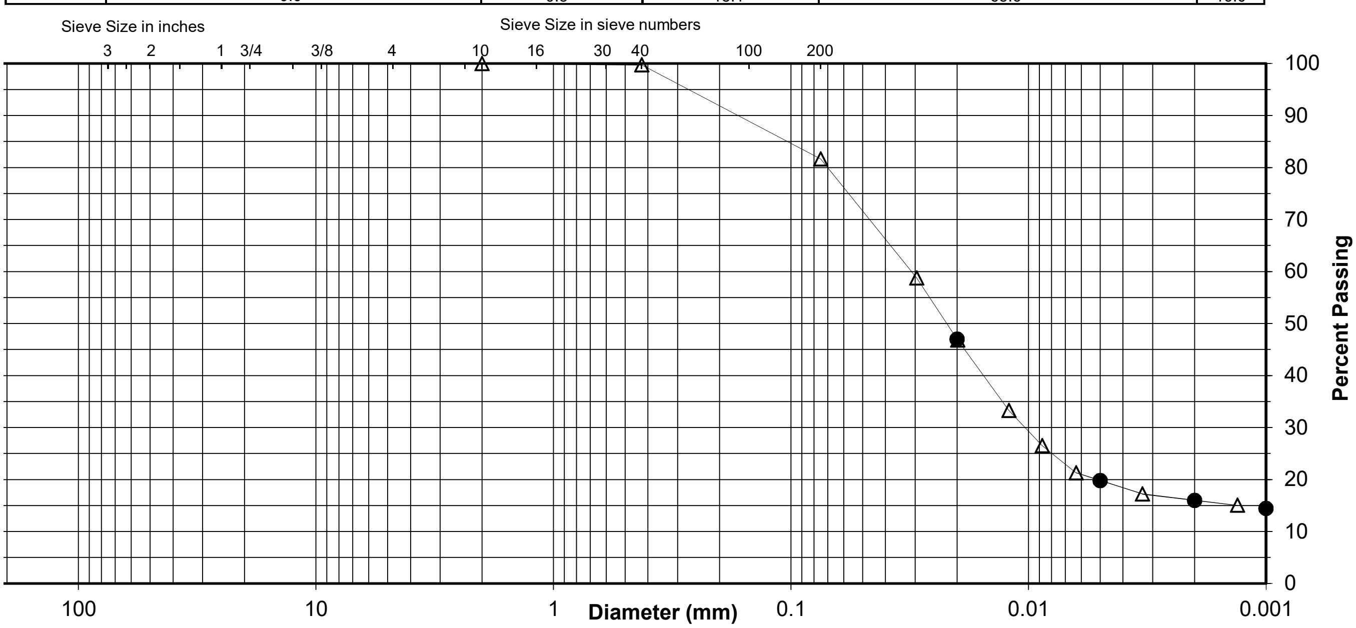
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	99.7
No. 200	81.6
0.02 mm	47.0
0.005 mm	19.8
0.002 mm	16.0
0.001 mm	14.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.3	18.1	61.8	19.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.3	18.1	65.6	16.0



Comments ______________________

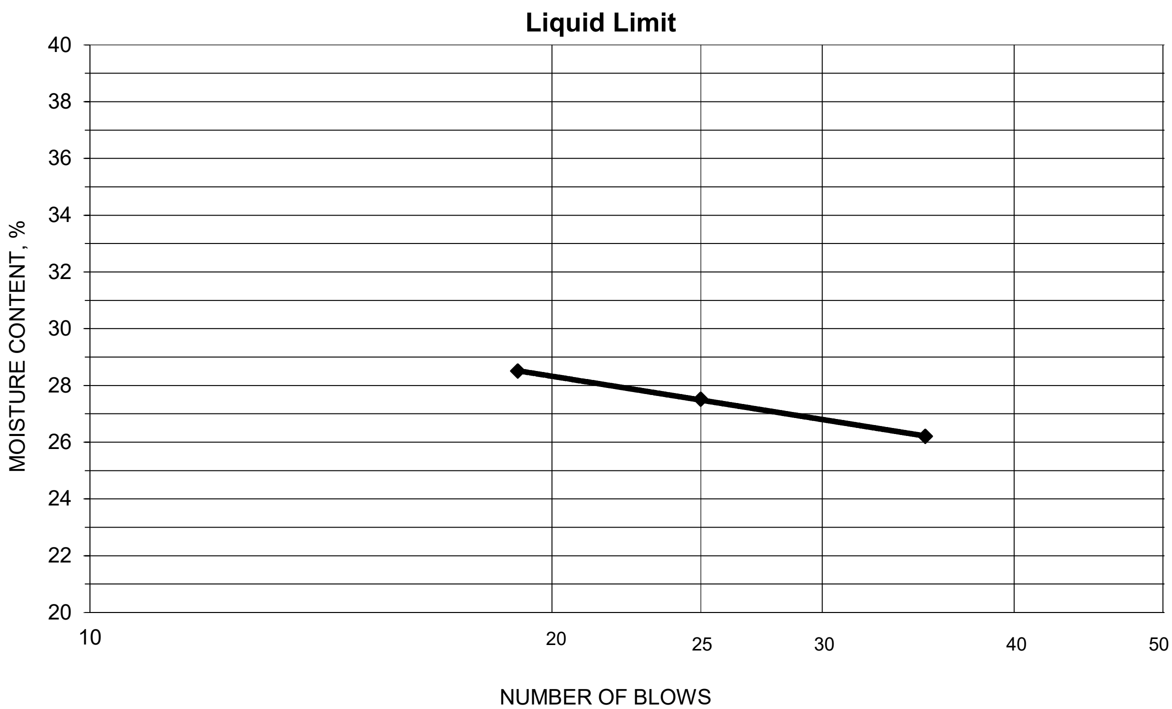
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS64, 100.5'-102.0'	Lab ID	207
		% + No. 40	0
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.20	19.08	10.99	35	26.2	27
22.14	19.79	11.25	25	27.5	
21.47	19.15	11.01	19	28.5	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.44	18.83	10.93	20.4	20	7
21.74	19.92	10.87	20.1		

Remarks:

Reviewed By RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 03/21/2019

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW08-SS66, 103.5'-105.0'
Lab ID: 209

Sample Type: SS
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 27.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 28
Plastic Limit: 22
Plasticity Index: 6
Activity Index: 0.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	97.3
No. 200	0.075	84.3
	0.02	48.6
	0.005	19.1
	0.002	15.0
estimated	0.001	13.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	2.7
Medium Sand	2.7	---
Fine Sand	13.0	13.0
Silt	65.2	69.3
Clay	19.1	15.0

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.64

Classification

Unified Group Symbol: CL-ML
Group Name: Silty clay with sand

AASHTO Classification: A-4 (4)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS66, 103.5'-105.0'	Lab ID	209

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: MP
Test Date: 02-26-2019
Date Received: 02-12-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.64

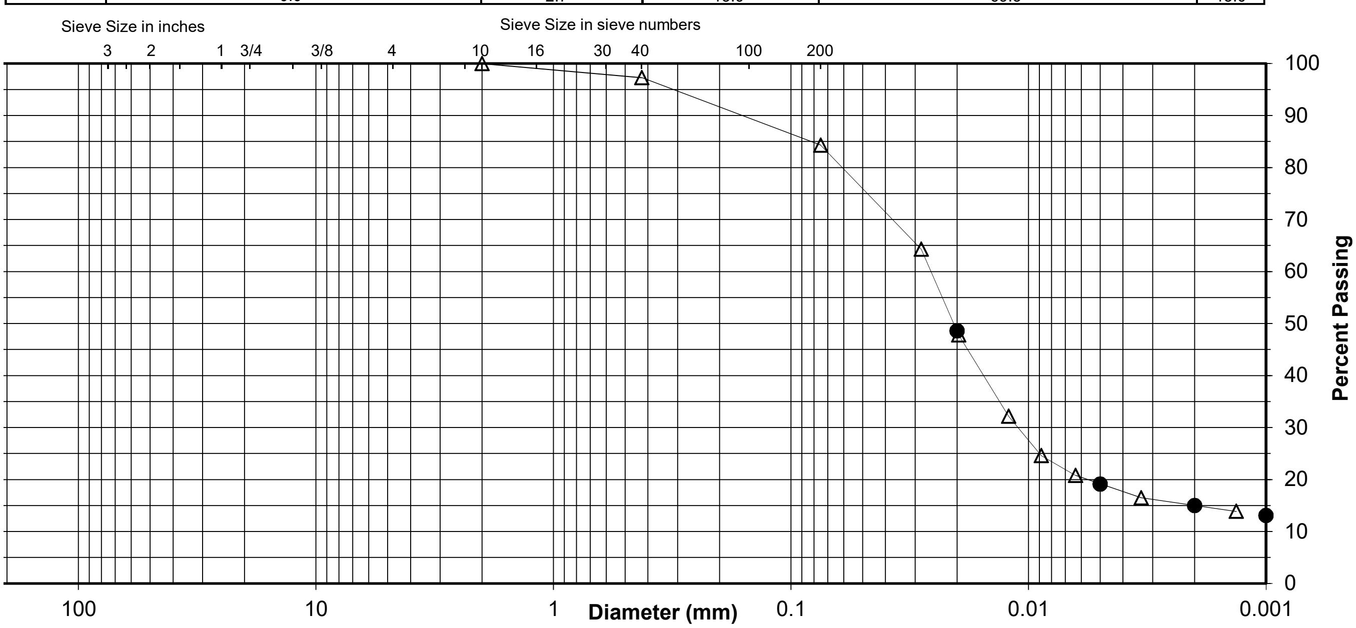
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	97.3
No. 200	84.3
0.02 mm	48.6
0.005 mm	19.1
0.002 mm	15.0
0.001 mm	13.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	2.7	13.0	65.2	19.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	2.7	13.0	69.3	15.0



Comments ______

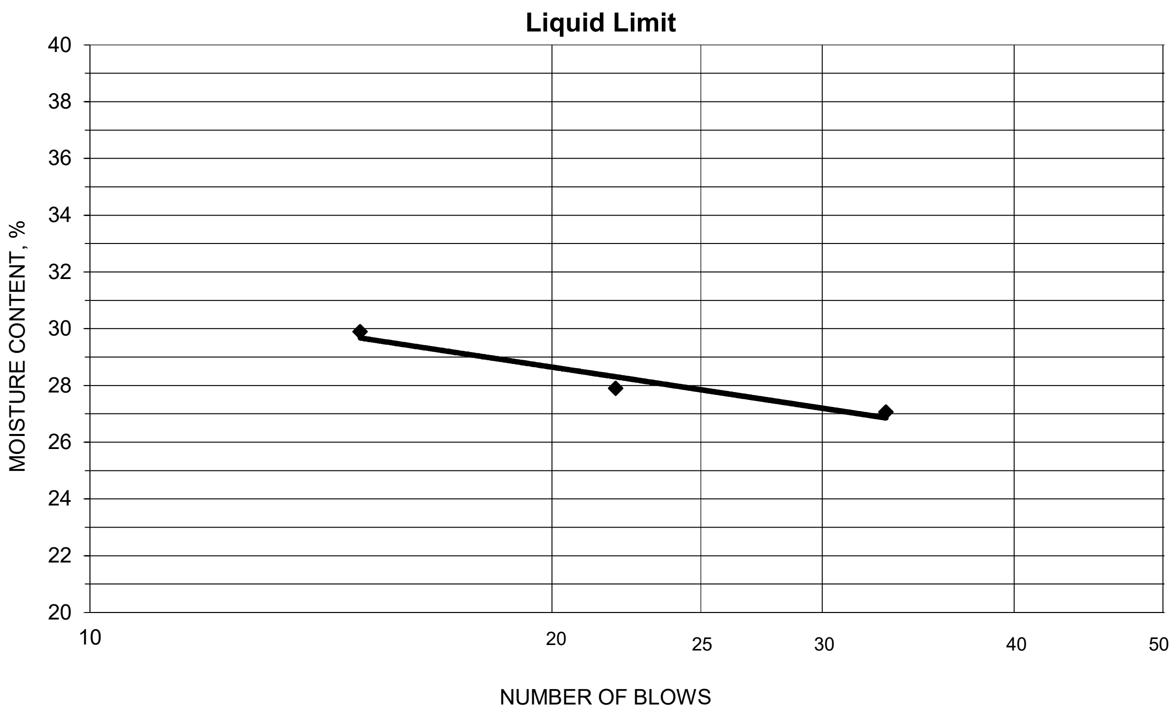
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS66, 103.5'-105.0'	Lab ID	209
		% + No. 40	3
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.94	19.64	11.14	33	27.1	
22.56	20.10	11.28	22	27.9	
21.47	19.10	11.17	15	29.9	28



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
21.16	19.37	11.18	21.9	22	6
19.83	18.24	10.92	21.7		

Remarks:

Reviewed By RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 03/21/2019

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW08-SS68, 106.5'-108.0' & SS69, 108.0'-109.5'
Lab ID: 211/212

Sample Type: SPT Composite
Date Received: 2-12-19
Date Reported: 3-21-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.8
3/8"	9.5	80.6
No. 4	4.75	64.8
No. 10	2	48.9
No. 40	0.425	23.5
No. 200	0.075	16.1
	0.02	10.0
	0.005	4.9
	0.002	3.7
estimated	0.001	3.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	35.2	51.1
Coarse Sand	15.9	25.4
Medium Sand	25.4	---
Fine Sand	7.4	7.4
Silt	11.2	12.4
Clay	4.9	3.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.74

Classification

Unified Group Symbol: SM
Group Name: Silty sand with gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS68, 106.5'-108.0' & SS69, 108.0'-109.5'	Lab ID	211/212

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: RC
Test Date: 03-01-2019
Date Received: 02-12-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.8
3/8"	80.6
No. 4	64.8
No. 10	48.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.74

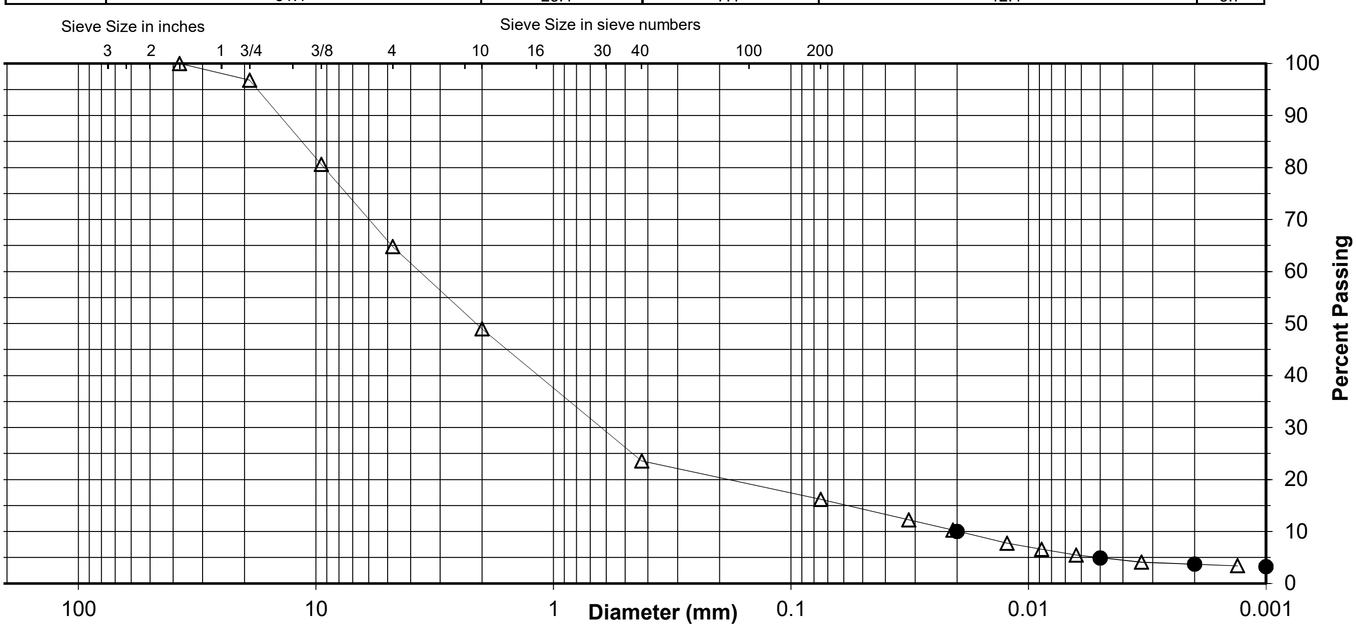
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	23.5
No. 200	16.1
0.02 mm	10.0
0.005 mm	4.9
0.002 mm	3.7
0.001 mm	3.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.2	32.0	15.9	25.4	7.4	11.2	4.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	51.1	25.4	7.4	12.4	3.7



Comments ______

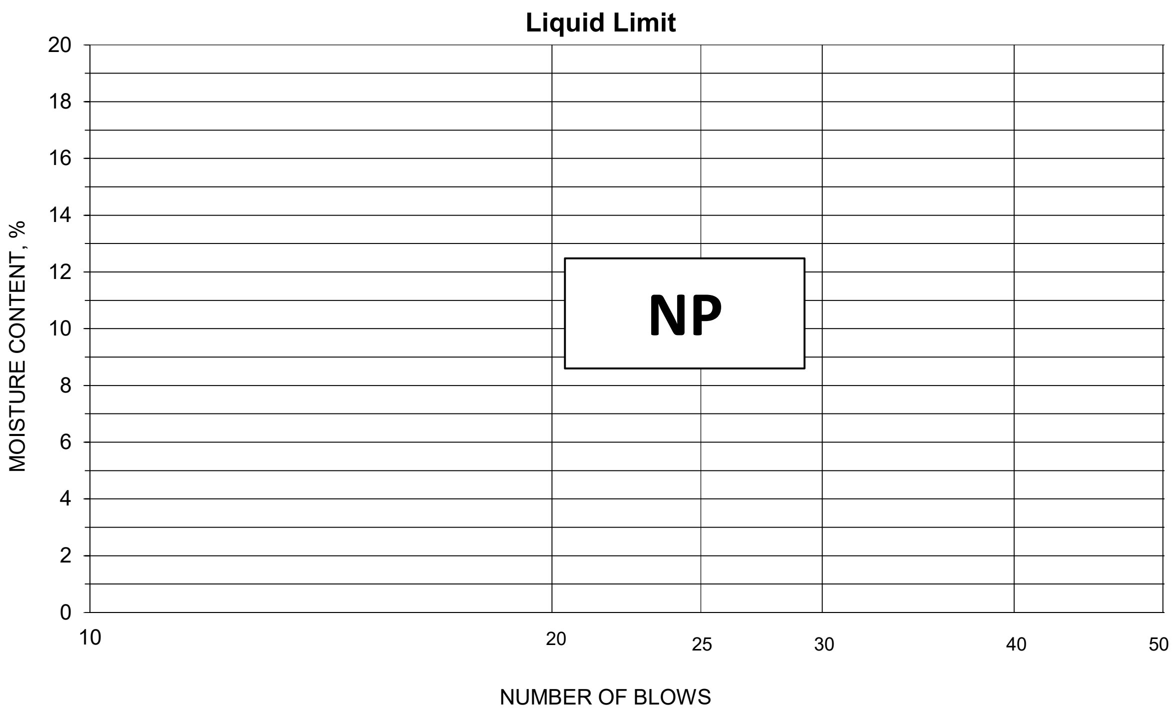
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS68, 106.5'-108.0' & SS69, 108.0'-109.5'	Lab ID	211/212
		% + No. 40	76
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS70a, 109.5'-110.5'	Lab ID	213
Sample Type	SS	Date Received	2-12-19
		Date Reported	3-21-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 19.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	88.5
3/8"	9.5	81.2
No. 4	4.75	71.3
No. 10	2	54.3
No. 40	0.425	41.5
No. 200	0.075	32.0
	0.02	20.3
	0.005	9.6
	0.002	7.6
estimated	0.001	6.7

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	28.7	45.7
Coarse Sand	17.0	12.8
Medium Sand	12.8	---
Fine Sand	9.5	9.5
Silt	22.4	24.4
Clay	9.6	7.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 28
Plastic Limit: 20
Plasticity Index: 8
Activity Index: 1.1

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification

Unified Group Symbol: SC
Group Name: Clayey sand with gravel

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS70a, 109.5'-110.5'	Lab ID	213

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: MP
Test Date: 02-27-2019
Date Received: 02-12-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	88.5
3/8"	81.2
No. 4	71.3
No. 10	54.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

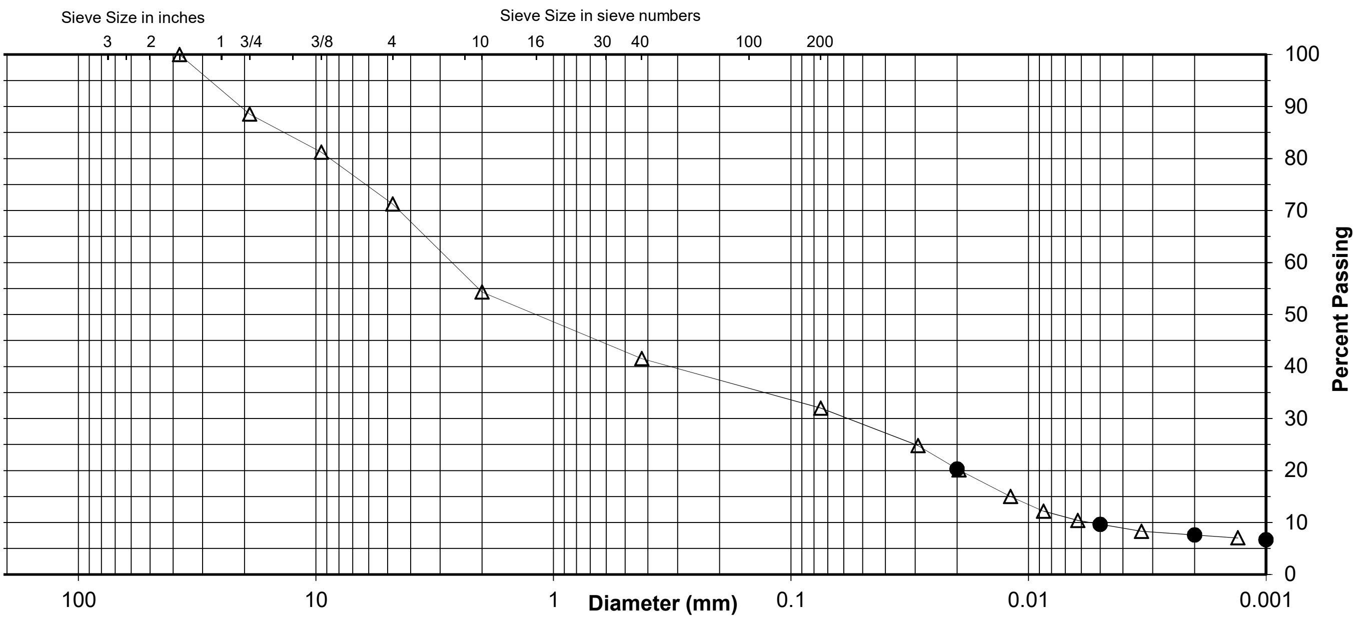
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	41.5
No. 200	32.0
0.02 mm	20.3
0.005 mm	9.6
0.002 mm	7.6
0.001 mm	6.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	11.5	17.2	17.0	12.8	9.5	22.4	9.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	45.7	12.8	9.5	24.4	7.6



Comments ______

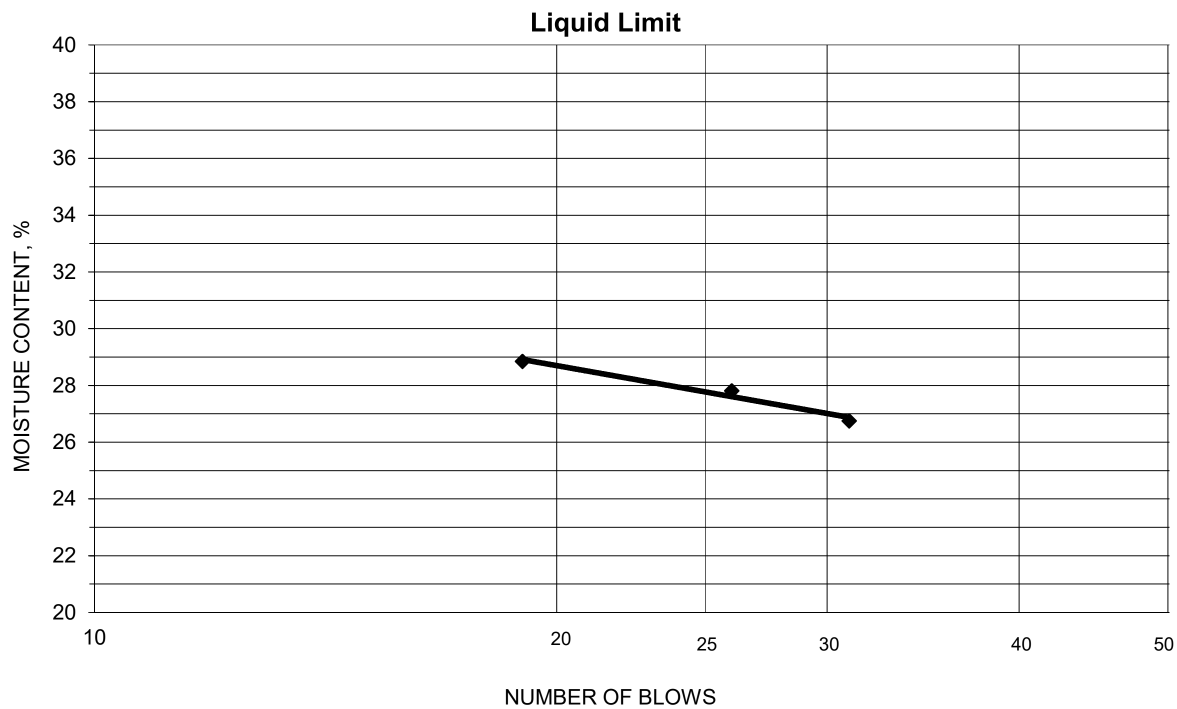
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS70a, 109.5'-110.5'	Lab ID	213
		% + No. 40	59
Tested By	CM	Test Method	ASTM D 4318 Method A
Date Received	02-12-2019		
Test Date	03-04-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
22.39	19.98	10.97	31	26.7	28
21.22	19.04	11.20	26	27.8	
21.63	19.34	11.40	19	28.8	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.79	19.25	11.52	19.9	20	8
21.01	19.39	11.16	19.7		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS77, 120.0'-121.5' & SS78, 121.5'-123.0' & SS79, 123.0'-124.5'	Lab ID	221/222/223
Sample Type	SPT Composite	Date Received	2-12-19
		Date Reported	3-21-19

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size: Sieve Size	Particle Size: (mm)	% Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	73.3
3/8"	9.5	51.1
No. 4	4.75	38.3
No. 10	2	26.6
No. 40	0.425	12.8
No. 200	0.075	7.7
	0.02	4.8
	0.005	3.2
	0.002	2.7
estimated	0.001	2.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	61.7	73.4
Coarse Sand	11.7	13.8
Medium Sand	13.8	---
Fine Sand	5.1	5.1
Silt	4.5	5.0
Clay	3.2	2.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 29
Plastic Limit: 21
Plasticity Index: 8
Activity Index: 3.0

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.69

Classification

Unified Group Symbol: GP-GC
Group Name: Poorly graded gravel with clay and sand (or silty clay and sand)

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW08-SS77, 120.0'-121.5' & SS78, 121.5'-123.0' & SS79, 123.0'-124.5'	Lab ID	221/222/223

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: CM
Test Date: 03-04-2019
Date Received: 02-12-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	73.3
3/8"	51.1
No. 4	38.3
No. 10	26.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.69

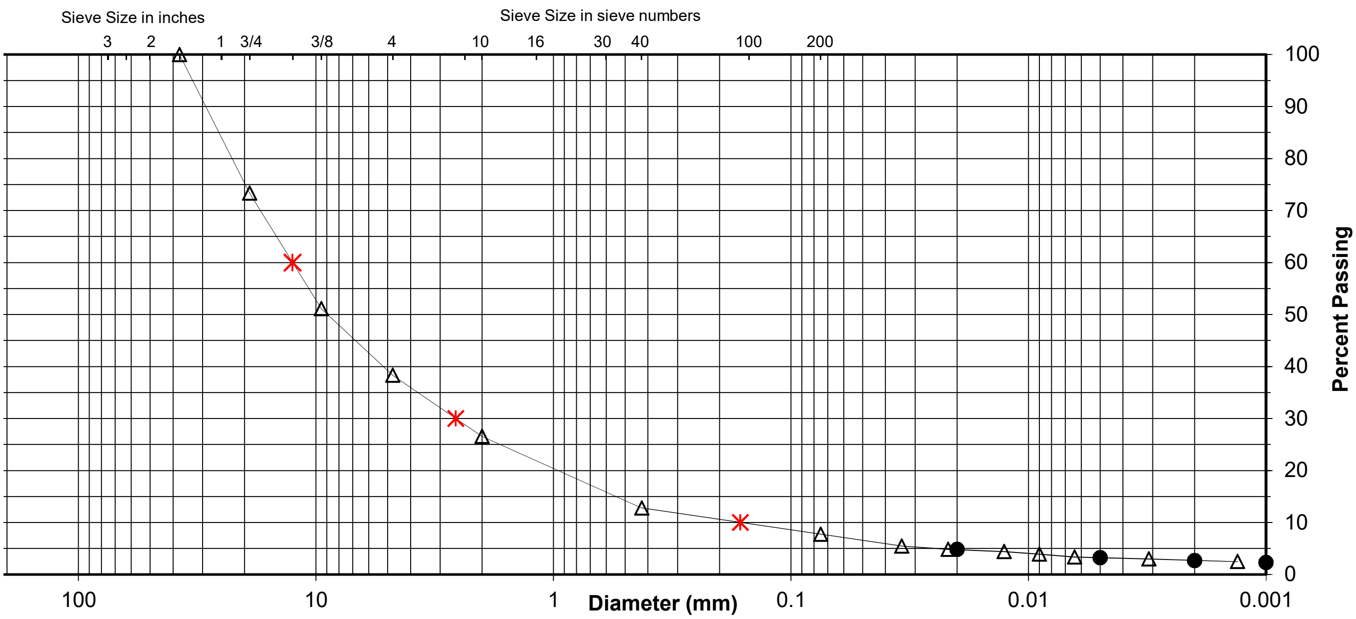
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	12.8
No. 200	7.7
0.02 mm	4.8
0.005 mm	3.2
0.002 mm	2.7
0.001 mm	2.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	26.7	35.0	11.7	13.8	5.1	4.5	3.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	73.4	13.8	5.1	5.0	2.7



Comments ______________________

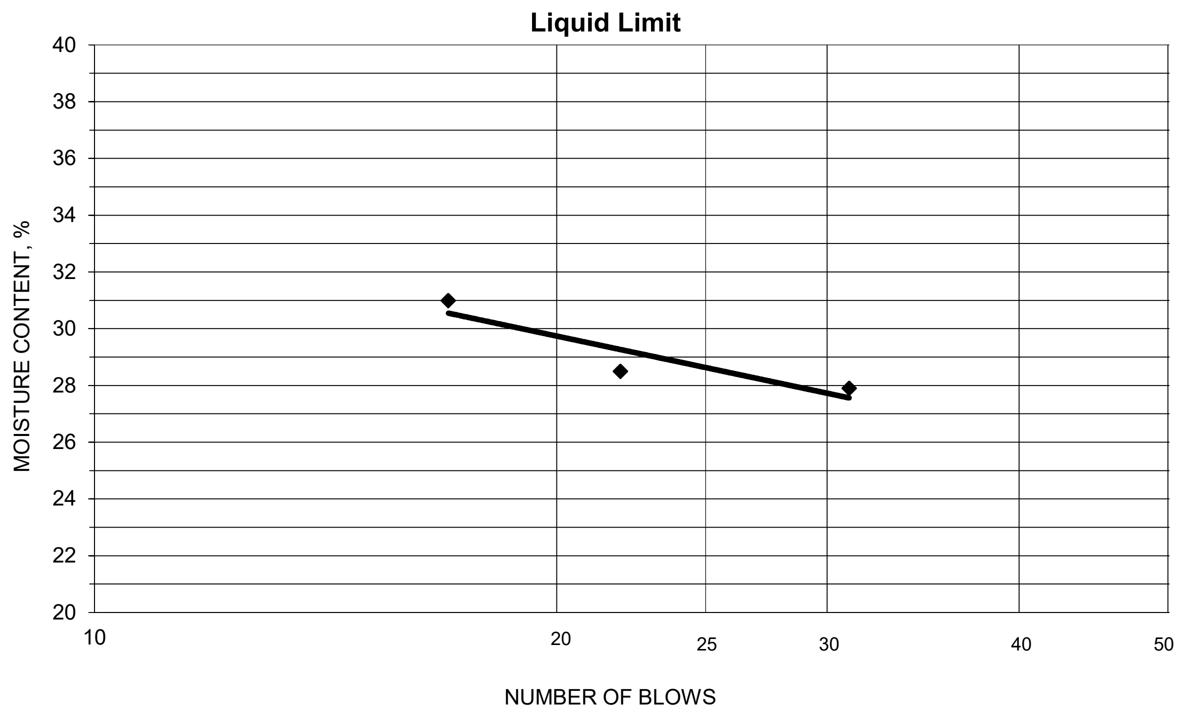
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-SS77, 120.0'-121.5' & SS78, 121.5'-123.0' & SS79, 123.0'-124.5'	Lab ID	221/222/223
		% + No. 40	87
Tested By	CM	Date Received	02-12-2019
Test Method	ASTM D 4318 Method A		
Test Date	03-05-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
23.27	20.57	10.89	31	27.9	29
23.33	20.54	10.75	22	28.5	
22.56	19.83	11.02	17	31.0	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.65	18.15	10.98	20.9	21	8
19.82	18.29	11.10	21.3		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW09-SS03b, 3.5'-4.5'
Lab ID: 228

Sample Type: SS
Date Received: 3-13-19
Date Reported: 4-11-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 29.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.3
No. 40	0.425	79.5
No. 200	0.075	65.7
	0.02	35.1
	0.005	11.6
	0.002	8.2
estimated	0.001	7.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.1	0.7
Coarse Sand	0.6	19.8
Medium Sand	19.8	---
Fine Sand	13.8	13.8
Silt	54.1	57.5
Clay	11.6	8.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.52

Classification

Unified Group Symbol: ML
Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS03b, 3.5'-4.5'	Lab ID	228

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.52

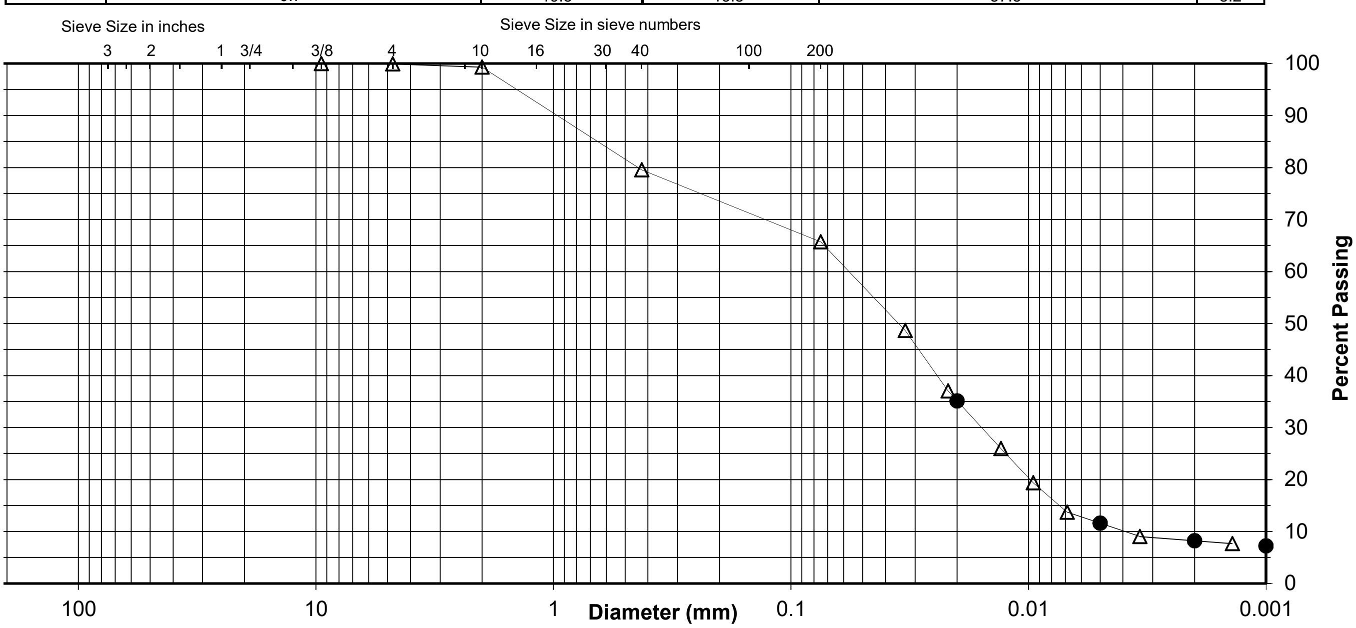
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	79.5
No. 200	65.7
0.02 mm	35.1
0.005 mm	11.6
0.002 mm	8.2
0.001 mm	7.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.6	19.8	13.8	54.1	11.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.7	19.8	13.8	57.5	8.2



Comments ______________________

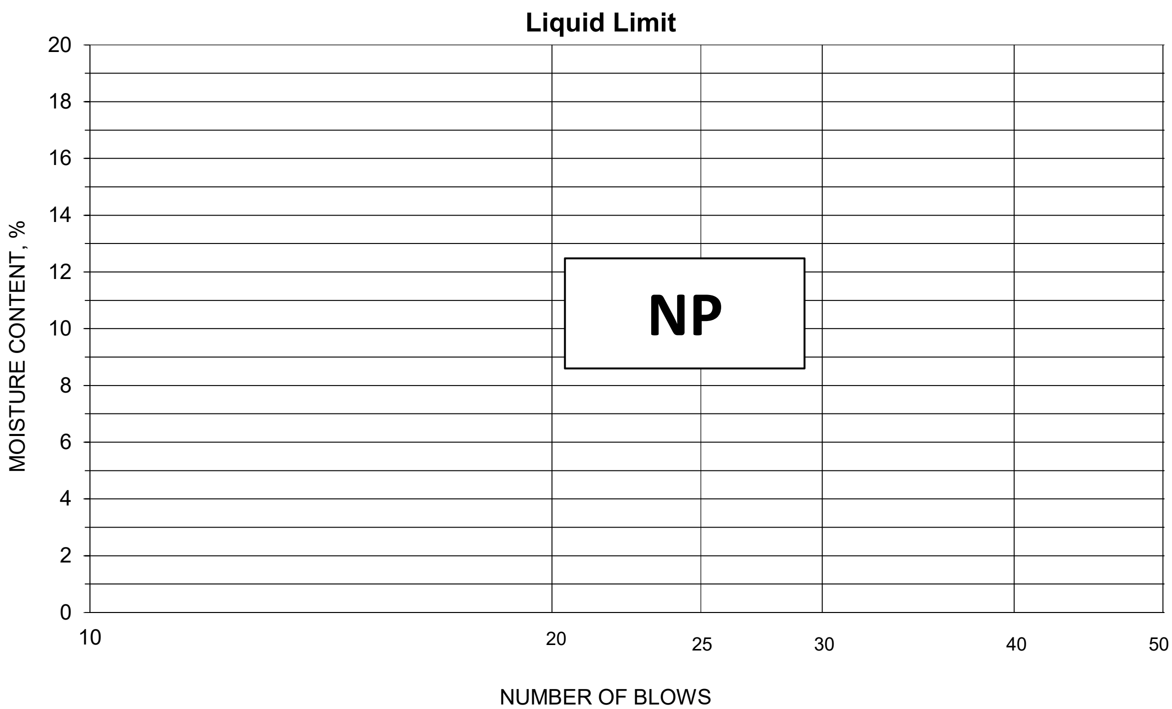
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS03b, 3.5'-4.5'	Lab ID	228
		% + No. 40	20
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	03-28-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS11, 15.0'-16.5'	Lab ID	234
Sample Type	SS	Date Received	3-13-19
		Date Reported	4-11-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 13.4

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.2
3/8"	9.5	91.4
No. 4	4.75	82.4
No. 10	2	65.9
No. 40	0.425	37.7
No. 200	0.075	24.2
	0.02	11.8
	0.005	5.7
	0.002	5.4
estimated	0.001	5.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	17.6	34.1
Coarse Sand	16.5	28.2
Medium Sand	28.2	---
Fine Sand	13.5	13.5
Silt	18.5	18.8
Clay	5.7	5.4

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification
Unified Group Symbol: SM
Group Name: Silty sand with gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW09-SS11, 15.0'-16.5'
Lab ID: 234

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.2
3/8"	91.4
No. 4	82.4
No. 10	65.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

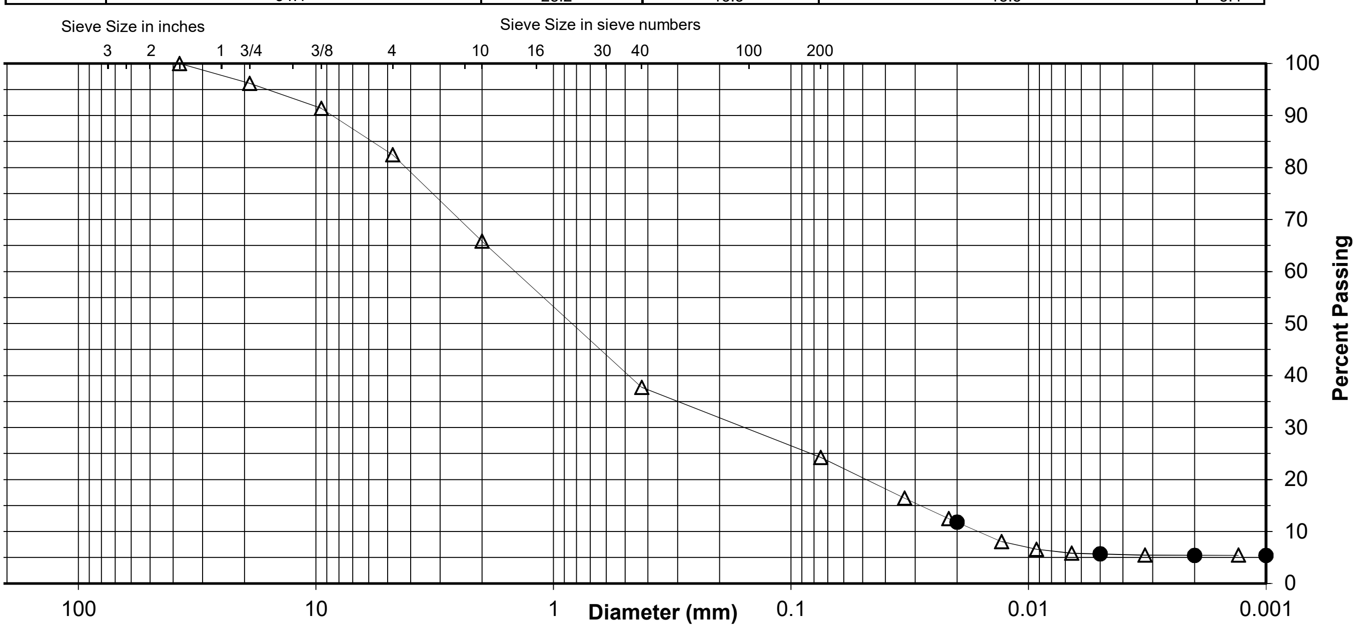
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	37.7
No. 200	24.2
0.02 mm	11.8
0.005 mm	5.7
0.002 mm	5.4
0.001 mm	5.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.8	13.8	16.5	28.2	13.5	18.5	5.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	34.1	28.2	13.5	18.8	5.4



Comments ____________________

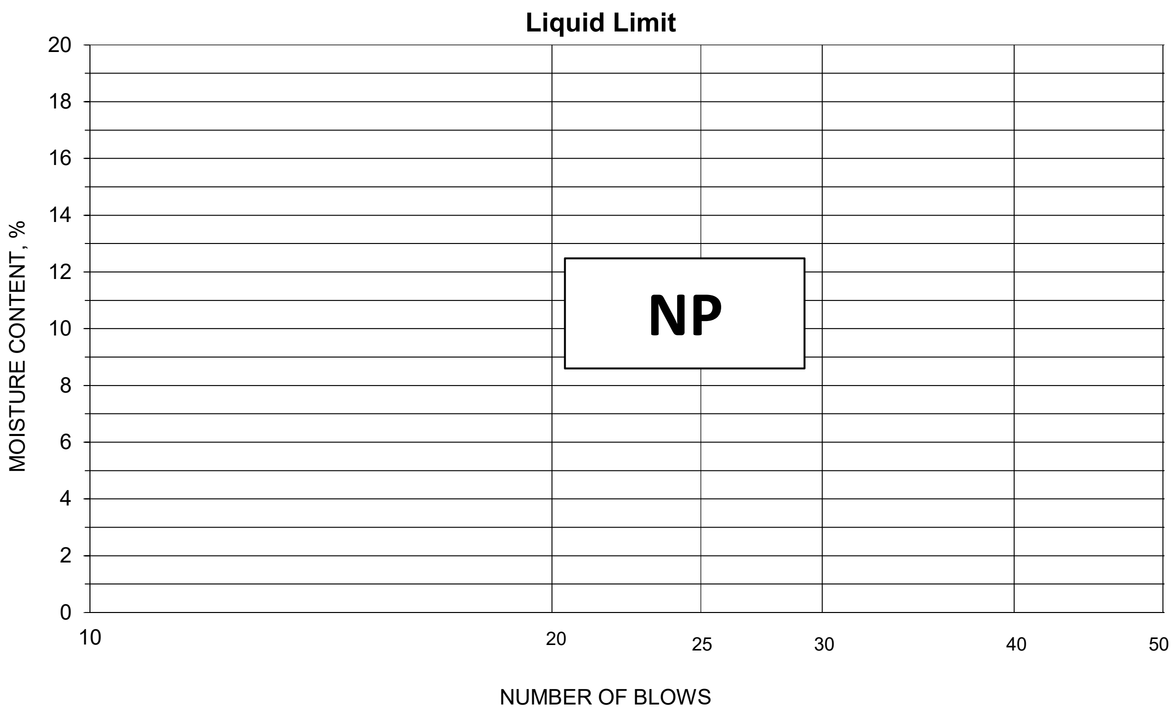
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS11, 15.0'-16.5'	Lab ID	234
		% + No. 40	62
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	03-28-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS17, 24.5'-26.0'	Lab ID	237
Sample Type	SS	Date Received	3-13-19
		Date Reported	4-11-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 24.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	91.8
No. 200	0.075	78.9
	0.02	43.6
	0.005	14.5
	0.002	8.3
estimated	0.001	6.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	8.2
Medium Sand	8.2	---
Fine Sand	12.9	12.9
Silt	64.4	70.6
Clay	14.5	8.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.58

Classification

Unified Group Symbol: ML
Group Name: Silt with sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS17, 24.5'-26.0'	Lab ID	237

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.58

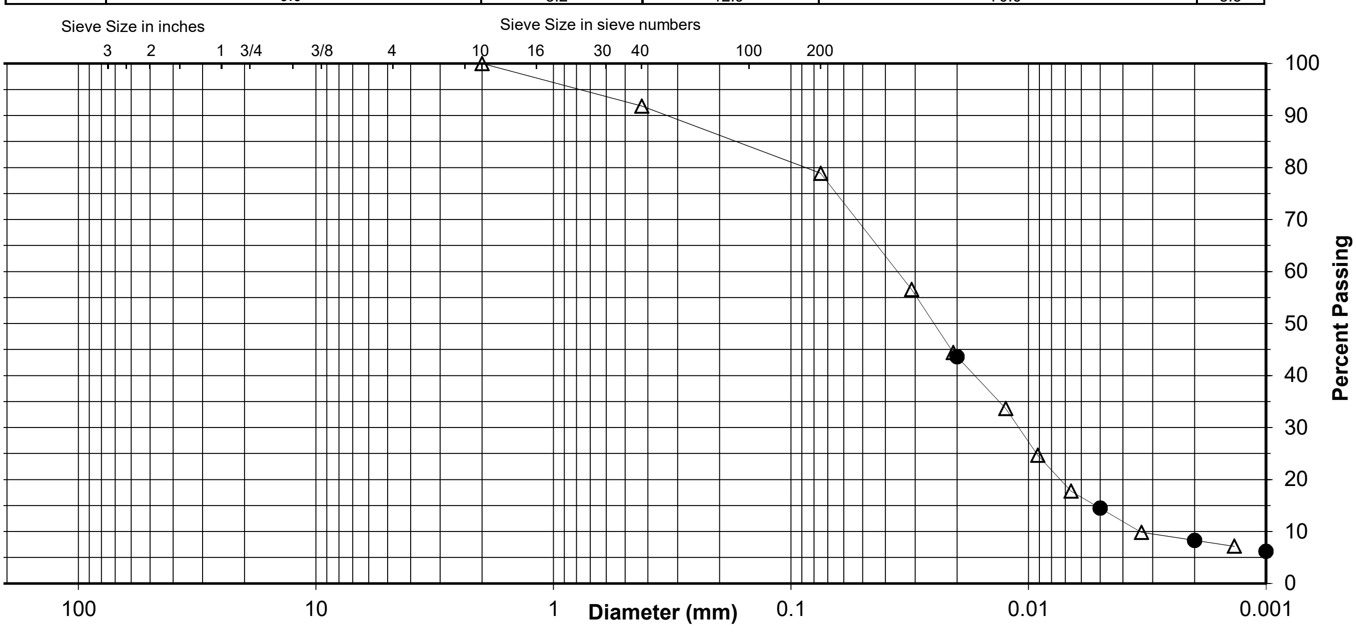
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	91.8
No. 200	78.9
0.02 mm	43.6
0.005 mm	14.5
0.002 mm	8.3
0.001 mm	6.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	8.2	12.9	64.4	14.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	8.2	12.9	70.6	8.3



Comments ______

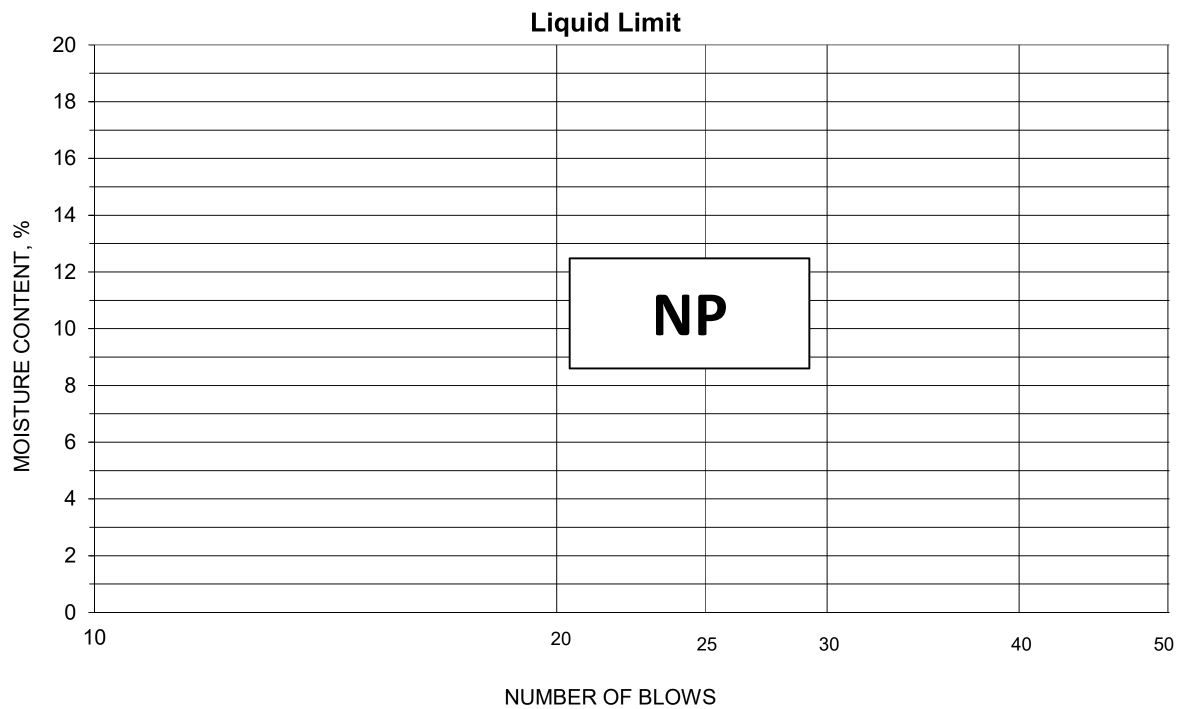
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project: CUF TDEC Order
Project No.: 175568209
Source: CUF-GT-TW09-SS17, 24.5'-26.0'
Lab ID: 237
% + No. 40: 8
Tested By: KG
Test Method: ASTM D 4318 Method A
Date Received: 03-13-2019
Test Date: 03-28-2019
Prepared: Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS27, 39.5'-41.0'	Lab ID	243
Sample Type	SS	Date Received	3-13-19
		Date Reported	4-11-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 8.6

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.4
No. 4	4.75	81.6
No. 10	2	60.4
No. 40	0.425	21.9
No. 200	0.075	6.5
	0.02	4.0
	0.005	2.6
	0.002	2.4
estimated	0.001	2.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	18.4	39.6
Coarse Sand	21.2	38.5
Medium Sand	38.5	---
Fine Sand	15.4	15.4
Silt	3.9	4.1
Clay	2.6	2.4

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.46

Classification

Unified Group Symbol: SW-SM

Group Name: Well-graded sand with silt and gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS27, 39.5'-41.0'	Lab ID	243

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.4
No. 4	81.6
No. 10	60.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.46

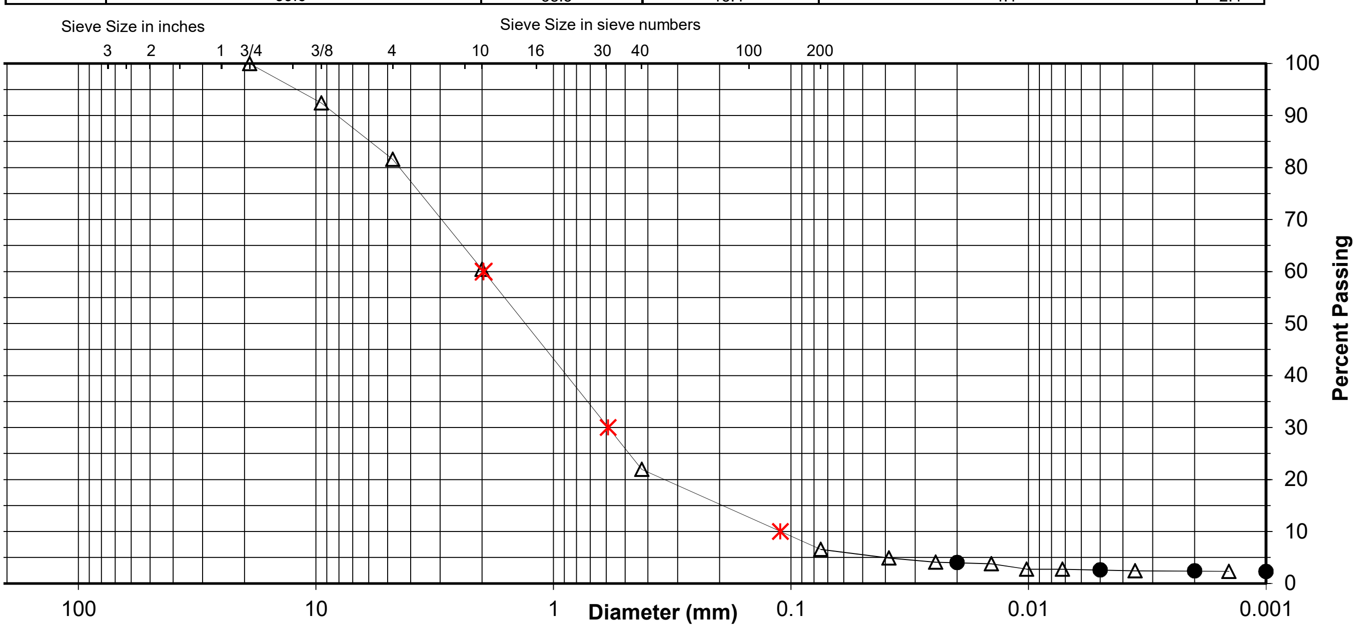
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	21.9
No. 200	6.5
0.02 mm	4.0
0.005 mm	2.6
0.002 mm	2.4
0.001 mm	2.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	18.4	21.2	38.5	15.4	3.9	2.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	39.6	38.5	15.4	4.1	2.4



Comments ______

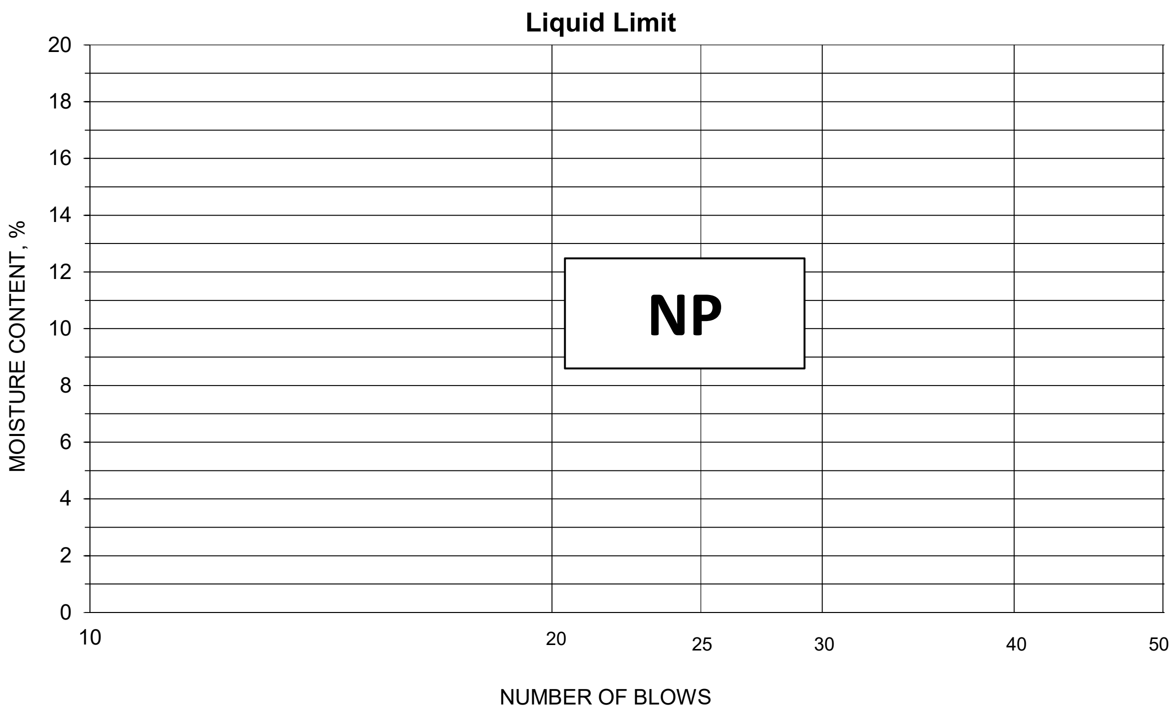
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS27, 39.5'-41.0'	Lab ID	243
		% + No. 40	78
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	03-28-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS37b, 55.8'-56.0'	Lab ID	251
Sample Type	SS	Date Received	3-13-19
		Date Reported	4-11-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.2

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	98.1
	0.02	20.4
	0.005	12.9
	0.002	11.5
estimated	0.001	10.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	1.5	1.5
Silt	85.2	86.6
Clay	12.9	11.5

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.36

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven Dried at 60º C.

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS37b, 55.8'-56.0'	Lab ID	251

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.36

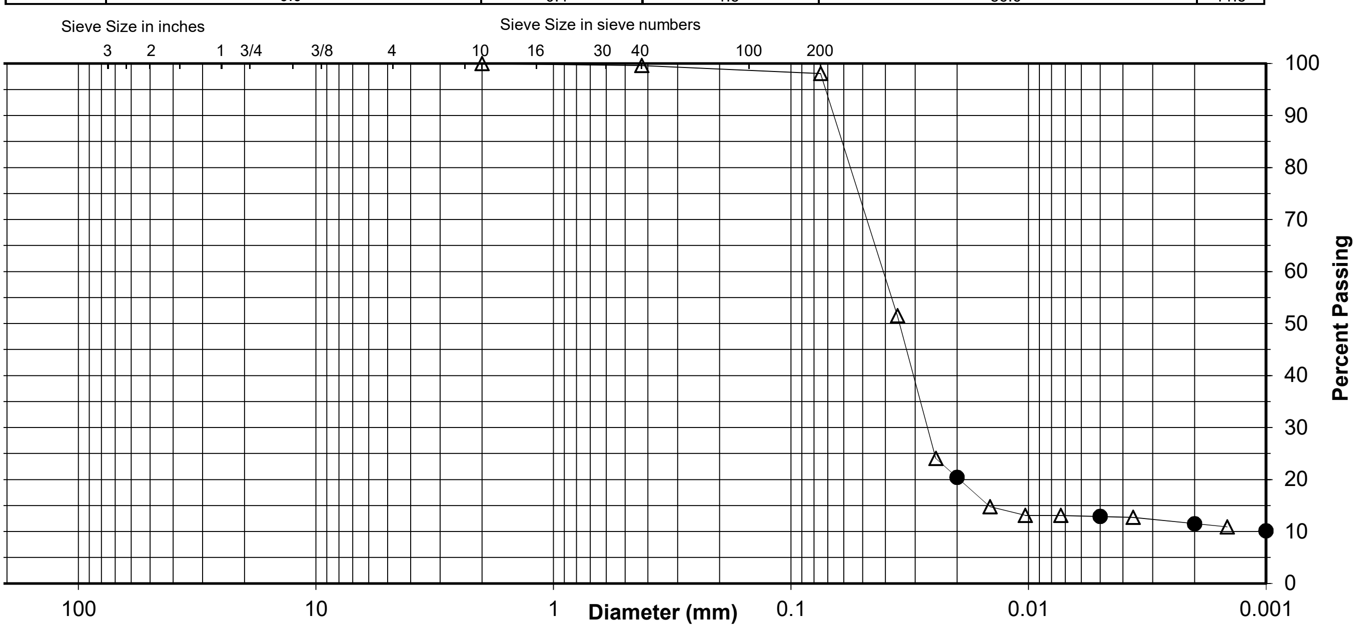
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	98.1
0.02 mm	20.4
0.005 mm	12.9
0.002 mm	11.5
0.001 mm	10.1

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.4	1.5	85.2	12.9

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.4	1.5	86.6	11.5



Comments: Oven Dried at 60º C.

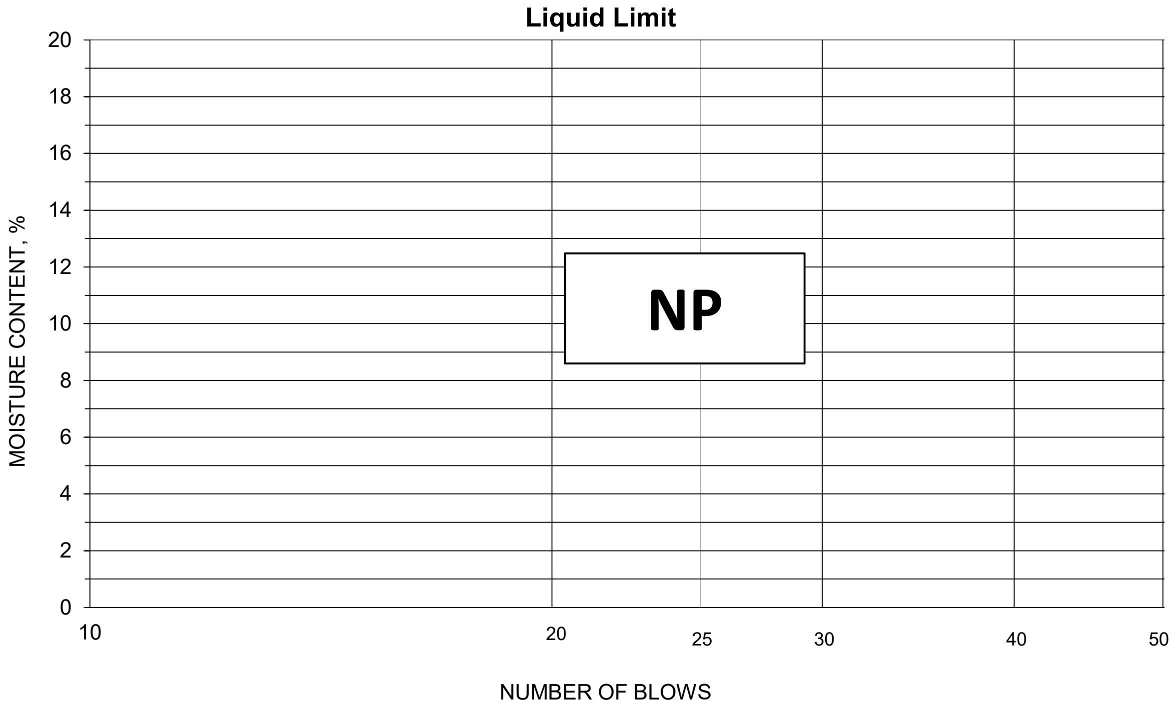
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW09-SS37b, 55.8'-56.0'			Lab ID	251
				% + No. 40	0
Tested By	KG	Test Method	ASTM D 4318 Method A	Date Received	03-13-2019
Test Date	03-28-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: Oven Dried at 60º C.

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-ST01, 63.5'-63.8'	Lab ID	254
Sample Type	ST	Date Received	3-13-19
		Date Reported	4-11-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 25.6

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.1
No. 10	2	96.4
No. 40	0.425	91.6
No. 200	0.075	82.5
	0.02	50.2
	0.005	22.9
	0.002	12.9
estimated	0.001	8.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.9	3.6
Coarse Sand	2.7	4.8
Medium Sand	4.8	---
Fine Sand	9.1	9.1
Silt	59.6	69.6
Clay	22.9	12.9

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.57

Classification
Unified Group Symbol: ML
Group Name: Silt with sand
AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-TW09-ST01, 63.5'-63.8'
Project Number: 175568209
Lab ID: 254

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.1
No. 10	96.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.57

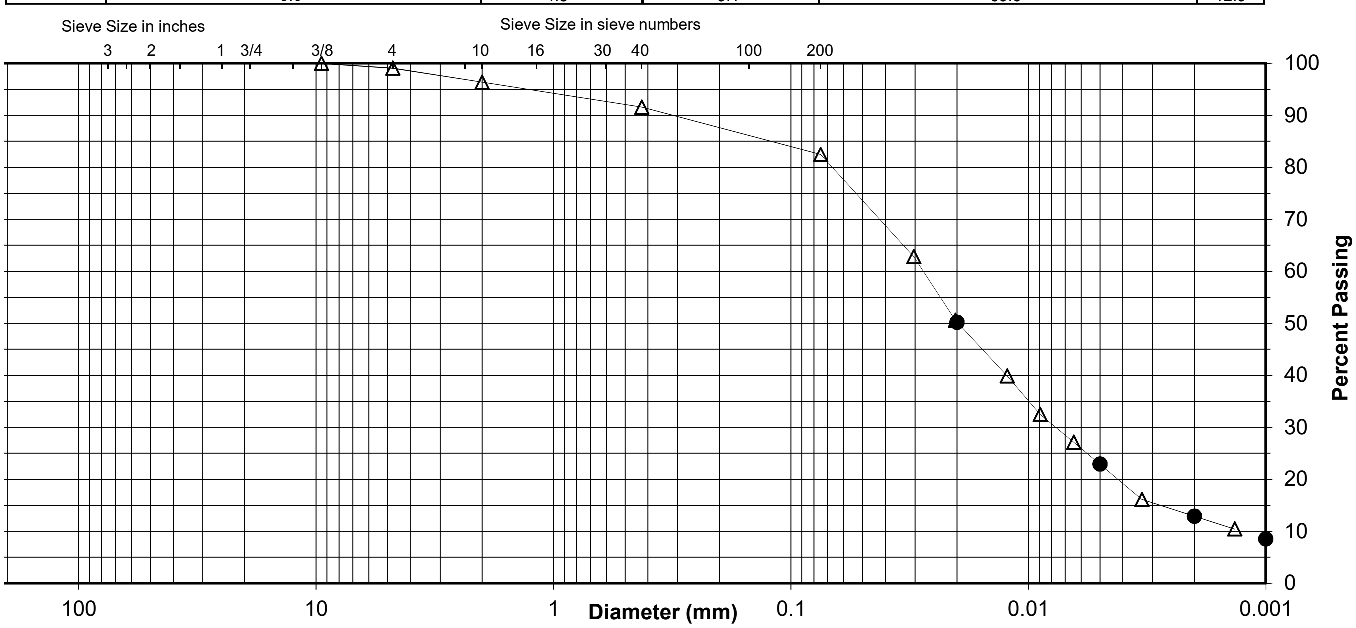
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	91.6
No. 200	82.5
0.02 mm	50.2
0.005 mm	22.9
0.002 mm	12.9
0.001 mm	8.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.9	2.7	4.8	9.1	59.6	22.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	3.6	4.8	9.1	69.6	12.9



Comments ______

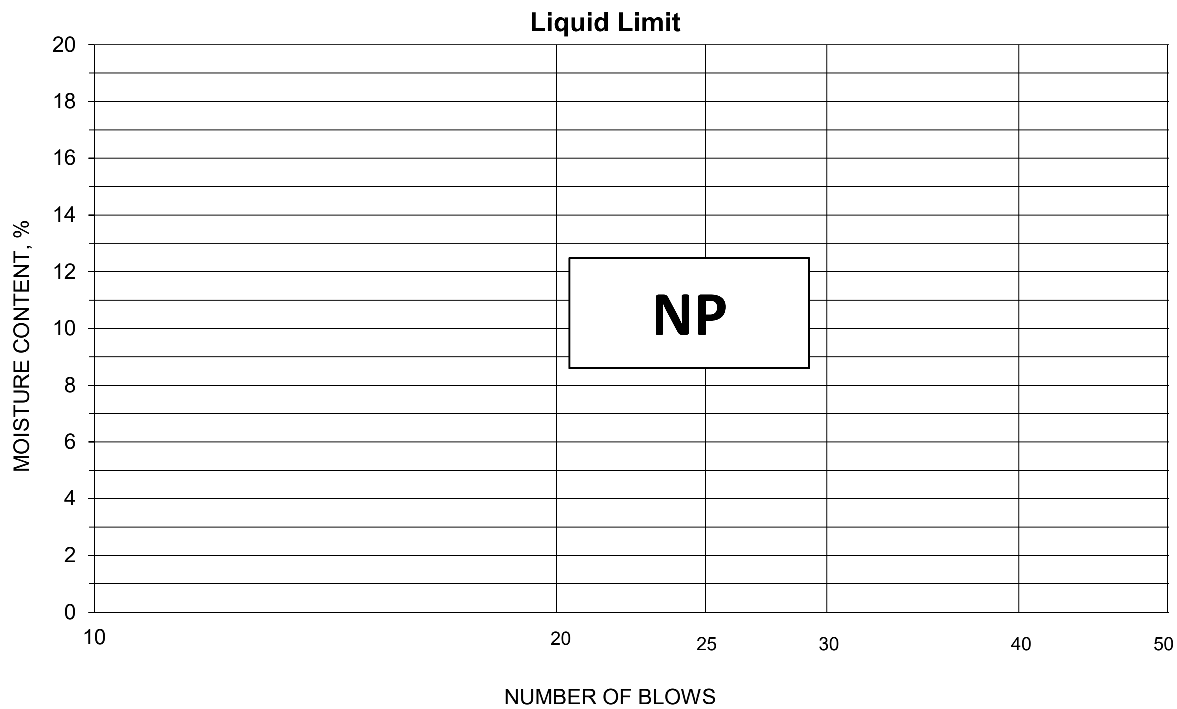
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-ST01, 63.5'-63.8'	Lab ID	254
		% + No. 40	8
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	03-28-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS51, 79.5'-81.0'	Lab ID	260
Sample Type	SS	Date Received	3-13-19
		Date Reported	4-11-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 48.7

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	100.0
No. 200	0.075	94.7
	0.02	62.9
	0.005	25.5
	0.002	11.9
estimated	0.001	5.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.0
Medium Sand	0.0	---
Fine Sand	5.3	5.3
Silt	69.2	82.8
Clay	25.5	11.9

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.51

Classification
Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name CUF TDEC Order | Project Number 175568209
Source CUF-GT-TW09-SS51, 79.5'-81.0' | Lab ID 260

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method ASTM D 422
Prepared using ASTM D 421

Particle Shape N/A
Particle Hardness: N/A

Tested By DB
Test Date 03-28-2019
Date Received 03-13-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.51

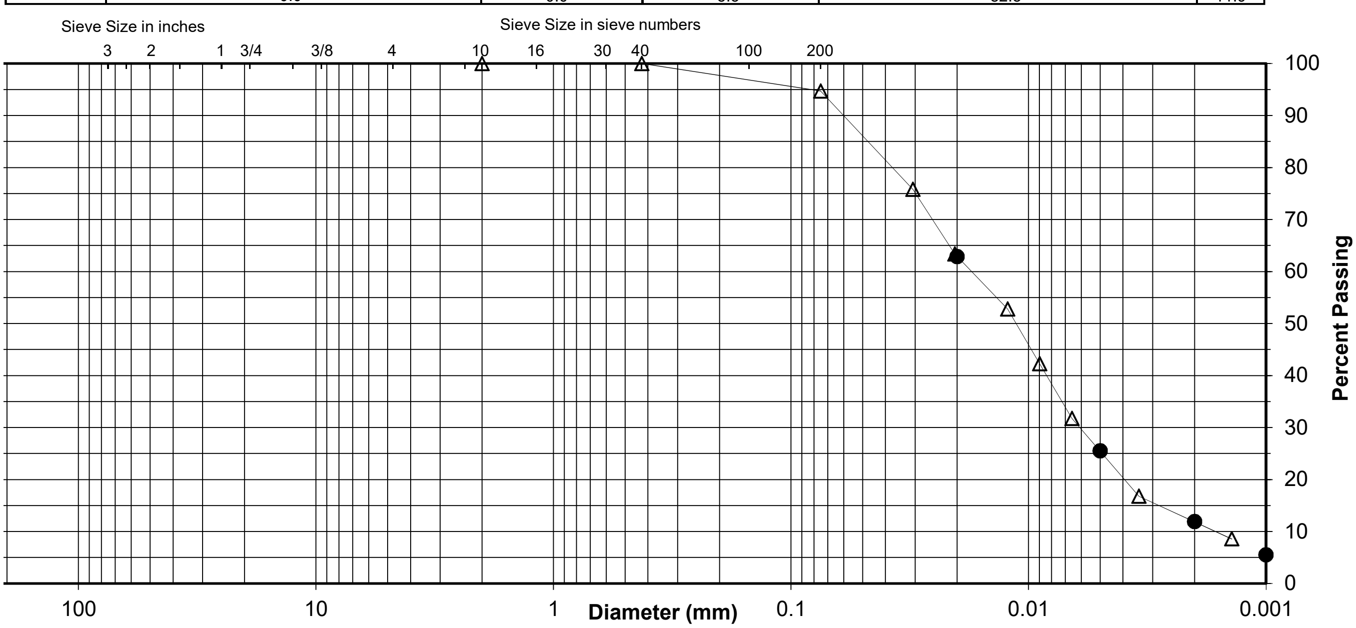
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	100.0
No. 200	94.7
0.02 mm	62.9
0.005 mm	25.5
0.002 mm	11.9
0.001 mm	5.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.0	5.3	69.2	25.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.0	5.3	82.8	11.9



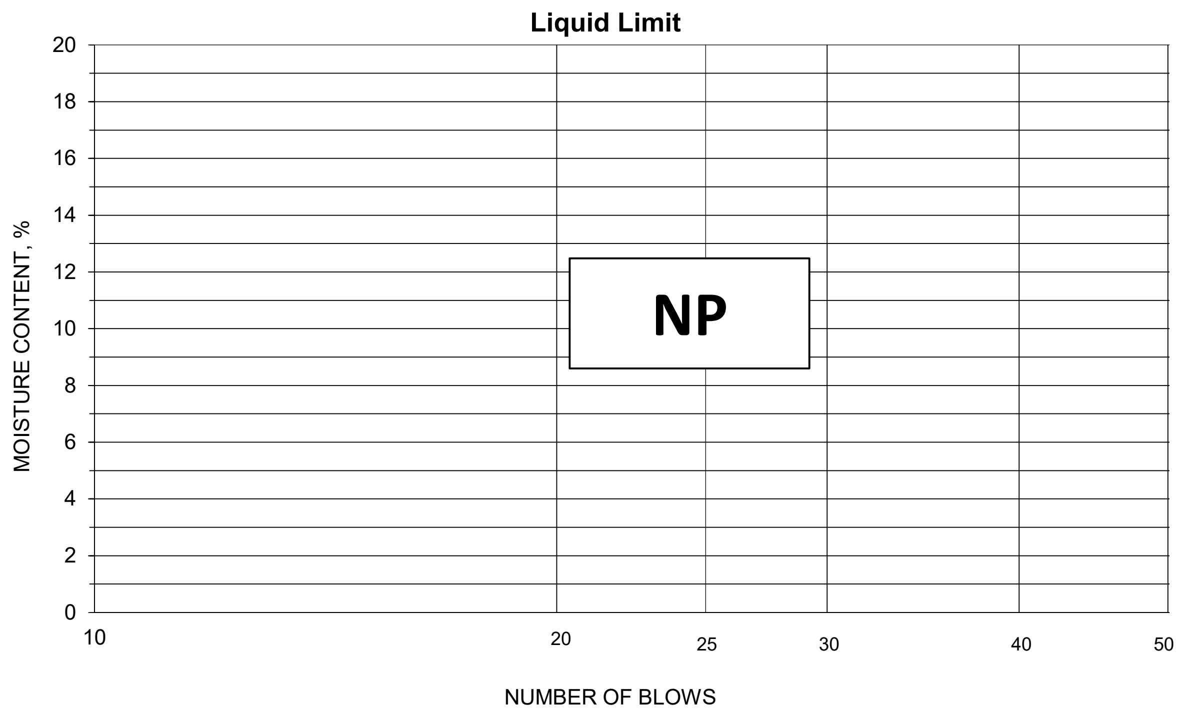
Comments

Reviewed By RJ

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS51, 79.5'-81.0'	Lab ID	260
		% + No. 40	0
Tested By	KG	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	03-28-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW09-SS59, 92.0'-93.0'
Lab ID: 266

Sample Type: SS
Date Received: 3-13-19
Date Reported: 4-11-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 23.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	98.9
	0.02	87.0
	0.005	45.8
	0.002	32.9
estimated	0.001	25.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	0.7	0.7
Silt	53.1	66.0
Clay	45.8	32.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 33
Plastic Limit: 21
Plasticity Index: 12
Activity Index: 0.4

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.64

Classification

Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-6 (12)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-TW09-SS59, 92.0'-93.0'
Project Number: 175568209
Lab ID: 266

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.64

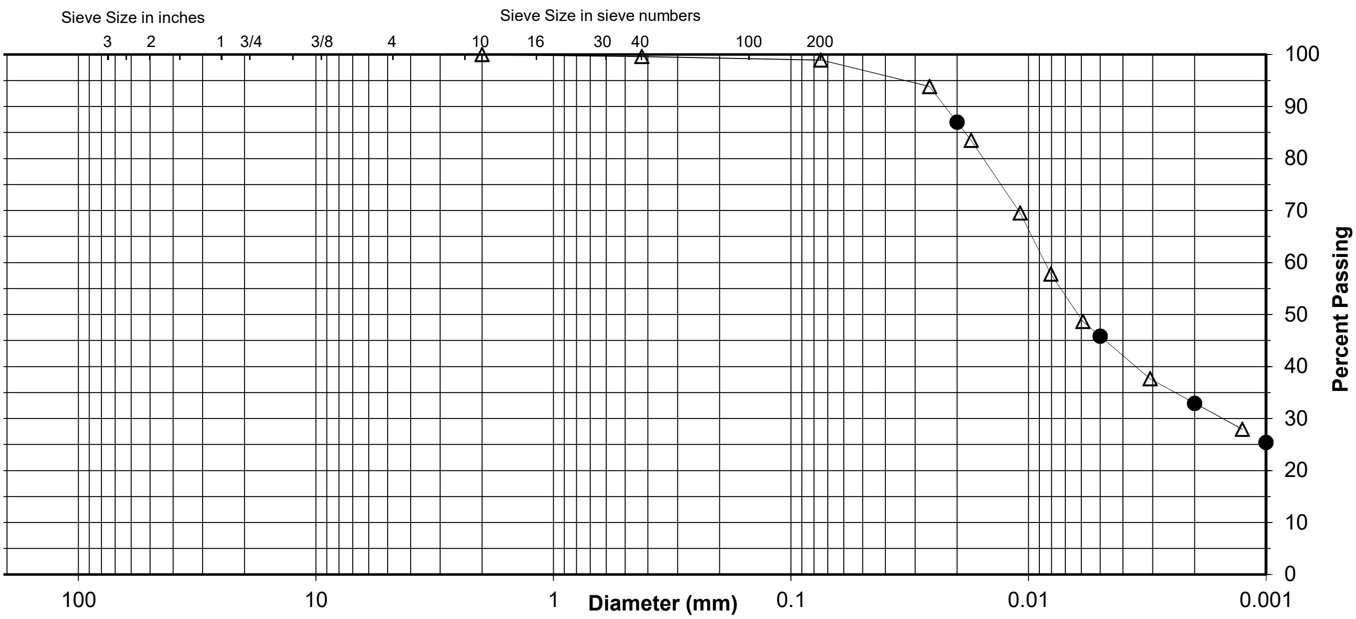
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	98.9
0.02 mm	87.0
0.005 mm	45.8
0.002 mm	32.9
0.001 mm	25.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.4	0.7	53.1	45.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.4	0.7	66.0	32.9



Comments

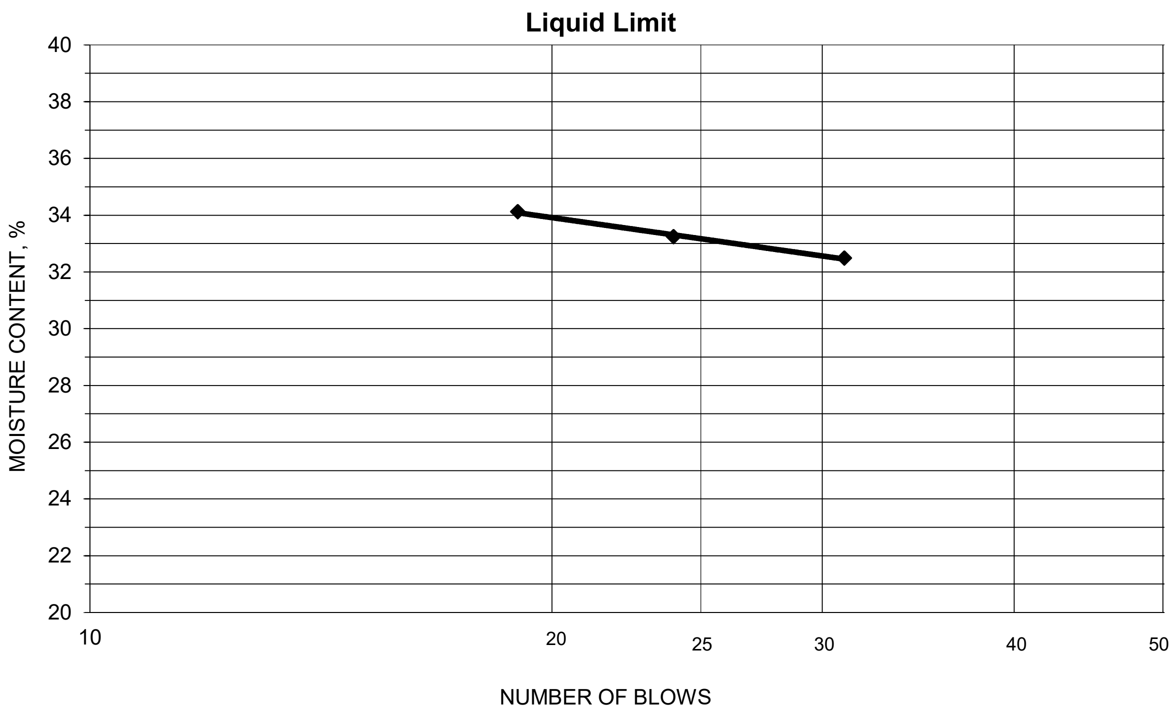
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS59, 92.0'-93.0'	Lab ID	266
		% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	04-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.43	17.38	11.07	31	32.5	
20.52	18.18	11.14	24	33.2	
19.59	17.43	11.10	19	34.1	33



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.74	16.58	11.01	20.8	21	12
17.80	16.62	10.94	20.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-ST03, 95.1'-95.6'	Lab ID	268
Sample Type	ST	Date Received	3-13-19
		Date Reported	4-11-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 24.4

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.4
No. 200	0.075	98.1
	0.02	91.6
	0.005	51.8
	0.002	38.2
estimated	0.001	30.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.5
Medium Sand	0.5	---
Fine Sand	1.3	1.3
Silt	46.3	59.9
Clay	51.8	38.2

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 38
Plastic Limit: 20
Plasticity Index: 18
Activity Index: 0.5

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification
Unified Group Symbol: CL
Group Name: Lean clay
AASHTO Classification: A-6 (19)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-ST03, 95.1'-95.6'	Lab ID	268

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

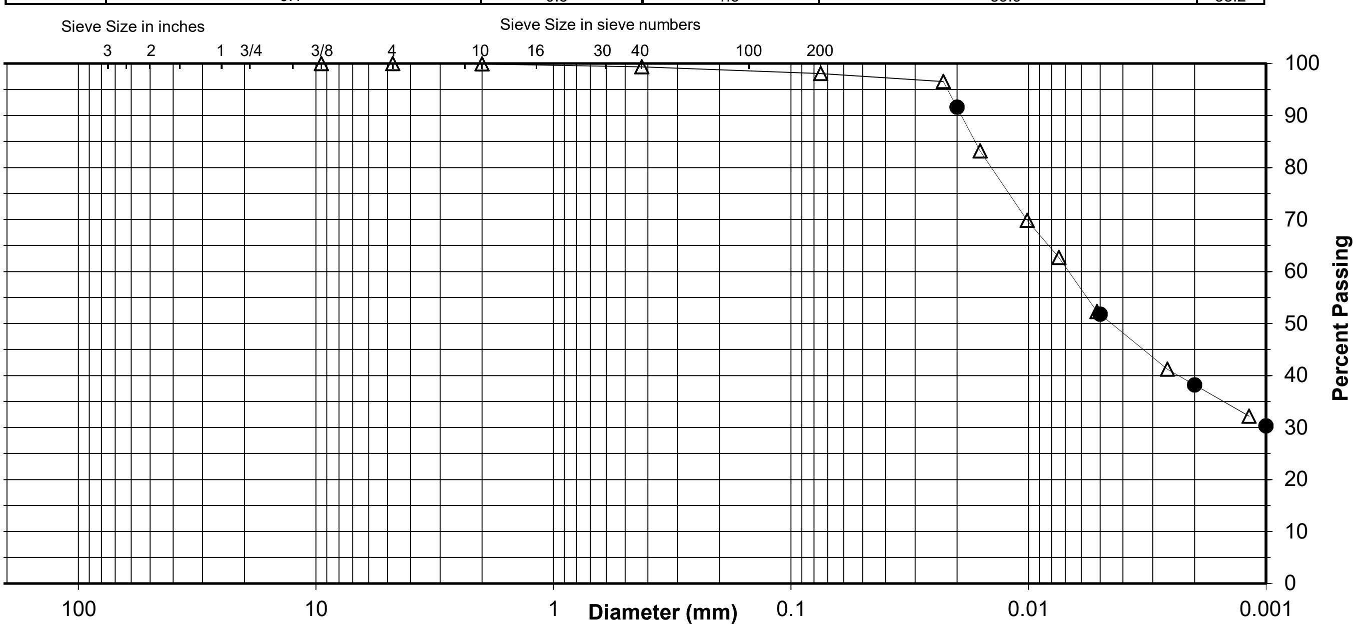
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	98.1
0.02 mm	91.6
0.005 mm	51.8
0.002 mm	38.2
0.001 mm	30.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	0.5	1.3	46.3	51.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.1	0.5	1.3	59.9	38.2



Comments ______

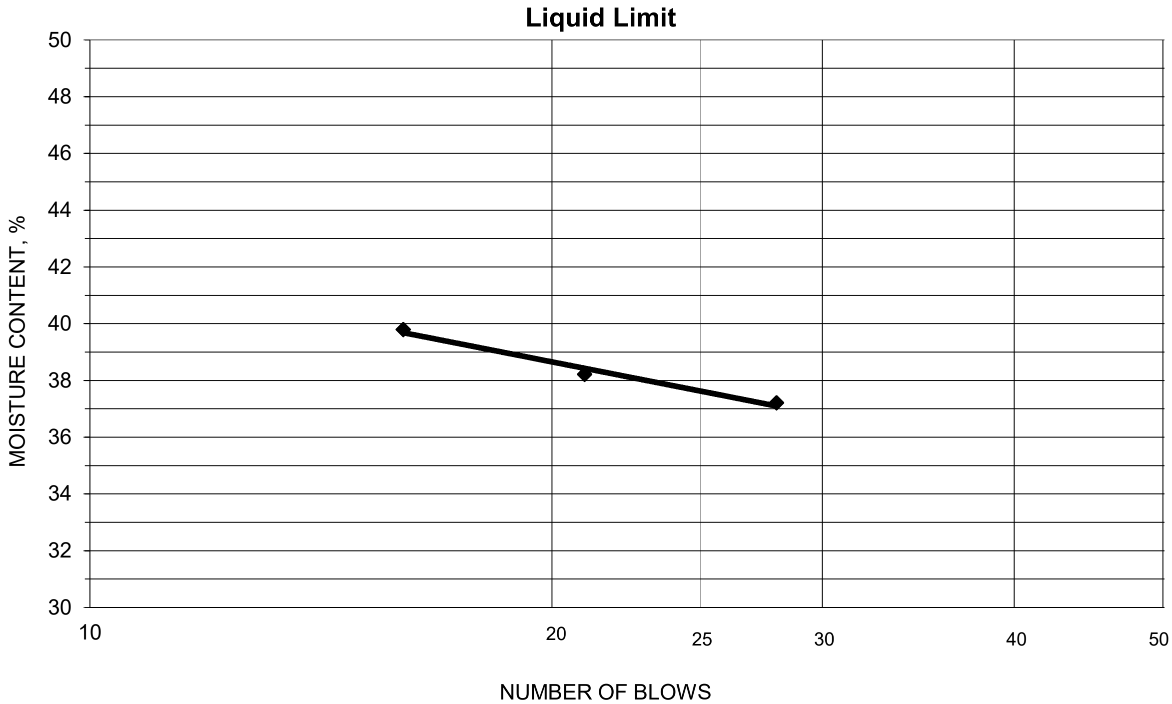
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-ST03, 95.1'-95.6'	Lab ID	268
		% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	04-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.31	16.97	11.09	16	39.8	38
19.10	16.96	11.36	21	38.2	
18.51	16.46	10.95	28	37.2	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.10	17.04	11.57	19.4	20	18
17.18	16.14	10.89	19.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order — Project Number: 175568209
Source: CUF-GT-TW09-SS64, 102.5'-104.0' — Lab ID: 272

Sample Type: SS — Date Received: 3-13-19
Date Reported: 4-11-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 25.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.7
No. 40	0.425	99.4
No. 200	0.075	97.4
	0.02	74.6
	0.005	34.2
	0.002	24.5
estimated	0.001	19.8

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.1	0.3
Coarse Sand	0.2	0.3
Medium Sand	0.3	---
Fine Sand	2.0	2.0
Silt	63.2	72.9
Clay	34.2	24.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 35
Plastic Limit: 20
Plasticity Index: 15
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.69

Classification

Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-6 (15)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS64, 102.5'-104.0'	Lab ID	272

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.69

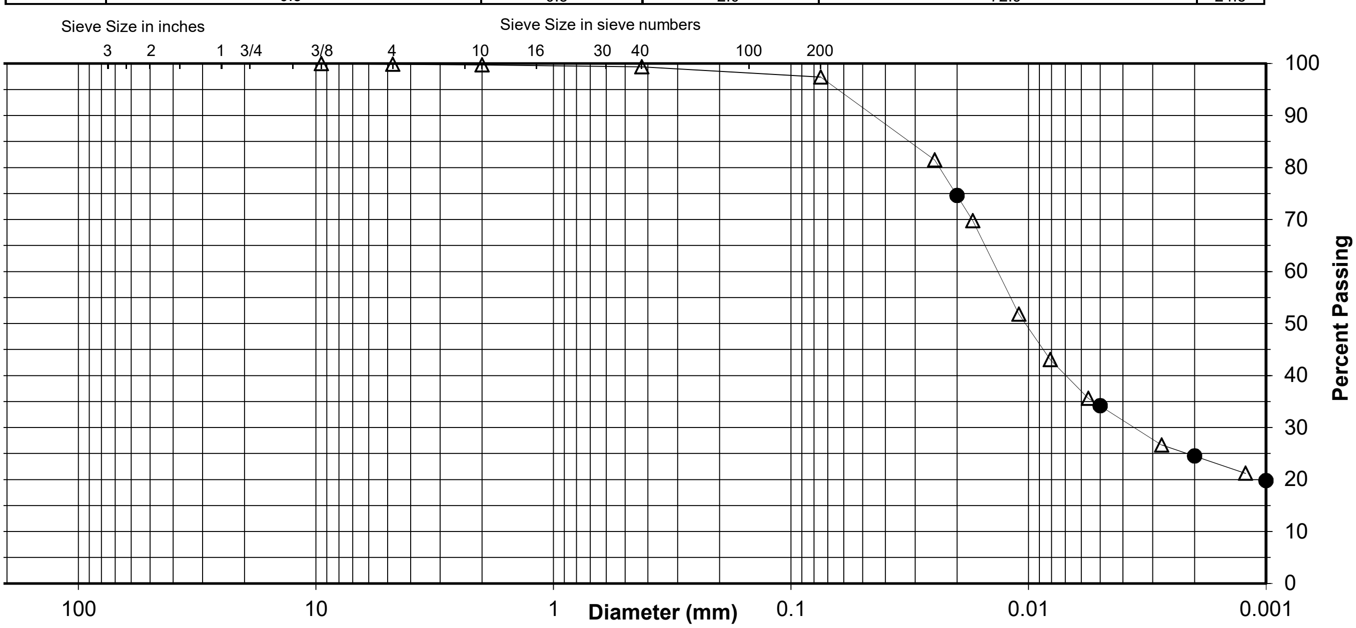
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	97.4
0.02 mm	74.6
0.005 mm	34.2
0.002 mm	24.5
0.001 mm	19.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.2	0.3	2.0	63.2	34.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.3	0.3	2.0	72.9	24.5



Comments ______

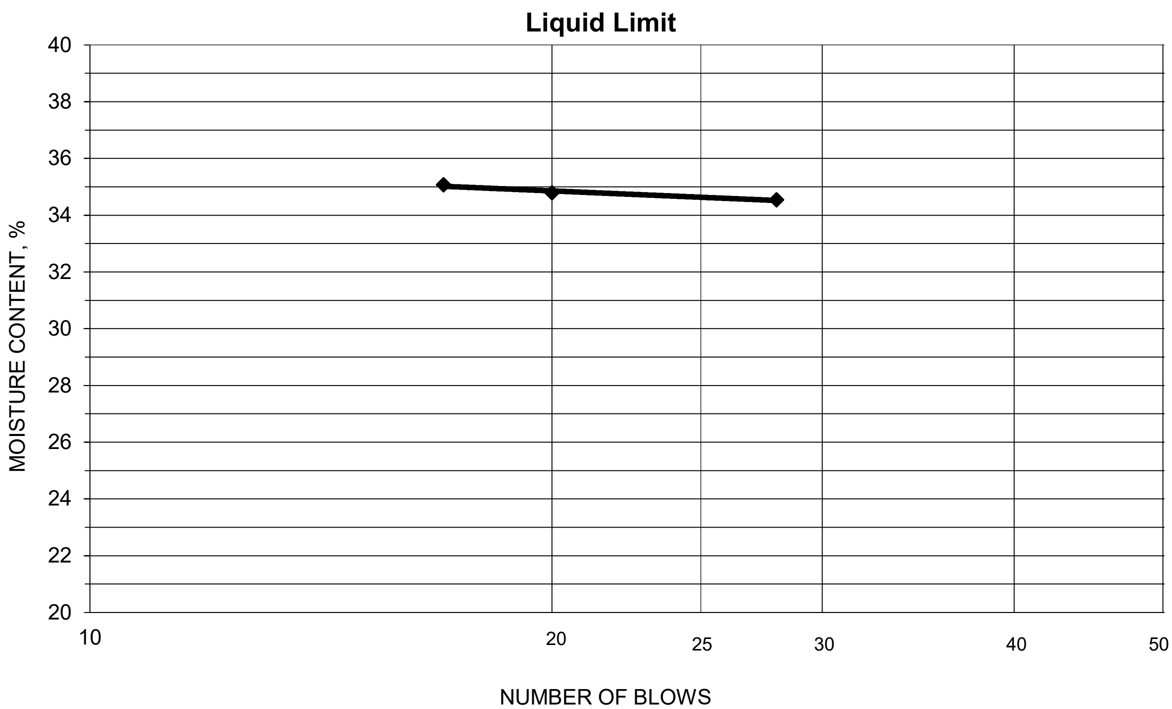
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS64, 102.5'-104.0'	Lab ID	272
		% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	04-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.47	16.66	11.42	28	34.5	
18.49	16.58	11.09	20	34.8	
18.42	16.53	11.14	17	35.1	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.17	17.07	11.46	19.6	20	15
17.87	16.79	11.36	19.9		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW09-SS69, 115'-116.5', CUF-GT-TW09-SS70, 117.5'-119.0', CUF-GT-TW09-SS71, 120.0'-121.5'
Lab ID: 279
Sample Type: SPT Composite
Date Received: 3-13-19
Date Reported: 4-11-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	80.2
3/8"	9.5	54.2
No. 4	4.75	35.1
No. 10	2	21.4
No. 40	0.425	13.0
No. 200	0.075	7.8
	0.02	5.6
	0.005	3.4
	0.002	2.7
estimated	0.001	2.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	64.9	78.6
Coarse Sand	13.7	8.4
Medium Sand	8.4	---
Fine Sand	5.2	5.2
Silt	4.4	5.1
Clay	3.4	2.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 26
Plastic Limit: 19
Plasticity Index: 7
Activity Index: 2.6

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.69

Classification

Unified Group Symbol: GP-GC
Group Name: Poorly graded gravel with clay and sand (or silty clay and sand)
AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS69, 115'-116.5', CUF-GT-TW09-SS70, 117.5'-119.0', CUF-GT-TW09-SS71, 120.0'-121.5'	Lab ID	279

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-29-2019
Date Received: 03-13-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	80.2
3/8"	54.2
No. 4	35.1
No. 10	21.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.69

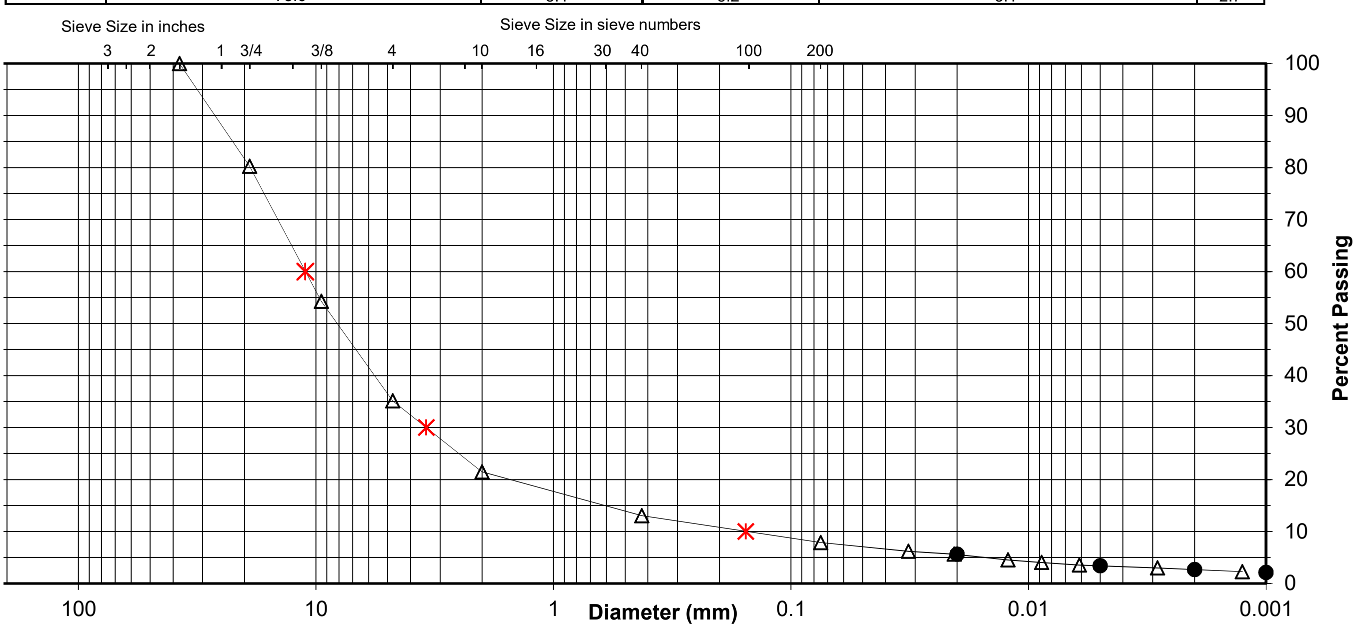
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	13.0
No. 200	7.8
0.02 mm	5.6
0.005 mm	3.4
0.002 mm	2.7
0.001 mm	2.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	19.8	45.1	13.7	8.4	5.2	4.4	3.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	78.6	8.4	5.2	5.1	2.7



Comments ______________________

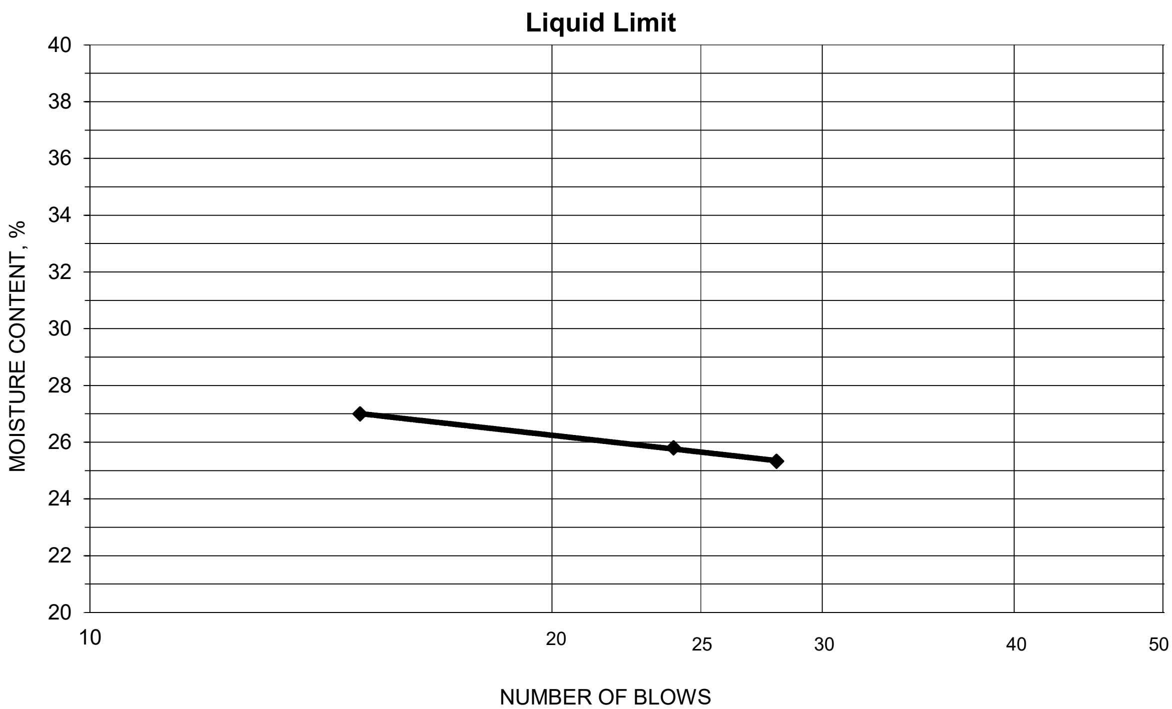
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS69, 115'-116.5', CUF-GT-TW09-SS70, 117.5'-119.0'	Lab ID	279
	CUF-GT-TW09-SS71, 120.0'-121.5'	% + No. 40	87
Tested By	DB Test Method ASTM D 4318 Method A	Date Received	03-13-2019
Test Date	04-08-2019 Prepared Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
23.33	20.73	11.10	15	27.0	26
24.17	21.51	11.20	24	25.8	
21.91	19.75	11.22	28	25.3	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.66	16.65	11.35	19.1	19	7
16.90	15.93	10.67	18.4		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS73, 125.0'-126.5'	Lab ID	282
Sample Type	SS	Date Received	3-13-19
		Date Reported	4-11-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.7

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	83.2
3/8"	9.5	69.7
No. 4	4.75	62.7
No. 10	2	58.1
No. 40	0.425	52.6
No. 200	0.075	36.4
	0.02	25.1
	0.005	15.0
	0.002	12.4
estimated	0.001	10.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	37.3	41.9
Coarse Sand	4.6	5.5
Medium Sand	5.5	---
Fine Sand	16.2	16.2
Silt	21.4	24.0
Clay	15.0	12.4

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 28

Plastic Limit: 17

Plasticity Index: 11

Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.67

Classification

Unified Group Symbol: GC

Group Name: Clayey gravel with sand

AASHTO Classification: A-6 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW09-SS73, 125.0'-126.5'
Lab ID: 282

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-28-2019
Date Received: 03-13-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	83.2
3/8"	69.7
No. 4	62.7
No. 10	58.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

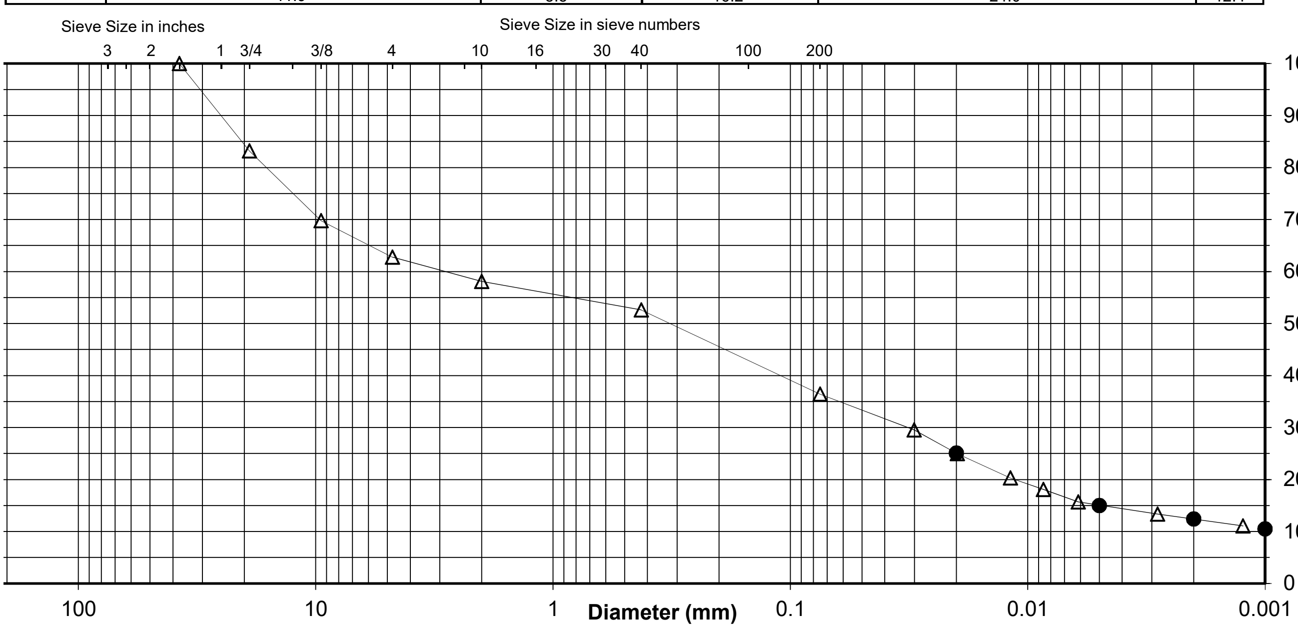
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	52.6
No. 200	36.4
0.02 mm	25.1
0.005 mm	15.0
0.002 mm	12.4
0.001 mm	10.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	16.8	20.5	4.6	5.5	16.2	21.4	15.0

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	41.9	5.5	16.2	24.0	12.4



Comments ______

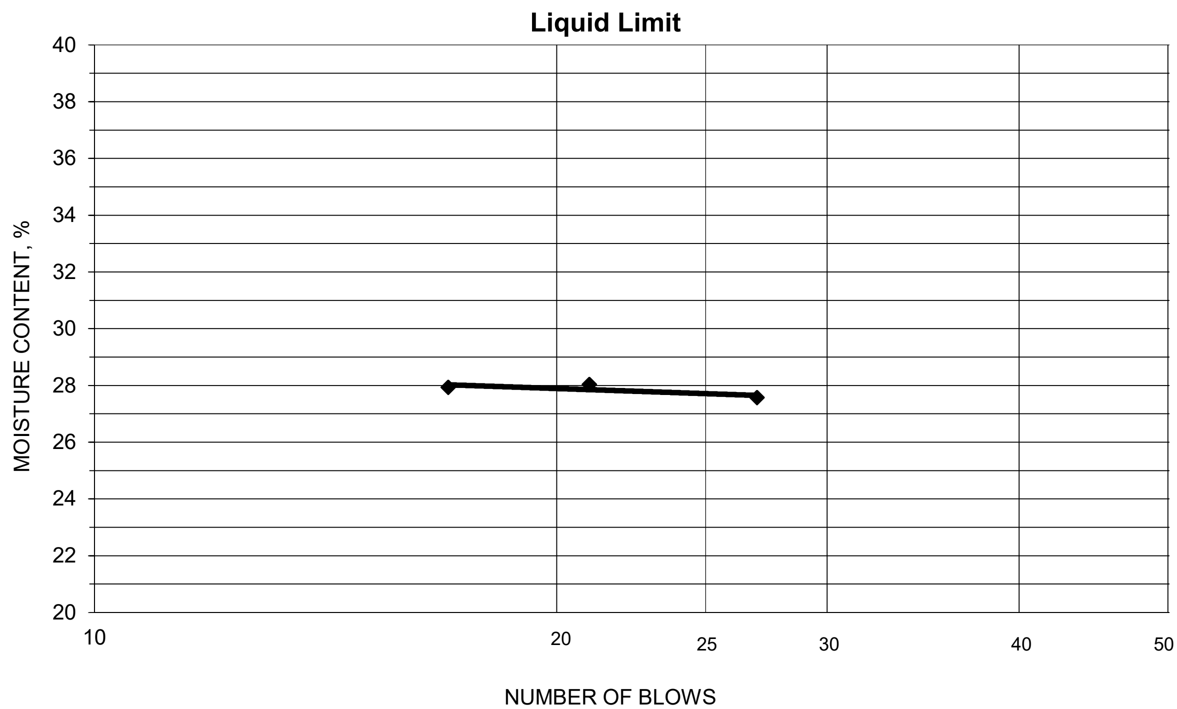
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS73, 125.0'-126.5'	Lab ID	282
		% + No. 40	47
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	04-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.14	17.47	11.49	17	27.9	28
19.28	17.57	11.47	21	28.0	
21.08	18.96	11.27	27	27.6	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.57	17.53	11.47	17.2	17	11
18.49	17.45	11.53	17.6		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW09-SS75, 130.0'-131.5'
Lab ID: 284

Sample Type: SS
Date Received: 3-13-19
Date Reported: 4-11-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 27.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	95.1
3/8"	9.5	82.8
No. 4	4.75	71.4
No. 10	2	56.9
No. 40	0.425	41.2
No. 200	0.075	33.2
	0.02	28.2
	0.005	21.8
	0.002	17.5
estimated	0.001	14.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	28.6	43.1
Coarse Sand	14.5	15.7
Medium Sand	15.7	---
Fine Sand	8.0	8.0
Silt	11.4	15.7
Clay	21.8	17.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 44
Plastic Limit: 18
Plasticity Index: 26
Activity Index: 1.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.73

Classification

Unified Group Symbol: SC
Group Name: Clayey sand with gravel

AASHTO Classification: A-2-7 (3)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW09-SS75, 130.0'-131.5'	Lab ID	284

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 03-23-2019
Date Received: 03-13-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	95.1
3/8"	82.8
No. 4	71.4
No. 10	56.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.73

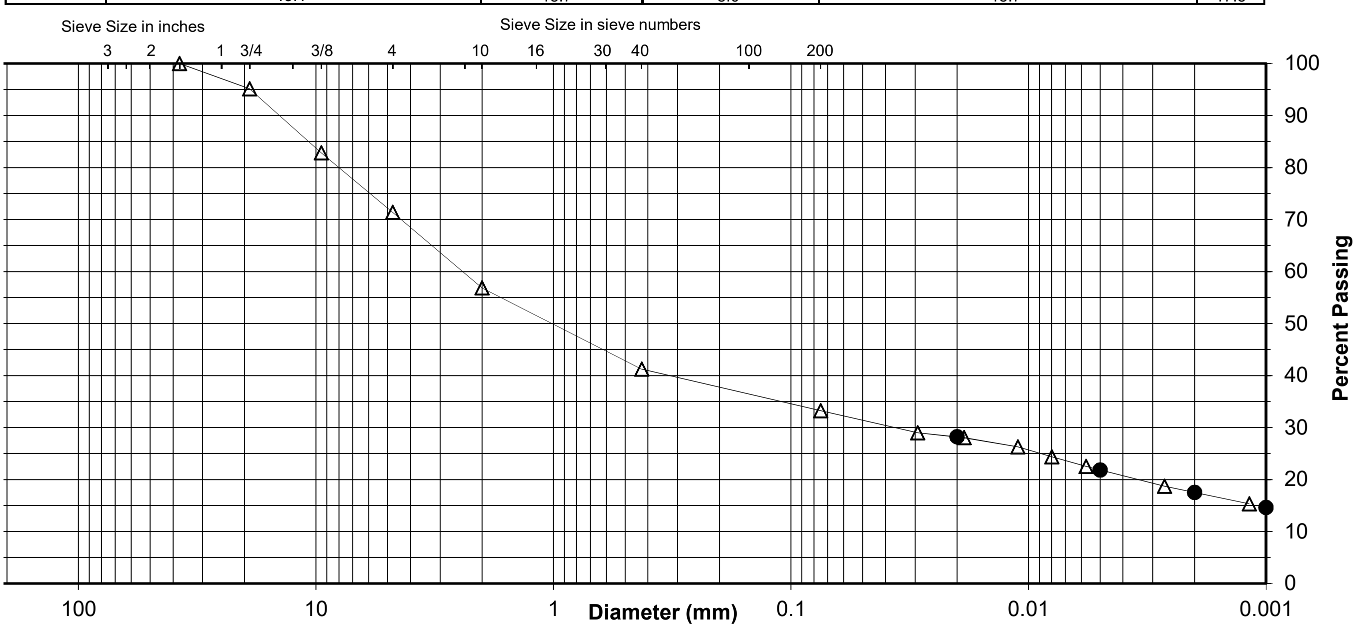
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	41.2
No. 200	33.2
0.02 mm	28.2
0.005 mm	21.8
0.002 mm	17.5
0.001 mm	14.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	4.9	23.7	14.5	15.7	8.0	11.4	21.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	43.1	15.7	8.0	15.7	17.5



Comments ____________________

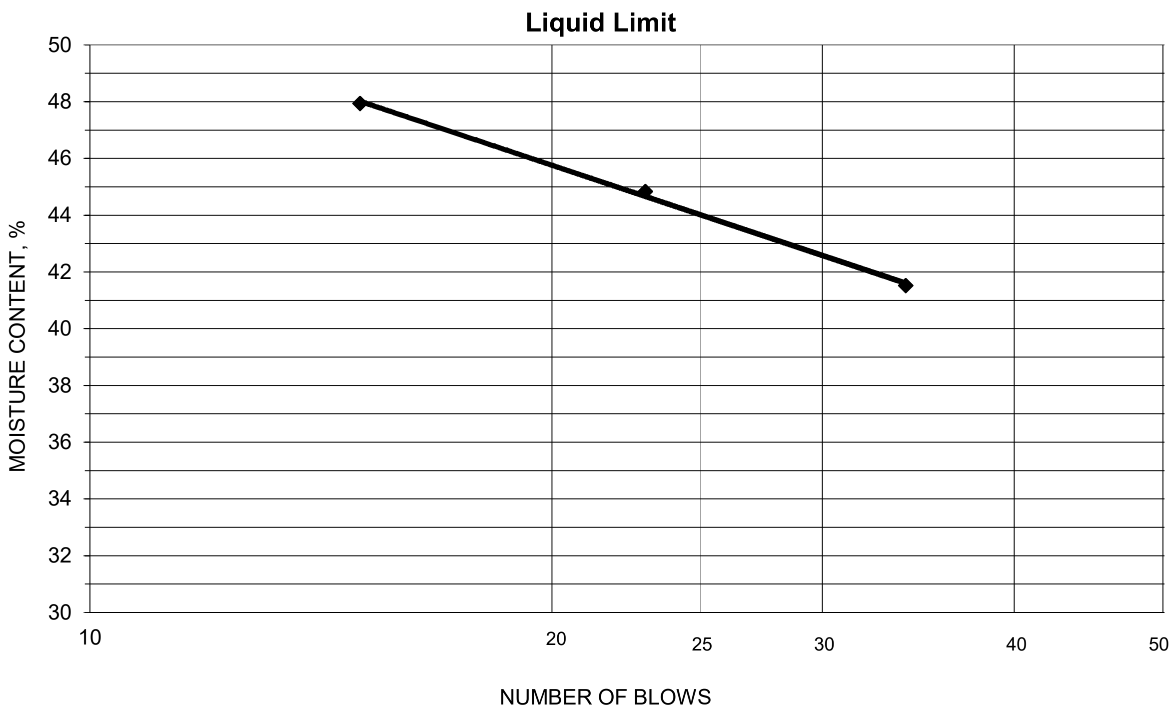
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-SS75, 130.0'-131.5'	Lab ID	284
		% + No. 40	59
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	03-13-2019		
Test Date	04-01-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.78	16.70	11.69	34	41.5	44
18.49	16.28	11.35	23	44.8	
18.84	16.40	11.31	15	47.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.89	16.90	11.54	18.5	18	26
17.36	16.45	11.43	18.1		

Remarks: __________

Reviewed By RJ

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Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 04/17/2019

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW01-SS08G, 10.5'-12.0'
Lab ID: 291

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 10.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	98.5
No. 200	0.075	96.6
	0.02	13.4
	0.005	6.5
	0.002	5.7
estimated	0.001	5.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.1
Coarse Sand	0.1	1.4
Medium Sand	1.4	---
Fine Sand	1.9	1.9
Silt	90.1	90.9
Clay	6.5	5.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.35

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven dried at 60° C.

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW01-SS08G, 10.5'-12.0'	Lab ID	291

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.35

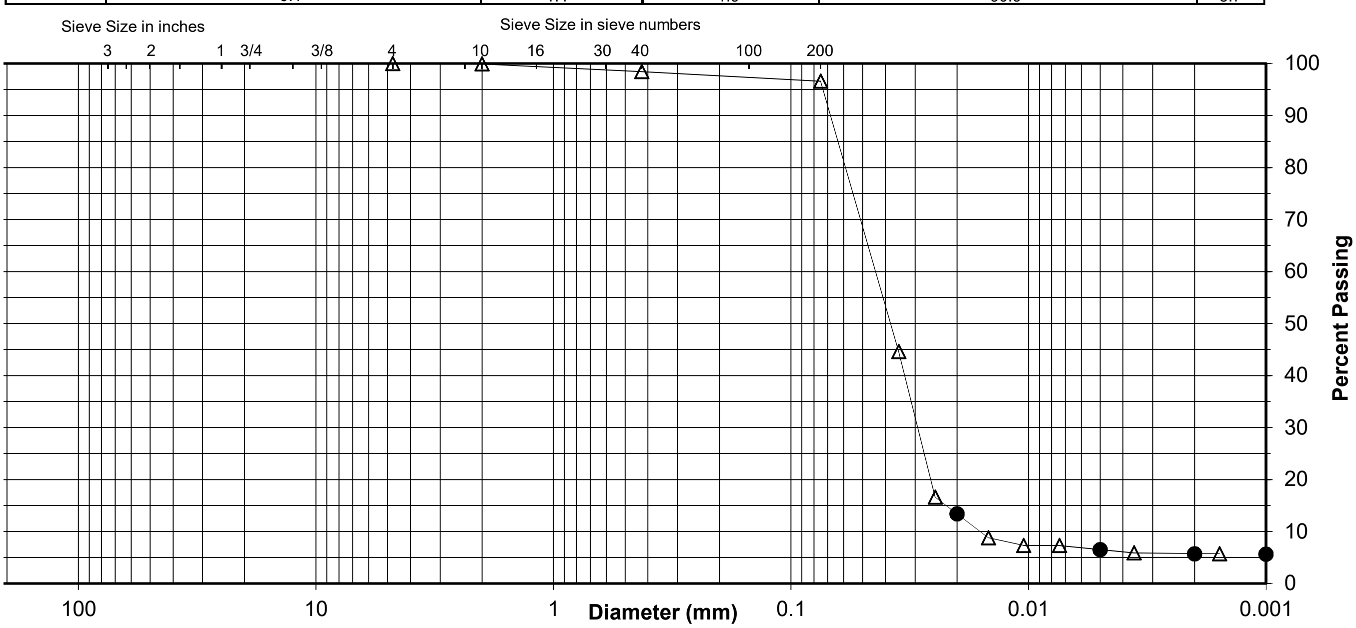
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.5
No. 200	96.6
0.02 mm	13.4
0.005 mm	6.5
0.002 mm	5.7
0.001 mm	5.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	1.4	1.9	90.1	6.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.1	1.4	1.9	90.9	5.7



Comments: Oven dried at 60° C.

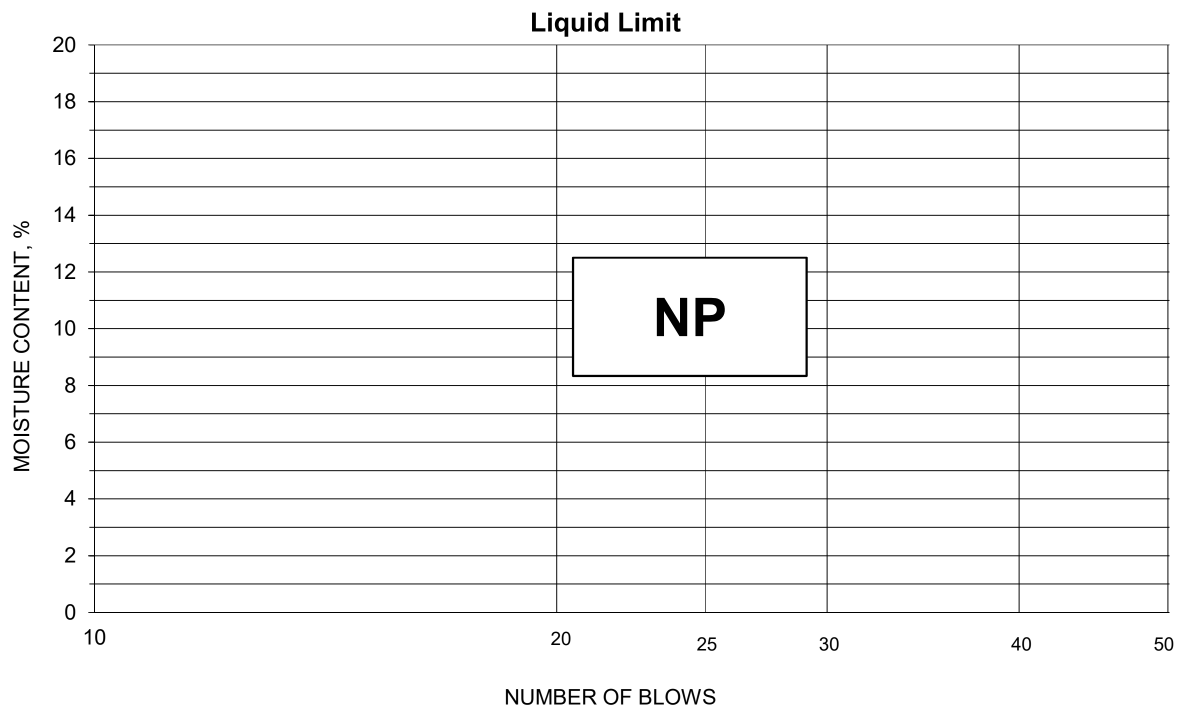
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW01-SS08G, 10.5'-12.0'	Lab ID	291
		% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW01-SS17cG, 25.0'-25.3' & CUF-GT-TW01-SS18aG, 25.5'-25.8' & CUF-GT-TW02-SS16aG, 25.5'-26.2'
Lab ID: 298

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-03-2019
Date Received: 04-19-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	59.4
3/8"	37.1
No. 4	30.2
No. 10	26.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

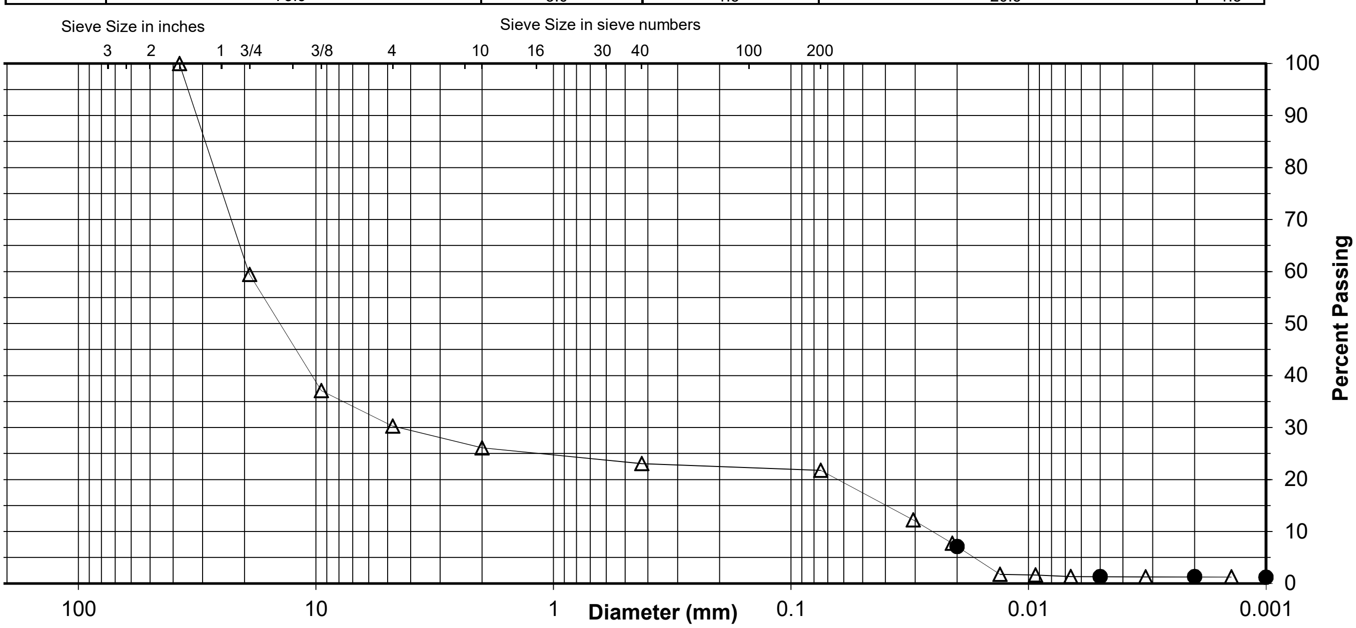
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	23.1
No. 200	21.8
0.02 mm	7.1
0.005 mm	1.3
0.002 mm	1.3
0.001 mm	1.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	40.6	29.2	4.1	3.0	1.3	20.5	1.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	73.9	3.0	1.3	20.5	1.3



Comments: Oven dried at 60° C.

Reviewed By: RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW01-SS21G, 30.0'-31.5'	Lab ID	303
Sample Type	SS	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 48.7

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.4
No. 10	2	97.6
No. 40	0.425	90.1
No. 200	0.075	73.1
	0.02	32.5
	0.005	10.2
	0.002	4.9
estimated	0.001	2.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.6	2.4
Coarse Sand	1.8	7.5
Medium Sand	7.5	---
Fine Sand	17.0	17.0
Silt	62.9	68.2
Clay	10.2	4.9

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.54

Classification

Unified Group Symbol: ML

Group Name: Silt with sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW01-SS21G, 30.0'-31.5'
Lab ID: 303

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded
Particle Hardness: Hard and Durable

Tested By: HW
Test Date: 05-29-2019
Date Received: 04-19-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.4
No. 10	97.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.54

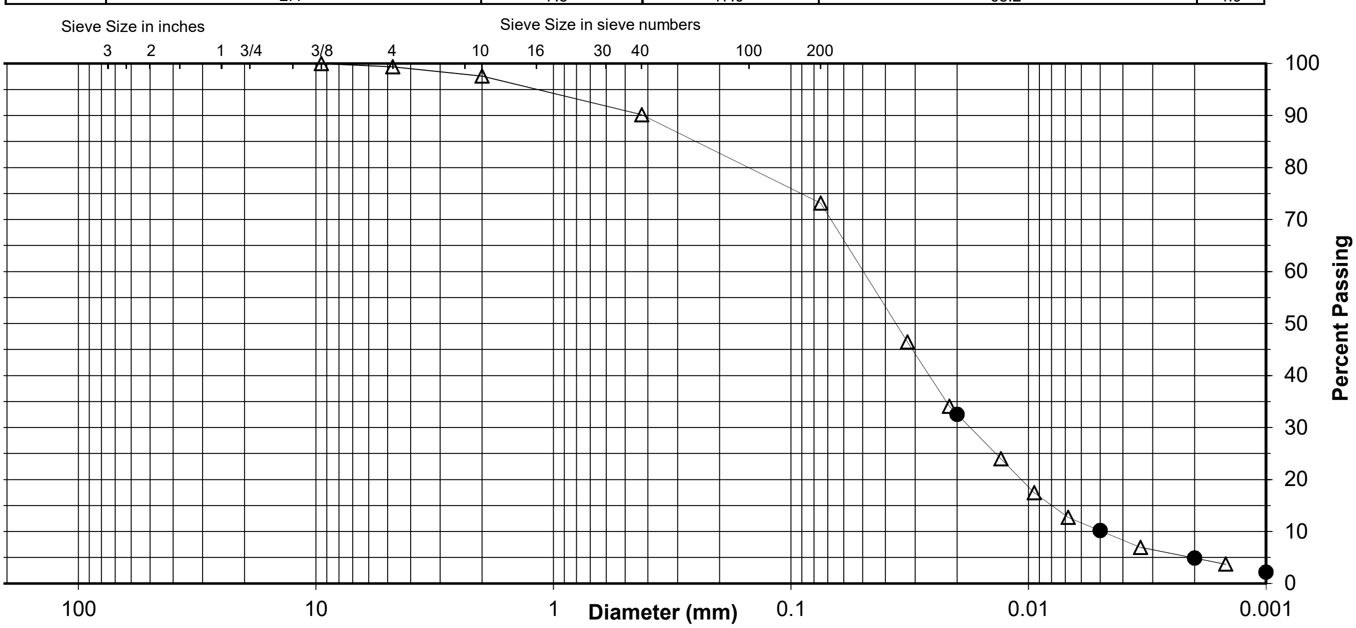
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	90.1
No. 200	73.1
0.02 mm	32.5
0.005 mm	10.2
0.002 mm	4.9
0.001 mm	2.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.6	1.8	7.5	17.0	62.9	10.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	2.4	7.5	17.0	68.2	4.9



Comments ______

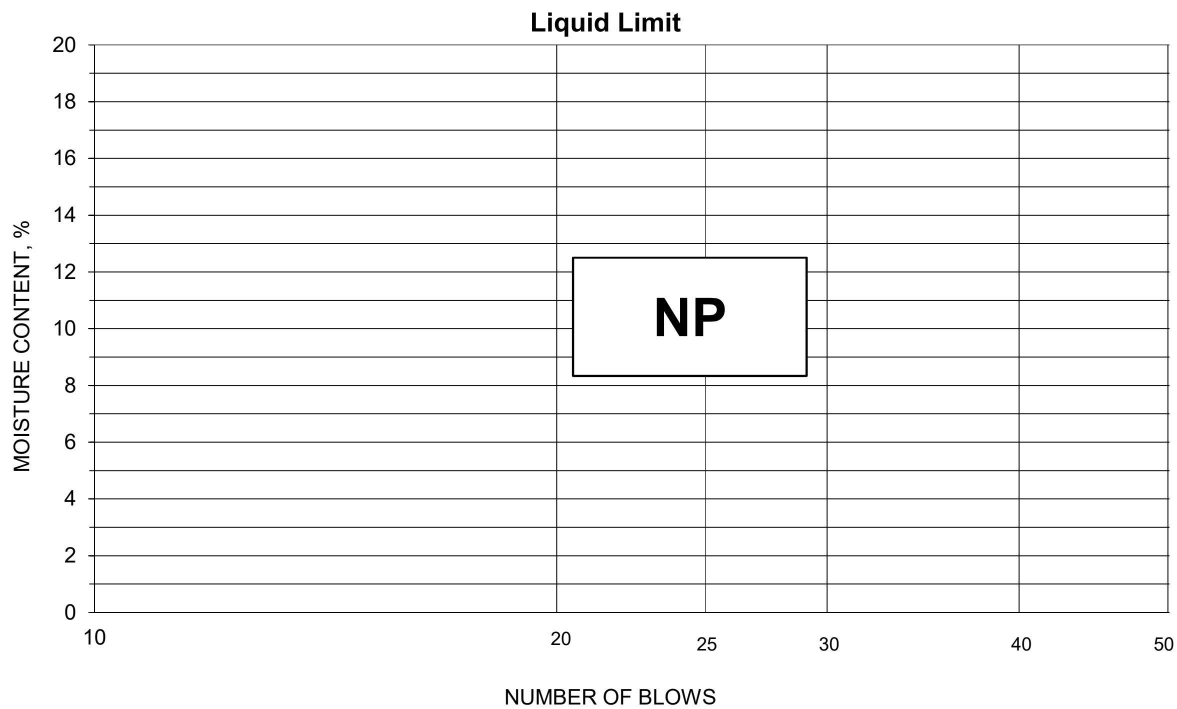
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW01-SS21G, 30.0'-31.5'	Lab ID	303
		% + No. 40	10
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-09-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order — Project Number: 175568209
Source: CUF-GT-TW01-ST02, 41.3'-41.7' — Lab ID: 309

Sample Type: ST — Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 40.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Sieve Size	Particle Size (mm)	% Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.3
No. 40	0.425	98.8
No. 200	0.075	91.8
	0.02	51.2
	0.005	20.1
	0.002	11.6
estimated	0.001	11.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.7
Coarse Sand	0.7	0.5
Medium Sand	0.5	---
Fine Sand	7.0	7.0
Silt	71.7	80.2
Clay	20.1	11.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.61

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-TW01-ST02, 41.3'-41.7'

Project Number: 175568209
Lab ID: 309

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: TNT
Test Date: 05-29-2019
Date Received: 04-19-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.61

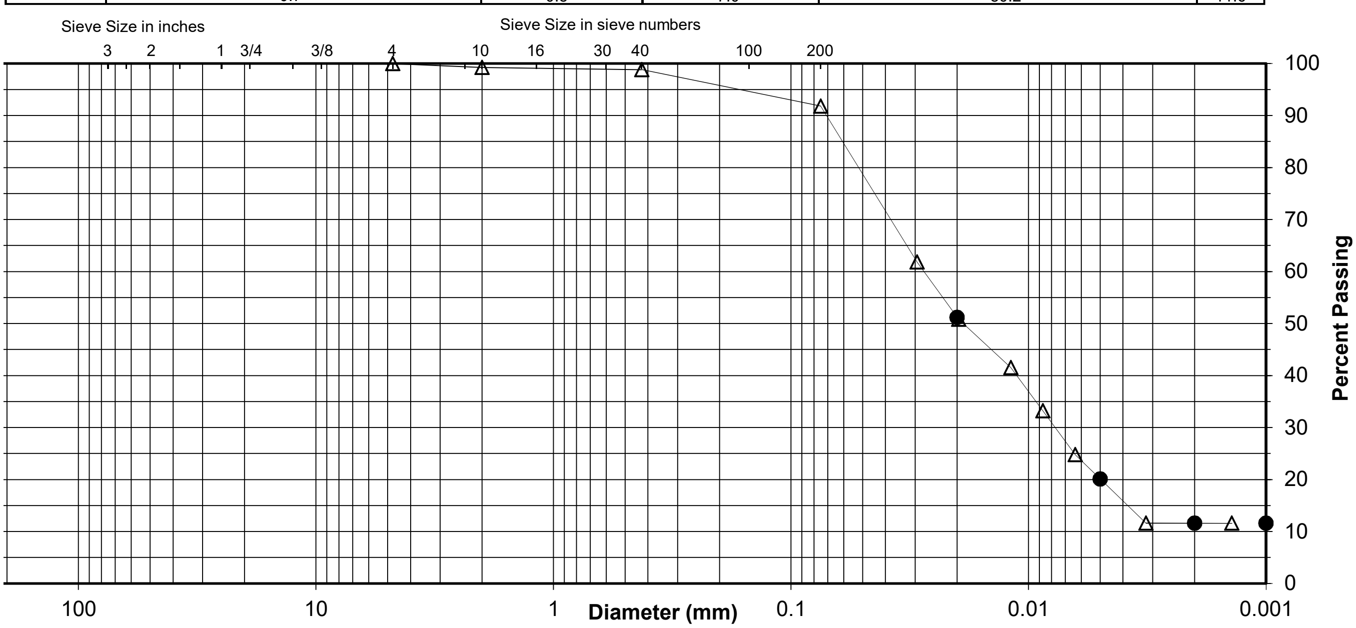
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	98.8
No. 200	91.8
0.02 mm	51.2
0.005 mm	20.1
0.002 mm	11.6
0.001 mm	11.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.7	0.5	7.0	71.7	20.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.7	0.5	7.0	80.2	11.6



Comments

Reviewed By: RJ

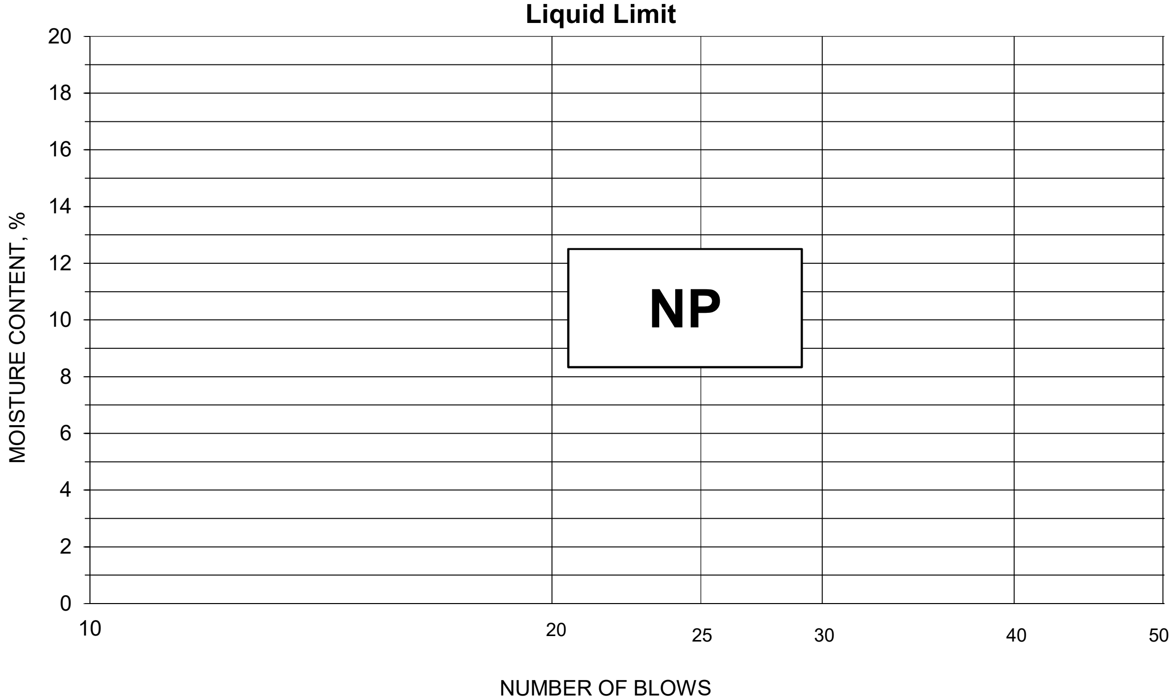
Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW01-ST02, 41.3'-41.7'	Lab ID	309
		% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	06-03-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit

Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW01-SS37G, 56.0'-57.5'
Lab ID: 317

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 24.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	98.6
No. 10	2	74.8
No. 40	0.425	74.3
No. 200	0.075	72.9
	0.02	55.6
	0.005	30.6
	0.002	24.1
estimated	0.001	21.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	1.4	25.2
Coarse Sand	23.8	0.5
Medium Sand	0.5	---
Fine Sand	1.4	1.4
Silt	42.3	48.8
Clay	30.6	24.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 38
Plastic Limit: 18
Plasticity Index: 20
Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.65

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-6 (13)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW01-SS37G, 56.0'-57.5'	Lab ID	317

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 05-02-2019
Date Received: 04-19-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	98.6
No. 10	74.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.65

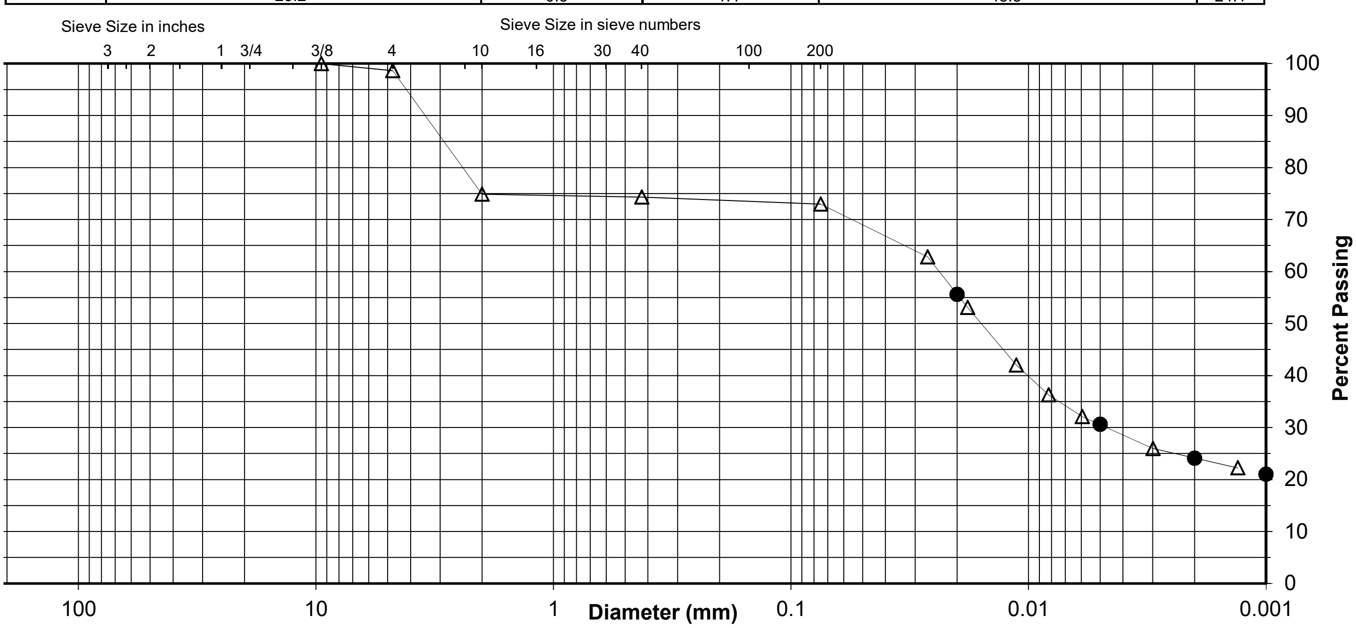
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	74.3
No. 200	72.9
0.02 mm	55.6
0.005 mm	30.6
0.002 mm	24.1
0.001 mm	21.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.4	23.8	0.5	1.4	42.3	30.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	25.2	0.5	1.4	48.8	24.1



Comments ______

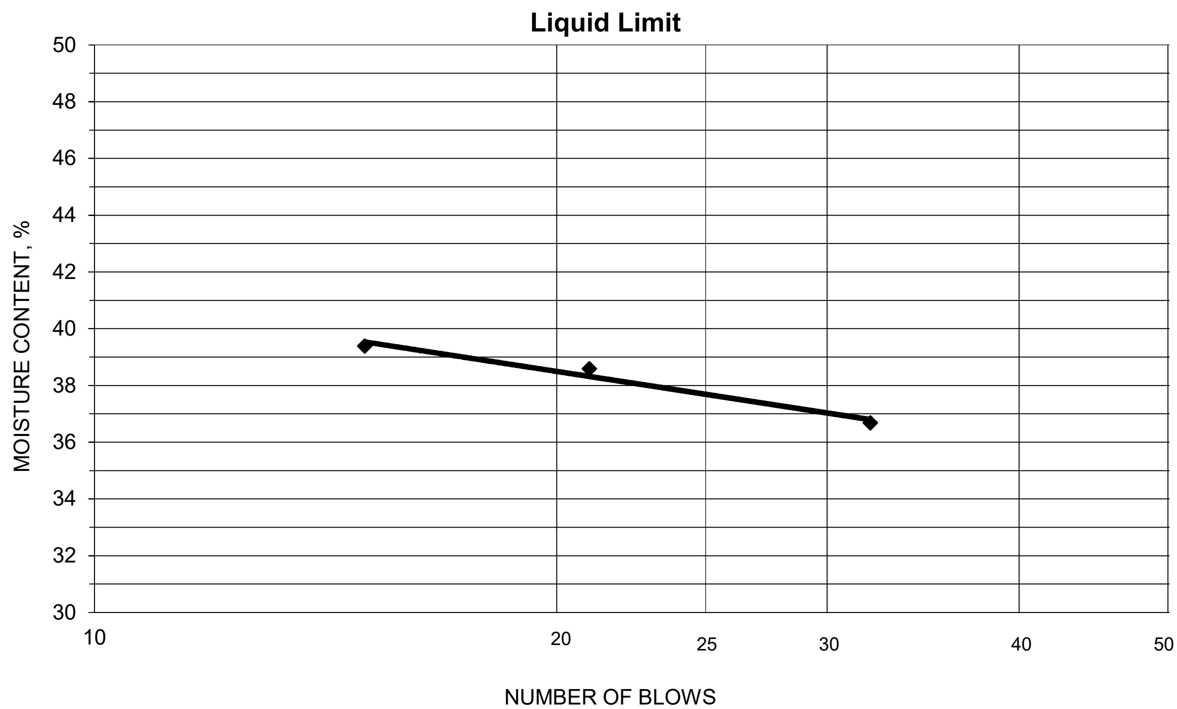
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW01-SS37G, 56.0'-57.5'	Lab ID	317
		% + No. 40	26
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.99	16.06	11.16	15	39.4	38
19.15	16.92	11.14	21	38.6	
17.69	15.90	11.02	32	36.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.24	17.24	11.73	18.1	18	20
18.09	17.10	11.52	17.7		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW01-SS41G, 64.0'-65.5' & CUF-GT-TW01-SS42G, 65.5'-67.0'
Lab ID: 323
Sample Type: SS Composite
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	79.9
3/8"	9.5	70.1
No. 4	4.75	63.4
No. 10	2	57.1
No. 40	0.425	50.0
No. 200	0.075	46.2
	0.02	41.6
	0.005	34.9
	0.002	30.5
estimated	0.001	27.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	36.6	42.9
Coarse Sand	6.3	7.1
Medium Sand	7.1	---
Fine Sand	3.8	3.8
Silt	11.3	15.7
Clay	34.9	30.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 57
Plastic Limit: 20
Plasticity Index: 37
Activity Index: 1.2

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification

Unified Group Symbol: GC
Group Name: Clayey gravel with sand

AASHTO Classification: A-7-6 (12)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW01-SS41G, 64.0'-65.5' & CUF-GT-TW01-SS42G, 65.5'-67.0'	Lab ID	323

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 05-02-2019
Date Received: 04-19-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	79.9
3/8"	70.1
No. 4	63.4
No. 10	57.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

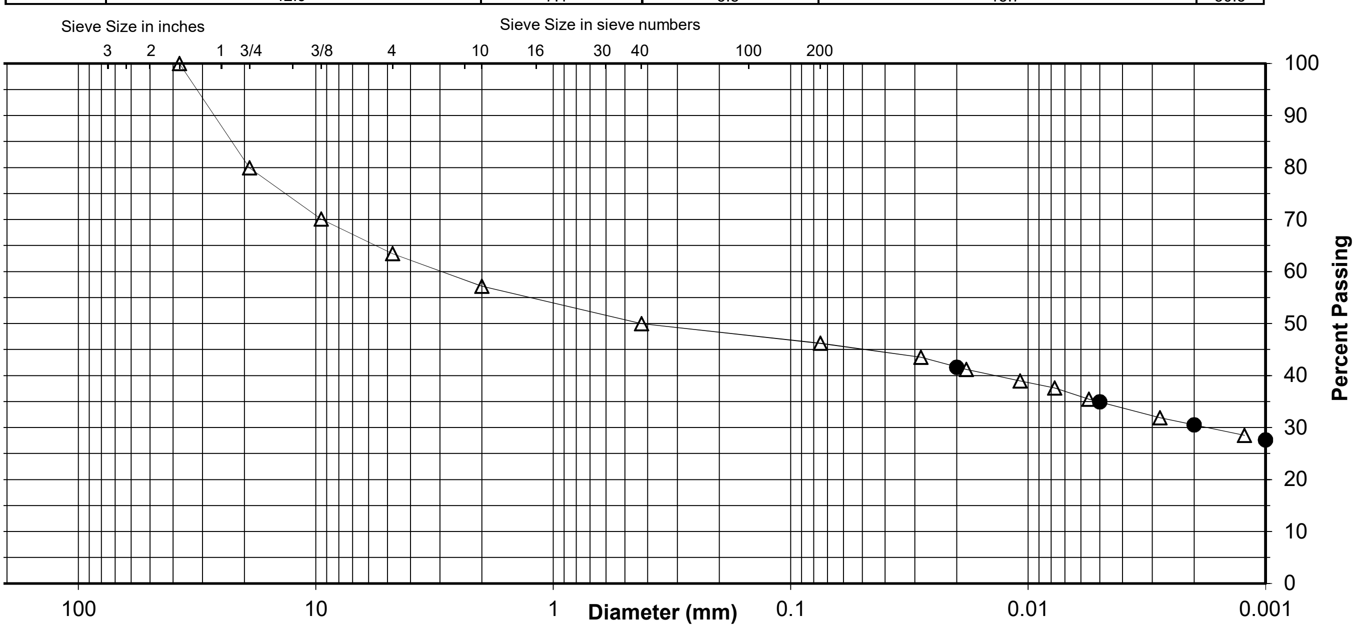
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	50.0
No. 200	46.2
0.02 mm	41.6
0.005 mm	34.9
0.002 mm	30.5
0.001 mm	27.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	20.1	16.5	6.3	7.1	3.8	11.3	34.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	42.9	7.1	3.8	15.7	30.5



Comments ______

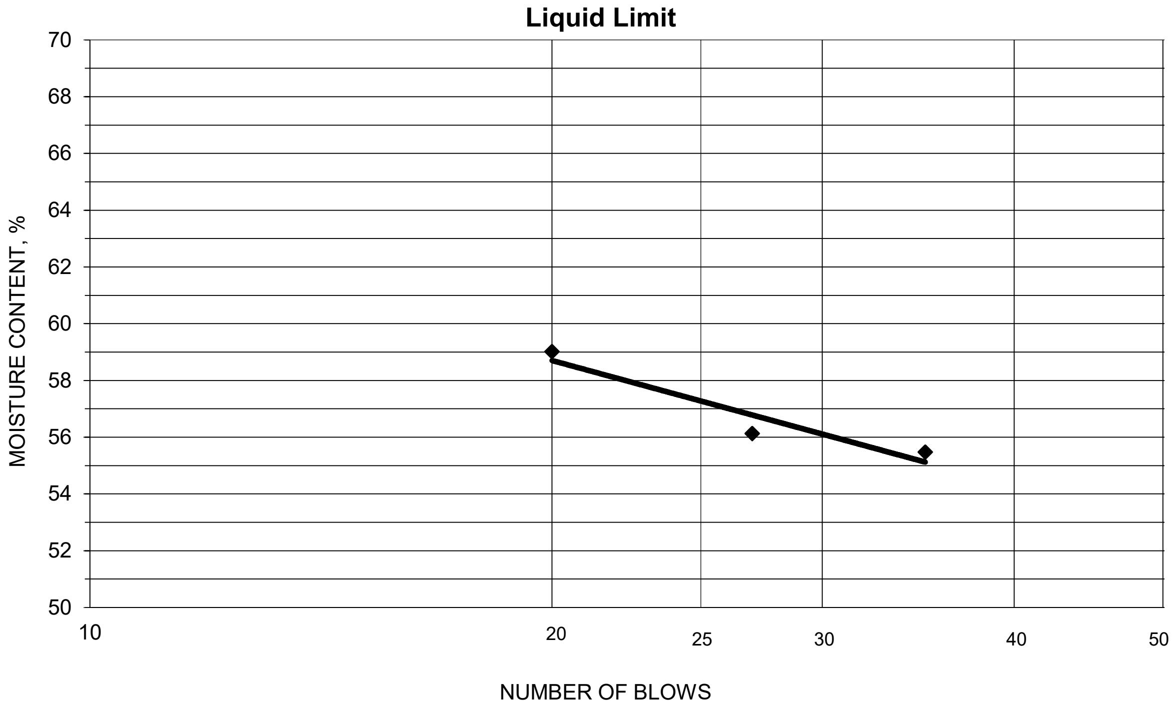
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW01-SS41G, 64.0'-65.5' &	Lab ID	323
	CUF-GT-TW01-SS42G, 65.5'-67.0'	% + No. 40	50
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.67	15.34	11.14	35	55.5	57
18.15	15.86	11.78	27	56.1	
17.05	14.79	10.96	20	59.0	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.54	16.55	11.42	19.3	20	37
17.70	16.59	11.38	21.3		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW02-SS03bG, 3.5'-4.5'
Lab ID: 328

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 13.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.6
No. 40	0.425	98.0
No. 200	0.075	94.4
	0.02	57.2
	0.005	6.3
	0.002	5.3
estimated	0.001	5.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.4
Coarse Sand	0.4	1.6
Medium Sand	1.6	---
Fine Sand	3.6	3.6
Silt	88.1	89.1
Clay	6.3	5.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.37

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven dried at 60° C.

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name CUF TDEC Order
Source CUF-GT-TW02-SS03bG, 3.5'-4.5'

Project Number 175568209
Lab ID 328

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method ASTM D 422
Prepared using ASTM D 421

Particle Shape Angular
Particle Hardness: Hard and Durable

Tested By HE
Test Date 05-06-2019
Date Received 04-19-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.37

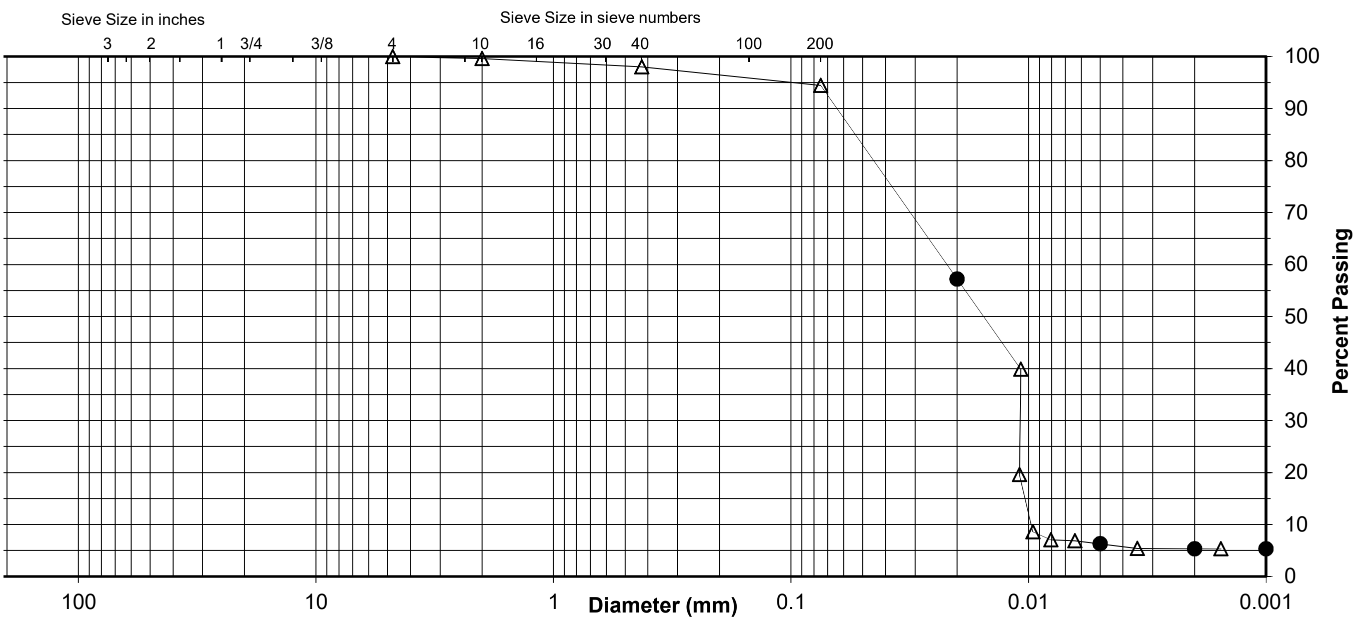
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.0
No. 200	94.4
0.02 mm	57.2
0.005 mm	6.3
0.002 mm	5.3
0.001 mm	5.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.4	1.6	3.6	88.1	6.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.4	1.6	3.6	89.1	5.3



Comments Oven dried at 60° C.

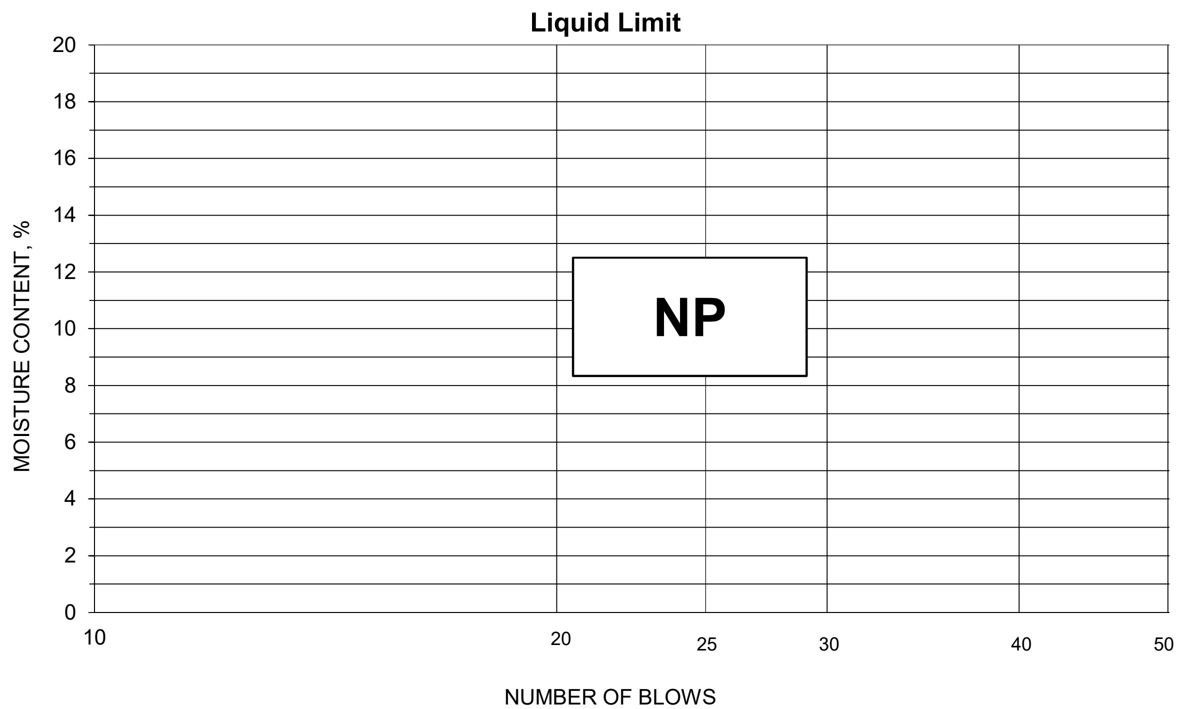
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW02-SS03bG, 3.5'-4.5'	Lab ID	328
		% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

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Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 06/24/2019

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW02-ST02, 20.0'-20.4'	Lab ID	336
Sample Type	ST	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 23.7

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.8
No. 40	0.425	99.6
No. 200	0.075	99.5
	0.02	60.4
	0.005	6.1
	0.002	5.4
estimated	0.001	5.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.2
Coarse Sand	0.2	0.2
Medium Sand	0.2	---
Fine Sand	0.1	0.1
Silt	93.4	94.1
Clay	6.1	5.4

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 24
Plastic Limit: 19
Plasticity Index: 5
Activity Index: 0.9

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.43

Classification
Unified Group Symbol: CL-ML
Group Name: Silty clay

AASHTO Classification: A-4 (4)

Comments: Oven dried at 60° C.

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-TW02-ST02, 20.0'-20.4'

Project Number: 175568209
Lab ID: 336

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TNT
Test Date: 05-29-2019
Date Received: 04-19-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.43

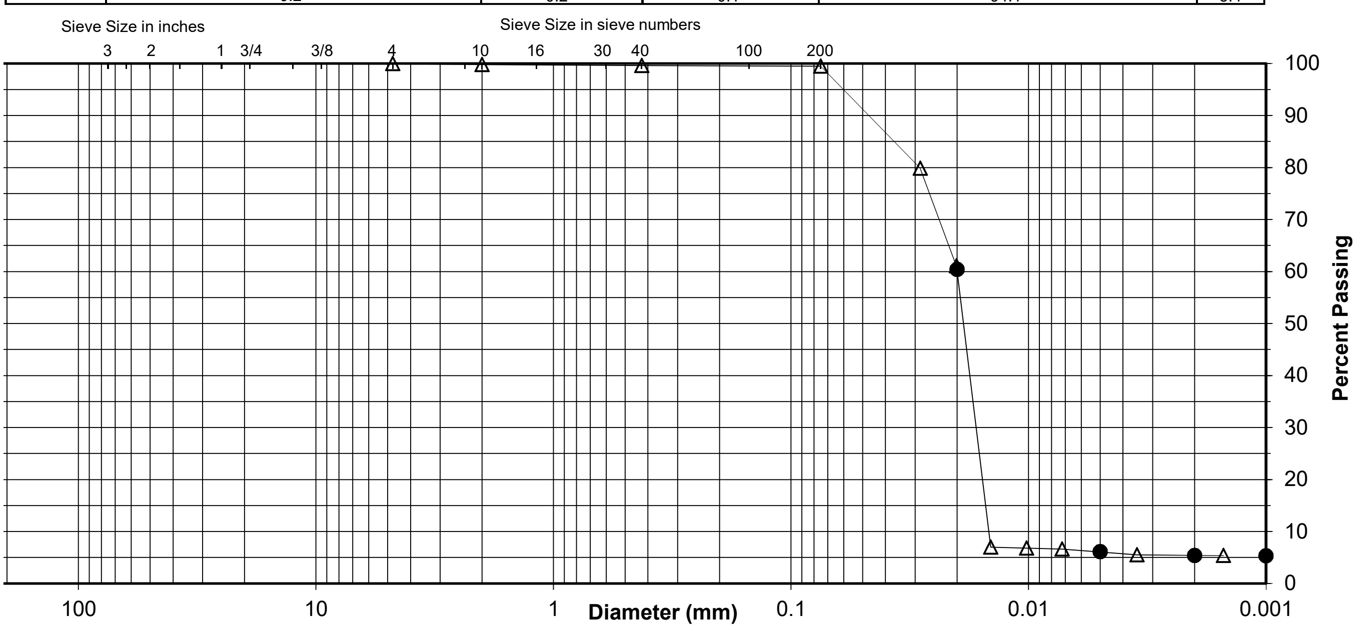
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	99.5
0.02 mm	60.4
0.005 mm	6.1
0.002 mm	5.4
0.001 mm	5.3

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.2	0.2	0.1	93.4	6.1

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.2	0.2	0.1	94.1	5.4



Comments: Oven dried at 60° C.

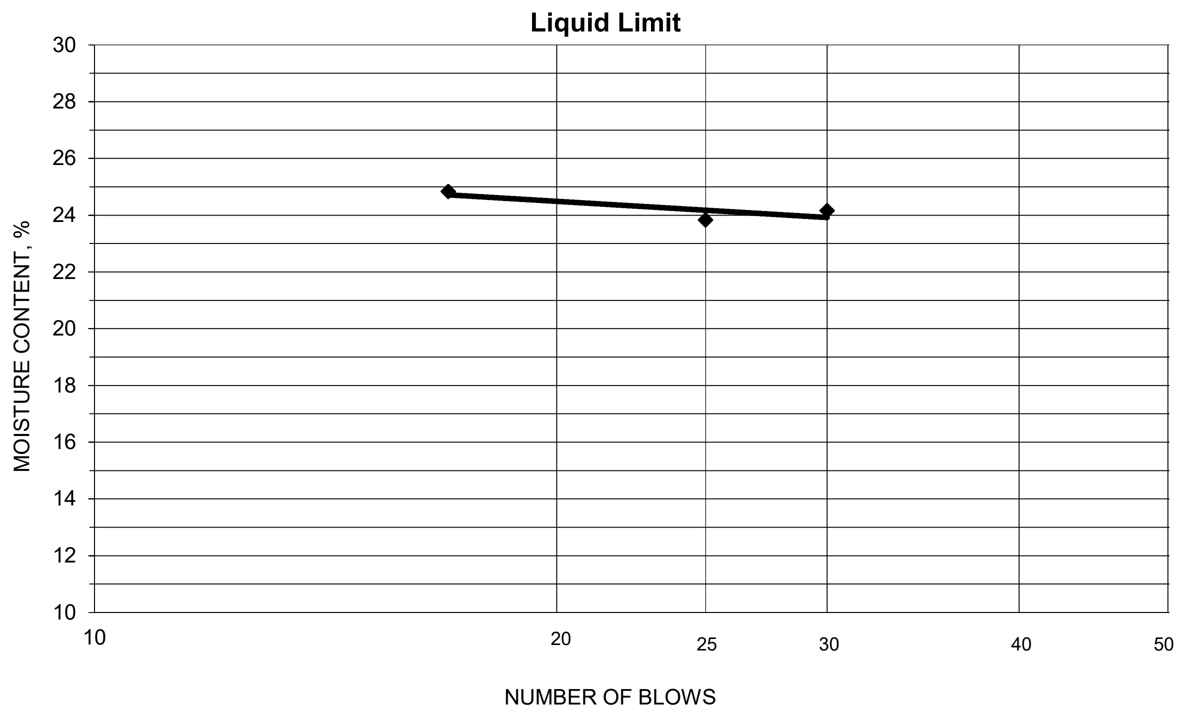
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW02-ST02, 20.0'-20.4'			Lab ID	336
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	04-19-2019
Test Date	06-03-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
16.83	15.69	10.97	30	24.2	24
18.27	16.84	10.84	25	23.8	
20.29	18.48	11.19	17	24.8	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.08	17.03	11.51	19.0	19	5
18.40	17.30	11.53	19.1		

Remarks: Oven dried at 60° C.

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW03-SS10G, 13.5'-15.0'	Lab ID	348
Sample Type	SS	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 12.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	97.3
	0.02	9.8
	0.005	6.8
	0.002	6.1
estimated	0.001	5.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	2.3	2.3
Silt	90.5	91.2
Clay	6.8	6.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.34

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven dried at 60° C.

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW03-SS10G, 13.5'-15.0'	Lab ID	348

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.34

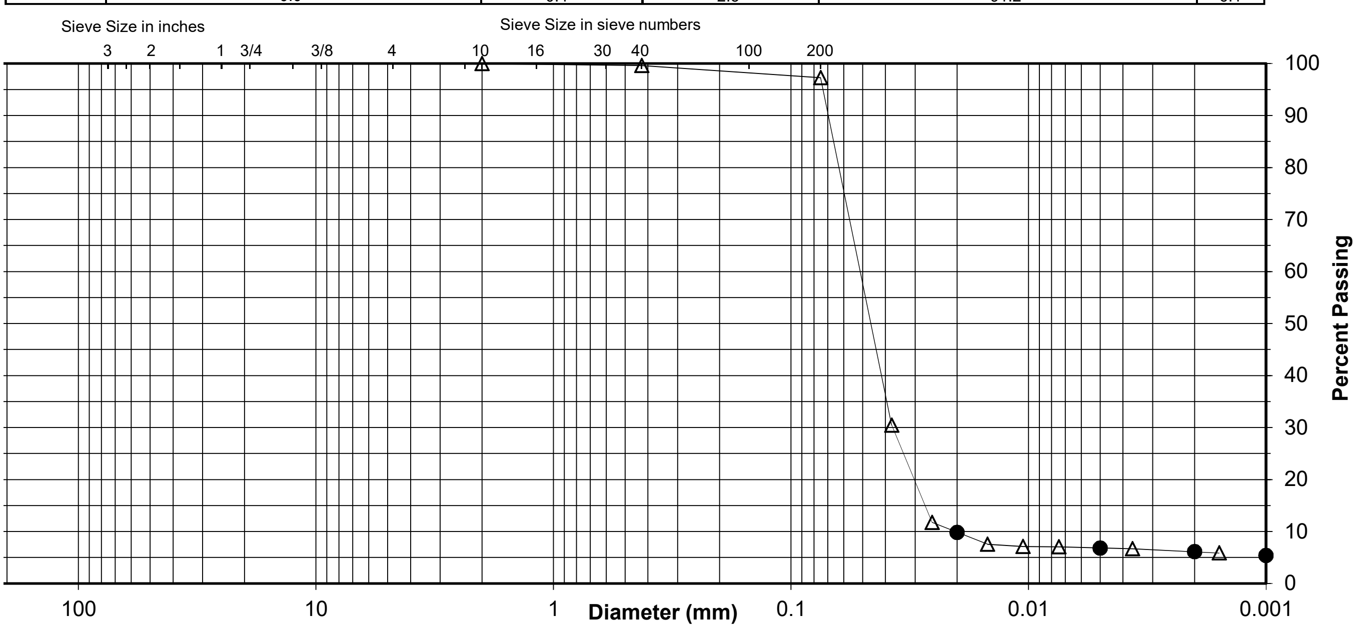
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	97.3
0.02 mm	9.8
0.005 mm	6.8
0.002 mm	6.1
0.001 mm	5.4

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.4	2.3	90.5	6.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.4	2.3	91.2	6.1



Comments: Oven dried at 60° C.

Reviewed By: RJ

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Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

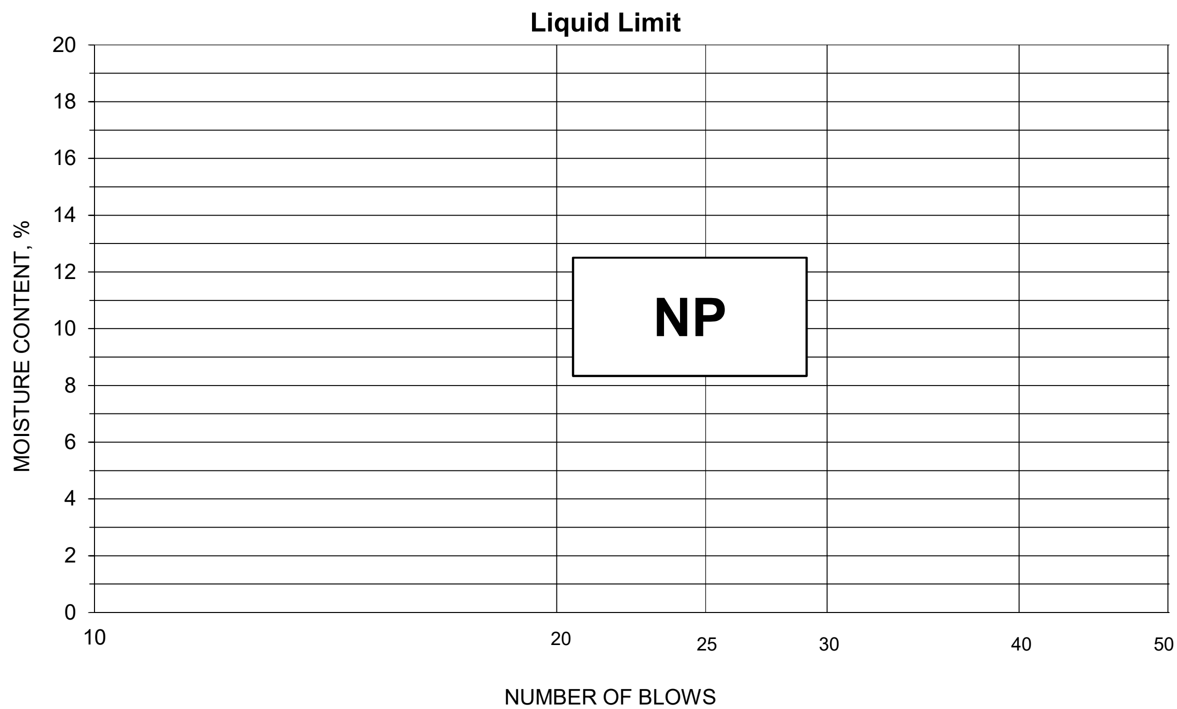
Reported By: RJ
Report Date: 06/24/2019

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW03-SS10G, 13.5'-15.0'	Lab ID	348
		% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW03-SS17G, 24.0'-25.5' & CUF-GT-TW04-SS16G, 23.0'-24.5'	Lab ID	353

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-03-2019
Date Received: 04-19-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	64.9
3/8"	46.0
No. 4	41.1
No. 10	37.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

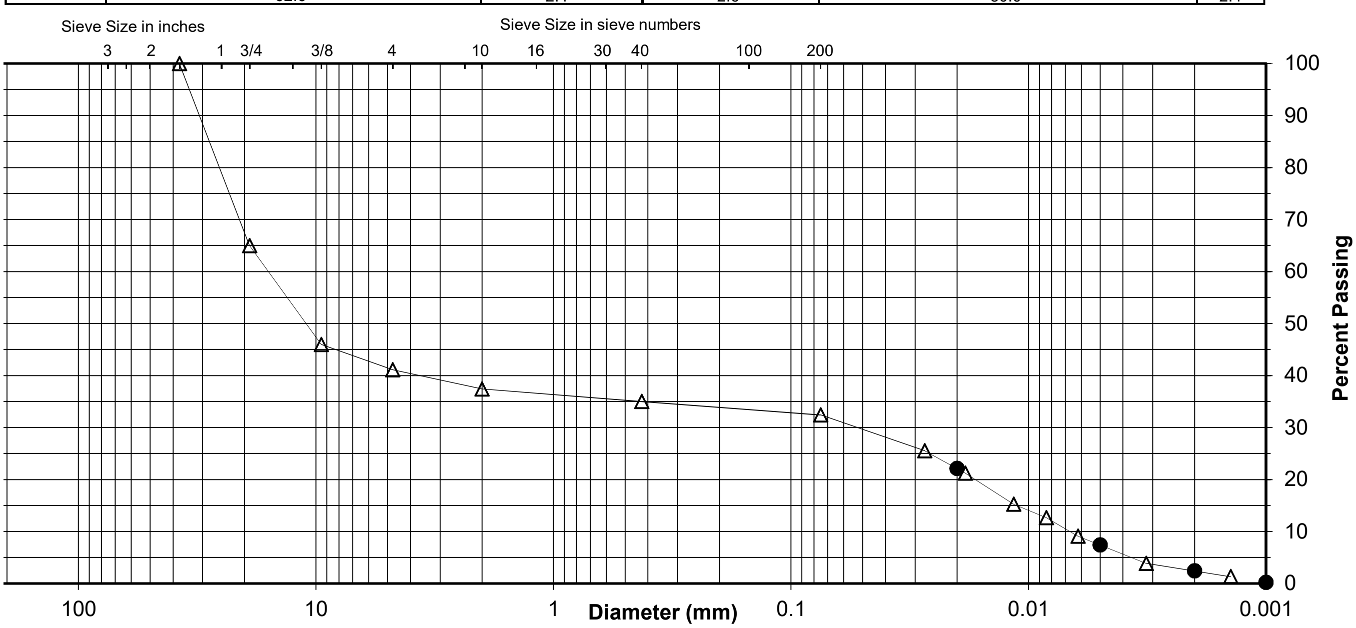
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	35.0
No. 200	32.4
0.02 mm	22.1
0.005 mm	7.4
0.002 mm	2.4
0.001 mm	0.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	35.1	23.8	3.7	2.4	2.6	25.0	7.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	62.6	2.4	2.6	30.0	2.4



Comments ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW03-ST01, 29.0'-29.4'	Lab ID	356
Sample Type	ST	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 38.5

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	94.8
3/8"	9.5	94.8
No. 4	4.75	94.8
No. 10	2	94.8
No. 40	0.425	94.4
No. 200	0.075	89.1
	0.02	52.3
	0.005	19.5
	0.002	7.6
estimated	0.001	2.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	5.2	5.2
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	5.3	5.3
Silt	69.6	81.5
Clay	19.5	7.6

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.55

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW03-ST01, 29.0'-29.4'	Lab ID	356

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TNT
Test Date: 05-30-2019
Date Received: 04-19-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	94.8
3/8"	94.8
No. 4	94.8
No. 10	94.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.55

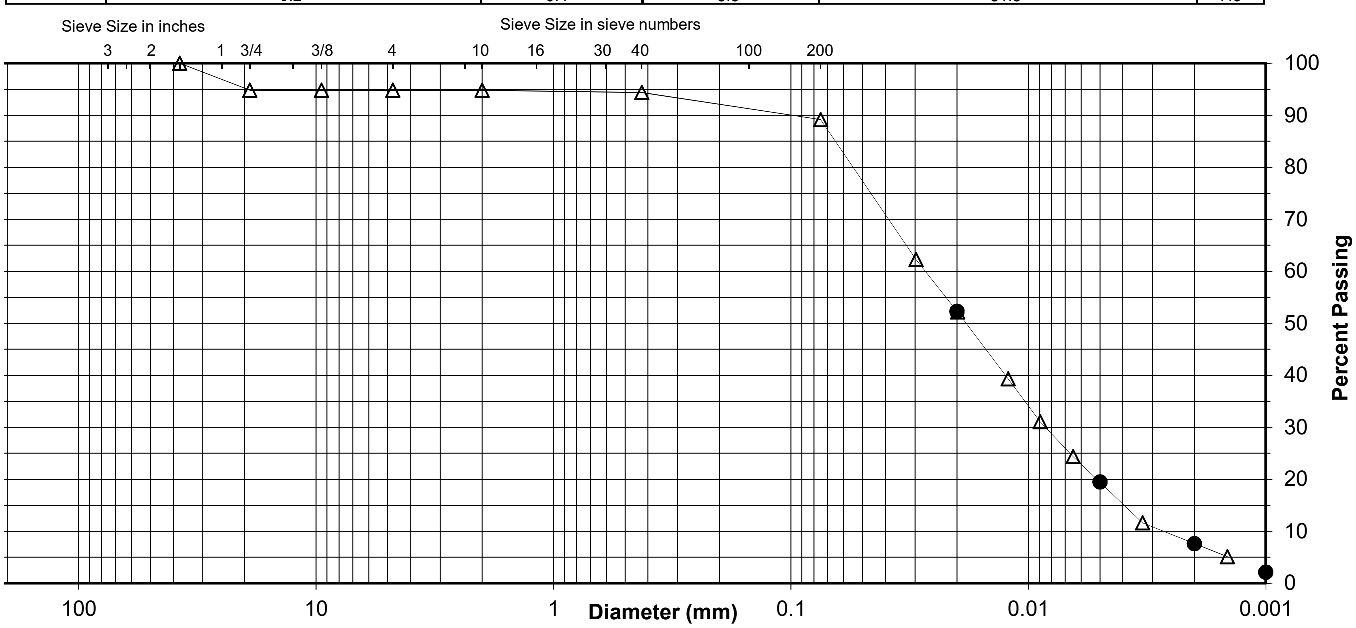
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	94.4
No. 200	89.1
0.02 mm	52.3
0.005 mm	19.5
0.002 mm	7.6
0.001 mm	2.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	5.2	0.0	0.0	0.4	5.3	69.6	19.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	5.2	0.4	5.3	81.5	7.6



Comments ______

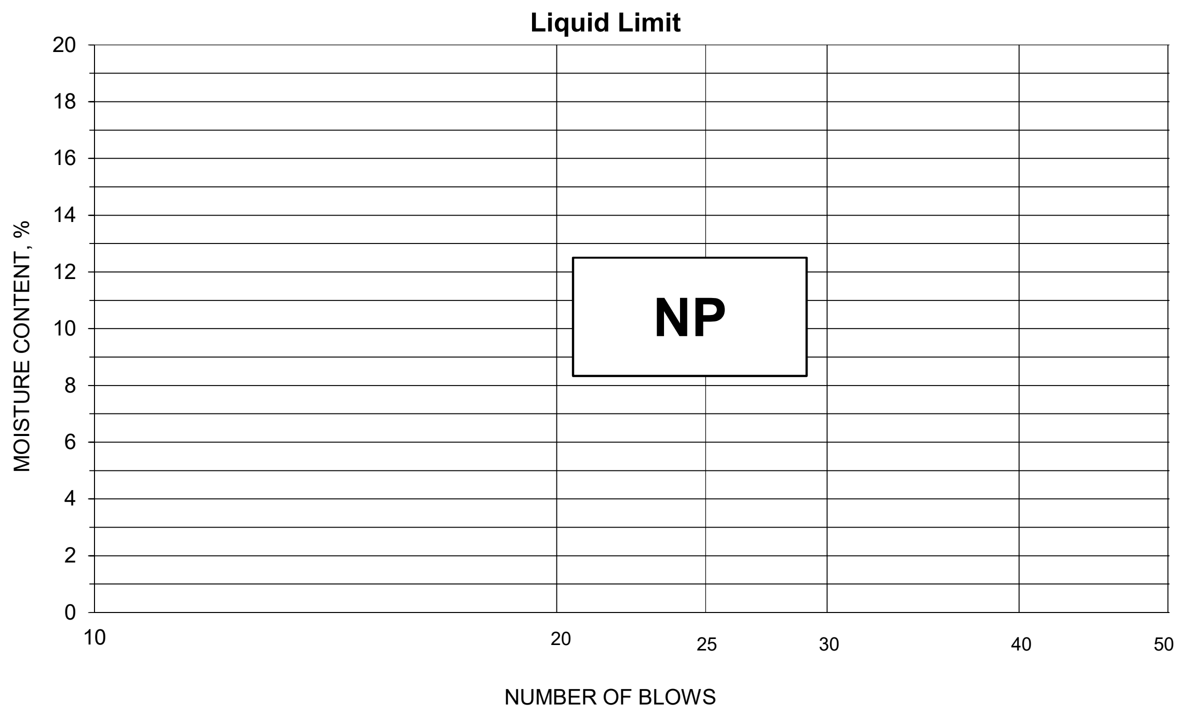
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW03-ST01, 29.0'-29.4'	Lab ID	356
		% + No. 40	6
Tested By	KWS	Date Received	04-19-2019
Test Method	ASTM D 4318 Method A		
Test Date	06-03-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

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Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 06/24/2019

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW03-SS29G, 44.0'-45.5'
Lab ID: 362

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 43.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.7
No. 200	0.075	96.2
	0.02	65.6
	0.005	25.4
	0.002	8.3
estimated	0.001	0.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.3
Medium Sand	0.3	---
Fine Sand	3.5	3.5
Silt	70.8	87.9
Clay	25.4	8.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.48

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Reported By: RJ
Report Date: 06/24/2019

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW03-SS29G, 44.0'-45.5'
Lab ID: 362

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: TNT
Test Date: 05-30-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.48

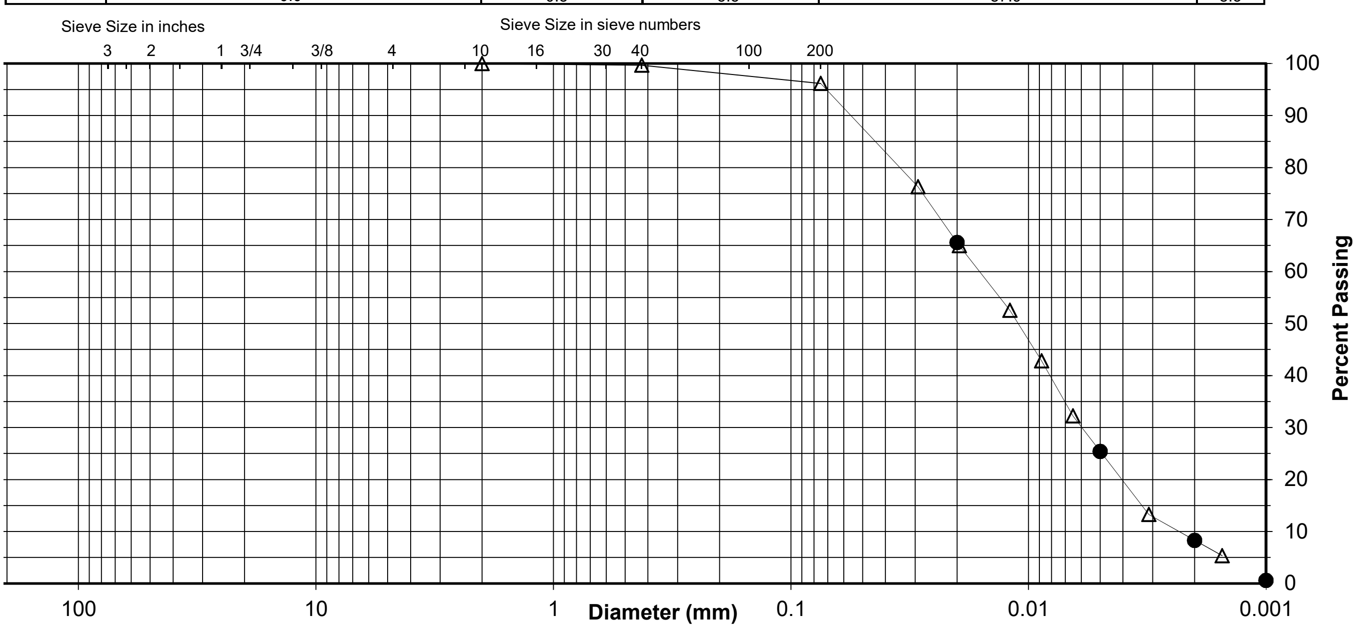
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	99.7
No. 200	96.2
0.02 mm	65.6
0.005 mm	25.4
0.002 mm	8.3
0.001 mm	0.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.3	3.5	70.8	25.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.3	3.5	87.9	8.3



Comments ____

Reviewed By: RJ

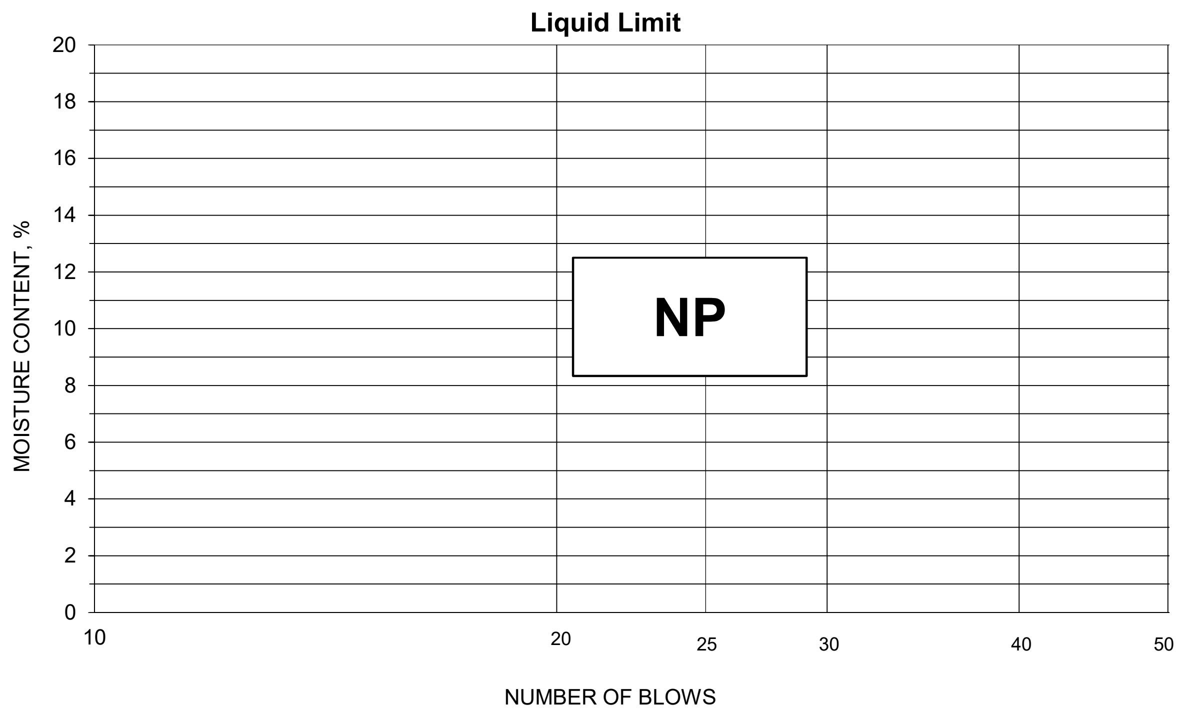
Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW03-SS29G, 44.0'-45.5'	Lab ID	362
		% + No. 40	0

Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	04-19-2019
Test Date	05-09-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW03-SS42G, 63.5'-65.0'
Lab ID: 369

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 54.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	90.3
	0.02	53.1
	0.005	17.6
	0.002	6.9
estimated	0.001	2.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	9.5	9.5
Silt	72.7	83.4
Clay	17.6	6.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.36

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW03-SS42G, 63.5'-65.0'
Lab ID: 369

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: TNT
Test Date: 05-30-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.36

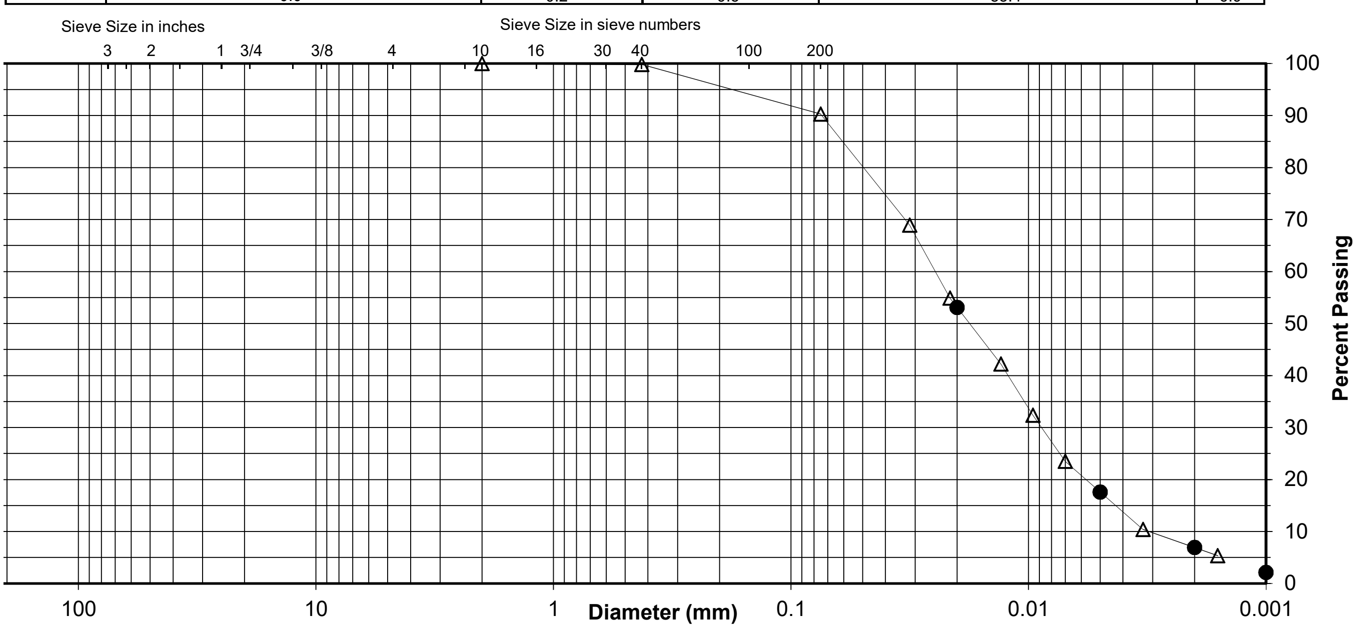
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	99.8
No. 200	90.3
0.02 mm	53.1
0.005 mm	17.6
0.002 mm	6.9
0.001 mm	2.1

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.2	9.5	72.7	17.6

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.2	9.5	83.4	6.9



Comments ______

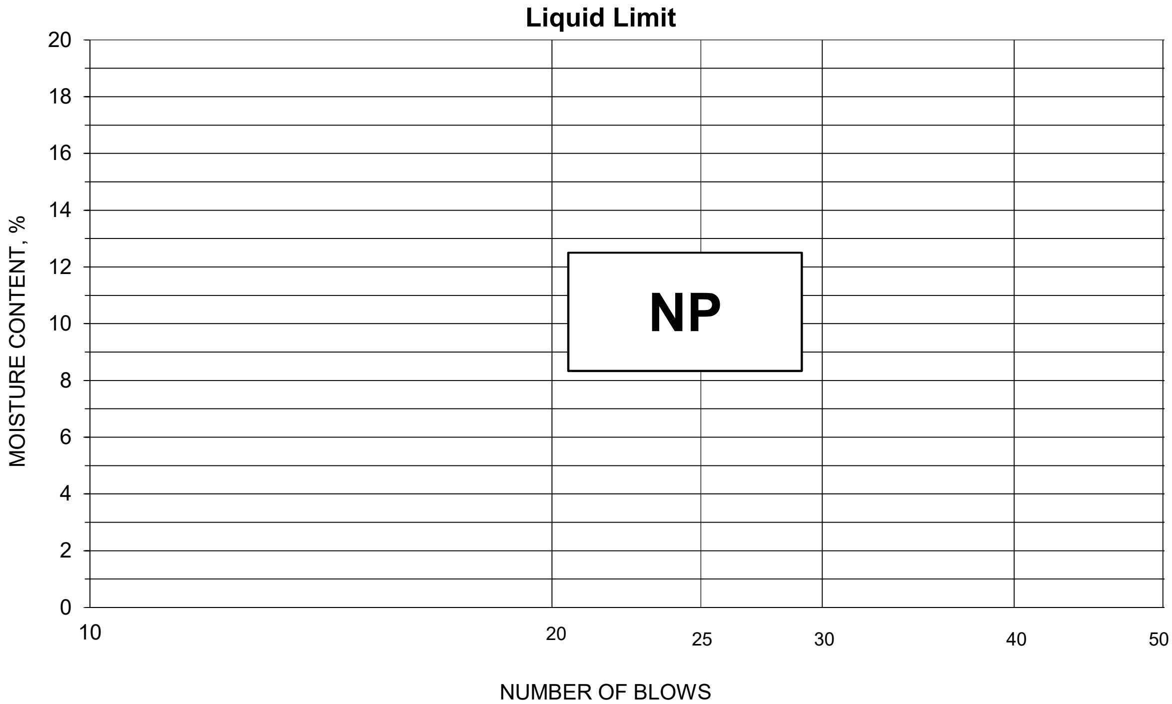
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW03-SS42G, 63.5'-65.0'			Lab ID	369
				% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	04-19-2019
Test Date	05-09-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW03-ST02, 68.9'-69.3'
Lab ID: 372

Sample Type: ST
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 19.5

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.8
No. 40	0.425	95.8
No. 200	0.075	86.3
	0.02	64.9
	0.005	37.4
	0.002	24.9
estimated	0.001	18.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.1	0.2
Coarse Sand	0.1	4.0
Medium Sand	4.0	---
Fine Sand	9.5	9.5
Silt	48.9	61.4
Clay	37.4	24.9

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 28
Plastic Limit: 16
Plasticity Index: 12
Activity Index: 0.5

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification
Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-6 (9)

Comments: Oven dried at 60º C.

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW03-ST02, 68.9'-69.3'
Lab ID: 372

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-03-2019
Date Received: 04-19-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

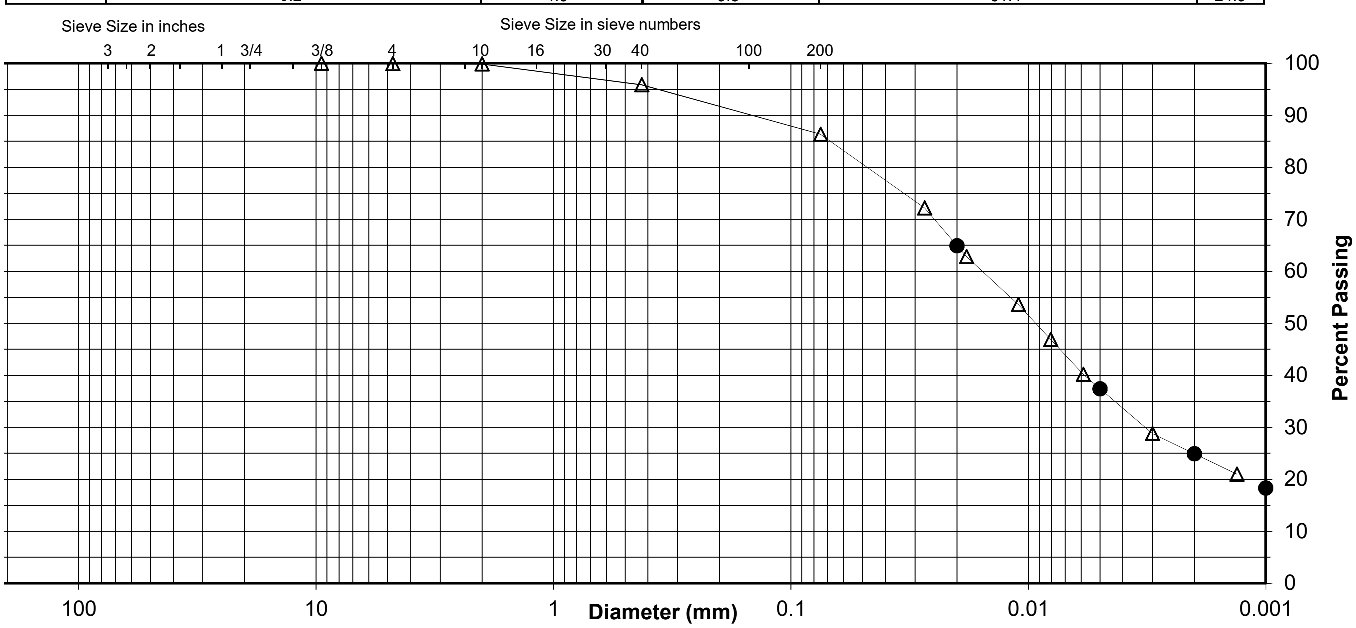
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	95.8
No. 200	86.3
0.02 mm	64.9
0.005 mm	37.4
0.002 mm	24.9
0.001 mm	18.3

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.1	0.1	4.0	9.5	48.9	37.4

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.2	4.0	9.5	61.4	24.9



Comments ______

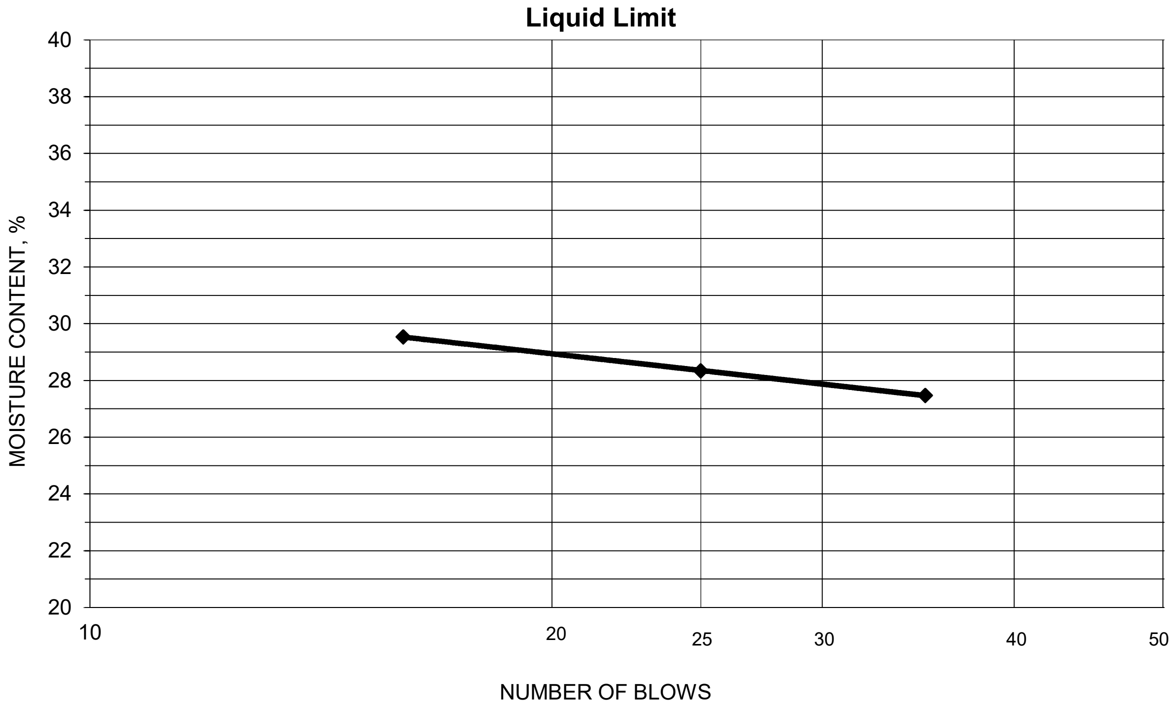
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW03-ST02, 68.9'-69.3'	Lab ID	372
		% + No. 40	4
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	06-03-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.70	17.73	11.06	16	29.5	28
19.03	17.27	11.06	25	28.3	
19.10	17.35	10.98	35	27.5	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.57	16.60	10.85	16.9	16	12
17.78	16.87	11.22	16.1		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW04-SS04G, 4.5'-6.0'	Lab ID	379
Sample Type	SS	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 12.9

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	99.3
No. 40	0.425	98.3
No. 200	0.075	95.9
	0.02	14.1
	0.005	6.6
	0.002	5.6
estimated	0.001	4.8

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.2	0.7
Coarse Sand	0.5	1.0
Medium Sand	1.0	---
Fine Sand	2.4	2.4
Silt	89.3	90.3
Clay	6.6	5.6

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.35

Classification
Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven dried at 60° C.

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW04-SS04G, 4.5'-6.0'
Lab ID: 379

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	99.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.35

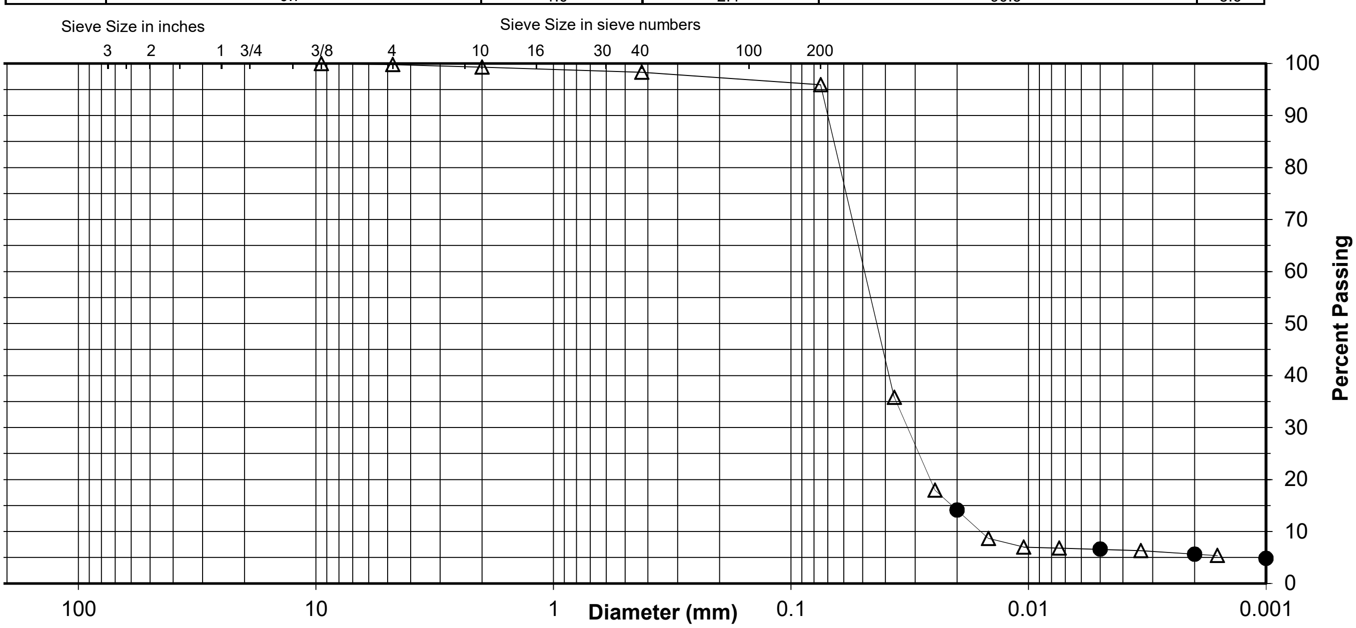
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.3
No. 200	95.9
0.02 mm	14.1
0.005 mm	6.6
0.002 mm	5.6
0.001 mm	4.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.2	0.5	1.0	2.4	89.3	6.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.7	1.0	2.4	90.3	5.6



Comments: Oven dried at 60° C.

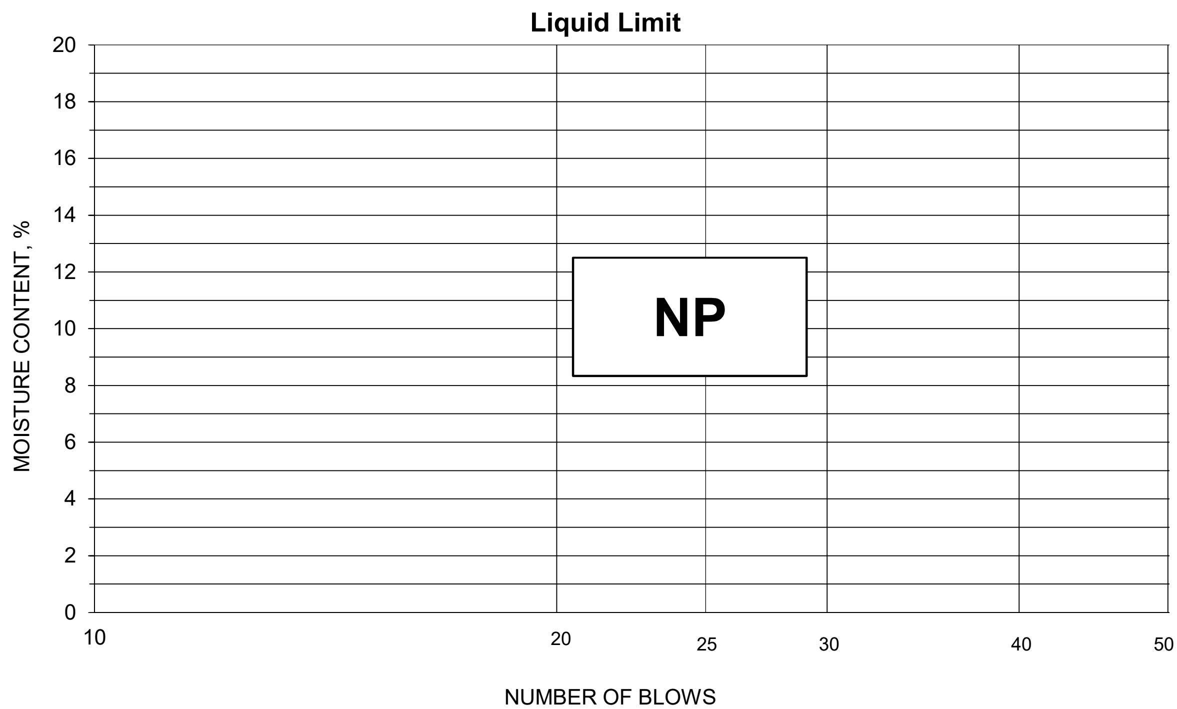
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW04-SS04G, 4.5'-6.0'			Lab ID	379
				% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	04-19-2019
Test Date	05-10-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW04-SS13bG, 18.5'-19.5'
Lab ID: 383

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 23.6

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	100.0
No. 200	0.075	98.3
	0.02	11.3
	0.005	7.6
	0.002	7.0
estimated	0.001	6.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.0
Medium Sand	0.0	---
Fine Sand	1.7	1.7
Silt	90.7	91.3
Clay	7.6	7.0

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.34

Classification
Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven dried at 60° C.

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW04-SS13bG, 18.5'-19.5'
Lab ID: 383

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.34

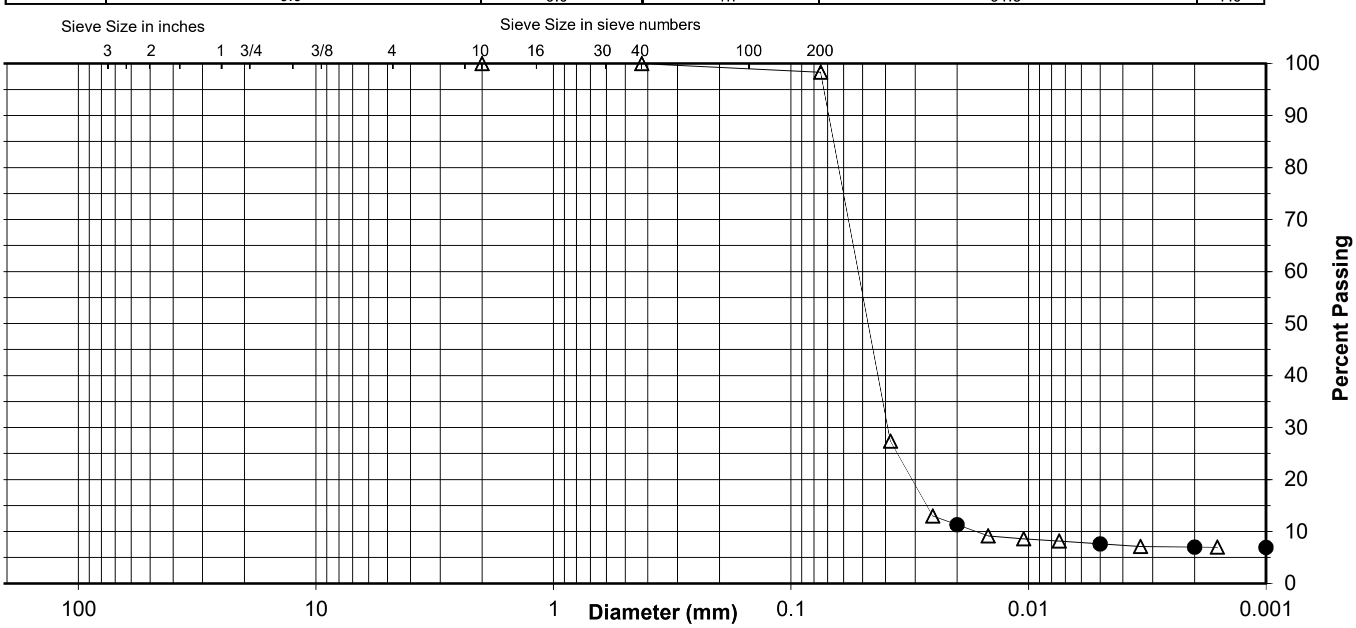
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	100.0
No. 200	98.3
0.02 mm	11.3
0.005 mm	7.6
0.002 mm	7.0
0.001 mm	6.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.0	1.7	90.7	7.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.0	1.7	91.3	7.0



Comments: Oven dried at 60° C.

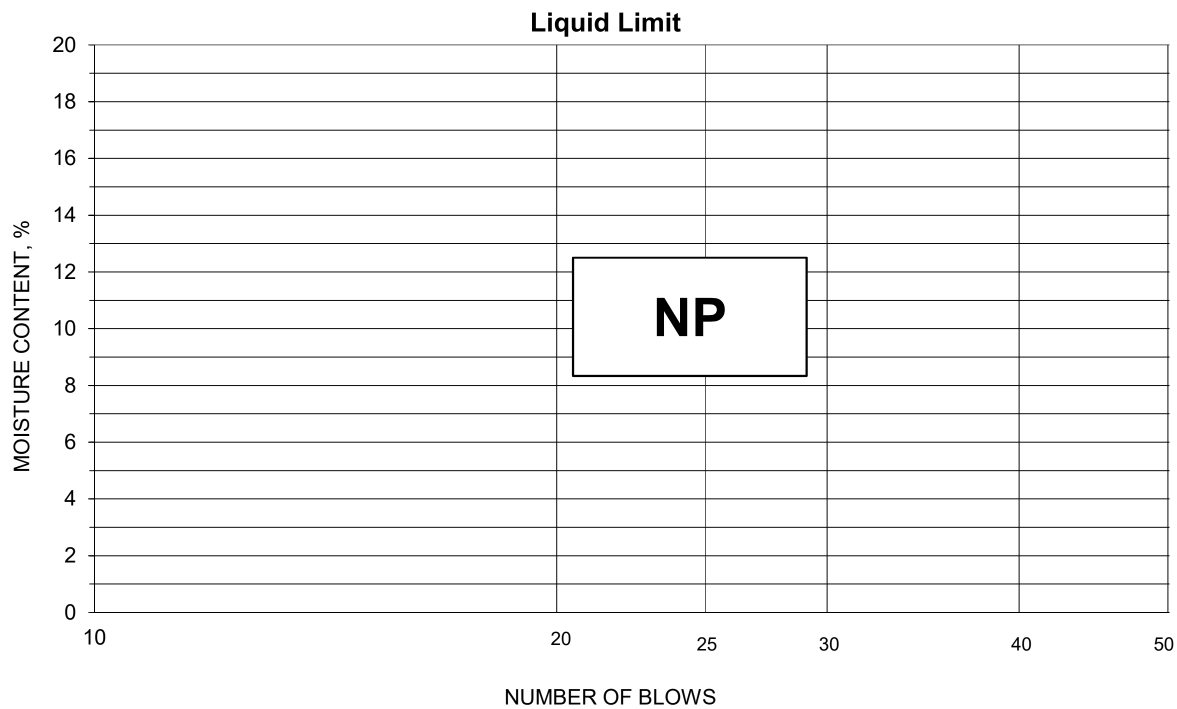
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW04-SS13bG, 18.5'-19.5'	Lab ID	383
		% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A
		Date Received	04-19-2019
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order — Project Number: 175568209
Source: CUF-GT-TW05-ST01, 5.25'-5.7' — Lab ID: 390

Sample Type: ST — Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 18.3

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.7
No. 4	4.75	99.7
No. 10	2	99.7
No. 40	0.425	99.0
No. 200	0.075	95.8
	0.02	10.9
	0.005	5.6
	0.002	4.1
estimated	0.001	3.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.3	0.3
Coarse Sand	0.0	0.7
Medium Sand	0.7	---
Fine Sand	3.2	3.2
Silt	90.2	91.7
Clay	5.6	4.1

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.38

Classification
Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven dried at 60° C.

Reviewed By: RJ

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Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 06/24/2019

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-TW05-ST01, 5.25'-5.7'
Project Number: 175568209
Lab ID: 390

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TNT
Test Date: 05-29-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.7
No. 4	99.7
No. 10	99.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.38

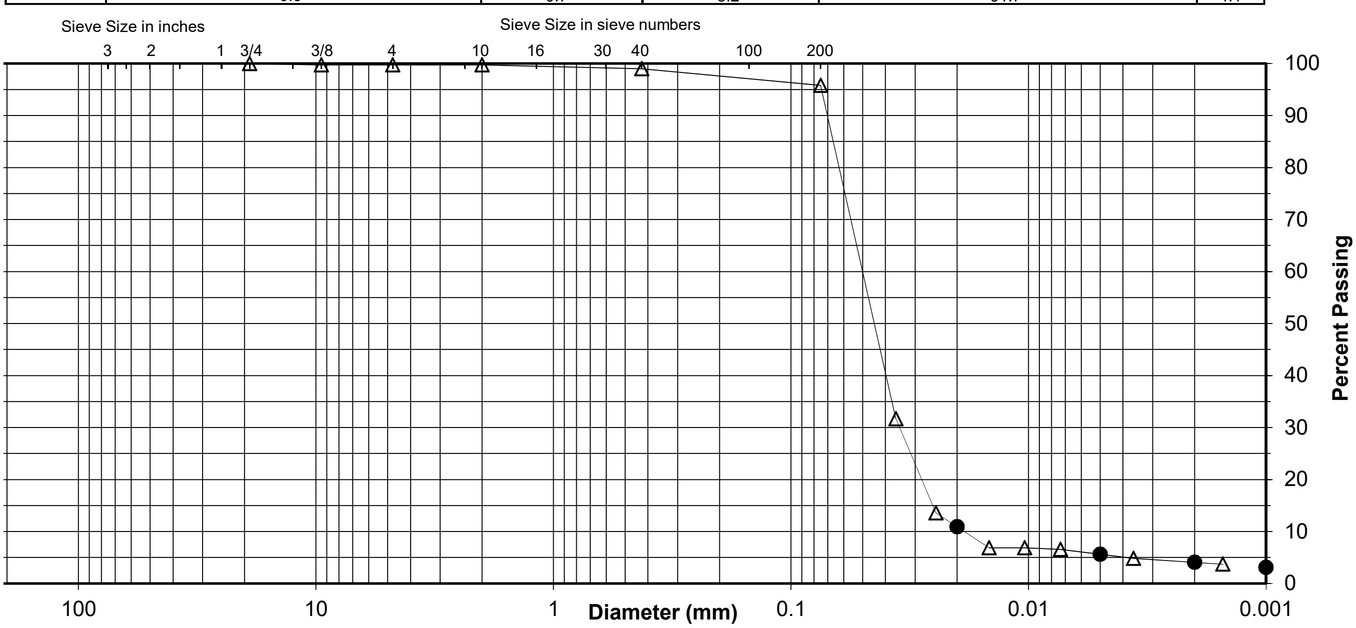
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.0
No. 200	95.8
0.02 mm	10.9
0.005 mm	5.6
0.002 mm	4.1
0.001 mm	3.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.3	0.0	0.7	3.2	90.2	5.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.3	0.7	3.2	91.7	4.1



Comments: Oven dried at 60° C.

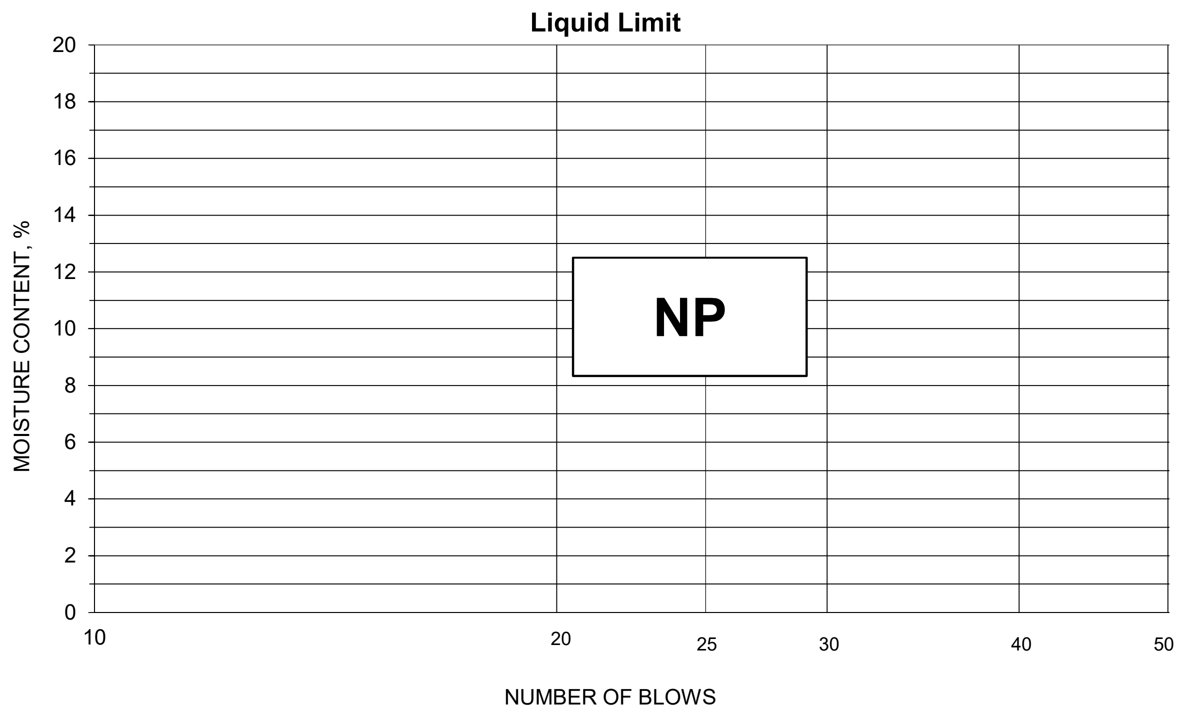
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW05-ST01, 5.25'-5.7'	Lab ID	390
		% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	06-03-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW05-SS10aG, 15.5'-16.5'	Lab ID	396
Sample Type	SS	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 22.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	99.3
	0.02	15.4
	0.005	7.0
	0.002	6.6
estimated	0.001	6.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	0.5	0.5
Silt	92.3	92.7
Clay	7.0	6.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.36

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven dried at 60° C.

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-TW05-SS10aG, 15.5'-16.5'

Project Number: 175568209
Lab ID: 396

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.36

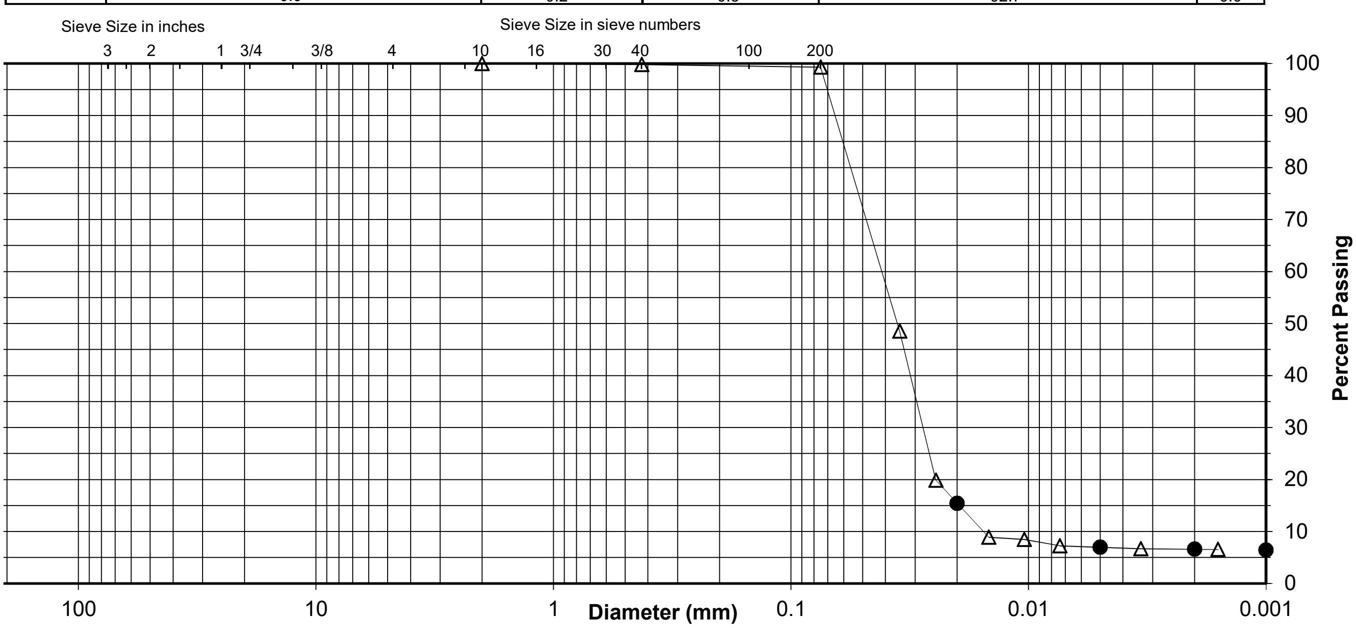
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	99.3
0.02 mm	15.4
0.005 mm	7.0
0.002 mm	6.6
0.001 mm	6.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.2	0.5	92.3	7.0

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.2	0.5	92.7	6.6



Comments: Oven dried at 60° C.

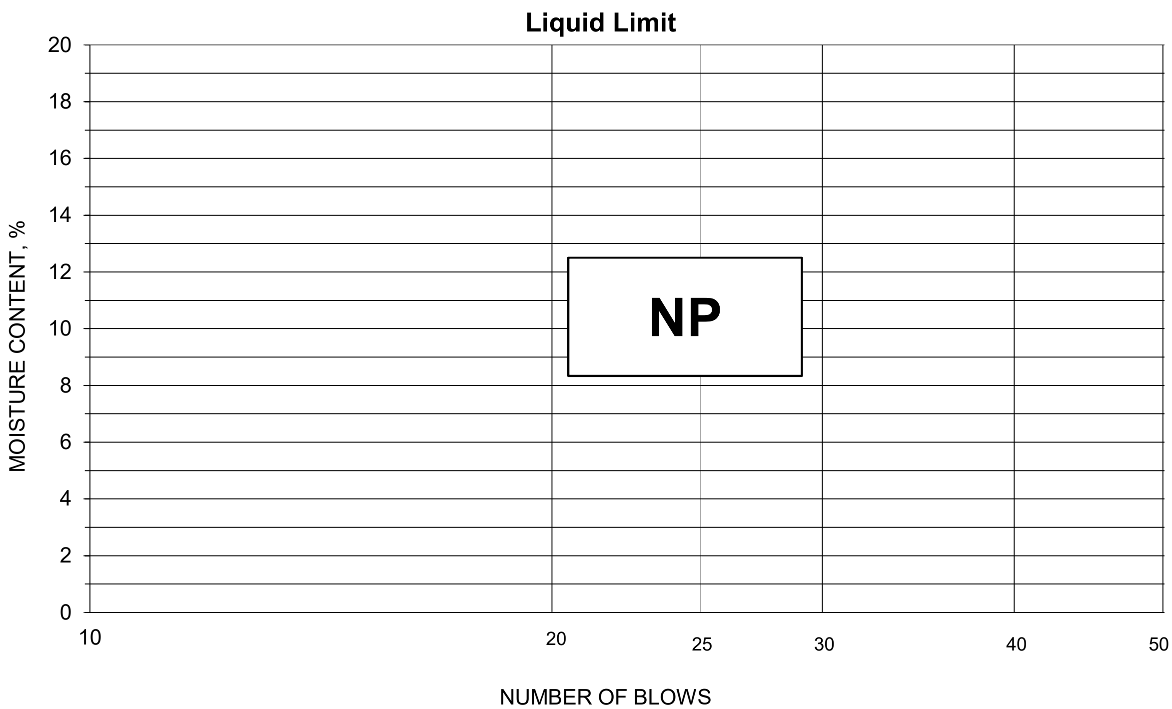
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW05-SS10aG, 15.5'-16.5'	Lab ID	396
		% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW05-SS13aG, 20.0'-21.0' & CUF-GT-TW06-SS13aG, 20.0'-20.6'
Lab ID: 398

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: 3" Sieve

Sieve Size	% Passing
3"	100.0
1 1/2"	84.6
3/4"	73.1
3/8"	45.1
No. 4	42.0
No. 10	40.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

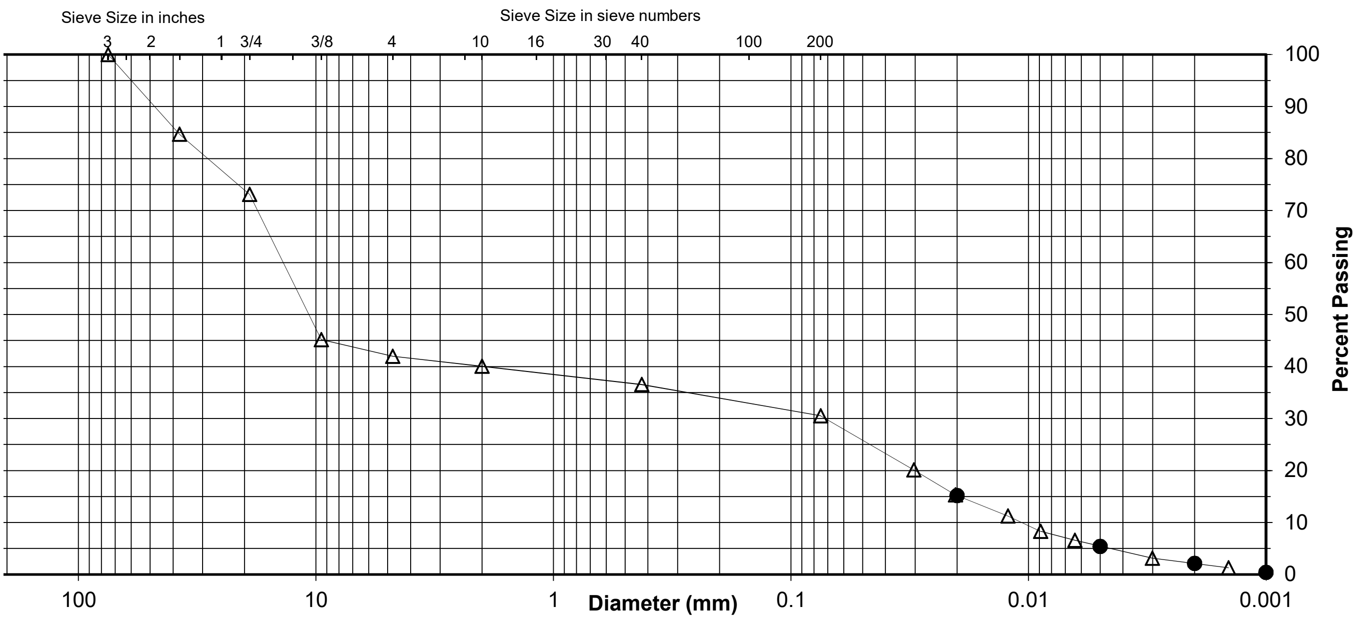
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	36.5
No. 200	30.5
0.02 mm	15.2
0.005 mm	5.4
0.002 mm	2.1
0.001 mm	0.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	26.9	31.1	2.0	3.5	6.0	25.1	5.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	60.0	3.5	6.0	28.4	2.1



Comments ____________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW05-SS19aG, 31.0'-31.5'	Lab ID	406
Sample Type	SS	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 37.7

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	98.9
No. 10	2	98.0
No. 40	0.425	91.5
No. 200	0.075	85.2
	0.02	54.9
	0.005	20.4
	0.002	7.5
estimated	0.001	1.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	1.1	2.0
Coarse Sand	0.9	6.5
Medium Sand	6.5	---
Fine Sand	6.3	6.3
Silt	64.8	77.7
Clay	20.4	7.5

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.54

Classification
Unified Group Symbol: ML
Group Name: Silt
AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW05-SS19aG, 31.0'-31.5'	Lab ID	406

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded
Particle Hardness: Soft

Tested By: TNT
Test Date: 05-30-2019
Date Received: 04-19-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	98.9
No. 10	98.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.54

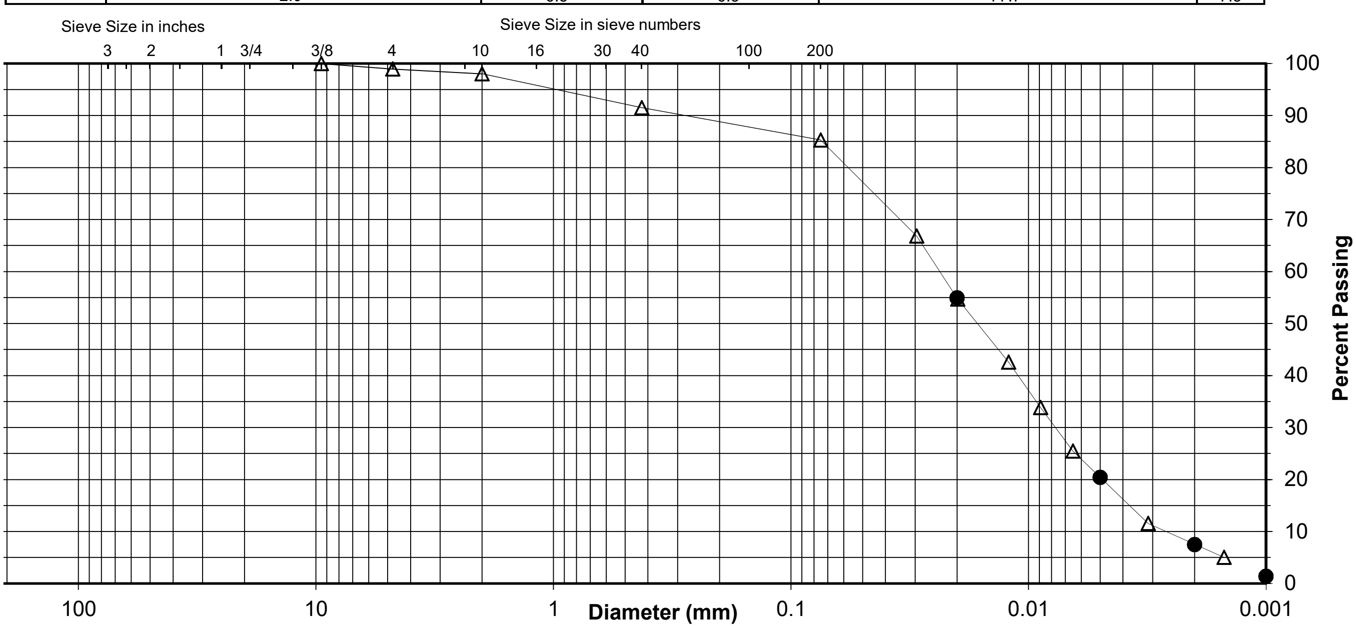
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	91.5
No. 200	85.2
0.02 mm	54.9
0.005 mm	20.4
0.002 mm	7.5
0.001 mm	1.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.1	0.9	6.5	6.3	64.8	20.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	2.0	6.5	6.3	77.7	7.5



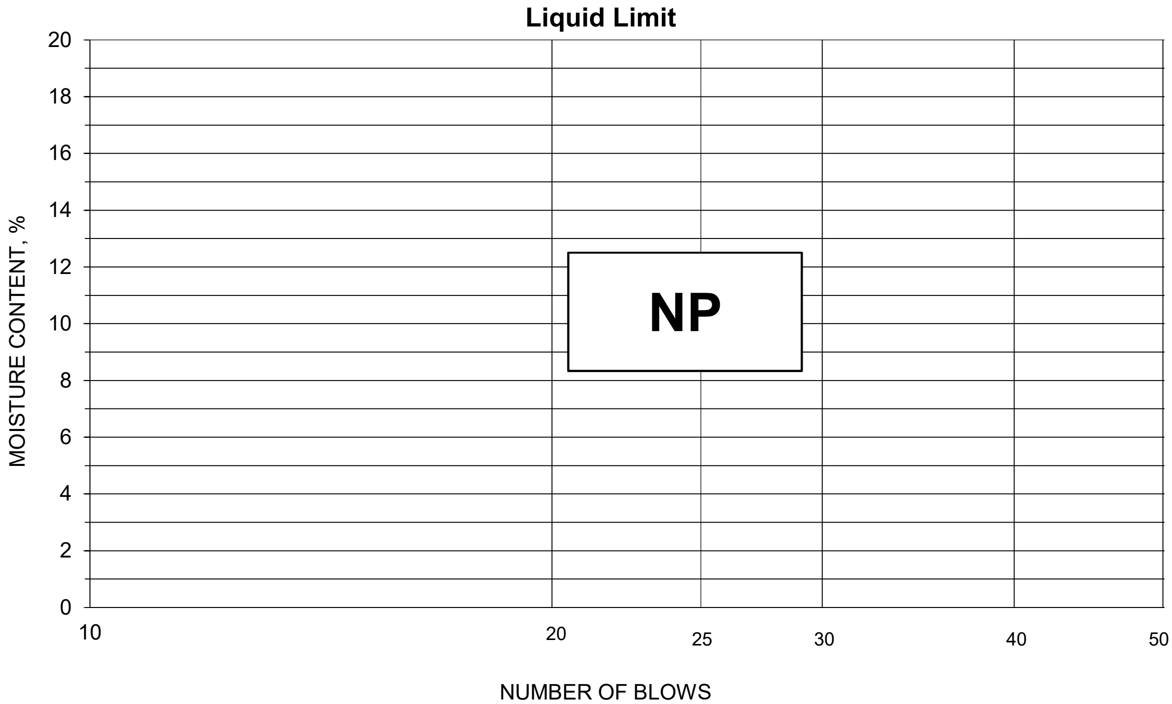
Comments ______________________ Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW05-SS19aG, 31.0'-31.5'	Lab ID	406
		% + No. 40	9
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-09-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW05-SS28G, 44.5'-46.0'
Lab ID: 411

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 39.4

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size: Sieve Size	Particle Size: (mm)	% Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	96.3
	0.02	73.4
	0.005	27.7
	0.002	9.6
estimated	0.001	1.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	3.6	3.6
Silt	68.6	86.7
Clay	27.7	9.6

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.45

Classification
Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW05-SS28G, 44.5'-46.0'
Lab ID: 411

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: TNT
Test Date: 05-30-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.45

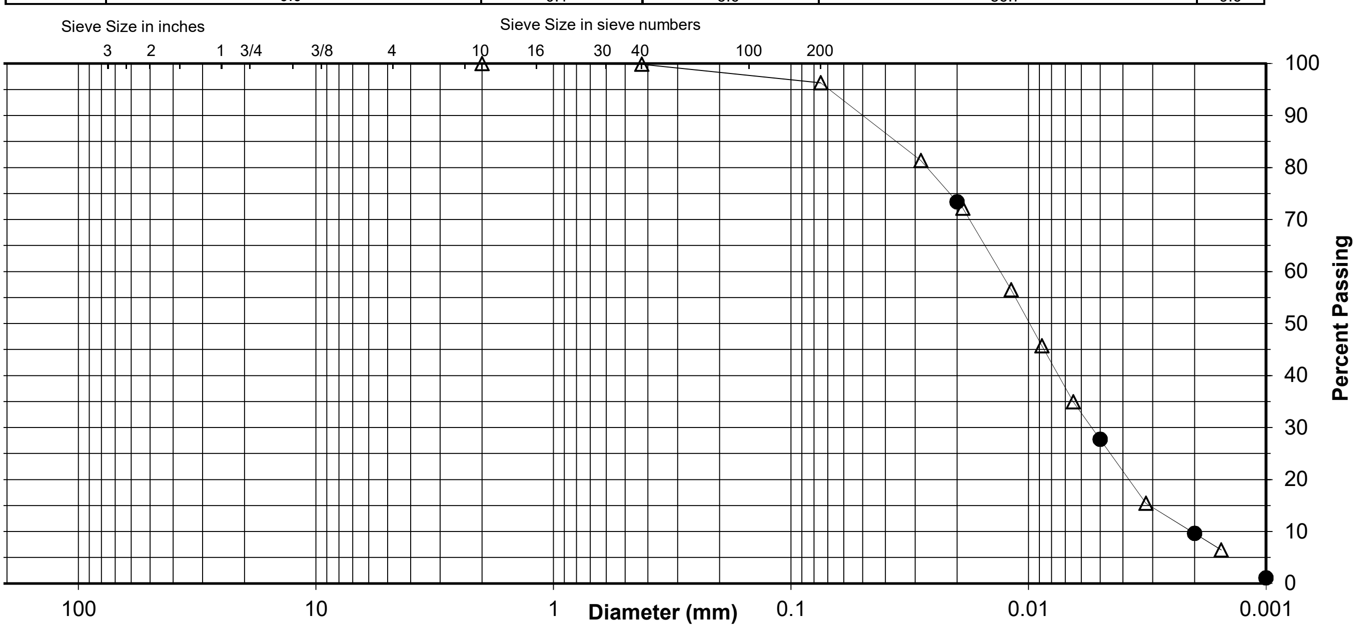
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.9
No. 200	96.3
0.02 mm	73.4
0.005 mm	27.7
0.002 mm	9.6
0.001 mm	1.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.1	3.6	68.6	27.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.1	3.6	86.7	9.6



Comments

Reviewed By RJ

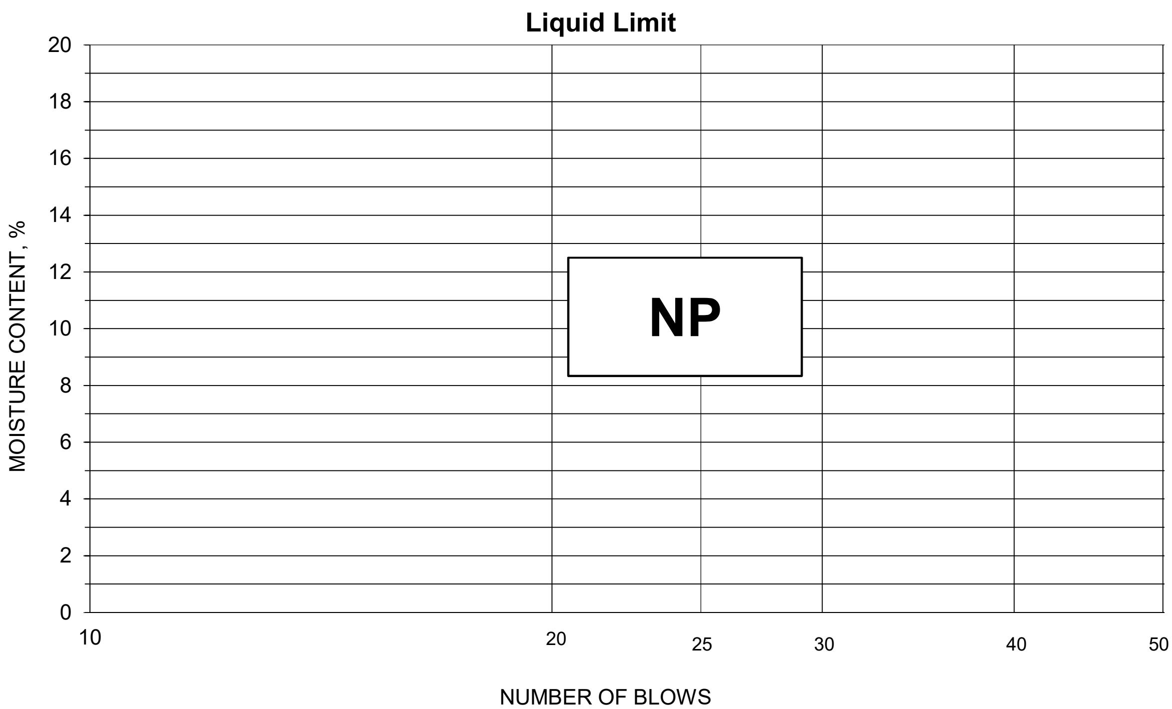
Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW05-SS28G, 44.5'-46.0'	Lab ID	411
		% + No. 40	0

Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	04-19-2019
Test Date	05-09-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW05-SS37bG, 58.5'-59.5'
Lab ID: 416

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 23.9

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.8
No. 4	4.75	99.4
No. 10	2	99.1
No. 40	0.425	98.4
No. 200	0.075	93.3
	0.02	68.2
	0.005	43.6
	0.002	34.7
estimated	0.001	29.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.6	0.9
Coarse Sand	0.3	0.7
Medium Sand	0.7	---
Fine Sand	5.1	5.1
Silt	49.7	58.6
Clay	43.6	34.7

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 42
Plastic Limit: 18
Plasticity Index: 24
Activity Index: 0.7

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.65

Classification
Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-7-6 (23)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW05-SS37bG, 58.5'-59.5'	Lab ID	416

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TNT
Test Date: 05-30-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.8
No. 4	99.4
No. 10	99.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.65

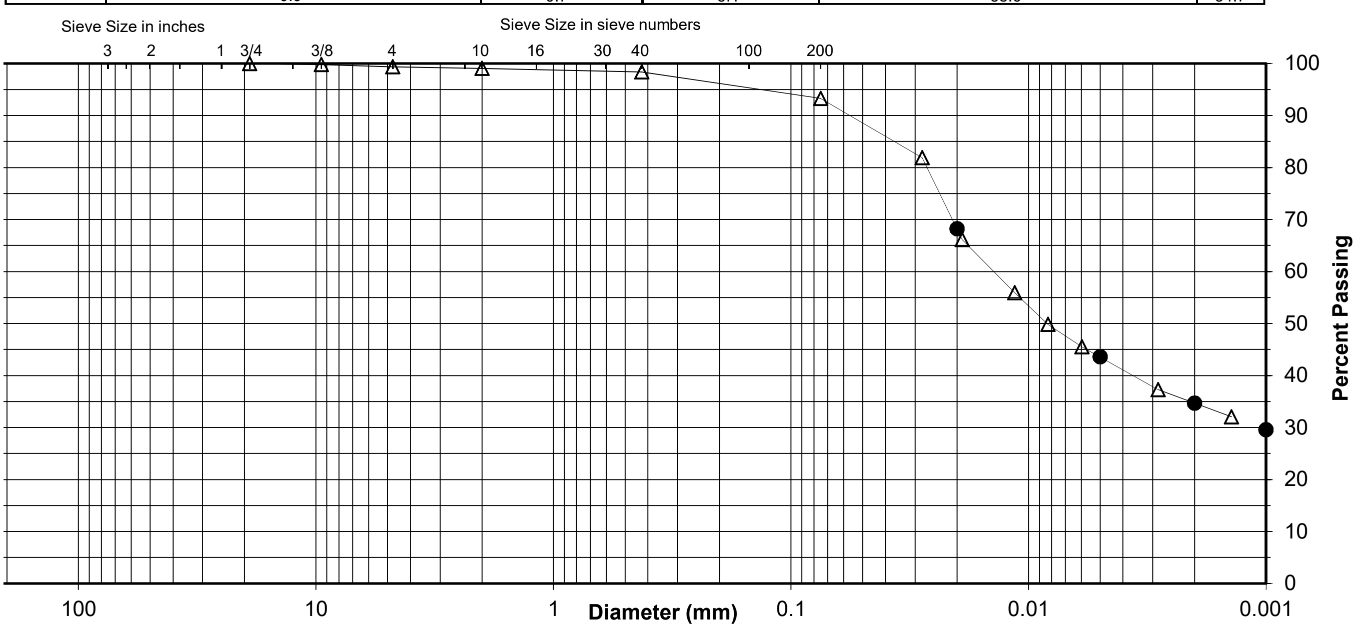
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	98.4
No. 200	93.3
0.02 mm	68.2
0.005 mm	43.6
0.002 mm	34.7
0.001 mm	29.6

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.6	0.3	0.7	5.1	49.7	43.6

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.9	0.7	5.1	58.6	34.7



Comments ____________________

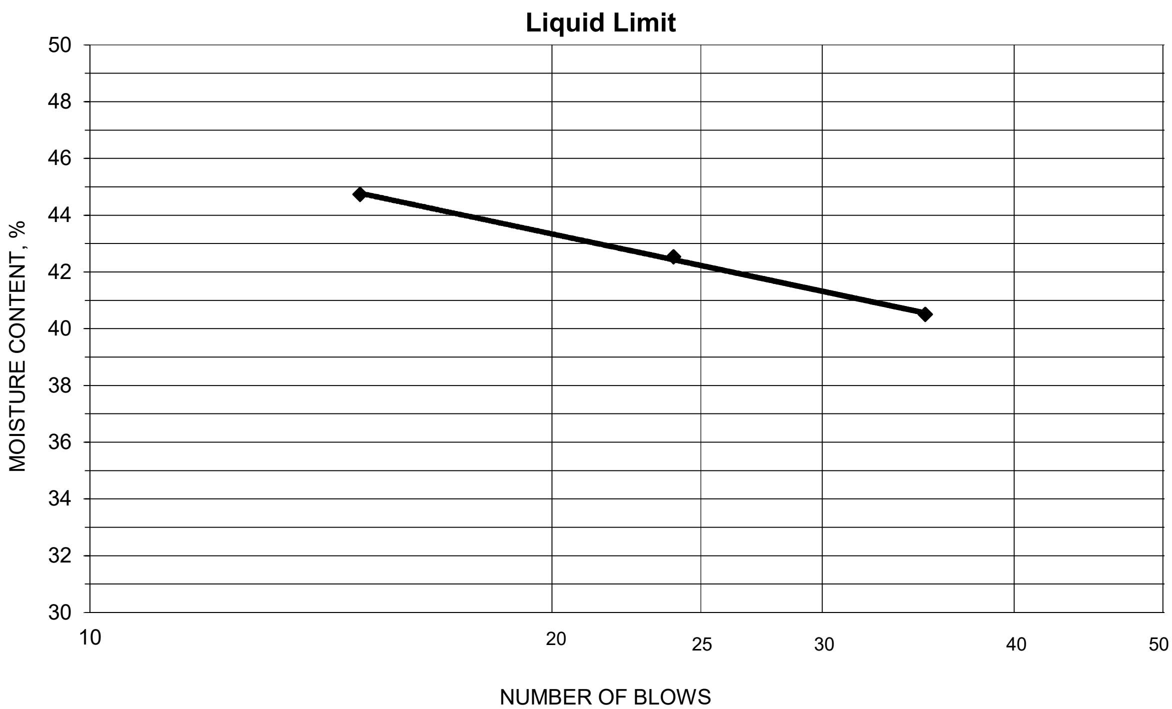
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW05-SS37bG, 58.5'-59.5'	Lab ID	416
		% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.07	17.96	12.75	35	40.5	42
19.98	17.76	12.54	24	42.5	
20.10	17.85	12.82	15	44.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.97	18.02	12.78	18.1	18	24
18.71	17.74	12.51	18.5		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW05-ST04, 66.5'-66.9'	Lab ID	419
Sample Type	ST	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 29.7

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	98.6
No. 40	0.425	93.6
No. 200	0.075	87.5
	0.02	71.3
	0.005	55.2
	0.002	51.2
estimated	0.001	49.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.2	1.4
Coarse Sand	1.2	5.0
Medium Sand	5.0	---
Fine Sand	6.1	6.1
Silt	32.3	36.3
Clay	55.2	51.2

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 56

Plastic Limit: 20

Plasticity Index: 36

Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CH

Group Name: Fat clay

AASHTO Classification: A-7-6 (34)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW05-ST04, 66.5'-66.9'	Lab ID	419

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-03-2019
Date Received: 04-19-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	98.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

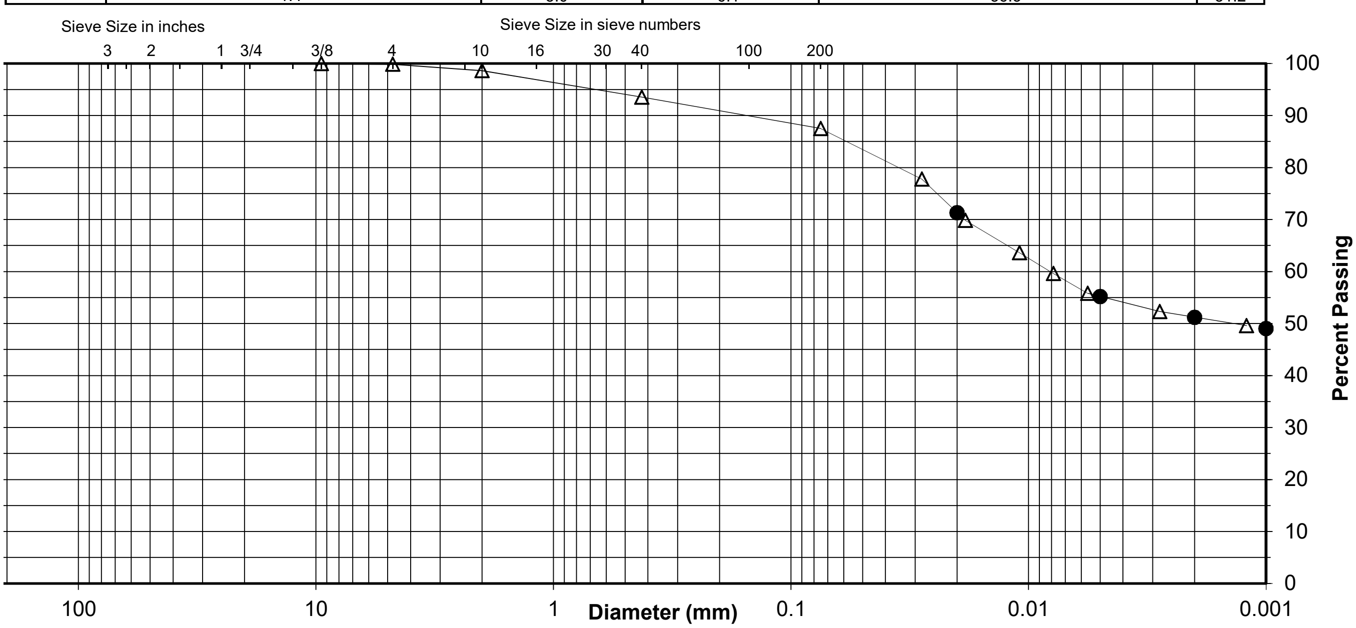
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	93.6
No. 200	87.5
0.02 mm	71.3
0.005 mm	55.2
0.002 mm	51.2
0.001 mm	49.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.2	1.2	5.0	6.1	32.3	55.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	1.4	5.0	6.1	36.3	51.2



Comments ______

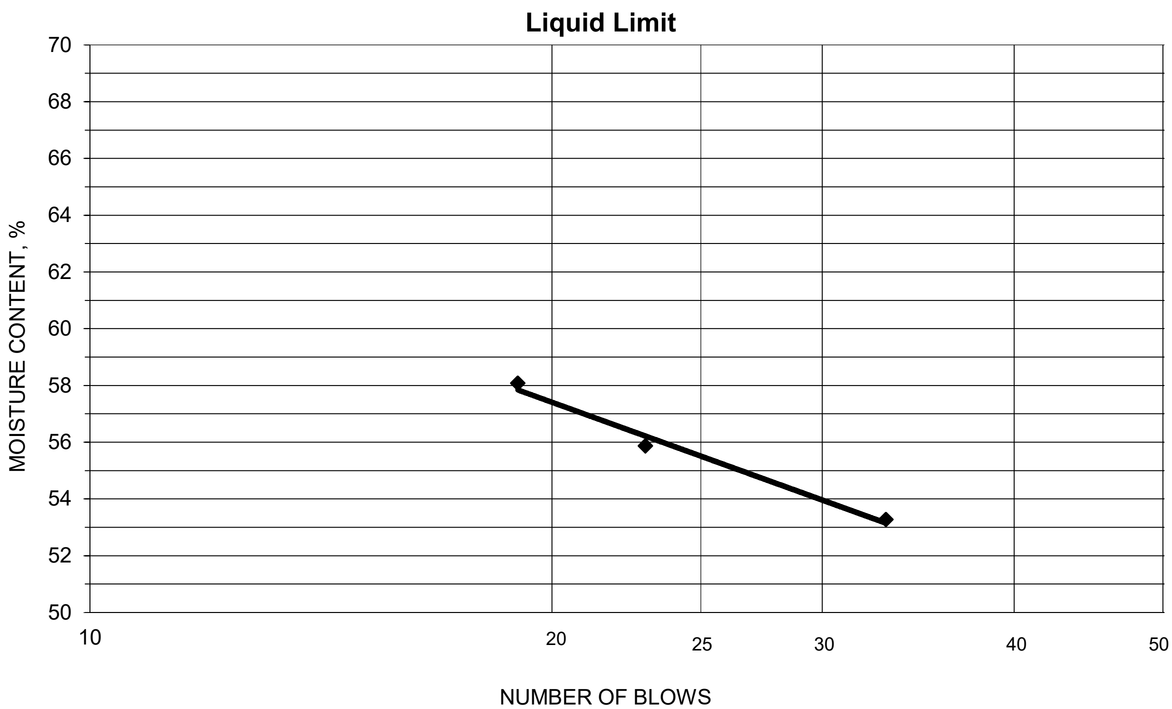
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW05-ST04, 66.5'-66.9'	Lab ID	419
		% + No. 40	6
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	06-03-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.47	16.62	11.27	33	53.3	56
18.35	15.78	11.18	23	55.9	
18.28	15.69	11.23	19	58.1	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.21	16.18	10.95	19.7	20	36
17.50	16.44	11.12	19.9		

Remarks: ________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-TW06-ST01, 10.9'-11.3'	Lab ID	429
Sample Type	ST	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.5
No. 200	0.075	97.6
	0.02	11.5
	0.005	8.0
	0.002	7.1
estimated	0.001	6.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.5
Medium Sand	0.5	---
Fine Sand	1.9	1.9
Silt	89.6	90.5
Clay	8.0	7.1

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.35

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments: Oven dried at 60° C.

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-TW06-ST01, 10.9'-11.3'
Lab ID: 429

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: TNT
Test Date: 05-29-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.35

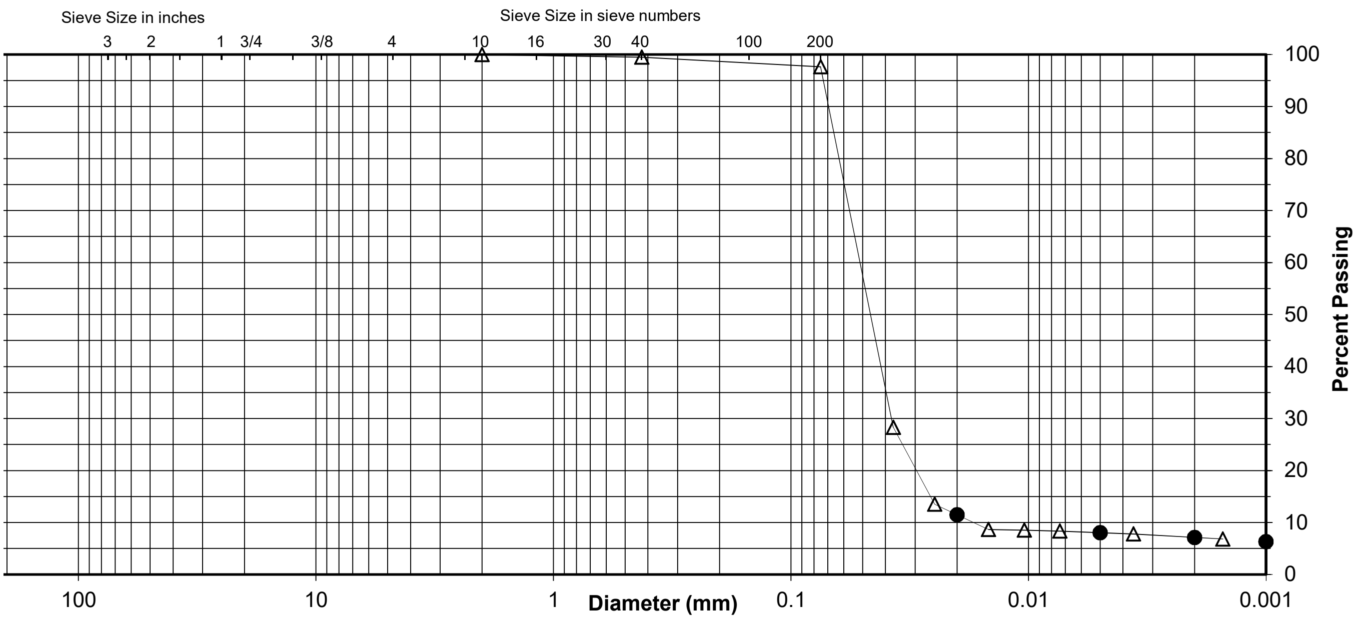
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.5
No. 200	97.6
0.02 mm	11.5
0.005 mm	8.0
0.002 mm	7.1
0.001 mm	6.3

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.5	1.9	89.6	8.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.5	1.9	90.5	7.1



Comments: Oven dried at 60° C.

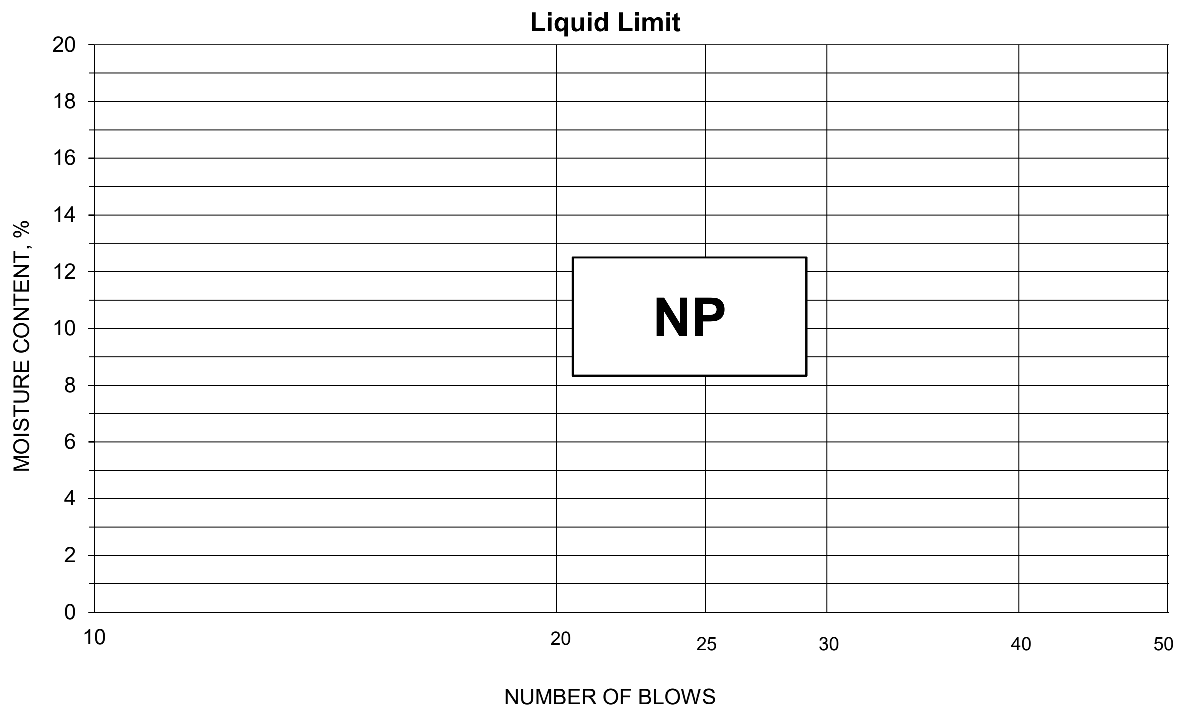
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW06-ST01, 10.9'-11.3'	Lab ID	429
		% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	06-03-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B11-SS02G, 2.5'-4.0' & CUF-GT-B11-SS03G, 5.0'-6.5'	Lab ID	436

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.0
No. 4	84.0
No. 10	62.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.62

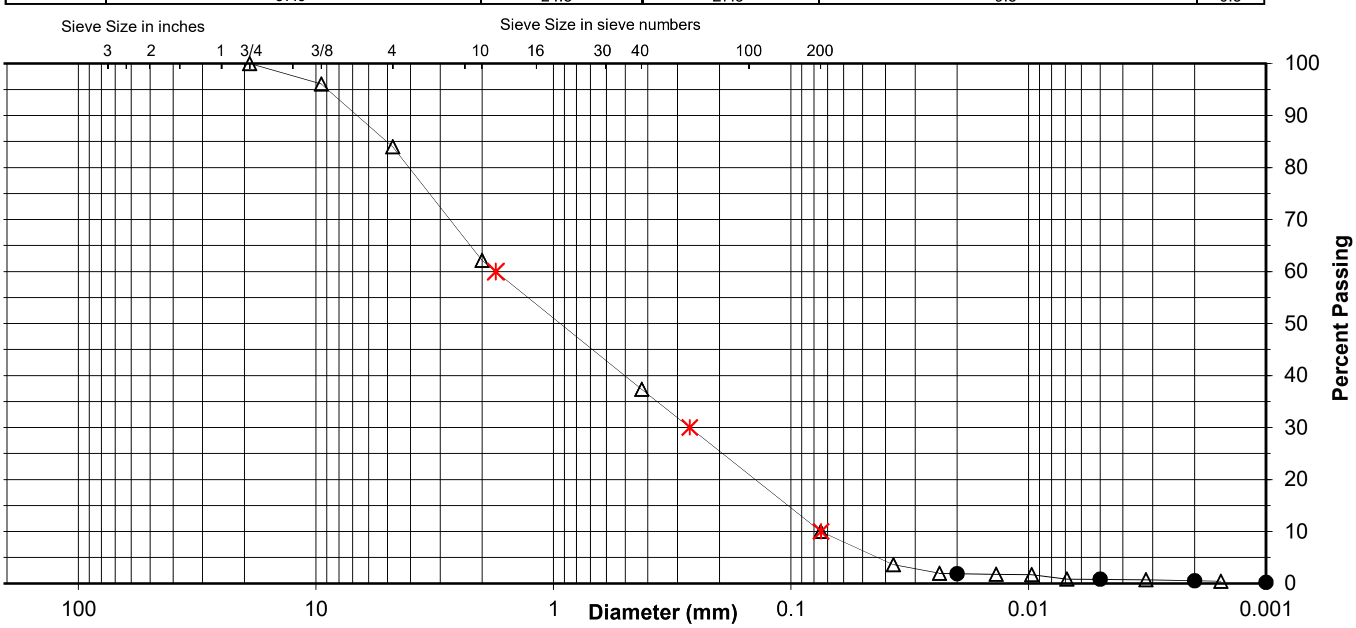
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	37.3
No. 200	10.0
0.02 mm	1.9
0.005 mm	0.8
0.002 mm	0.5
0.001 mm	0.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	16.0	21.9	24.8	27.3	9.2	0.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	37.9	24.8	27.3	9.5	0.5



Comments ______

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B11-SS09G, 20.0'-21.5'
Lab ID: 445

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.2
No. 4	79.8
No. 10	59.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.68

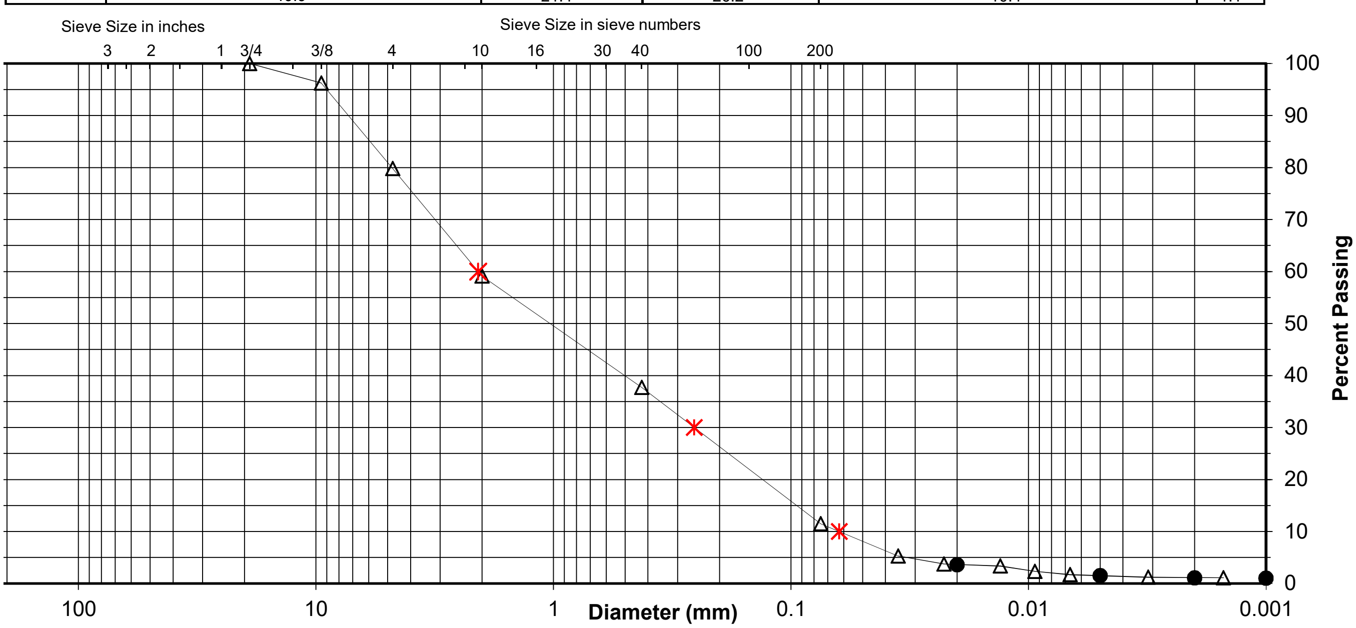
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	37.7
No. 200	11.5
0.02 mm	3.6
0.005 mm	1.5
0.002 mm	1.1
0.001 mm	1.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	20.2	20.7	21.4	26.2	10.0	1.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	40.9	21.4	26.2	10.4	1.1



Comments

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B11-SS11G, 25.0'-26.5' & CUF-GT-B11-SS12G, 27.5'-29.0'	Lab ID	447

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	95.4
3/8"	86.8
No. 4	71.8
No. 10	54.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.72

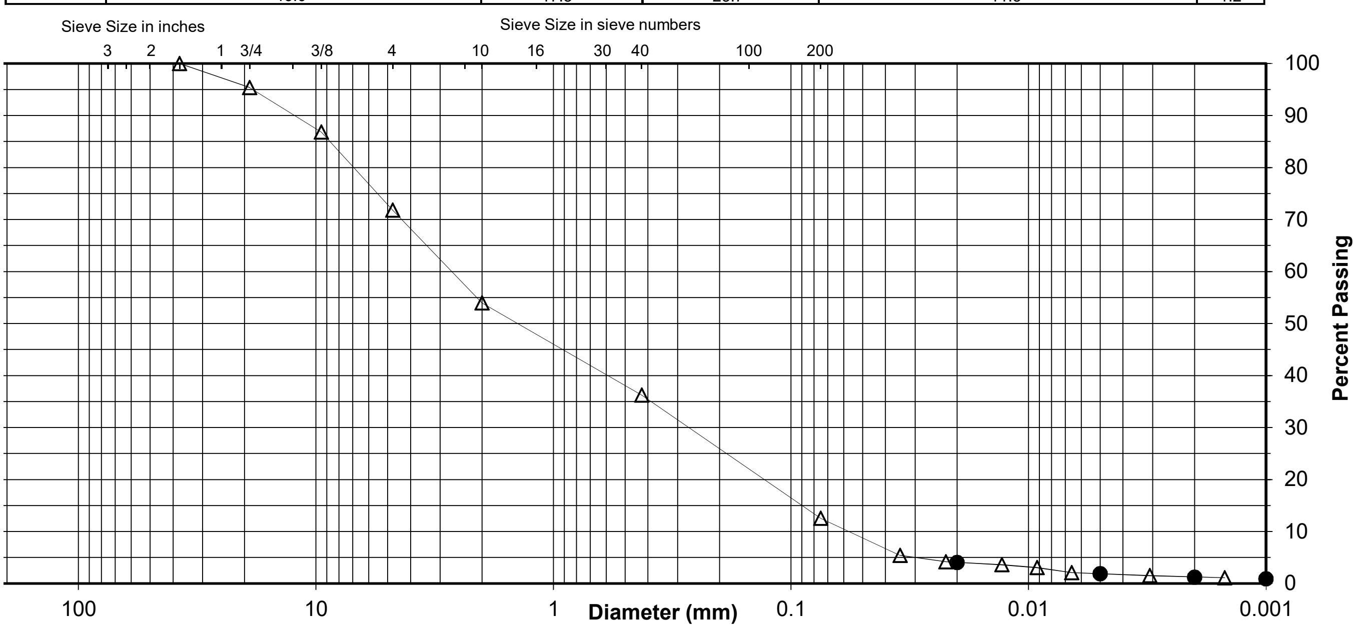
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	36.2
No. 200	12.5
0.02 mm	4.0
0.005 mm	1.9
0.002 mm	1.2
0.001 mm	0.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	4.6	23.6	17.8	17.8	23.7	10.6	1.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	46.0	17.8	23.7	11.3	1.2



Comments ______

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B11-SS15G, 35.0'-36.5' & CUF-GT-B11-SS16G, 37.5'-39.0'
Lab ID: 452

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	95.4
No. 4	87.2
No. 10	72.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

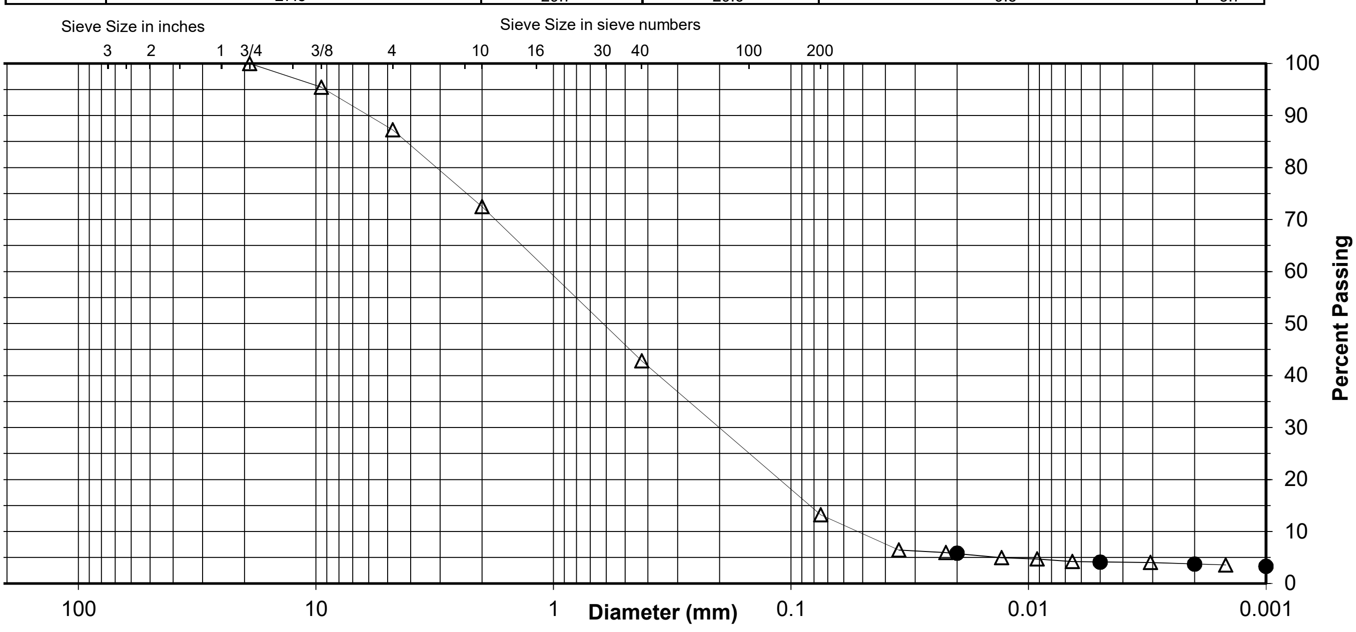
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	42.8
No. 200	13.2
0.02 mm	5.8
0.005 mm	4.1
0.002 mm	3.7
0.001 mm	3.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	12.8	14.7	29.7	29.6	9.1	4.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	27.5	29.7	29.6	9.5	3.7



Comments ______

Reviewed By: RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B11-ST01, 43.5'-43.9'
Lab ID: 456
Sample Type: ST
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 25.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	98.5
No. 200	0.075	95.2
	0.02	81.9
	0.005	53.5
	0.002	39.4
estimated	0.001	31.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	1.5
Medium Sand	1.5	---
Fine Sand	3.3	3.3
Silt	41.7	55.8
Clay	53.5	39.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 43
Plastic Limit: 21
Plasticity Index: 22
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification

Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-7-6 (23)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B11-ST01, 43.5'-43.9'	Lab ID	456

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 06-03-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

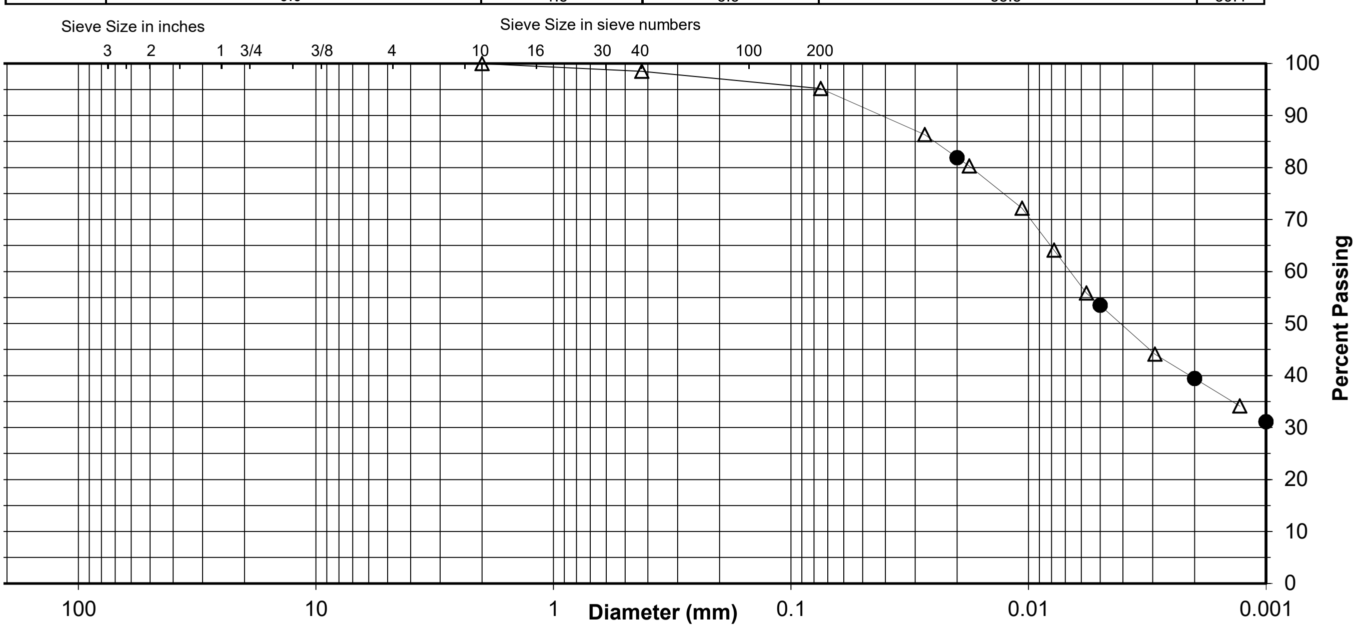
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	98.5
No. 200	95.2
0.02 mm	81.9
0.005 mm	53.5
0.002 mm	39.4
0.001 mm	31.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	1.5	3.3	41.7	53.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	1.5	3.3	55.8	39.4



Comments ______

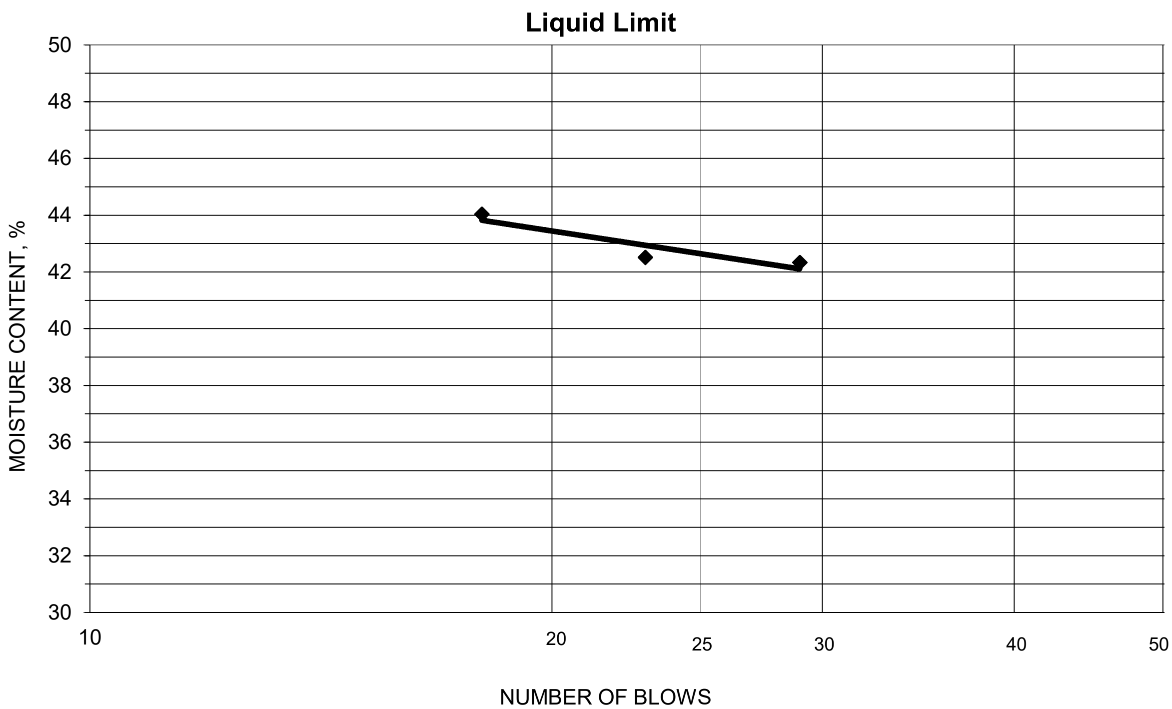
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B11-ST01, 43.5'-43.9'	Lab ID	456
		% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	06-03-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.35	16.73	10.78	18	44.0	43
19.58	16.97	10.83	23	42.5	
17.93	15.86	10.97	29	42.3	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.62	16.51	11.08	20.4	21	22
17.42	16.29	10.83	20.7		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B11-SS22G, 55.0'-56.5'
Lab ID: 462

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 26.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	100.0
No. 10	2	100.0
No. 40	0.425	92.0
No. 200	0.075	54.2
	0.02	39.2
	0.005	24.3
	0.002	19.9
estimated	0.001	16.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	8.0
Medium Sand	8.0	---
Fine Sand	37.8	37.8
Silt	29.9	34.3
Clay	24.3	19.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 27
Plastic Limit: 16
Plasticity Index: 11
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.65

Classification

Unified Group Symbol: CL
Group Name: Sandy lean clay

AASHTO Classification: A-6 (3)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B11-SS22G, 55.0'-56.5'	Lab ID	462

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TNT
Test Date: 05-30-2019
Date Received: 04-19-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	100.0
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.65

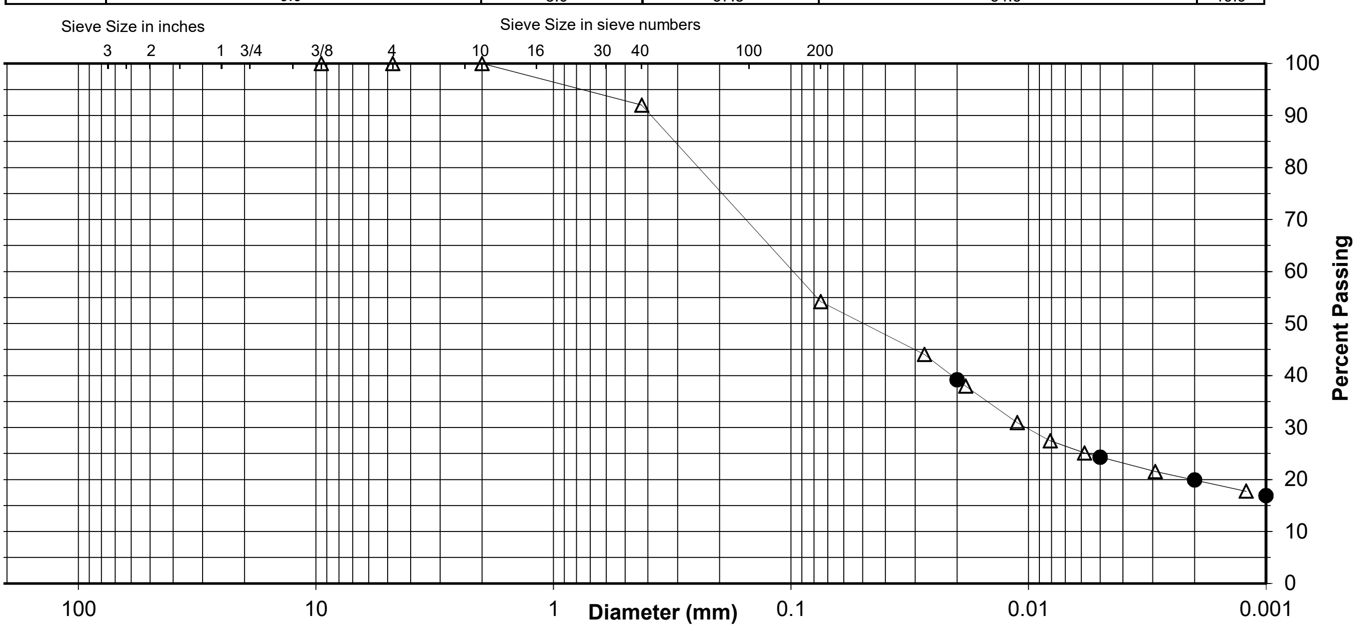
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	92.0
No. 200	54.2
0.02 mm	39.2
0.005 mm	24.3
0.002 mm	19.9
0.001 mm	16.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	8.0	37.8	29.9	24.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	8.0	37.8	34.3	19.9



Comments ____________

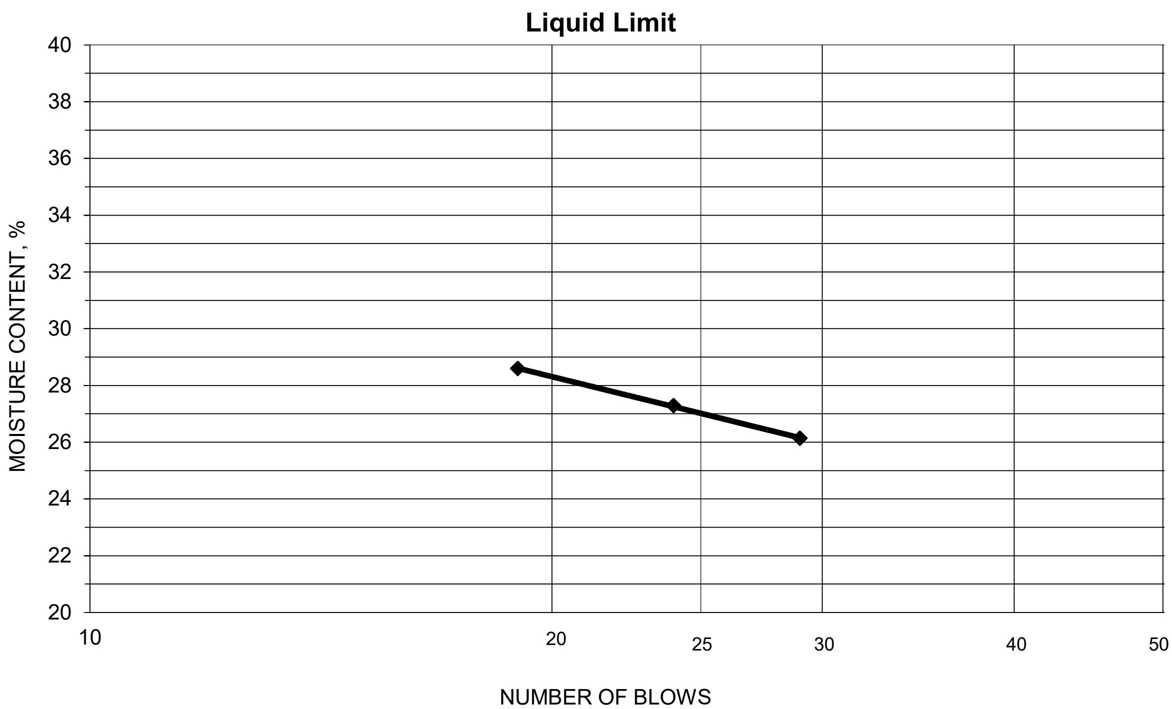
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B11-SS22G, 55.0'-56.5'	Lab ID	462
		% + No. 40	8
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.13	17.41	10.83	29	26.1	27
19.96	18.14	11.47	24	27.3	
19.40	17.57	11.17	19	28.6	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.84	16.92	11.24	16.2	16	11
18.21	17.28	11.47	16.0		

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B11-SS25G, 62.5'-64.0' & CUF-GT-B11-SS26G, 65.0'-66.5'	Lab ID	465

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	81.0
No. 4	63.4
No. 10	44.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.65

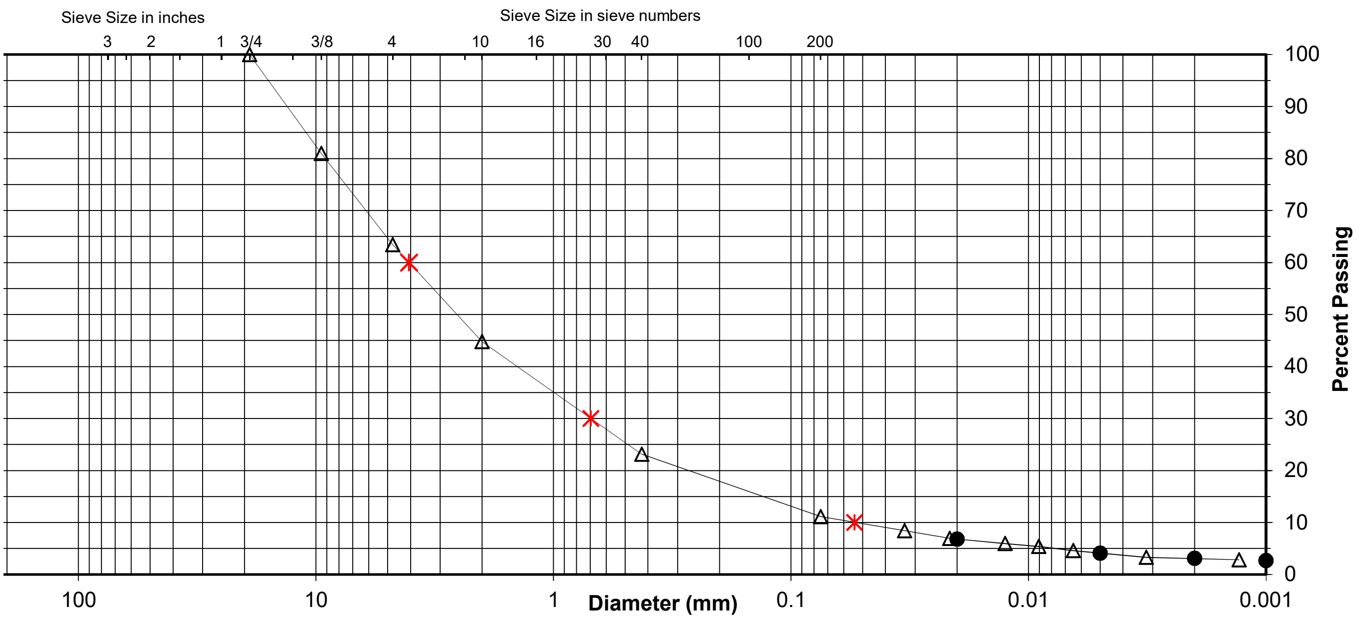
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	23.1
No. 200	11.1
0.02 mm	6.8
0.005 mm	4.1
0.002 mm	3.1
0.001 mm	2.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	36.6	18.6	21.7	12.0	7.0	4.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	55.2	21.7	12.0	8.0	3.1



Comments ____________________

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B11-SS30G, 75.0'-76.5' & CUF-GT-B11-SS31G, 77.5'-79.0'
Lab ID: 471

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 05-06-2019
Date Received: 04-19-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	90.0
3/8"	69.0
No. 4	52.4
No. 10	36.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

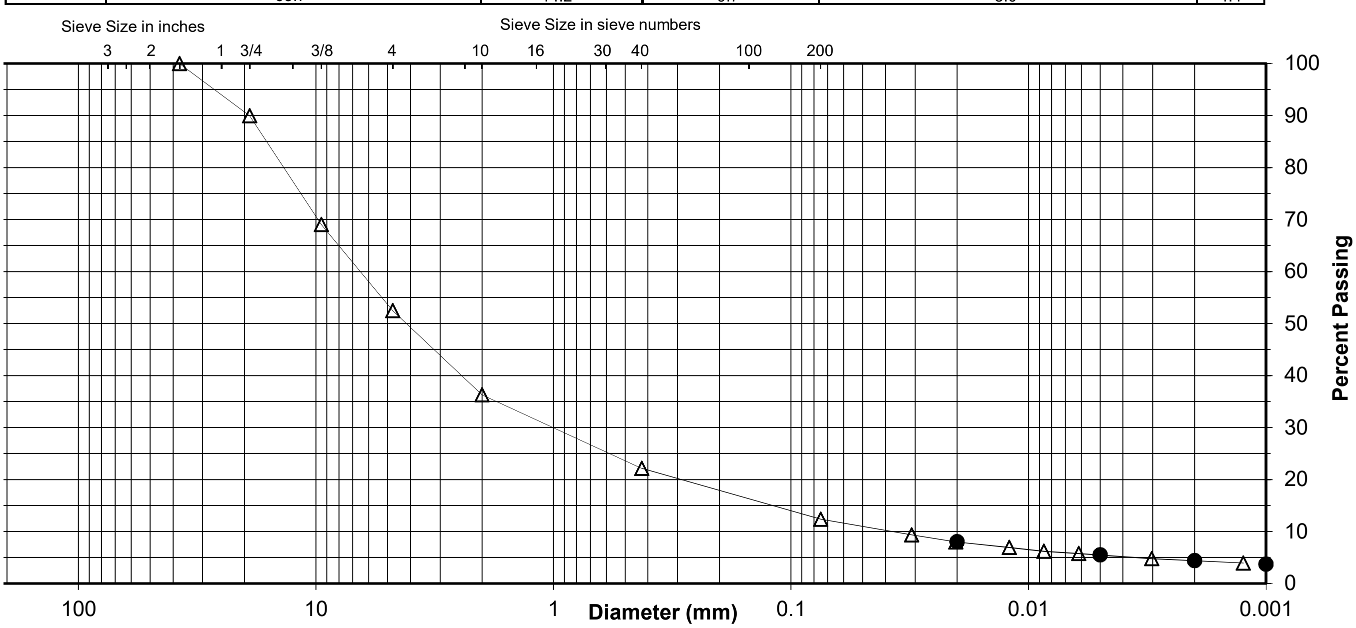
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	22.1
No. 200	12.4
0.02 mm	8.0
0.005 mm	5.5
0.002 mm	4.4
0.001 mm	3.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	10.0	37.6	16.1	14.2	9.7	6.9	5.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	63.7	14.2	9.7	8.0	4.4



Comments ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B12-SS05G, 10.0'-11.5'
Lab ID: 480

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 19.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.6
No. 4	4.75	98.2
No. 10	2	97.3
No. 40	0.425	94.5
No. 200	0.075	91.0
	0.02	65.9
	0.005	37.9
	0.002	30.4
estimated	0.001	25.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	1.8	2.7
Coarse Sand	0.9	2.8
Medium Sand	2.8	---
Fine Sand	3.5	3.5
Silt	53.1	60.6
Clay	37.9	30.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 34
Plastic Limit: 17
Plasticity Index: 17
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.65

Classification

Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-6 (15)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B12-SS05G, 10.0'-11.5'
Lab ID: 480

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 06-03-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.6
No. 4	98.2
No. 10	97.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.65

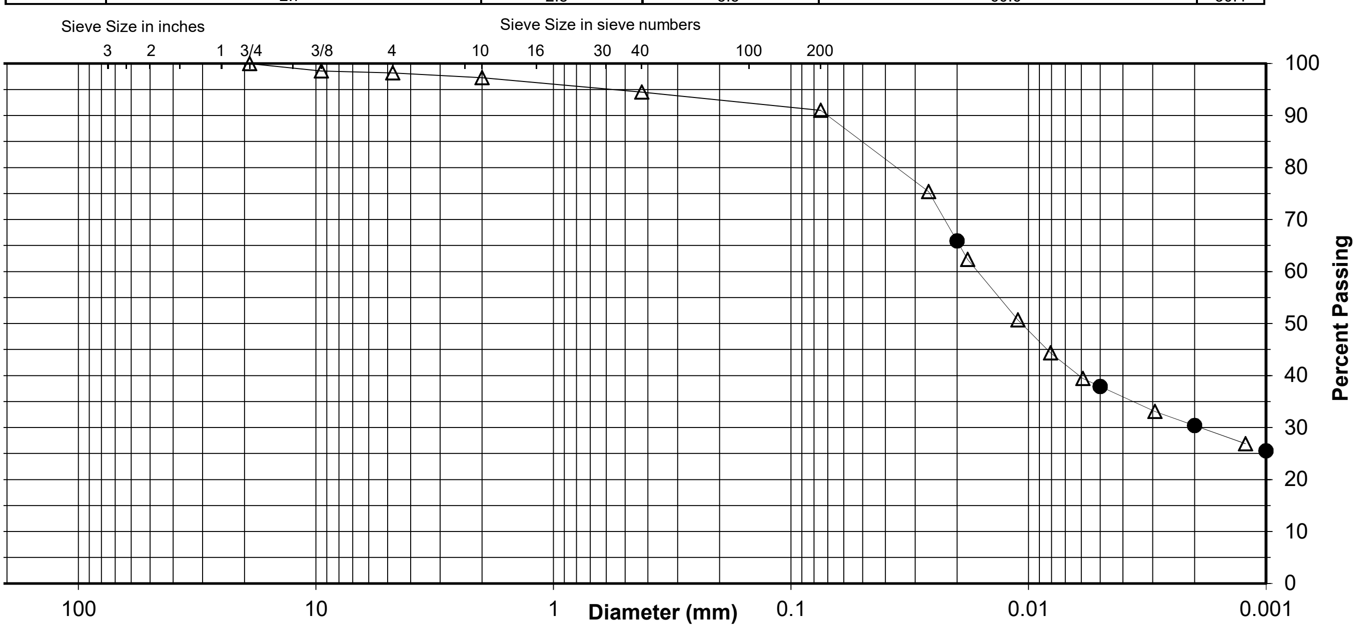
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	94.5
No. 200	91.0
0.02 mm	65.9
0.005 mm	37.9
0.002 mm	30.4
0.001 mm	25.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.8	0.9	2.8	3.5	53.1	37.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	2.7	2.8	3.5	60.6	30.4



Comments ______

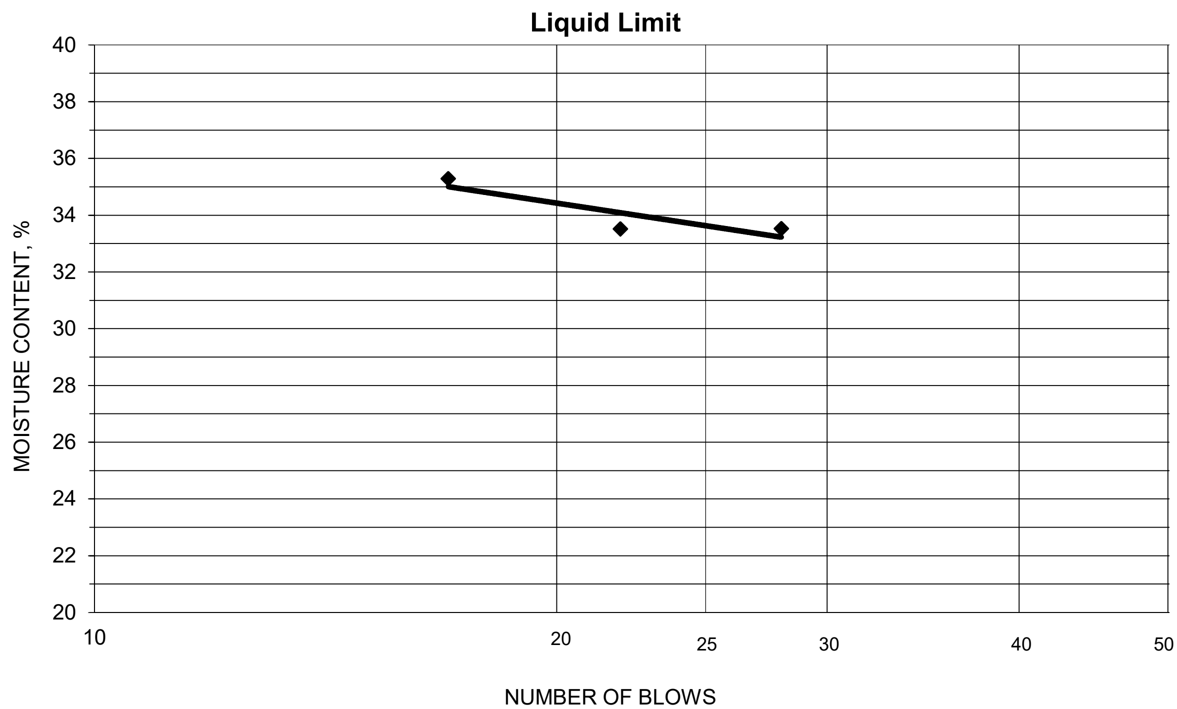
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B12-SS05G, 10.0'-11.5'	Lab ID	480
		% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-14-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.08	18.91	12.76	17	35.3	34
20.43	18.55	12.94	22	33.5	
19.65	17.90	12.68	28	33.5	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.27	18.29	12.52	17.0	17	17
19.32	18.40	12.81	16.5		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B12-SS08G, 17.5'-19.0'
Lab ID: 483

Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 22.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	91.8
3/8"	9.5	86.2
No. 4	4.75	83.1
No. 10	2	77.2
No. 40	0.425	71.3
No. 200	0.075	65.6
	0.02	46.8
	0.005	29.4
	0.002	24.0
estimated	0.001	19.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	16.9	22.8
Coarse Sand	5.9	5.9
Medium Sand	5.9	---
Fine Sand	5.7	5.7
Silt	36.2	41.6
Clay	29.4	24.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 36
Plastic Limit: 17
Plasticity Index: 19
Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.68

Classification

Unified Group Symbol: CL
Group Name: Sandy lean clay with gravel

AASHTO Classification: A-6 (10)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B12-SS08G, 17.5'-19.0'

Project Number: 175568209
Lab ID: 483

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 06-03-2019
Date Received: 04-19-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	91.8
3/8"	86.2
No. 4	83.1
No. 10	77.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.68

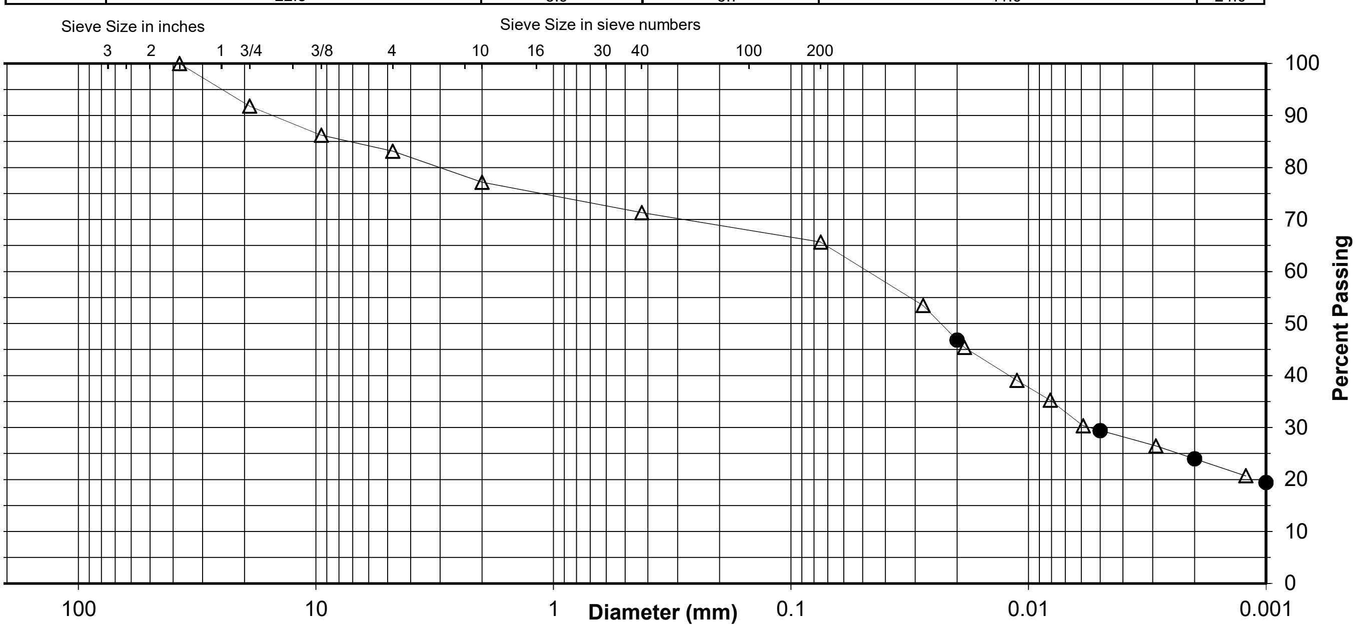
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	71.3
No. 200	65.6
0.02 mm	46.8
0.005 mm	29.4
0.002 mm	24.0
0.001 mm	19.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	8.2	8.7	5.9	5.9	5.7	36.2	29.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	22.8	5.9	5.7	41.6	24.0



Comments ______

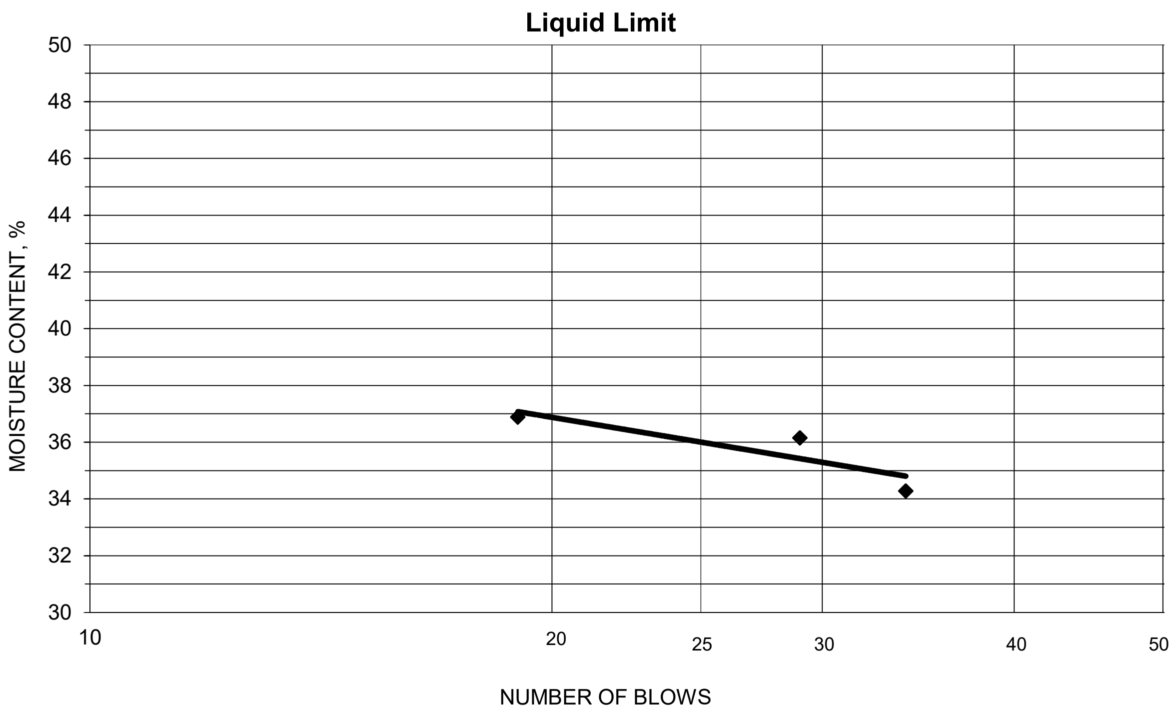
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B12-SS08G, 17.5'-19.0'	Lab ID	483
		% + No. 40	29
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-14-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.72	16.78	11.12	34	34.3	
18.07	16.23	11.14	29	36.1	
18.75	16.67	11.03	19	36.9	36



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
16.99	16.09	10.69	16.7	17	19
17.80	16.78	11.01	17.7		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B12-SS12G, 27.5'-29.0'	Lab ID	488
Sample Type	SS	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.2

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	85.9
3/8"	9.5	79.5
No. 4	4.75	74.3
No. 10	2	70.1
No. 40	0.425	65.6
No. 200	0.075	57.1
	0.02	44.0
	0.005	34.2
	0.002	28.2
estimated	0.001	24.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	25.7	29.9
Coarse Sand	4.2	4.5
Medium Sand	4.5	---
Fine Sand	8.5	8.5
Silt	22.9	28.9
Clay	34.2	28.2

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 43

Plastic Limit: 17

Plasticity Index: 26

Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.66

Classification

Unified Group Symbol: CL

Group Name: Gravelly lean clay with sand

AASHTO Classification: A-7-6 (11)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B12-SS12G, 27.5'-29.0'	Lab ID	488

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	HE
Test Date	06-03-2019
Date Received	04-19-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	85.9
3/8"	79.5
No. 4	74.3
No. 10	70.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.66

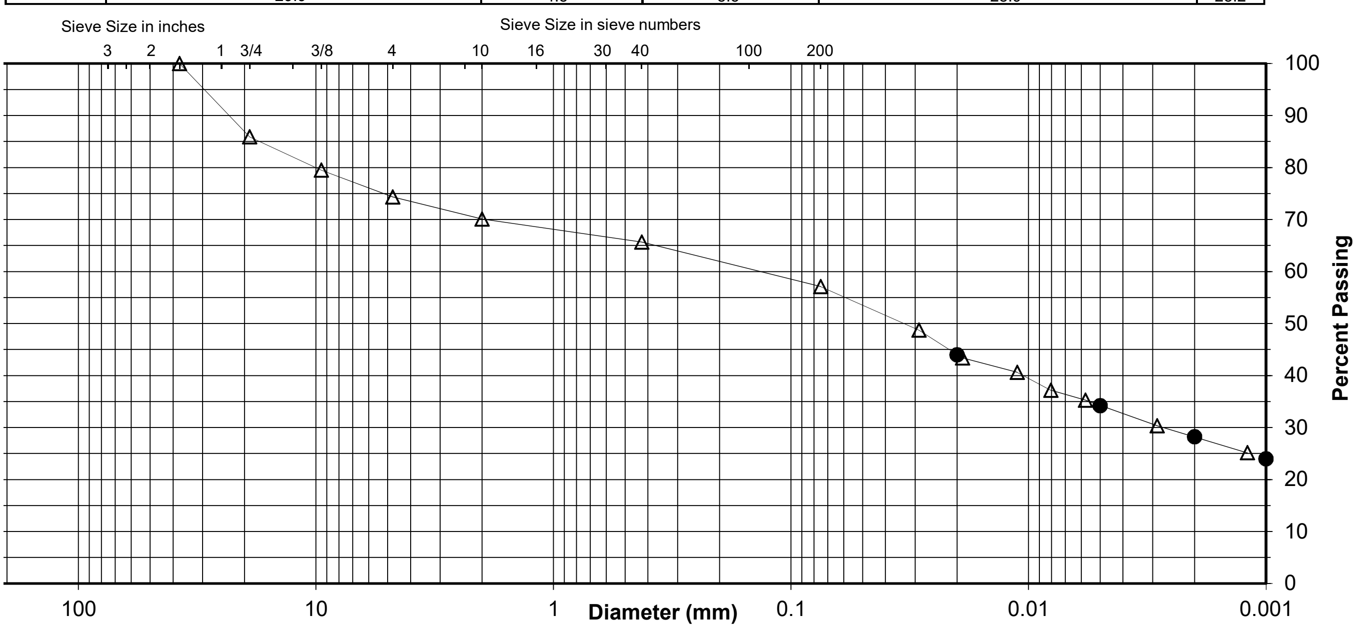
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	65.6
No. 200	57.1
0.02 mm	44.0
0.005 mm	34.2
0.002 mm	28.2
0.001 mm	24.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	14.1	11.6	4.2	4.5	8.5	22.9	34.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	29.9	4.5	8.5	28.9	28.2



Comments ____________________

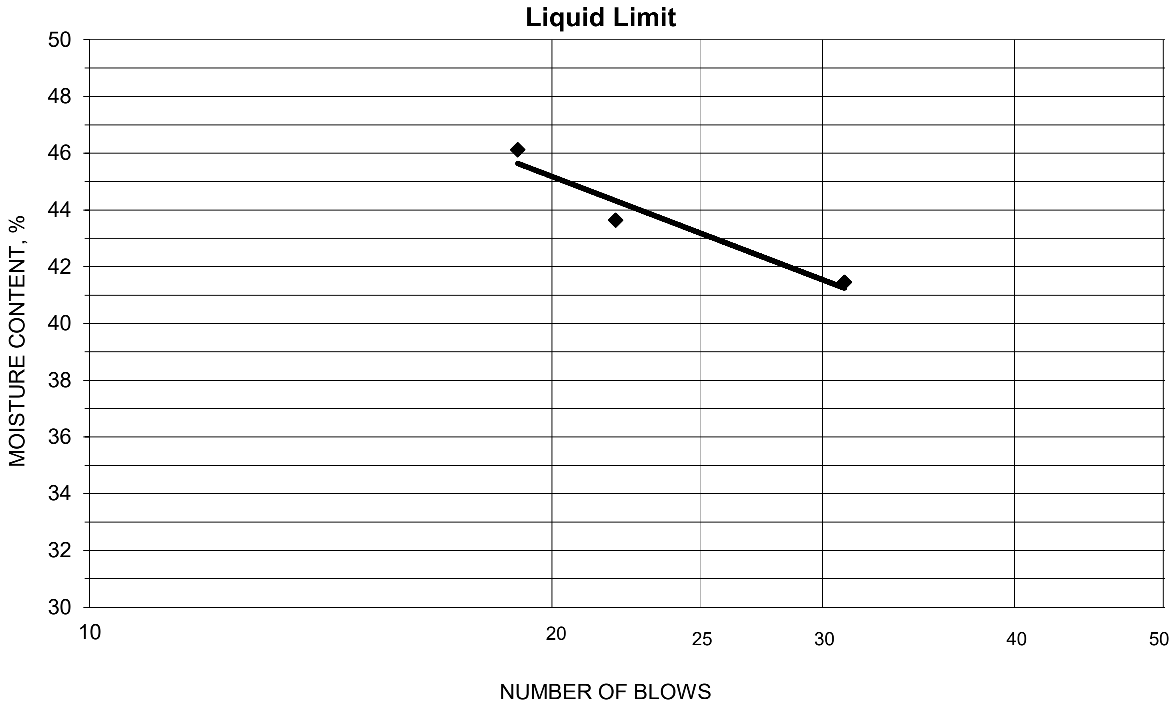
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B12-SS12G, 27.5'-29.0'	Lab ID	488
		% + No. 40	34
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-14-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.87	15.93	11.25	31	41.5	
17.83	15.84	11.28	22	43.6	
17.74	15.72	11.34	19	46.1	43



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
16.70	15.93	11.44	17.1	17	26
17.05	16.24	11.70	17.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B13-SS02G, 5.0'-6.5'	Lab ID	500
Sample Type	SS	Date Received	4-19-19
		Date Reported	6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 19.7

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	95.5
No. 4	4.75	89.5
No. 10	2	83.6
No. 40	0.425	77.3
No. 200	0.075	57.8
	0.02	45.3
	0.005	36.8
	0.002	33.2
estimated	0.001	31.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	10.5	16.4
Coarse Sand	5.9	6.3
Medium Sand	6.3	---
Fine Sand	19.5	19.5
Silt	21.0	24.6
Clay	36.8	33.2

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 47

Plastic Limit: 16

Plasticity Index: 31

Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.69

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay

AASHTO Classification: A-7-6 (14)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B13-SS02G, 5.0'-6.5'	Lab ID	500

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 06-03-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	95.5
No. 4	89.5
No. 10	83.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.69

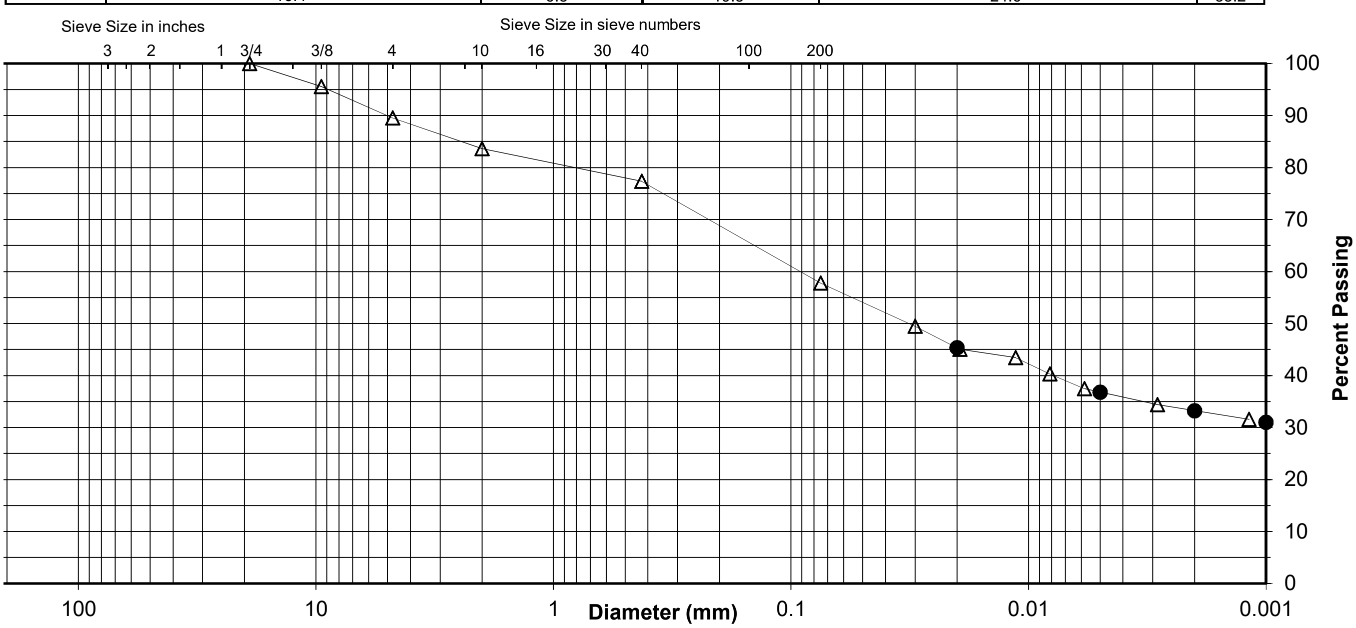
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	77.3
No. 200	57.8
0.02 mm	45.3
0.005 mm	36.8
0.002 mm	33.2
0.001 mm	31.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	10.5	5.9	6.3	19.5	21.0	36.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	16.4	6.3	19.5	24.6	33.2



Comments ______

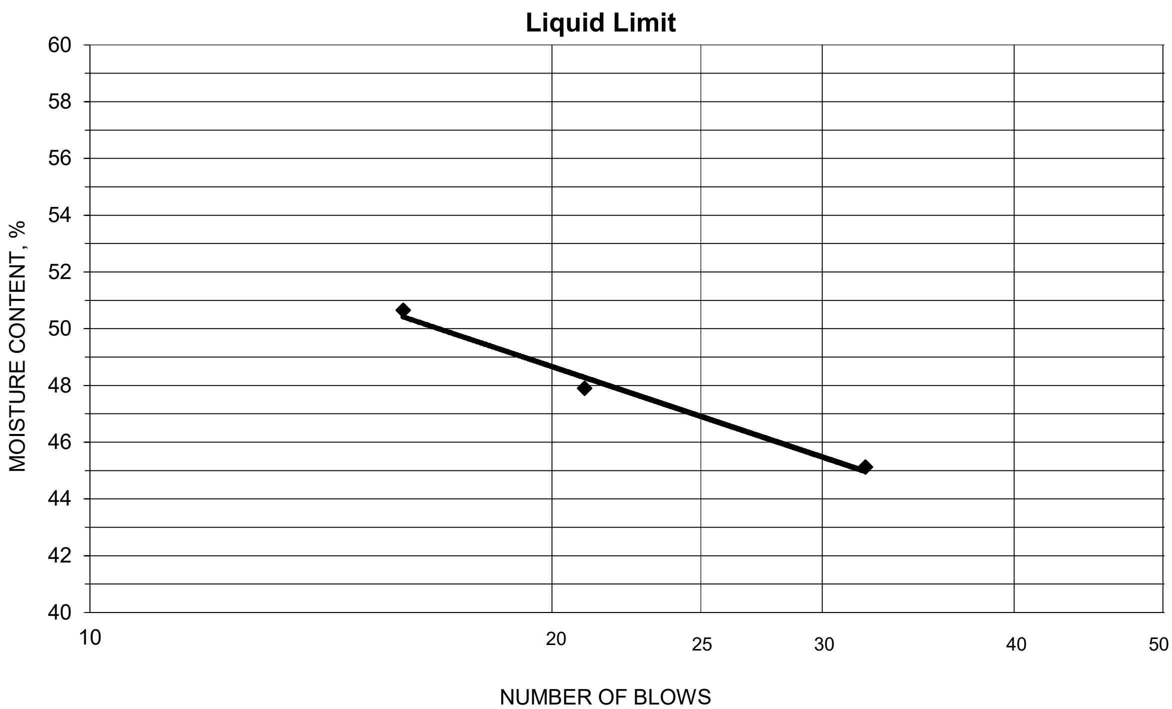
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B13-SS02G, 5.0'-6.5'	Lab ID	500
		% + No. 40	23
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	05-14-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.86	15.64	10.72	32	45.1	47
18.15	15.87	11.11	21	47.9	
18.38	16.04	11.42	16	50.6	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.83	16.97	11.68	16.3	16	31
17.04	16.18	10.77	15.9		

Remarks: ______________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B13-ST02, 18.3'-18.7'
Lab ID: 505

Sample Type: ST
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 37.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.9
No. 200	0.075	99.6
	0.02	83.8
	0.005	69.7
	0.002	65.0
estimated	0.001	61.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.1
Medium Sand	0.1	---
Fine Sand	0.3	0.3
Silt	29.9	34.6
Clay	69.7	65.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 71
Plastic Limit: 24
Plasticity Index: 47
Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.73

Classification

Unified Group Symbol: CH
Group Name: Fat clay

AASHTO Classification: A-7-6 (55)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B13-ST02, 18.3'-18.7'	Lab ID	505

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 06-03-2019
Date Received: 04-19-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.73

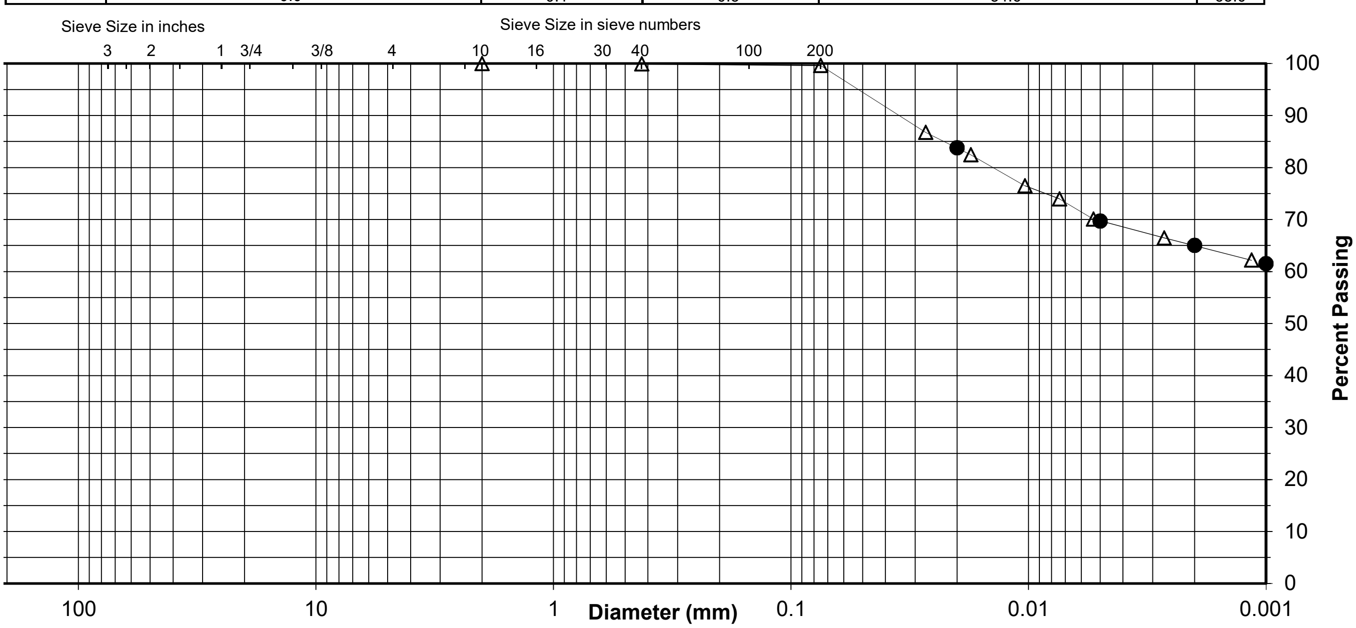
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	99.9
No. 200	99.6
0.02 mm	83.8
0.005 mm	69.7
0.002 mm	65.0
0.001 mm	61.5

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.1	0.3	29.9	69.7

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.1	0.3	34.6	65.0



Comments ______

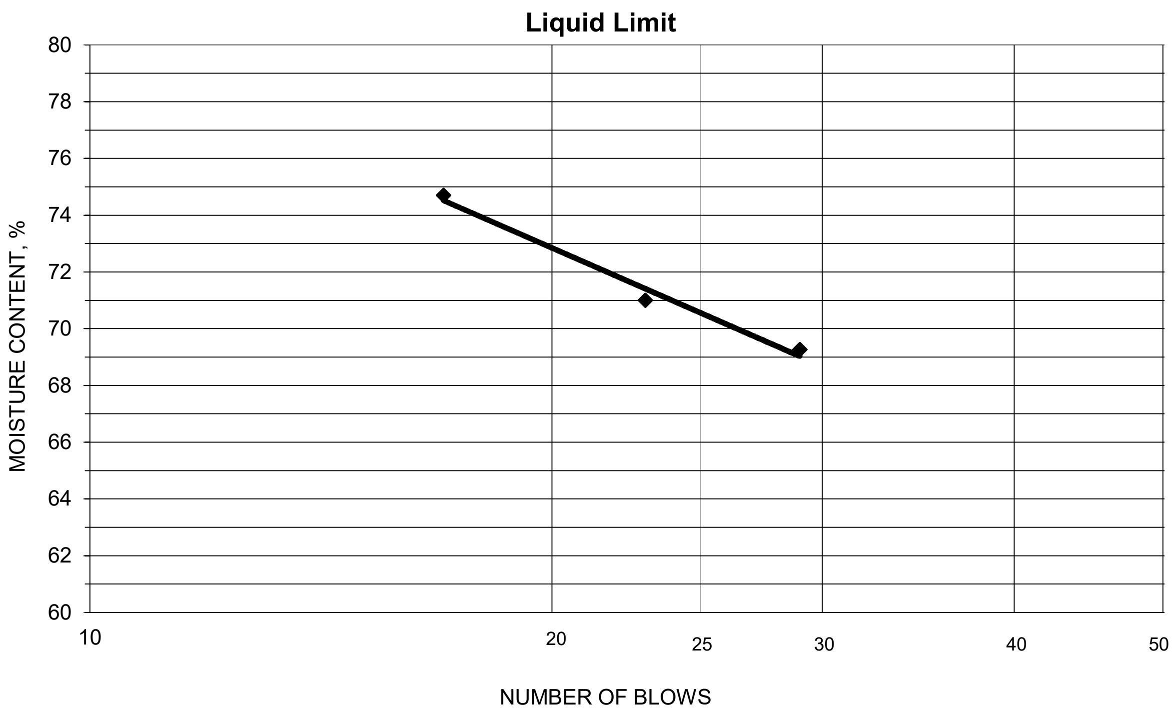
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B13-ST02, 18.3'-18.7'	Lab ID	505
		% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	04-19-2019		
Test Date	06-03-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.50	16.30	11.68	29	69.3	
17.90	15.06	11.06	23	71.0	
18.43	15.36	11.25	17	74.7	71



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
16.84	15.69	10.99	24.5	24	47
17.66	16.42	11.20	23.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B13-SS11aG, 55.0'-58.5'
Lab ID: 511
Sample Type: SS
Date Received: 4-19-19
Date Reported: 6-14-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 39.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.0
No. 4	4.75	97.4
No. 10	2	96.5
No. 40	0.425	95.8
No. 200	0.075	94.1
	0.02	63.3
	0.005	35.5
	0.002	29.9
estimated	0.001	26.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	2.6	3.5
Coarse Sand	0.9	0.7
Medium Sand	0.7	---
Fine Sand	1.7	1.7
Silt	58.6	64.2
Clay	35.5	29.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 39
Plastic Limit: 17
Plasticity Index: 22
Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.67

Classification

Unified Group Symbol: CL
Group Name: Lean clay
AASHTO Classification: A-6 (21)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B13-SS11aG, 55.0'-58.5'	Lab ID	511

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 06-03-2019
Date Received: 04-19-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.0
No. 4	97.4
No. 10	96.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.67

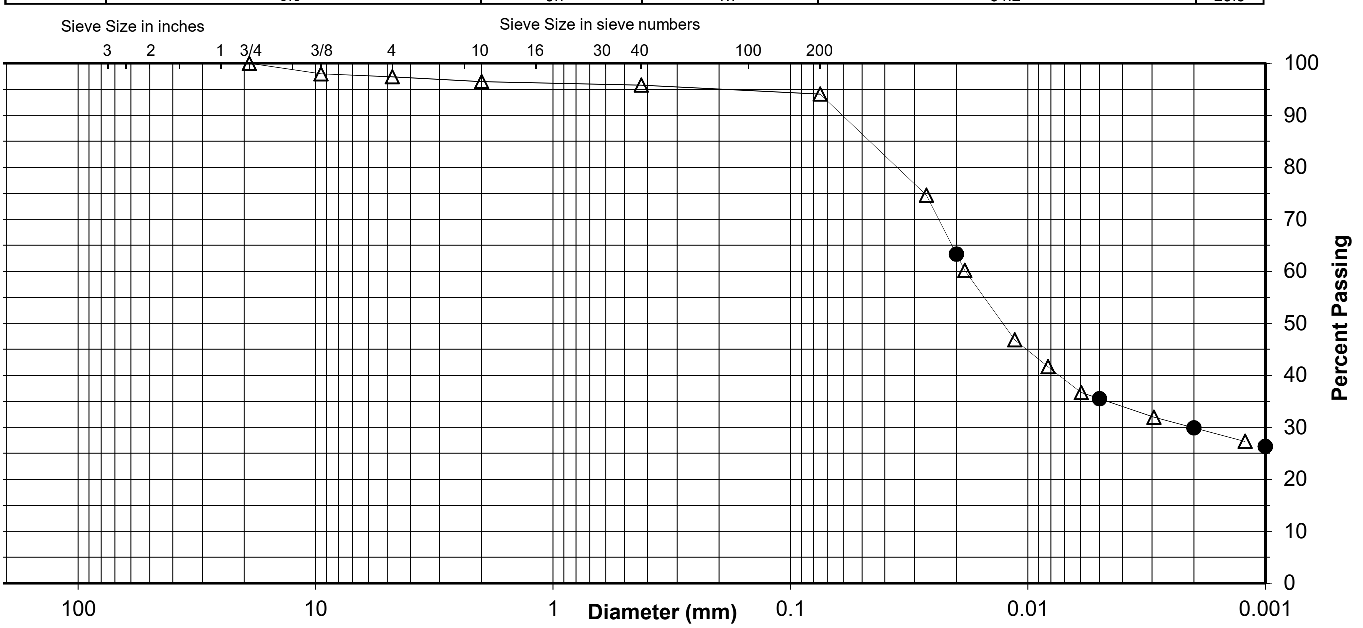
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	95.8
No. 200	94.1
0.02 mm	63.3
0.005 mm	35.5
0.002 mm	29.9
0.001 mm	26.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.6	0.9	0.7	1.7	58.6	35.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	3.5	0.7	1.7	64.2	29.9



Comments ______

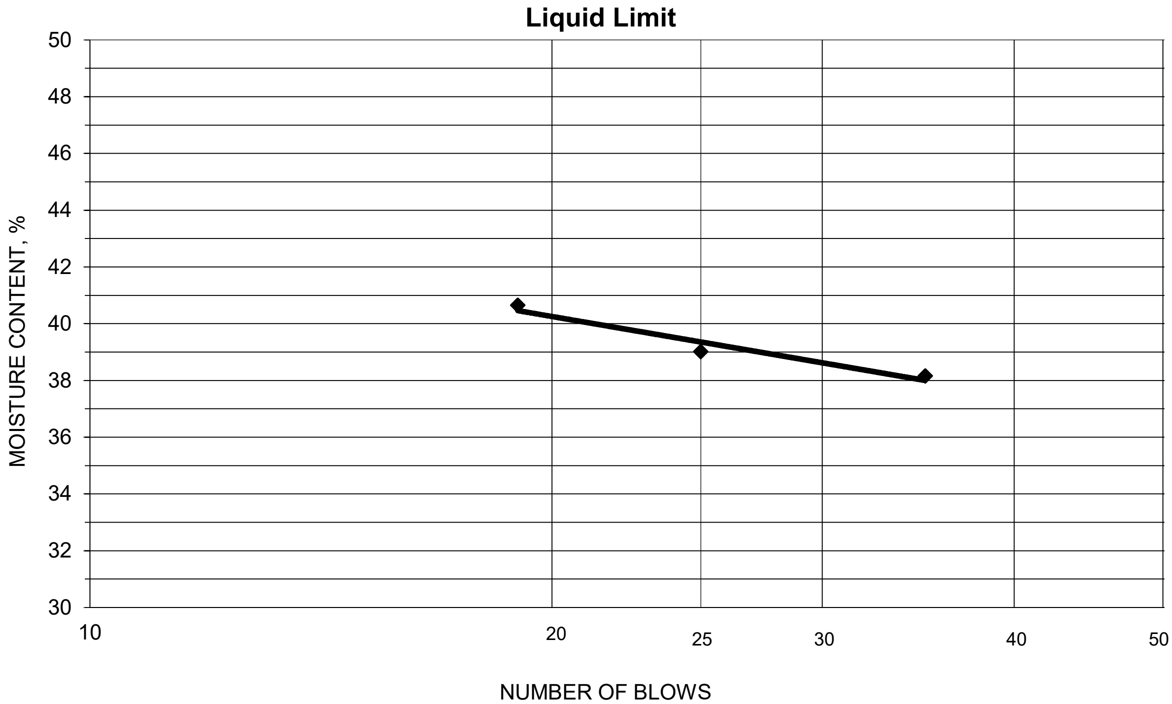
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B13-SS11aG, 55.0'-58.5'	Lab ID	511
		% + No. 40	4
Tested By	KWS	Test Method ASTM D 4318 Method A	Date Received 04-19-2019
Test Date	05-10-2019	Prepared Dry	

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.71	15.84	11.24	19	40.7	39
17.65	15.84	11.20	25	39.0	
17.77	16.03	11.47	35	38.2	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.11	16.22	11.00	17.0	17	22
17.37	16.42	10.96	17.4		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B14-SS03G, 5.0'-6.5'
Lab ID: 547

Sample Type: SS
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 31.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.1
No. 4	4.75	96.8
No. 10	2	88.3
No. 40	0.425	69.6
No. 200	0.075	55.0
	0.02	27.7
	0.005	7.2
	0.002	3.8
estimated	0.001	2.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	3.2	11.7
Coarse Sand	8.5	18.7
Medium Sand	18.7	---
Fine Sand	14.6	14.6
Silt	47.8	51.2
Clay	7.2	3.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.56

Classification

Unified Group Symbol: ML
Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B14-SS03G, 5.0'-6.5'

Project Number: 175568209
Lab ID: 547

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-08-2019
Date Received: 05-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.1
No. 4	96.8
No. 10	88.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.56

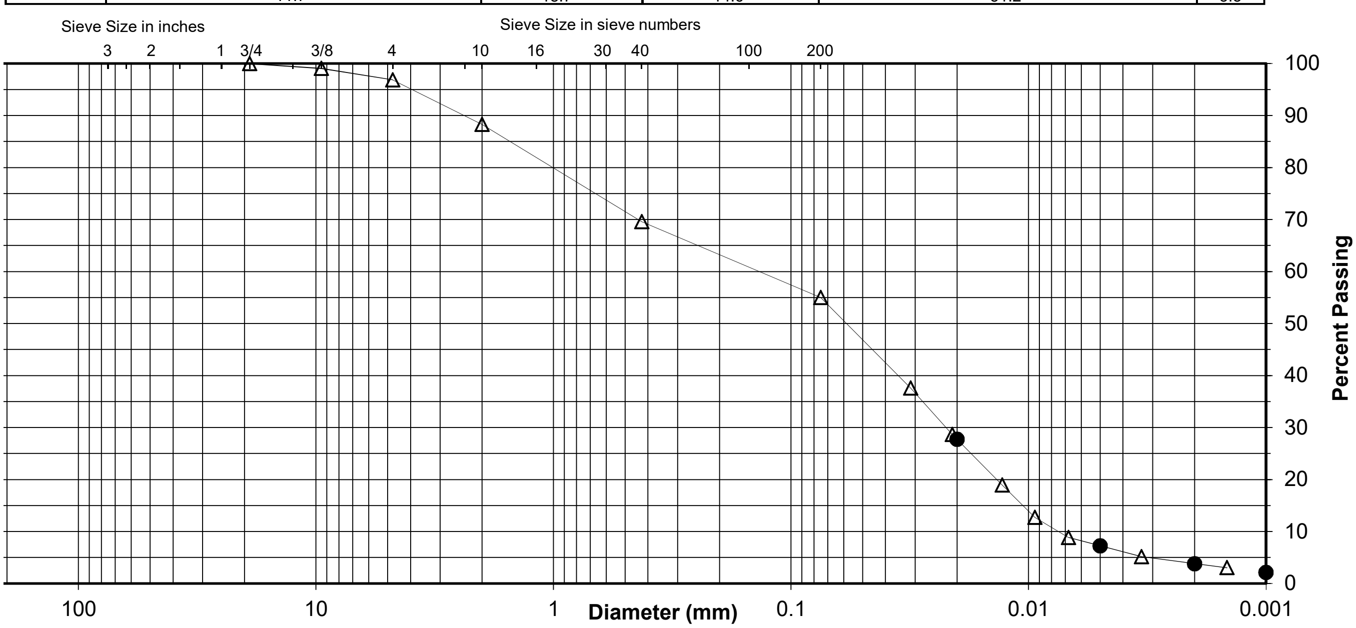
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	69.6
No. 200	55.0
0.02 mm	27.7
0.005 mm	7.2
0.002 mm	3.8
0.001 mm	2.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	3.2	8.5	18.7	14.6	47.8	7.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	11.7	18.7	14.6	51.2	3.8



Comments ______

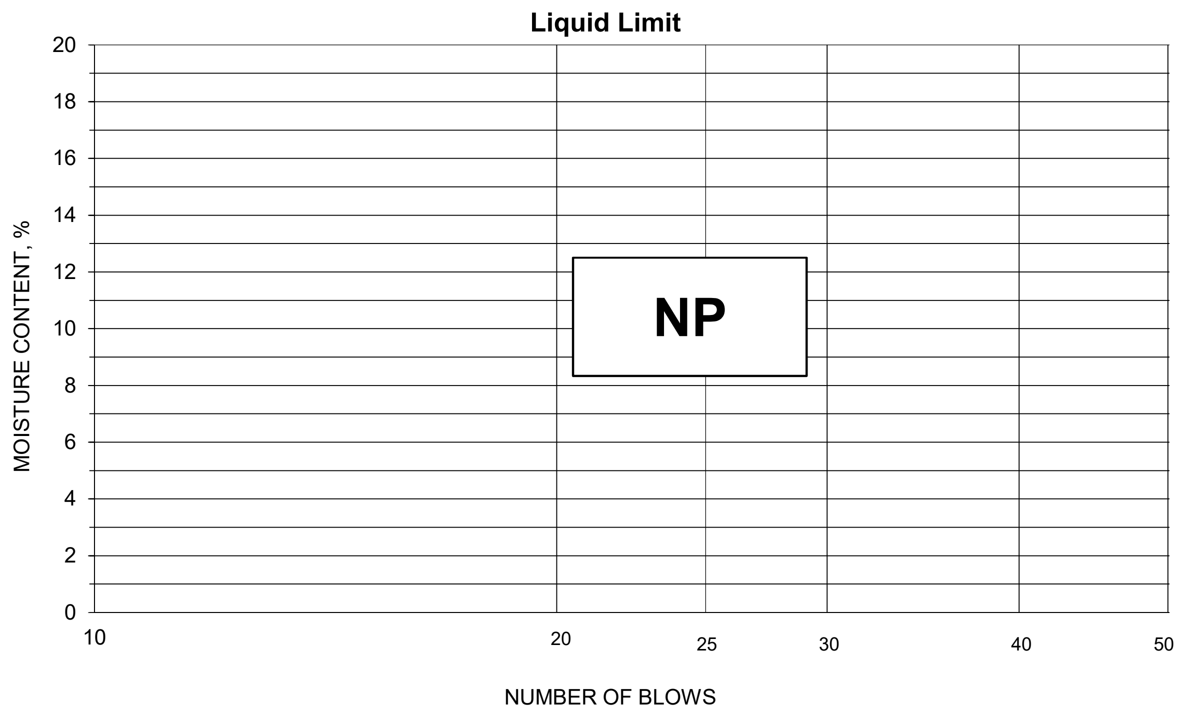
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-SS03G, 5.0'-6.5'	Lab ID	547
		% + No. 40	30
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B14-SS15G, 35.0'-36.5'	Lab ID	559
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 10.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.6
No. 4	4.75	96.8
No. 10	2	81.4
No. 40	0.425	47.4
No. 200	0.075	18.4
	0.02	4.6
	0.005	2.1
	0.002	1.4
estimated	0.001	1.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	3.2	18.6
Coarse Sand	15.4	34.0
Medium Sand	34.0	---
Fine Sand	29.0	29.0
Silt	16.3	17.0
Clay	2.1	1.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.49

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B14-SS15G, 35.0'-36.5'

Project Number: 175568209
Lab ID: 559

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 06-07-2019
Date Received: 05-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.6
No. 4	96.8
No. 10	81.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.49

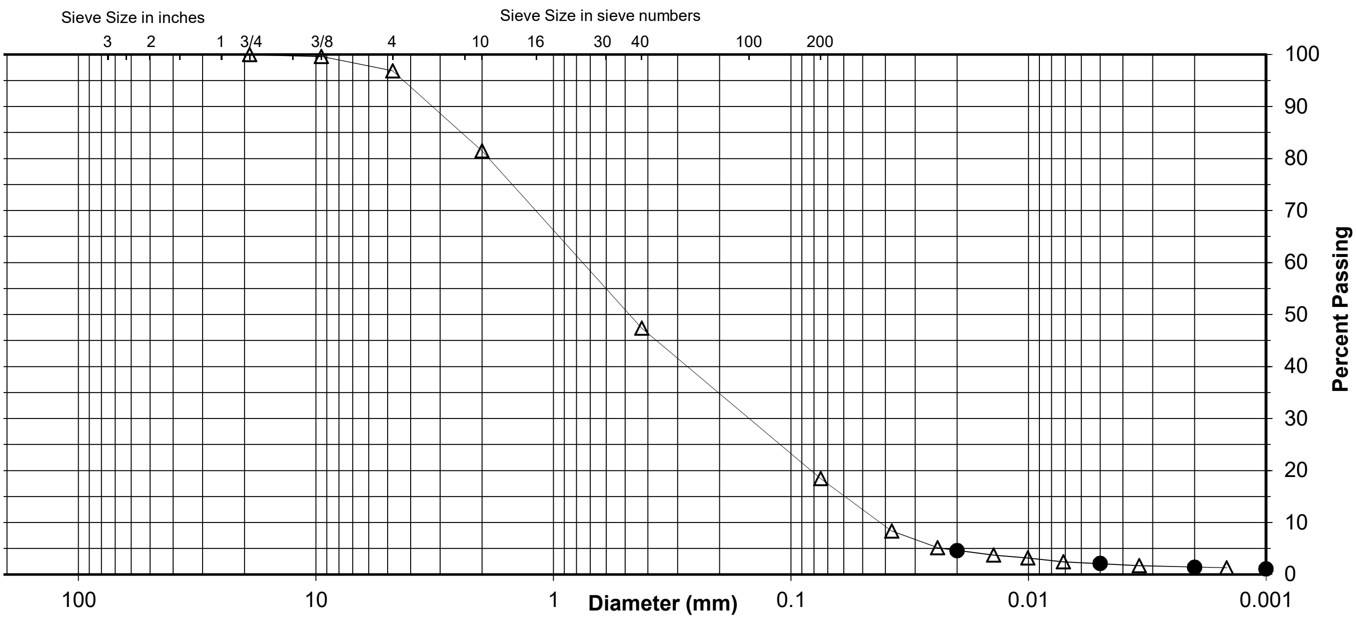
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	47.4
No. 200	18.4
0.02 mm	4.6
0.005 mm	2.1
0.002 mm	1.4
0.001 mm	1.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	3.2	15.4	34.0	29.0	16.3	2.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	18.6	34.0	29.0	17.0	1.4



Comments ____

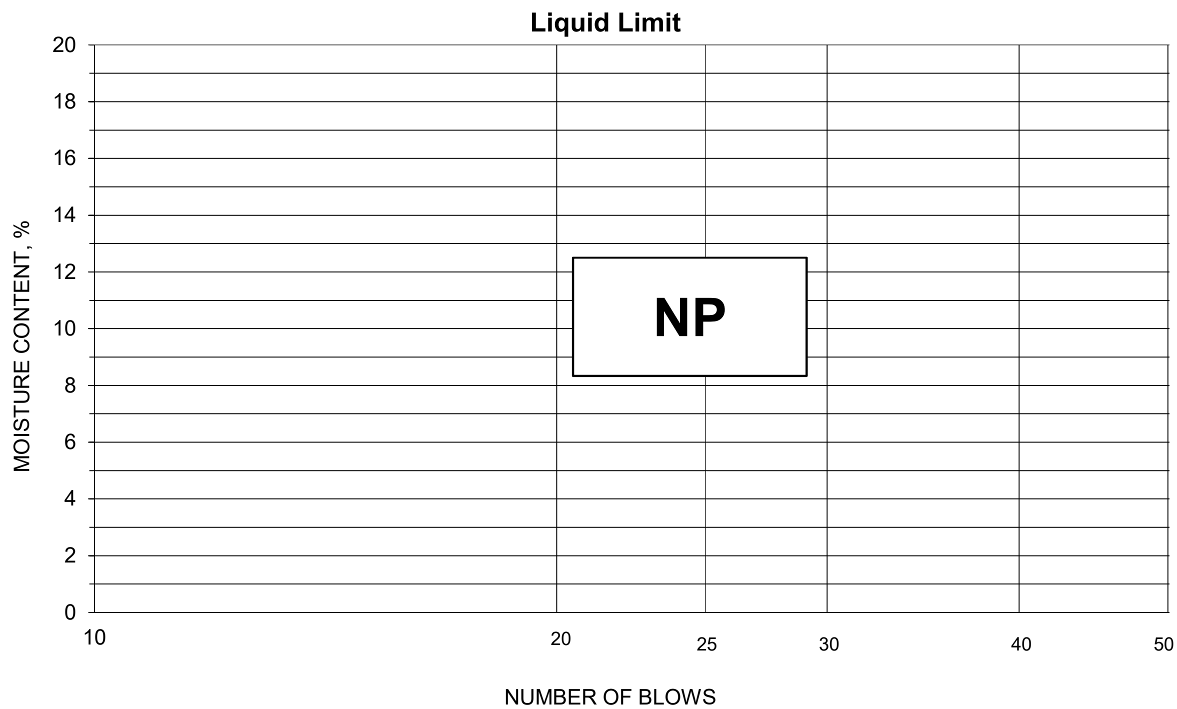
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-SS15G, 35.0'-36.5'	Lab ID	559
		% + No. 40	53
Tested By	DB	Test Method ASTM D 4318 Method A	Date Received 05-28-2019
Test Date	06-07-2019	Prepared Dry	

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B14-ST02G, 46.2'-46.6'
Lab ID: 563

Sample Type: ST
Date Received: 5-28-19
Date Reported: 8-6-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	60.3
No. 200	0.075	44.9
	0.02	18.7
	0.005	6.0
	0.002	2.8
estimated	0.001	1.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	39.7
Medium Sand	39.7	---
Fine Sand	15.4	15.4
Silt	38.9	42.1
Clay	6.0	2.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.59

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B14-ST02G, 46.2'-46.6'	Lab ID	563

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: KWS
Test Date: 06-14-2019
Date Received: 05-28-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.59

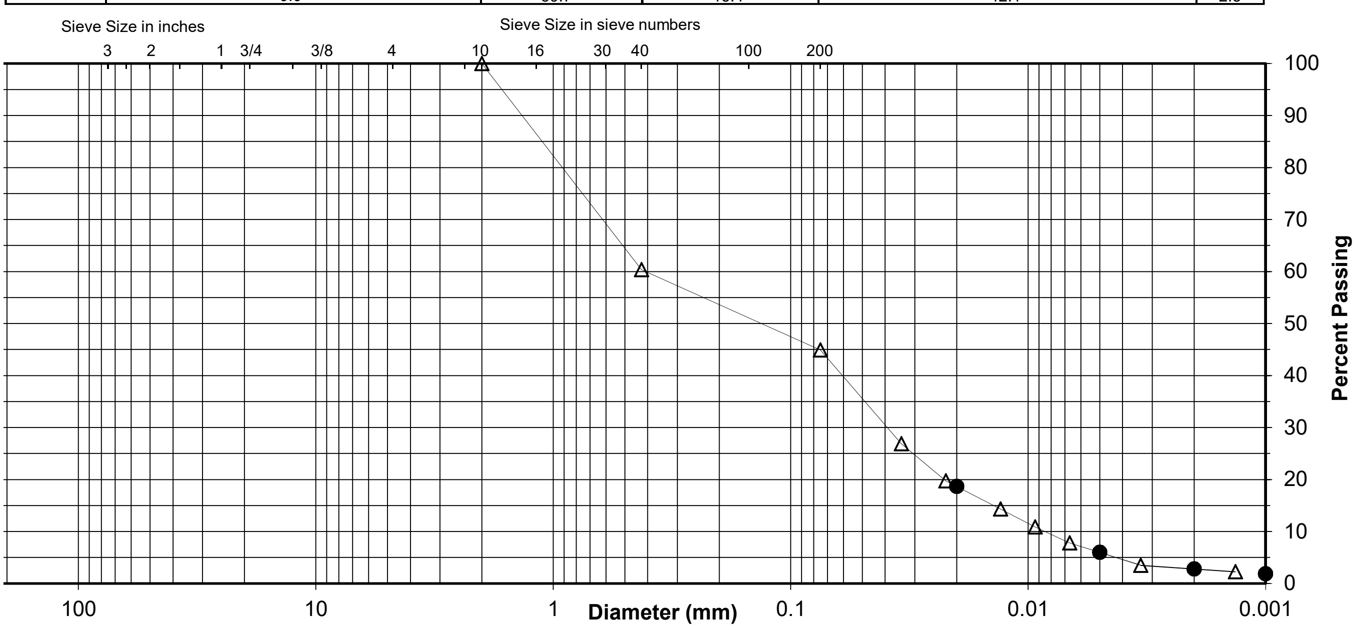
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	60.3
No. 200	44.9
0.02 mm	18.7
0.005 mm	6.0
0.002 mm	2.8
0.001 mm	1.9

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	39.7	15.4	38.9	6.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	39.7	15.4	42.1	2.8



Comments ____________________

Reviewed By RJ

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Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

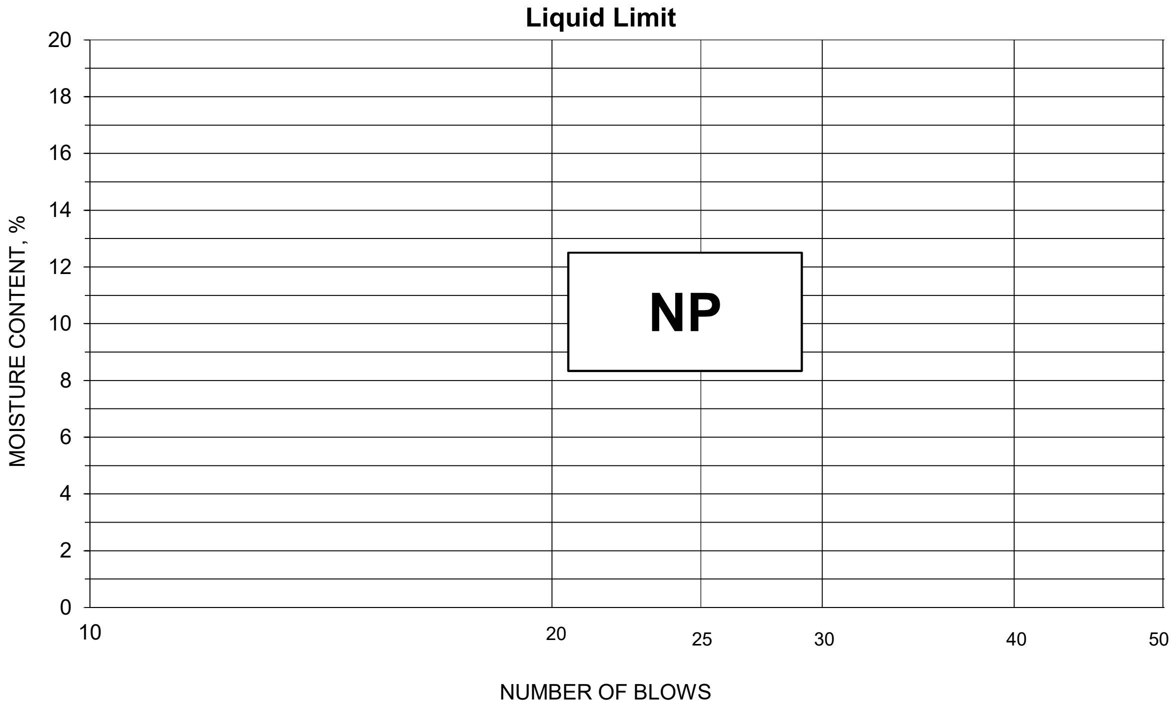
Reported By: RJ
Report Date: 08/06/2019

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-ST02G, 46.2'-46.6'	Lab ID	563
		% + No. 40	40
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-18-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B14-SS19G, 47.5'-49.0'	Lab ID	564
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.7
No. 4	4.75	98.7
No. 10	2	93.1
No. 40	0.425	67.4
No. 200	0.075	50.7
	0.02	24.1
	0.005	8.0
	0.002	4.1
estimated	0.001	2.4

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.3	6.9
Coarse Sand	5.6	25.7
Medium Sand	25.7	---
Fine Sand	16.7	16.7
Silt	42.7	46.6
Clay	8.0	4.1

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.41

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B14-SS19G, 47.5'-49.0'	Lab ID	564

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	HE
Test Date	06-07-2019
Date Received	05-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.7
No. 4	98.7
No. 10	93.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.41

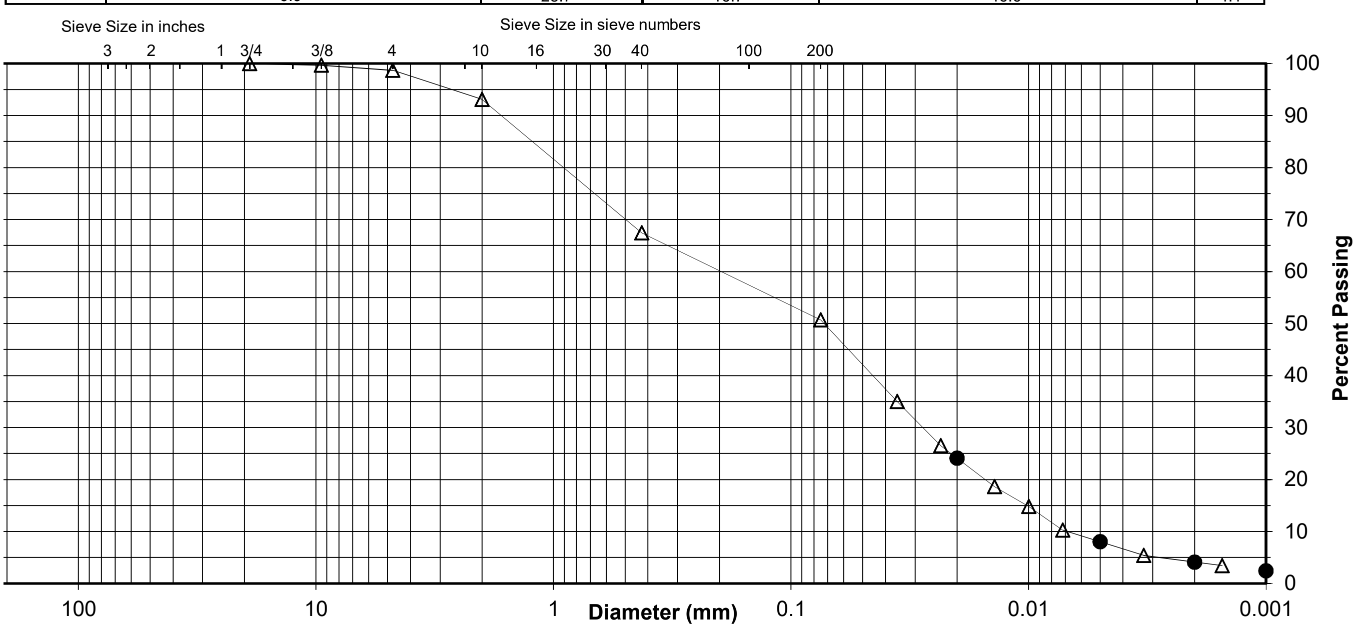
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	67.4
No. 200	50.7
0.02 mm	24.1
0.005 mm	8.0
0.002 mm	4.1
0.001 mm	2.4

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	1.3	5.6	25.7	16.7	42.7	8.0

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	6.9	25.7	16.7	46.6	4.1



Comments ______

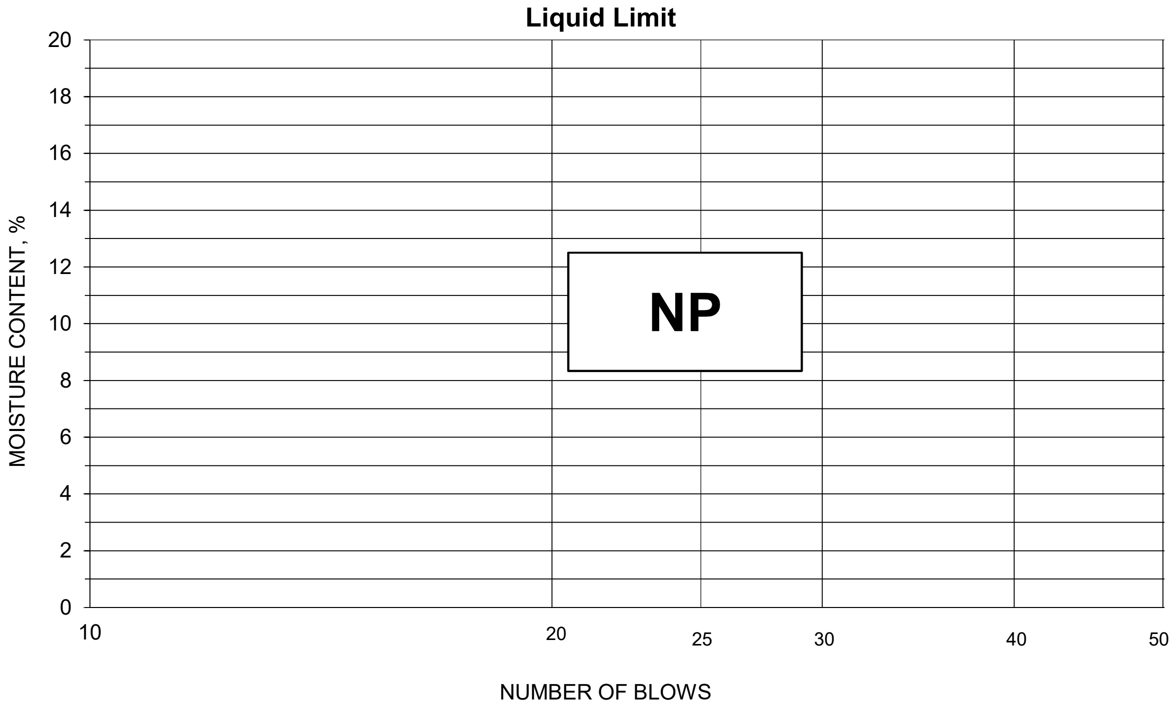
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-SS19G, 47.5'-49.0'	Lab ID	564
		% + No. 40	33
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B14-ST03G, 61.2'-61.6'	Lab ID	569
Sample Type	ST	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Not Performed

Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	95.2
No. 40	0.425	94.7
No. 200	0.075	92.4
	0.02	69.3
	0.005	23.7
	0.002	7.4
estimated	0.001	0.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	4.8
Coarse Sand	4.8	0.5
Medium Sand	0.5	---
Fine Sand	2.3	2.3
Silt	68.7	85.0
Clay	23.7	7.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: In Situ
Specific Gravity at 20° Celsius: 2.41

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order | Project Number: 175568209
Source: CUF-GT-B14-ST03G, 61.2'-61.6' | Lab ID: 569

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: KWS
Test Date: 06-14-2019
Date Received: 05-28-2019

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	95.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.41

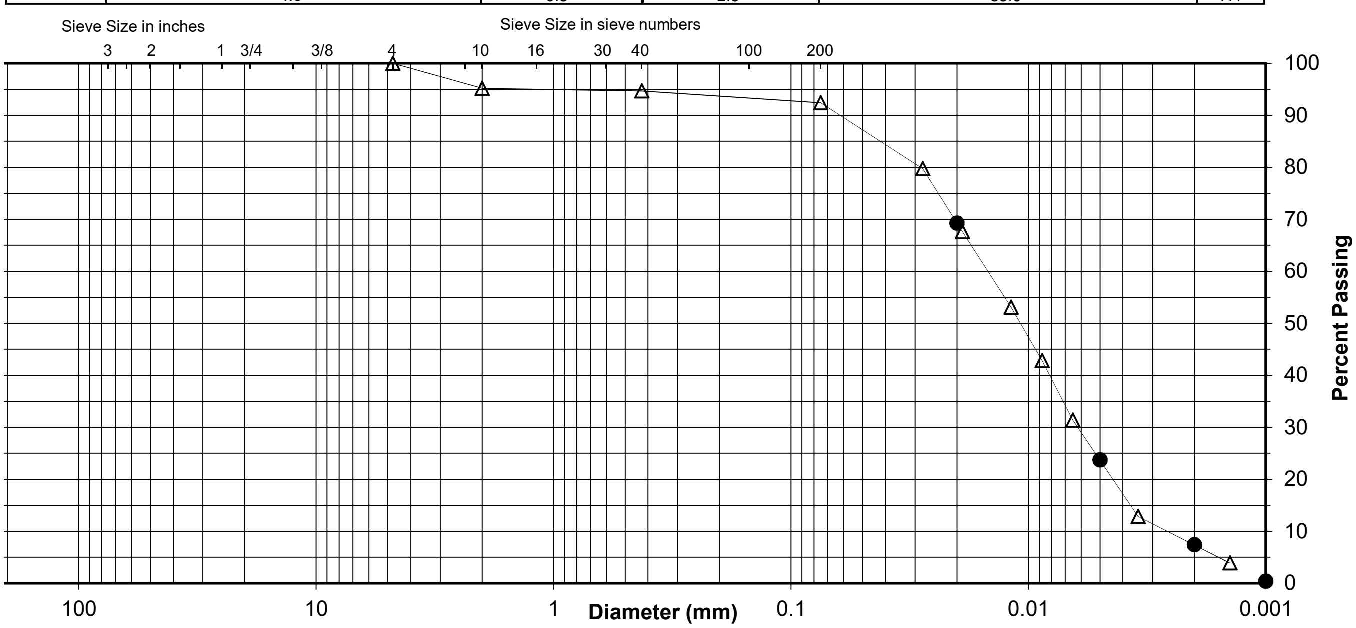
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	94.7
No. 200	92.4
0.02 mm	69.3
0.005 mm	23.7
0.002 mm	7.4
0.001 mm	0.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	4.8	0.5	2.3	68.7	23.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	4.8	0.5	2.3	85.0	7.4



Comments ______

Reviewed By: RJ

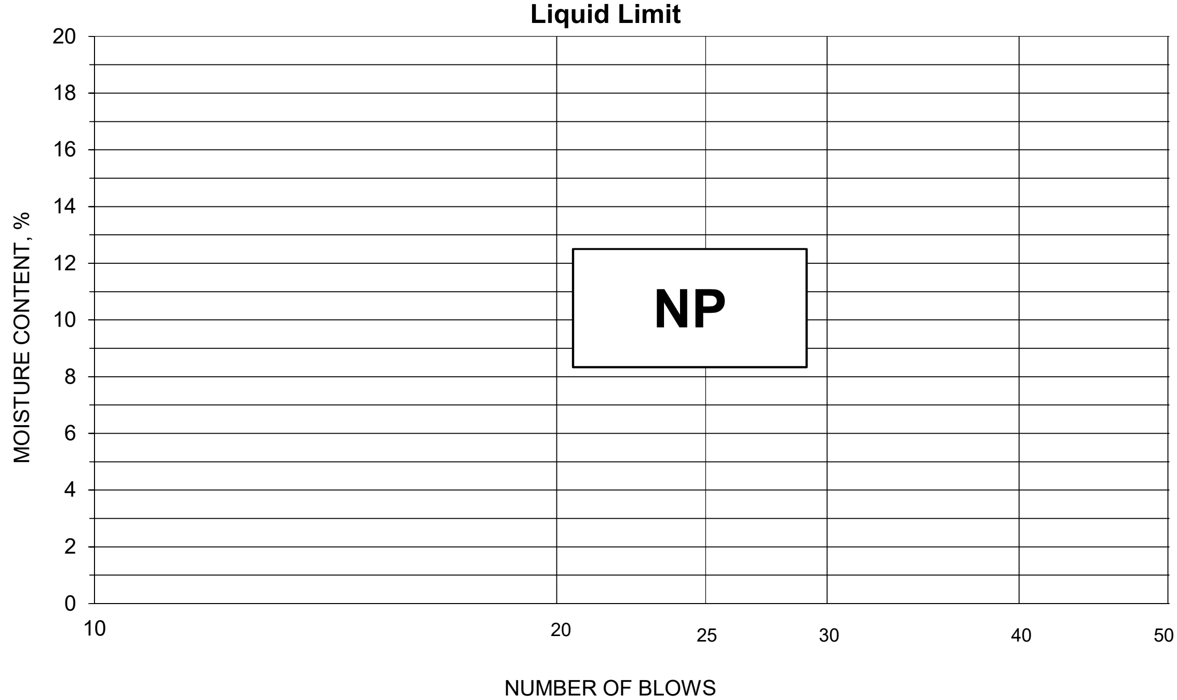
Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-ST03G, 61.2'-61.6'	Lab ID	569
		% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-18-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit

Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B14-SS26G, 67.5'-69.0' & CUF-GT-B14-SS27G, 70.0'-71.5'
Lab ID: 572

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-08-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	97.8
3/8"	94.8
No. 4	85.0
No. 10	64.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.64

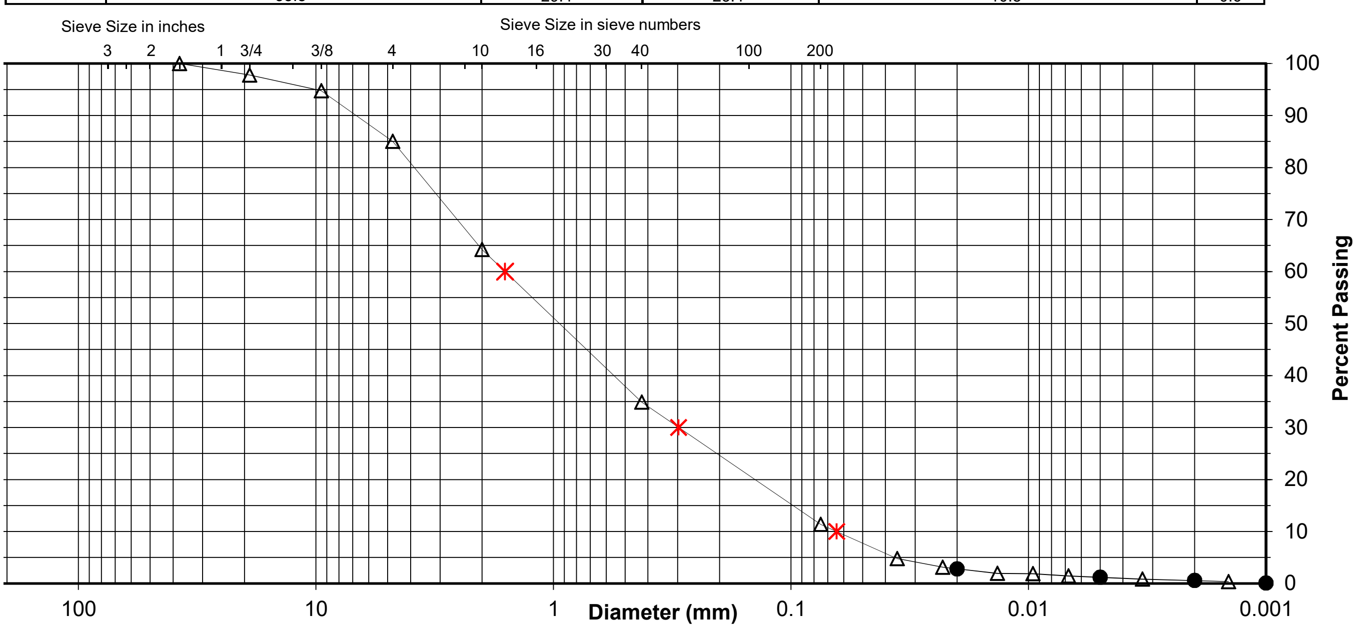
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	34.8
No. 200	11.4
0.02 mm	2.8
0.005 mm	1.2
0.002 mm	0.6
0.001 mm	0.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	2.2	12.8	20.8	29.4	23.4	10.2	1.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	35.8	29.4	23.4	10.8	0.6



Comments

Reviewed By: RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B14-ST04G, 80.9'-81.2'
Lab ID: 578

Sample Type: ST
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content
Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	91.9
3/8"	9.5	86.2
No. 4	4.75	80.9
No. 10	2	67.2
No. 40	0.425	61.1
No. 200	0.075	55.9
	0.02	45.1
	0.005	37.0
	0.002	31.9
estimated	0.001	28.7

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	19.1	32.8
Coarse Sand	13.7	6.1
Medium Sand	6.1	---
Fine Sand	5.2	5.2
Silt	18.9	24.0
Clay	37.0	31.9

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 49
Plastic Limit: 16
Plasticity Index: 33
Activity Index: 1.0

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: CL
Group Name: Sandy lean clay with gravel

AASHTO Classification: A-7-6 (15)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B14-ST04G, 80.9'-81.2'
Lab ID: 578

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: KWS
Test Date: 06-14-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	91.9
3/8"	86.2
No. 4	80.9
No. 10	67.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

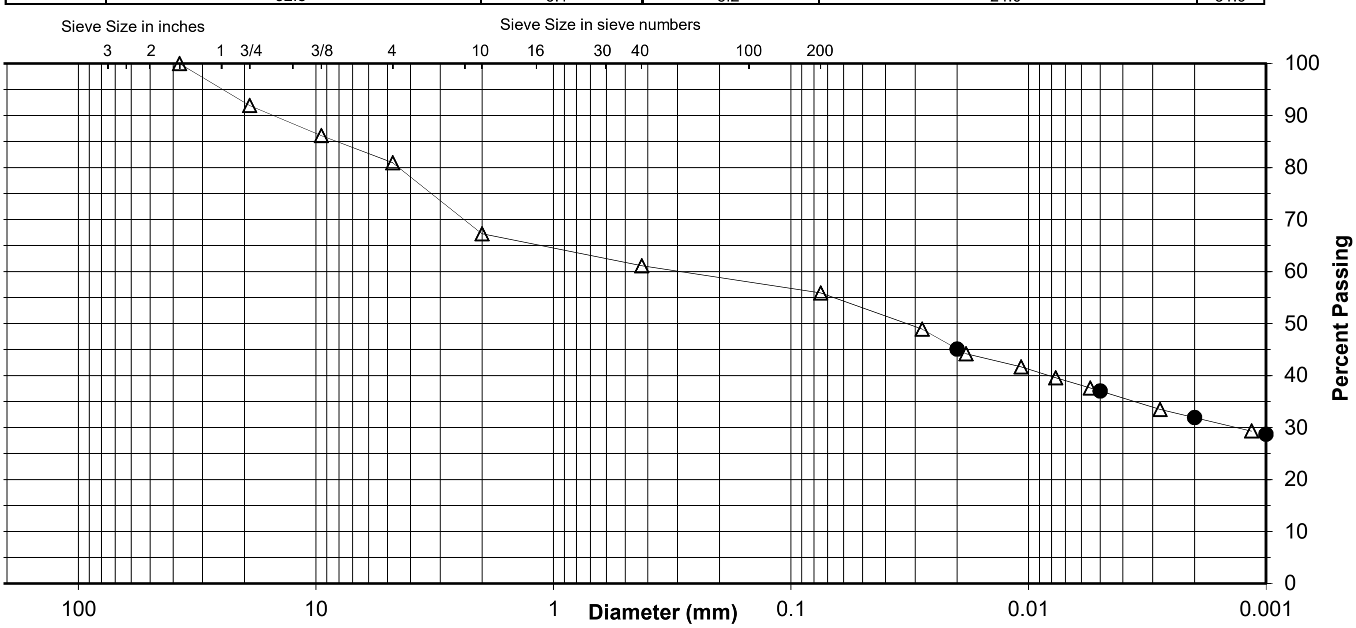
Specific Gravity: 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	61.1
No. 200	55.9
0.02 mm	45.1
0.005 mm	37.0
0.002 mm	31.9
0.001 mm	28.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	8.1	11.0	13.7	6.1	5.2	18.9	37.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	32.8			6.1	5.2	24.0	31.9



Comments ______

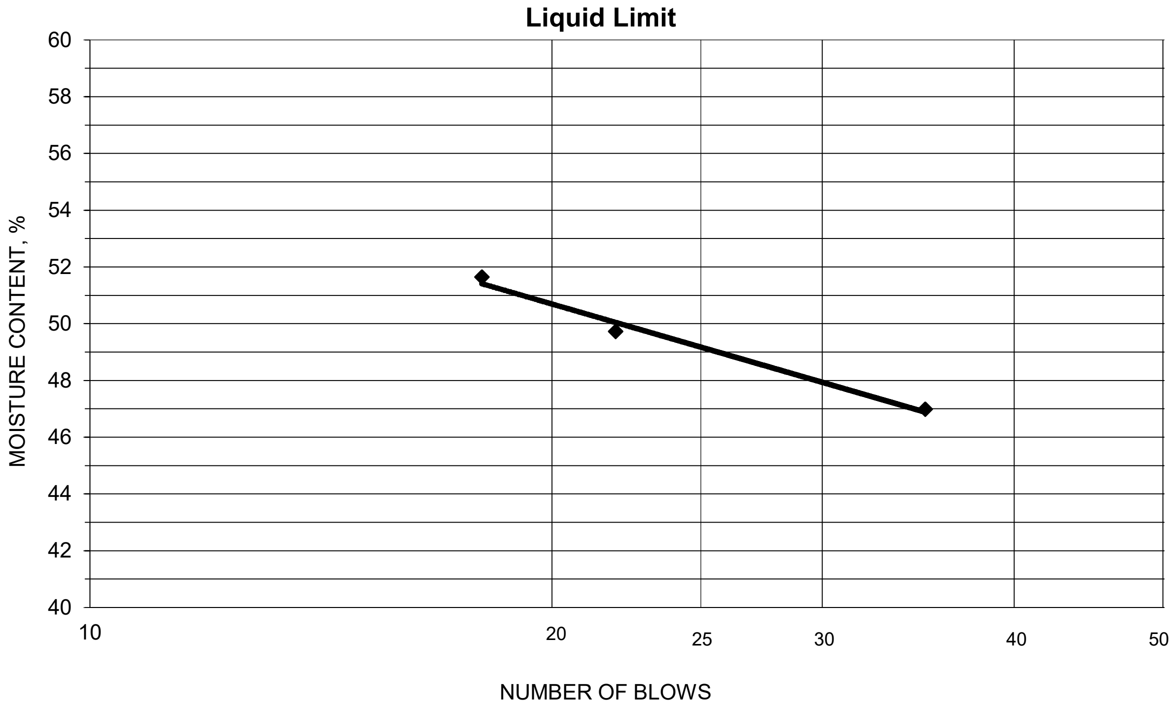
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-ST04G, 80.9'-81.2'	Lab ID	578
		% + No. 40	39
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-18-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.03	16.46	10.99	35	47.0	
19.20	16.53	11.16	22	49.7	
18.84	16.16	10.97	18	51.6	49



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.37	16.46	11.12	17.0	16	33
17.48	16.62	11.14	15.7		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B14-SS31G, 82.5'-84.0'	Lab ID	579
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 19.7

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 36
Plastic Limit: 16
Plasticity Index: 20
Activity Index: 1.3

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	90.1
3/8"	9.5	74.2
No. 4	4.75	64.6
No. 10	2	56.6
No. 40	0.425	47.1
No. 200	0.075	39.6
	0.02	27.6
	0.005	19.2
	0.002	15.7
estimated	0.001	13.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	35.4	43.4
Coarse Sand	8.0	9.5
Medium Sand	9.5	---
Fine Sand	7.5	7.5
Silt	20.4	23.9
Clay	19.2	15.7

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.72

Classification
Unified Group Symbol: GC
Group Name: Clayey gravel with sand

AASHTO Classification: A-6 (3)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B14-SS31G, 82.5'-84.0'
Lab ID: 579

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 06-07-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	90.1
3/8"	74.2
No. 4	64.6
No. 10	56.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.72

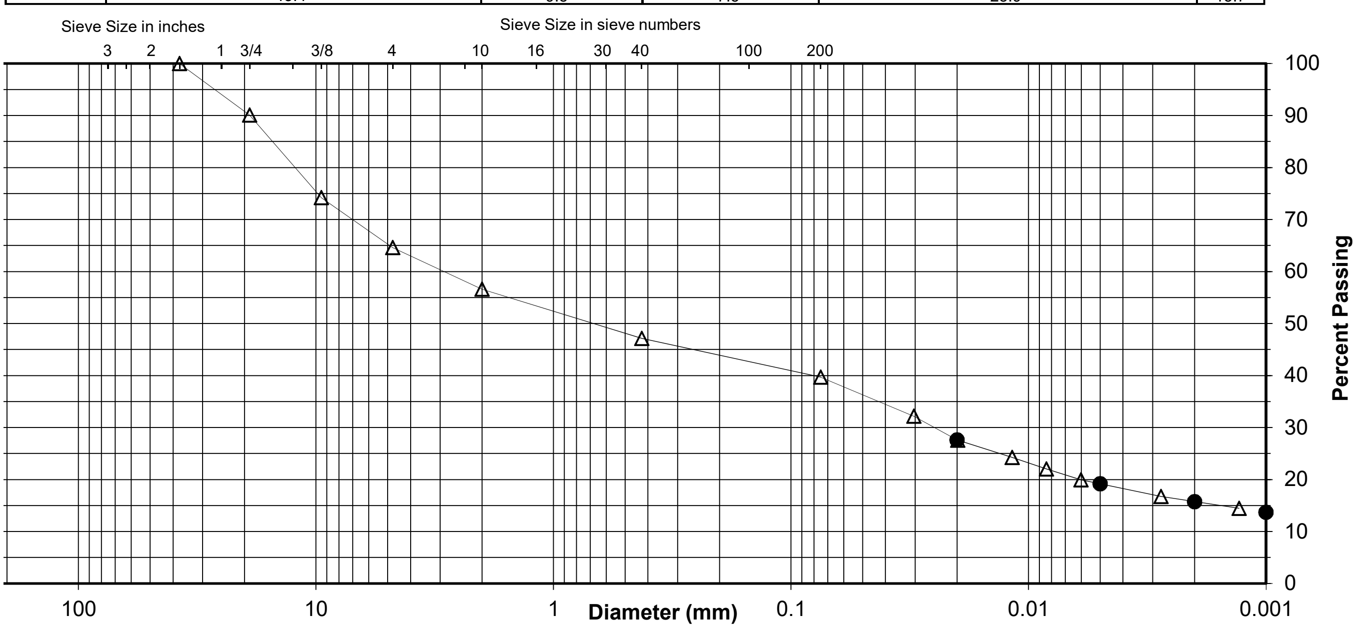
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	47.1
No. 200	39.6
0.02 mm	27.6
0.005 mm	19.2
0.002 mm	15.7
0.001 mm	13.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	9.9	25.5	8.0	9.5	7.5	20.4	19.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	43.4	9.5	7.5	23.9	15.7



Comments

Reviewed By RJ

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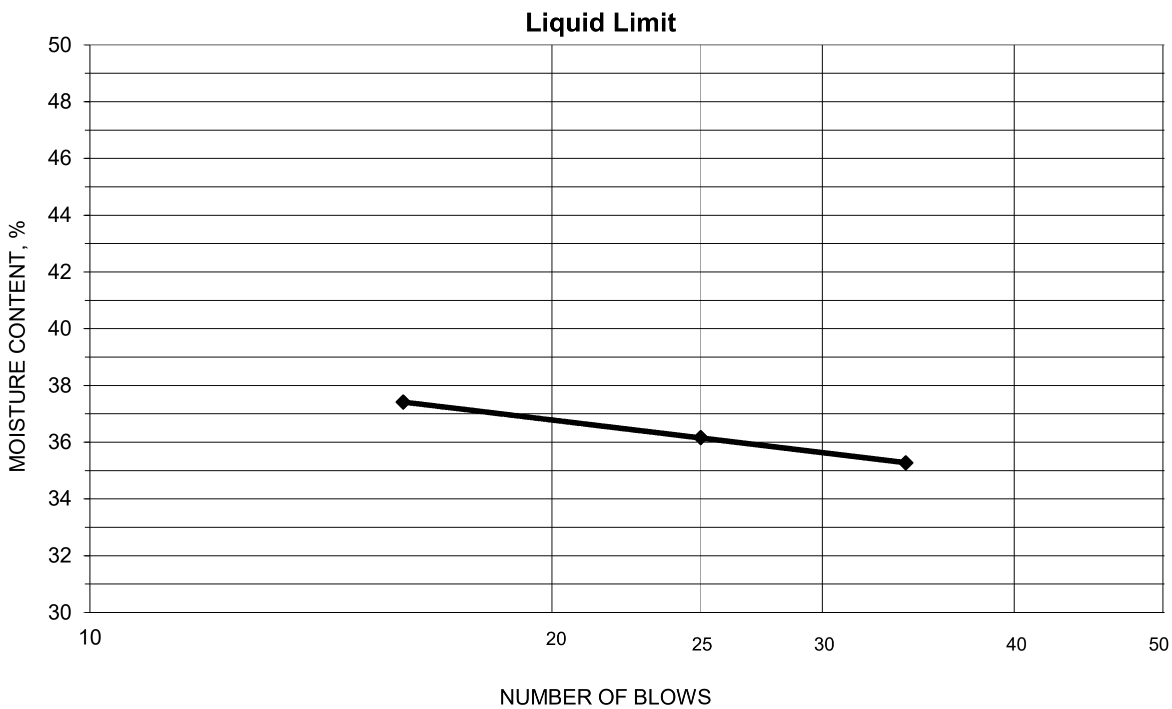
Reported By: RJ
Report Date: 07/26/2019

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-SS31G, 82.5'-84.0'	Lab ID	579
		% + No. 40	53
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.75	15.99	11.00	34	35.3	36
19.67	17.37	11.01	25	36.2	
19.17	17.09	11.53	16	37.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.04	17.16	11.61	15.9	16	20
17.92	17.05	11.48	15.6		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B14-SS36G, 97.5'-99.0'	Lab ID	584
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 17.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	70.8
3/8"	9.5	59.2
No. 4	4.75	51.5
No. 10	2	43.0
No. 40	0.425	32.2
No. 200	0.075	25.7
	0.02	17.1
	0.005	13.1
	0.002	10.4
estimated	0.001	8.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	48.5	57.0
Coarse Sand	8.5	10.8
Medium Sand	10.8	---
Fine Sand	6.5	6.5
Silt	12.6	15.3
Clay	13.1	10.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 35
Plastic Limit: 15
Plasticity Index: 20
Activity Index: 1.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.72

Classification

Unified Group Symbol: GC
Group Name: Clayey gravel with sand

AASHTO Classification: A-2-6 (1)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order — Project Number: 175568209
Source: CUF-GT-B14-SS36G, 97.5'-99.0' — Lab ID: 584

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: HE
Test Date: 06-07-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	70.8
3/8"	59.2
No. 4	51.5
No. 10	43.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.72

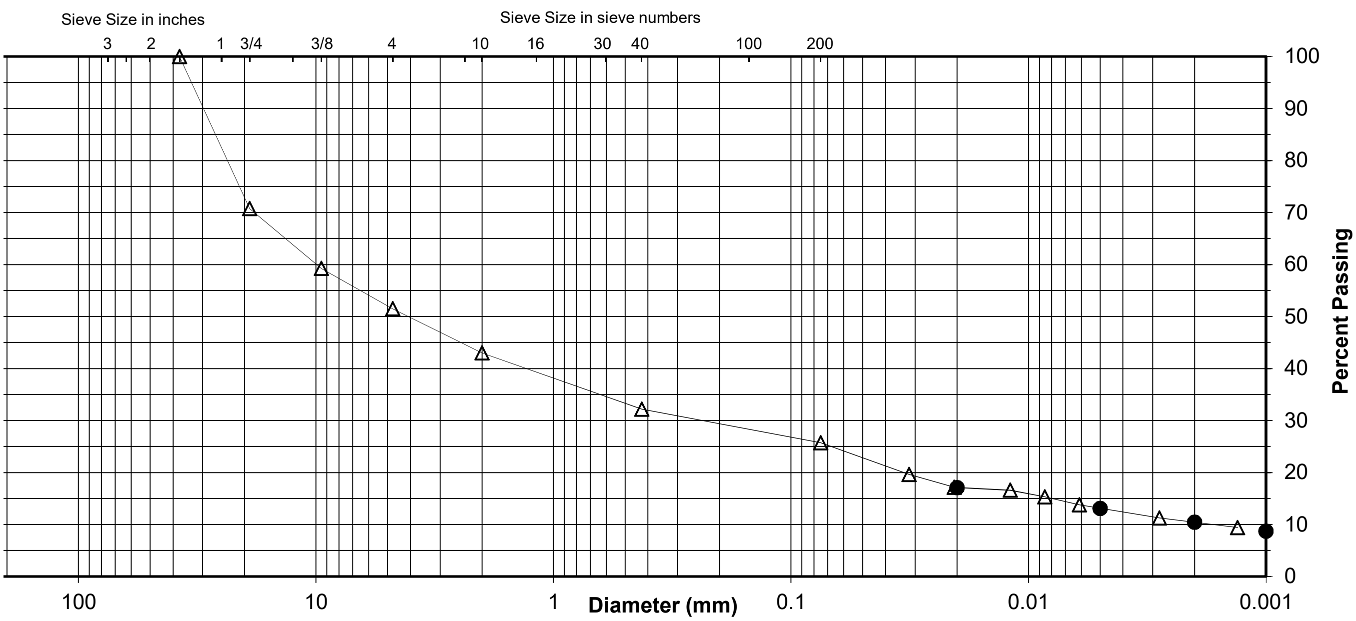
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	32.2
No. 200	25.7
0.02 mm	17.1
0.005 mm	13.1
0.002 mm	10.4
0.001 mm	8.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	29.2	19.3	8.5	10.8	6.5	12.6	13.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	57.0	10.8	6.5	15.3	10.4



Comments ______

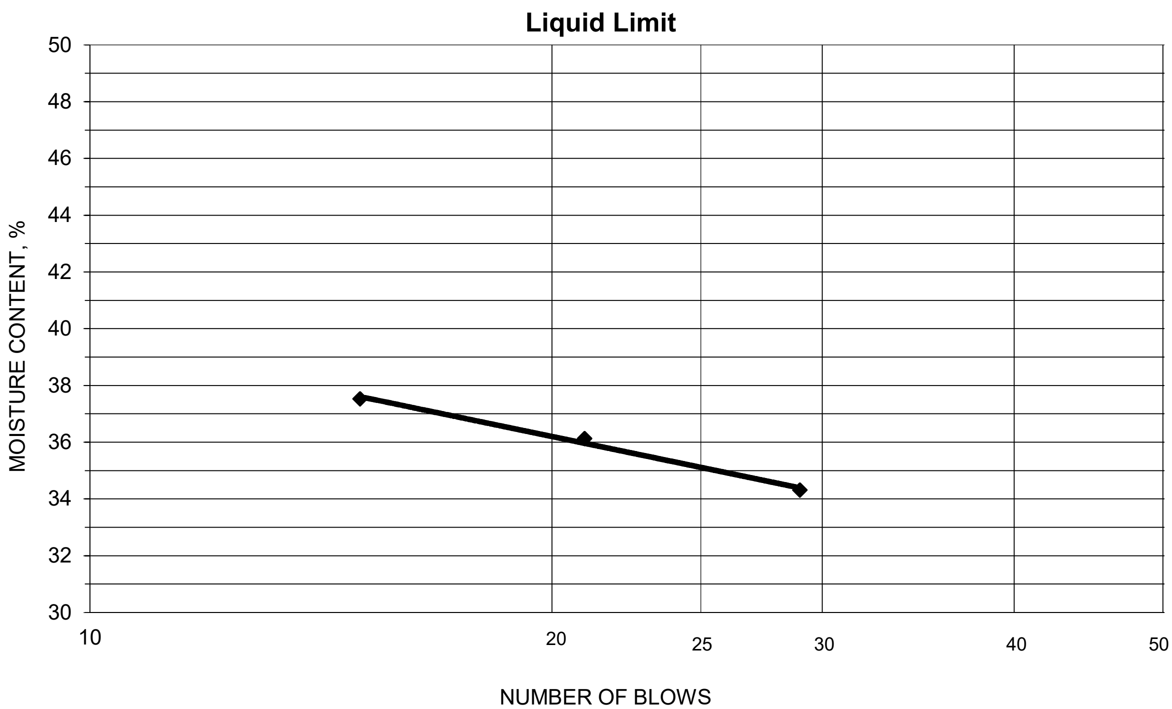
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-SS36G, 97.5'-99.0'	Lab ID	584
		% + No. 40	68
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-10-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.37	16.49	11.01	29	34.3	35
17.94	16.13	11.12	21	36.1	
18.37	16.34	10.93	15	37.5	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.04	16.27	11.10	14.9	15	20
17.42	16.55	10.95	15.5		

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B14-SS38G, 102.5'-104.0'
Lab ID: 587

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	91.1
No. 4	81.2
No. 10	65.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.62

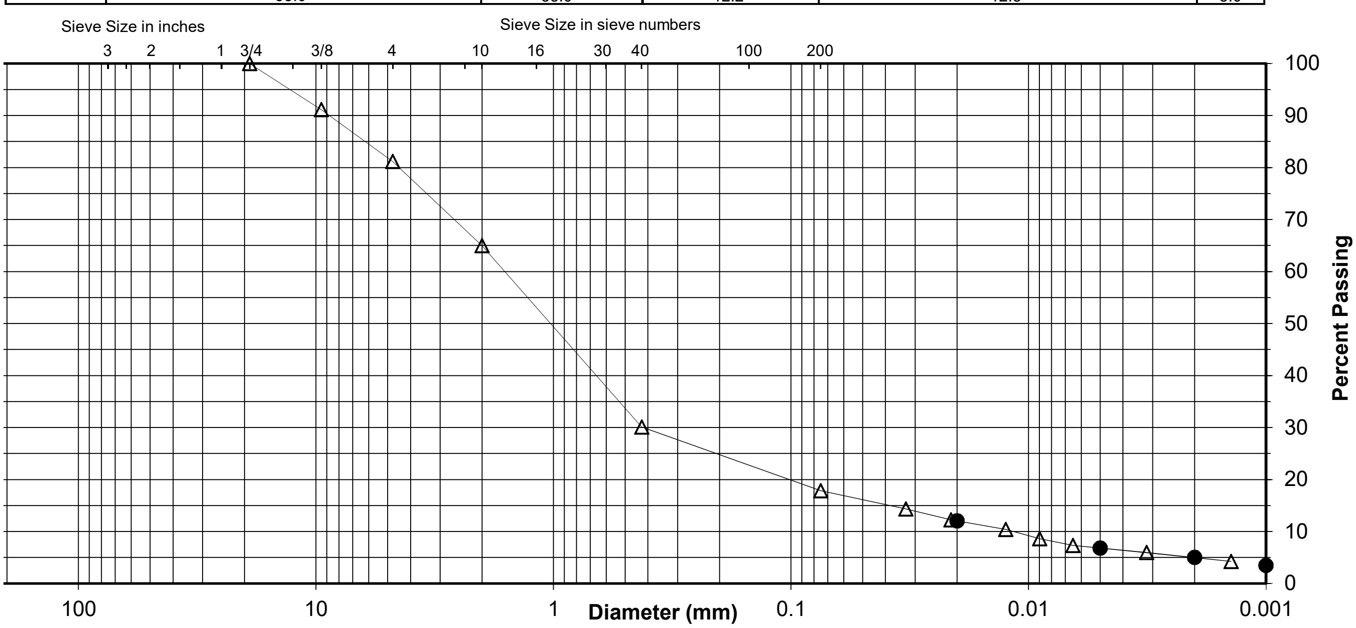
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	30.0
No. 200	17.8
0.02 mm	12.0
0.005 mm	6.8
0.002 mm	5.0
0.001 mm	3.5

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	18.8	16.2	35.0	12.2	11.0	6.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	35.0	35.0	12.2	12.8	5.0



Comments

Reviewed By: RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B14-SS42G, 112.5'-114.0'
Lab ID: 592
Sample Type: SS
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 17.0

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.9
3/8"	9.5	84.4
No. 4	4.75	75.9
No. 10	2	65.9
No. 40	0.425	53.4
No. 200	0.075	37.8
	0.02	23.9
	0.005	13.8
	0.002	10.2
estimated	0.001	8.3

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	24.1	34.1
Coarse Sand	10.0	12.5
Medium Sand	12.5	---
Fine Sand	15.6	15.6
Silt	24.0	27.6
Clay	13.8	10.2

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 27
Plastic Limit: 20
Plasticity Index: 7
Activity Index: 0.7

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.68

Classification
Unified Group Symbol: SC-SM
Group Name: Silty, clayey sand with gravel
AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B14-SS42G, 112.5'-114.0'	Lab ID	592

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-08-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.9
3/8"	84.4
No. 4	75.9
No. 10	65.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.68

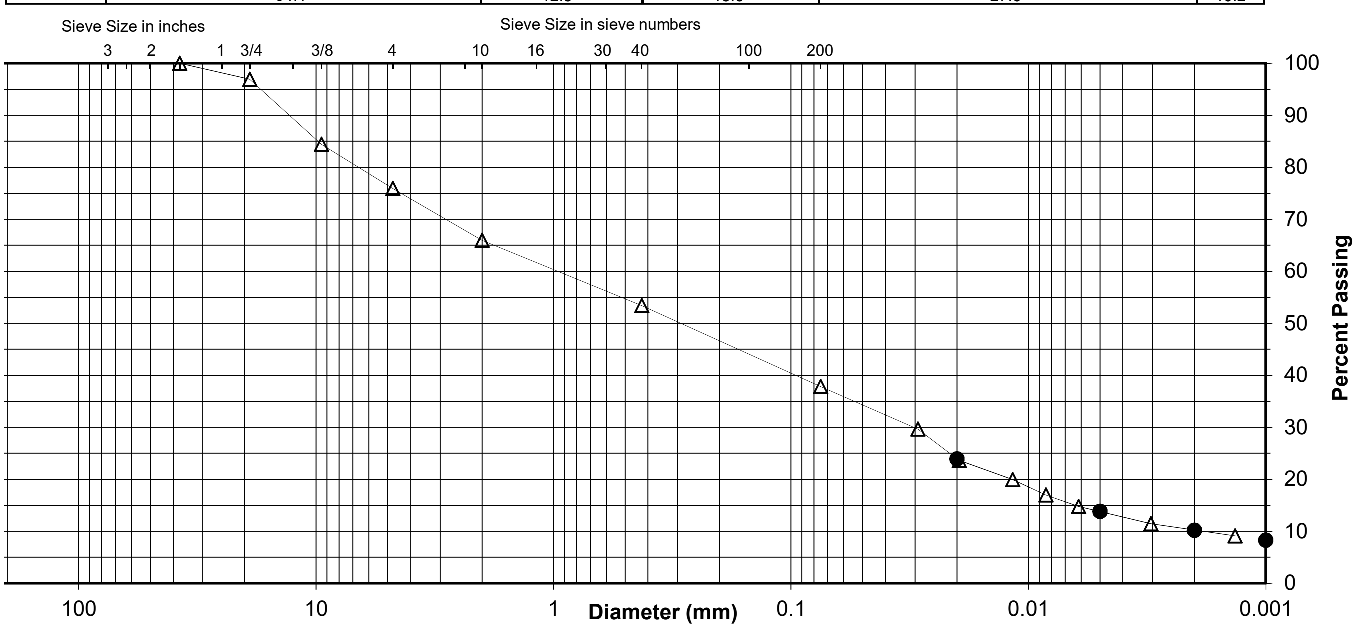
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	53.4
No. 200	37.8
0.02 mm	23.9
0.005 mm	13.8
0.002 mm	10.2
0.001 mm	8.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.1	21.0	10.0	12.5	15.6	24.0	13.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	34.1	12.5	15.6	27.6	10.2



Comments

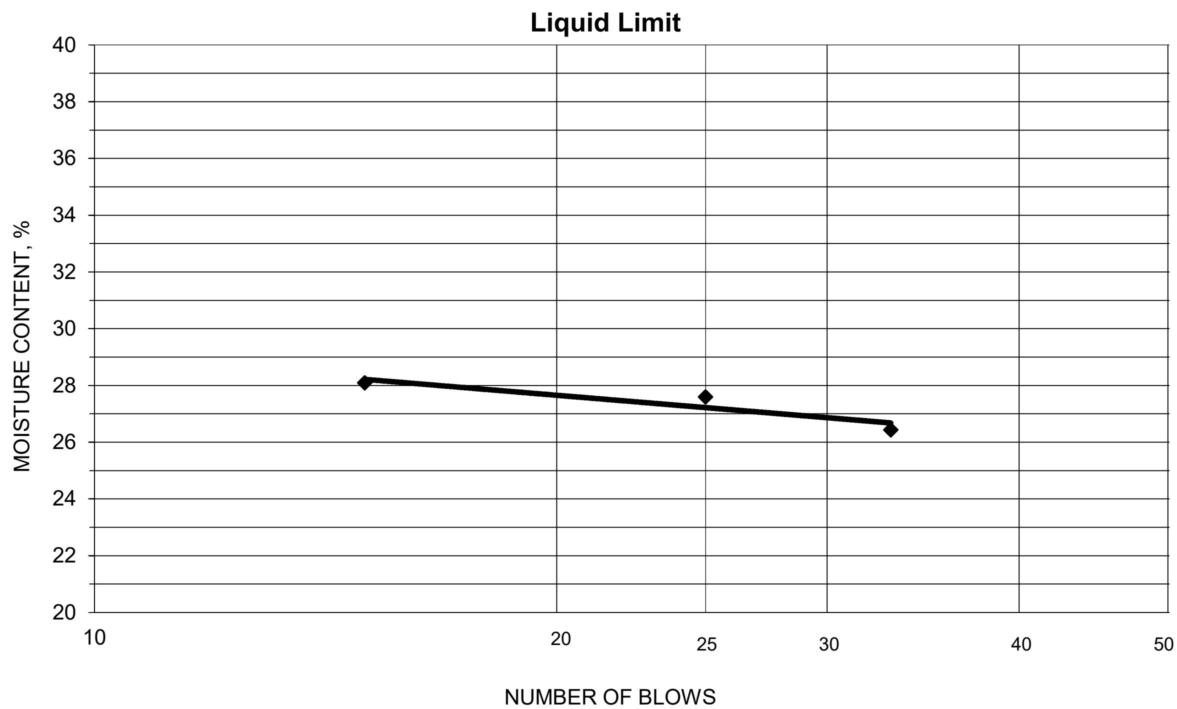
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-SS42G, 112.5'-114.0'	Lab ID	592
		% + No. 40	47
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.75	18.00	11.38	33	26.4	27
19.56	17.78	11.33	25	27.6	
18.30	16.66	10.82	15	28.1	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.60	16.60	11.47	19.5	20	7
17.61	16.61	11.50	19.6		

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-ST01, 15.0'-15.3'	Lab ID	604

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: KWS
Test Date: 06-14-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	98.8
3/8"	96.7
No. 4	92.3
No. 10	86.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.68

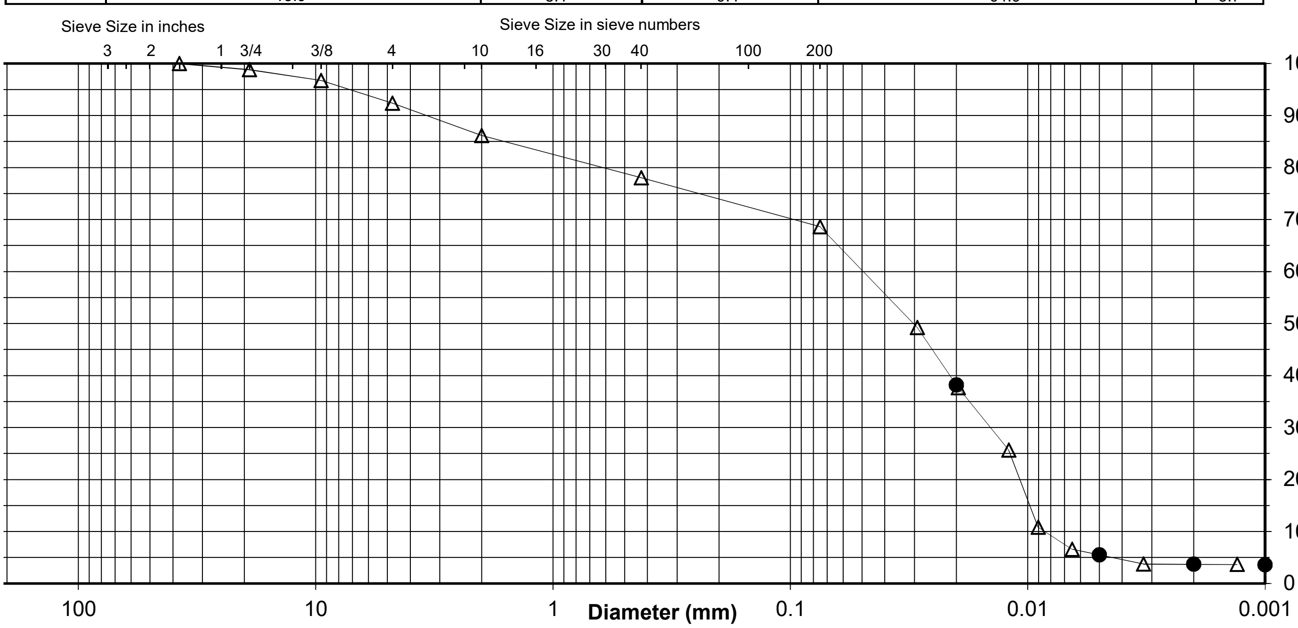
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	78.0
No. 200	68.6
0.02 mm	38.2
0.005 mm	5.5
0.002 mm	3.7
0.001 mm	3.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	1.2	6.5	6.2	8.1	9.4	63.1	5.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	13.9	8.1	9.4	64.9	3.7



Comments ______

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS14G, 35.0'-36.1'	Lab ID	612

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 06-08-2019
Date Received: 05-28-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.62

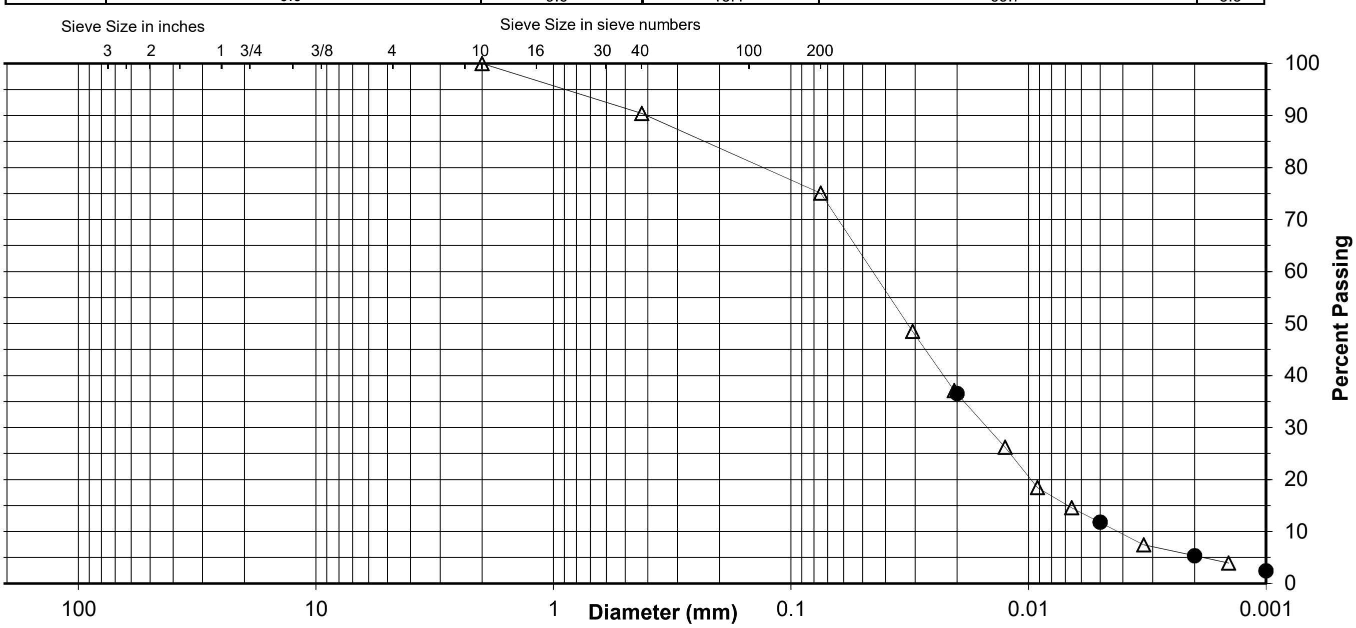
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	90.4
No. 200	75.0
0.02 mm	36.5
0.005 mm	11.8
0.002 mm	5.3
0.001 mm	2.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	9.6	15.4	63.2	11.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	9.6	15.4	69.7	5.3



Comments ______

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS20G, 50.0'-51.5'	Lab ID	618

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	95.1
3/8"	85.9
No. 4	74.8
No. 10	57.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.65

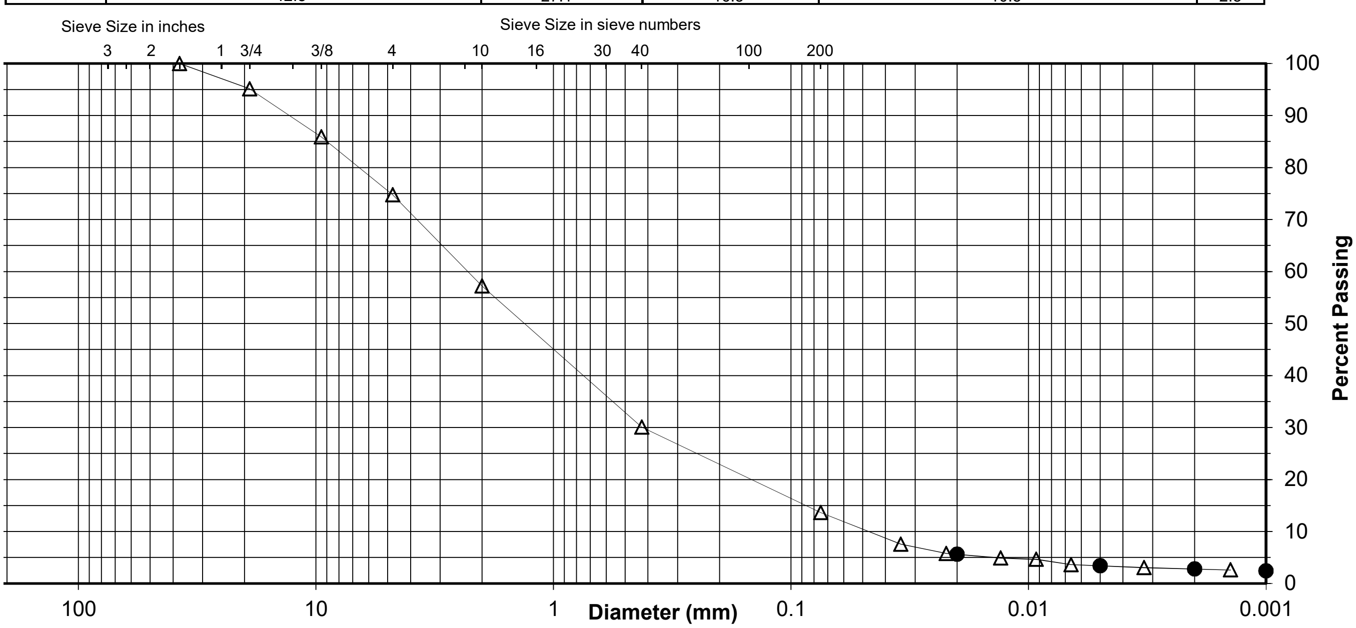
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	30.1
No. 200	13.6
0.02 mm	5.6
0.005 mm	3.4
0.002 mm	2.8
0.001 mm	2.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	4.9	20.3	17.6	27.1	16.5	10.2	3.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	42.8	27.1	16.5	10.8	2.8



Comments ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS23G, 57.5'-59.0'	Lab ID	622
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 29.9

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.7
No. 200	0.075	96.9
	0.02	67.3
	0.005	26.8
	0.002	9.5
estimated	0.001	1.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.3
Medium Sand	0.3	---
Fine Sand	2.8	2.8
Silt	70.1	87.4
Clay	26.8	9.5

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.46

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS23G, 57.5'-59.0'	Lab ID	622

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.46

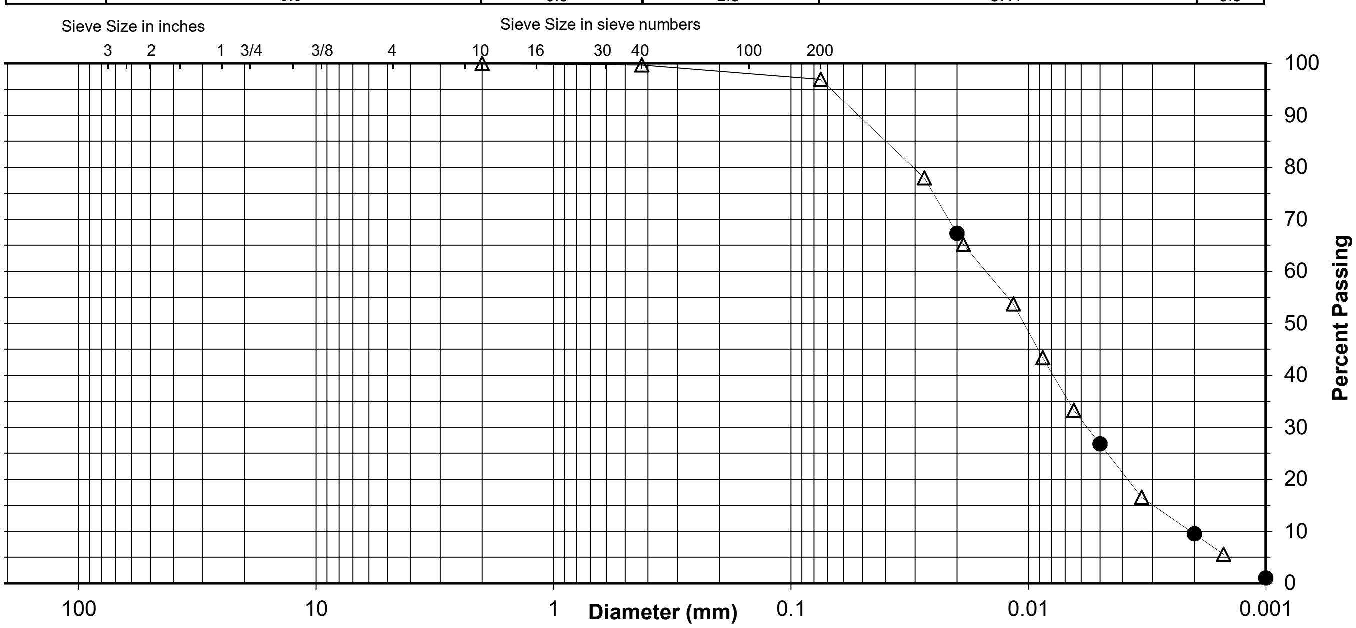
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	99.7
No. 200	96.9
0.02 mm	67.3
0.005 mm	26.8
0.002 mm	9.5
0.001 mm	1.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.3	2.8	70.1	26.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.3	2.8	87.4	9.5



Comments ______

Reviewed By RJ

Stantec

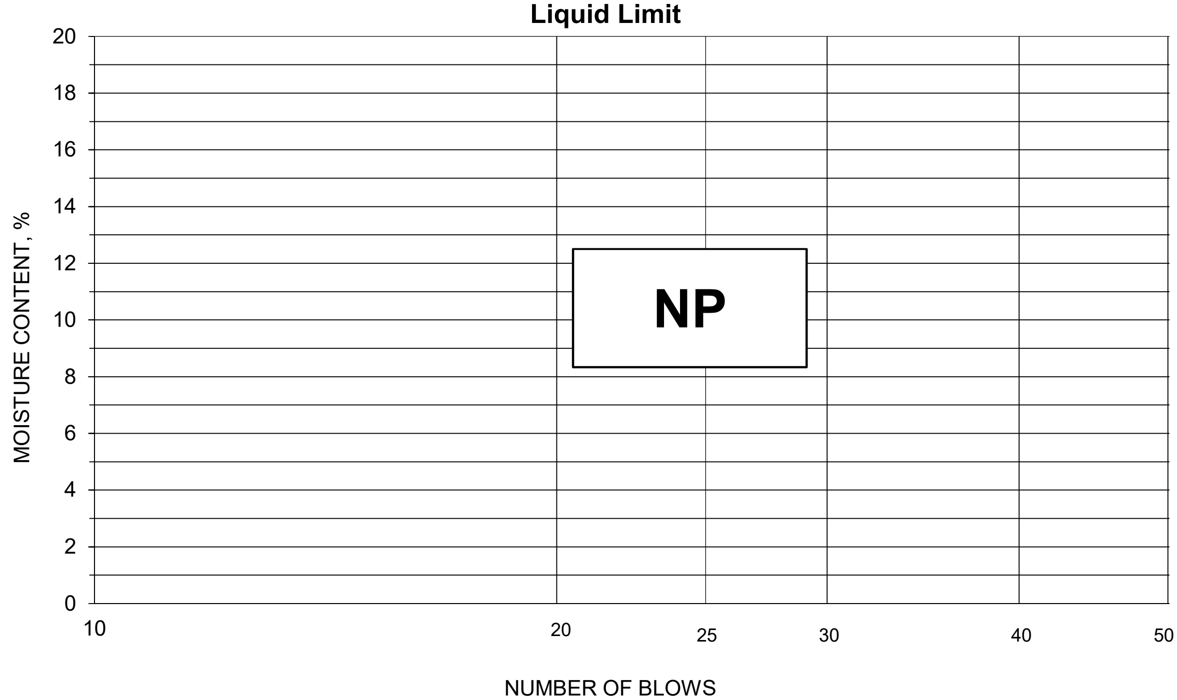
ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B15-SS23G, 57.5'-59.0'	Lab ID	622
		% + No. 40	0

Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	05-28-2019
Test Date	06-10-2019	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit

Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B15-ST02, 78.2'-78.5'
Lab ID: 630

Sample Type: ST
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.4
No. 200	0.075	77.7
	0.02	36.2
	0.005	12.7
	0.002	5.6
estimated	0.001	3.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.6
Medium Sand	0.6	---
Fine Sand	21.7	21.7
Silt	65.0	72.1
Clay	12.7	5.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.53

Classification

Unified Group Symbol: ML
Group Name: Silt with sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B15-ST02, 78.2'-78.5'

Project Number: 175568209
Lab ID: 630

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: KWS
Test Date: 06-14-2019
Date Received: 05-28-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.53

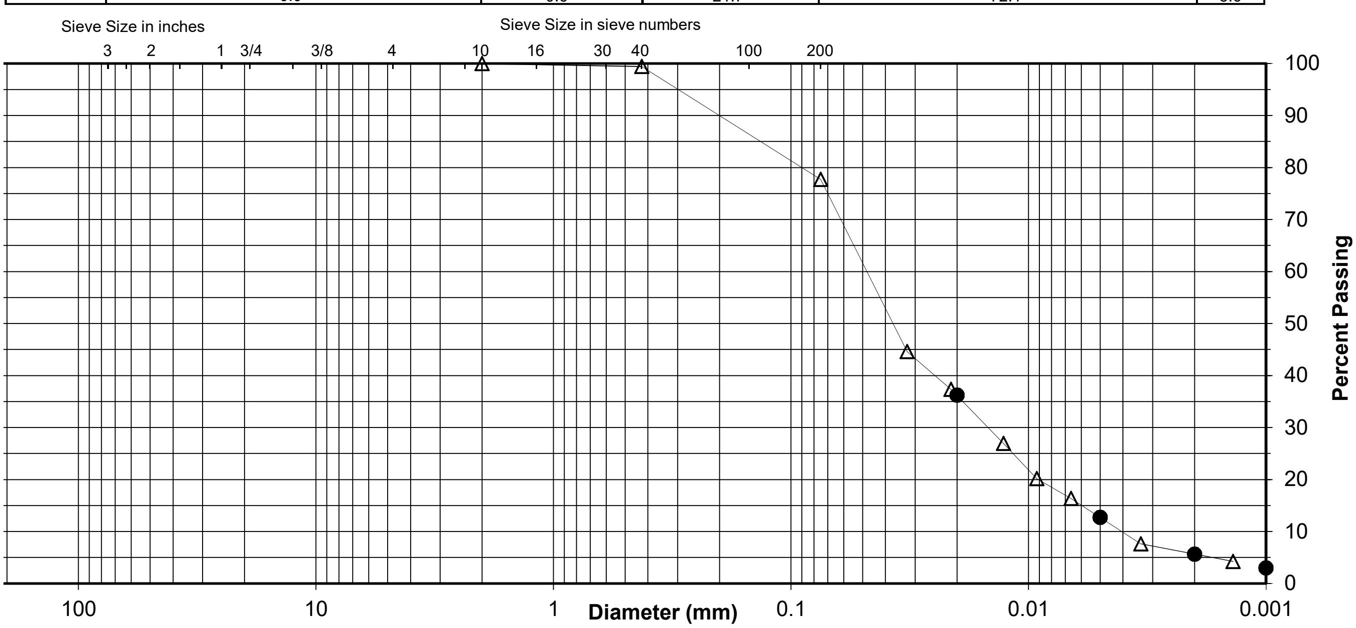
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.4
No. 200	77.7
0.02 mm	36.2
0.005 mm	12.7
0.002 mm	5.6
0.001 mm	3.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.6	21.7	65.0	12.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.6	21.7	72.1	5.6



Comments ______

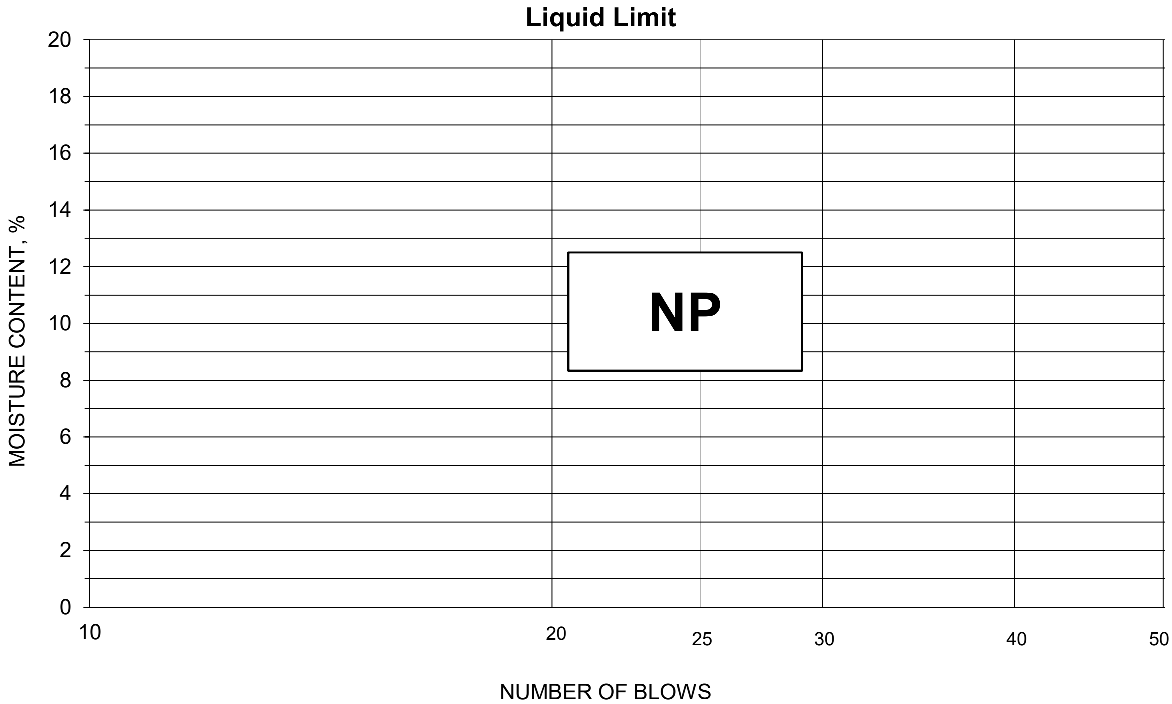
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B15-ST02, 78.2'-78.5'	Lab ID	630
		% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-18-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS37G, 95.0'-96.5'	Lab ID	637
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 53.7

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	88.3
	0.02	53.5
	0.005	18.1
	0.002	6.8
estimated	0.001	0.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	11.5	11.5
Silt	70.2	81.5
Clay	18.1	6.8

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.43

Classification
Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B15-SS37G, 95.0'-96.5'

Project Number: 175568209
Lab ID: 637

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.43

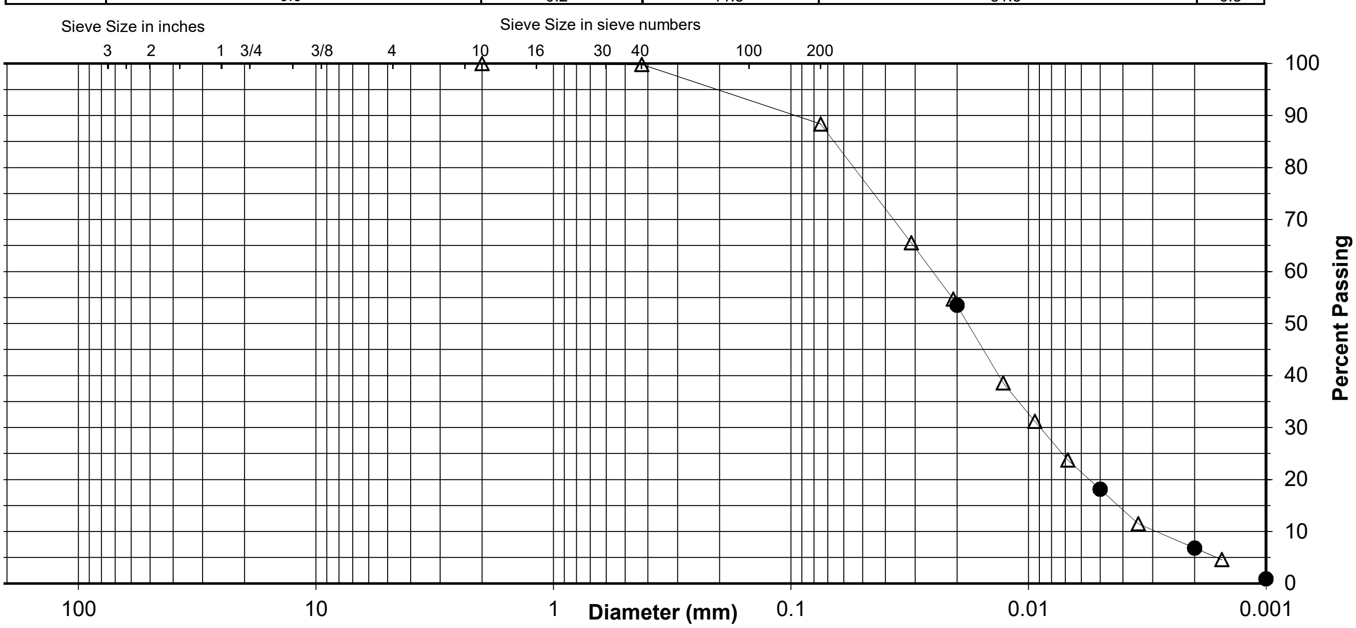
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	88.3
0.02 mm	53.5
0.005 mm	18.1
0.002 mm	6.8
0.001 mm	0.9

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.2	11.5	70.2	18.1

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.2	11.5	81.5	6.8



Comments

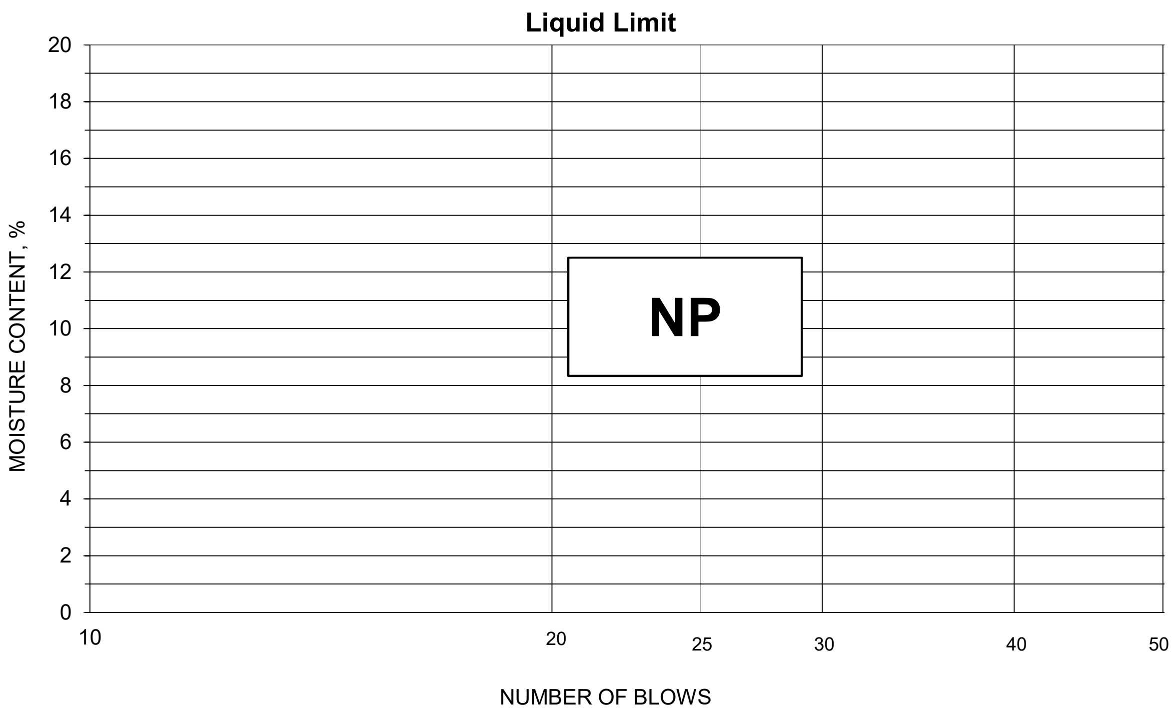
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B15-SS37G, 95.0'-96.5'	Lab ID	637
		% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS38G, 97.5'-99.0'	Lab ID	638
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 42.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	95.0
No. 200	0.075	64.9
	0.02	39.7
	0.005	19.4
	0.002	14.2
estimated	0.001	11.8

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	5.0
Medium Sand	5.0	---
Fine Sand	30.1	30.1
Silt	45.5	50.7
Clay	19.4	14.2

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: NP

Plastic Limit: NP

Plasticity Index: NP

Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.56

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS38G, 97.5'-99.0'	Lab ID	638

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.56

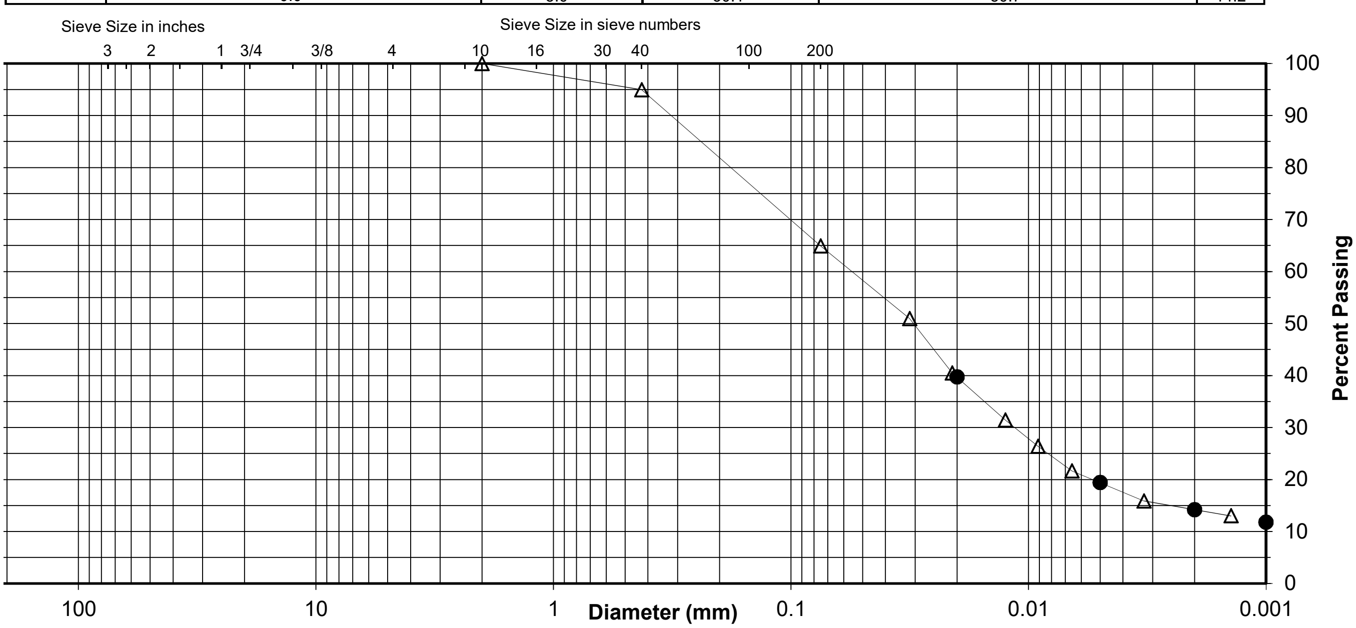
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	95.0
No. 200	64.9
0.02 mm	39.7
0.005 mm	19.4
0.002 mm	14.2
0.001 mm	11.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	5.0	30.1	45.5	19.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	5.0	30.1	50.7	14.2



Comments ______

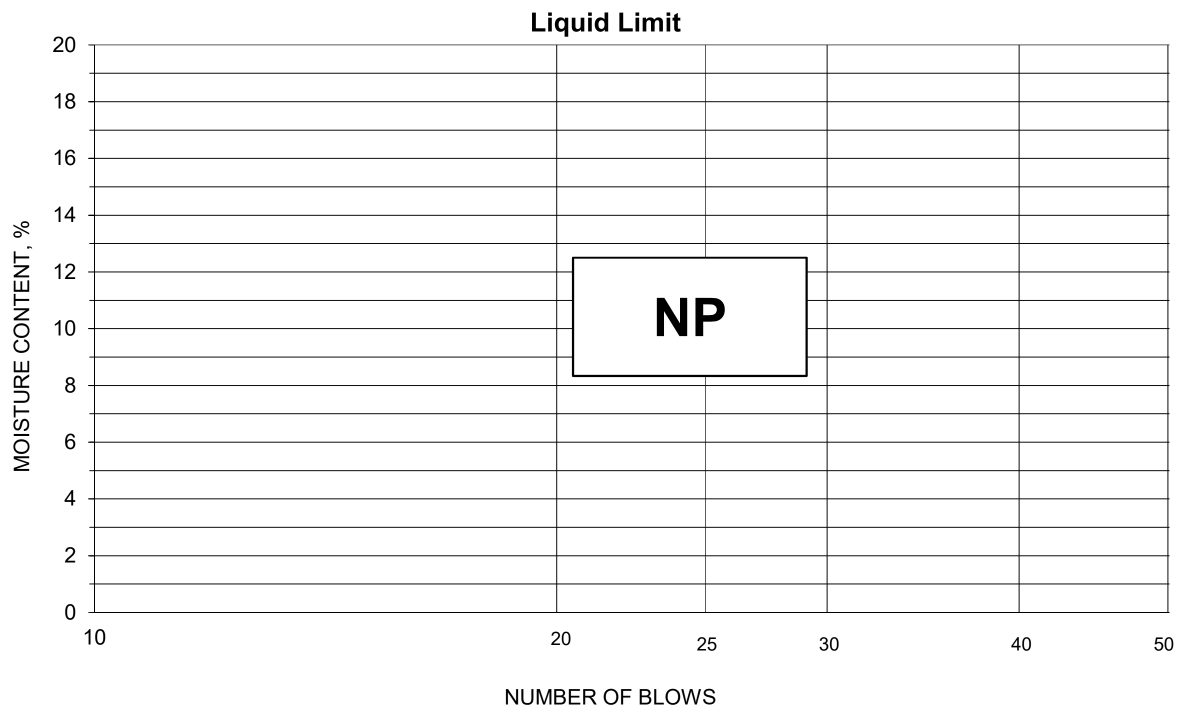
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B15-SS38G, 97.5'-99.0'	Lab ID	638
		% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B15-SS39bG, 101.1'-101.5' & CUF-GT-B15-SS40aG, 102.5'-103.4'
Lab ID: 640
Sample Type: SS Composite
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 31.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.2
No. 10	2	97.5
No. 40	0.425	88.9
No. 200	0.075	78.3
	0.02	58.7
	0.005	28.7
	0.002	19.0
estimated	0.001	14.2

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	0.8	2.5
Coarse Sand	1.7	8.6
Medium Sand	8.6	---
Fine Sand	10.6	10.6
Silt	49.6	59.3
Clay	28.7	19.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 36
Plastic Limit: 24
Plasticity Index: 12
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.59

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-6 (9)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS39bG, 101.1'-101.5' & CUF-GT-B15-SS40aG, 102.5'-103.4'	Lab ID	640

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.2
No. 10	97.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.59

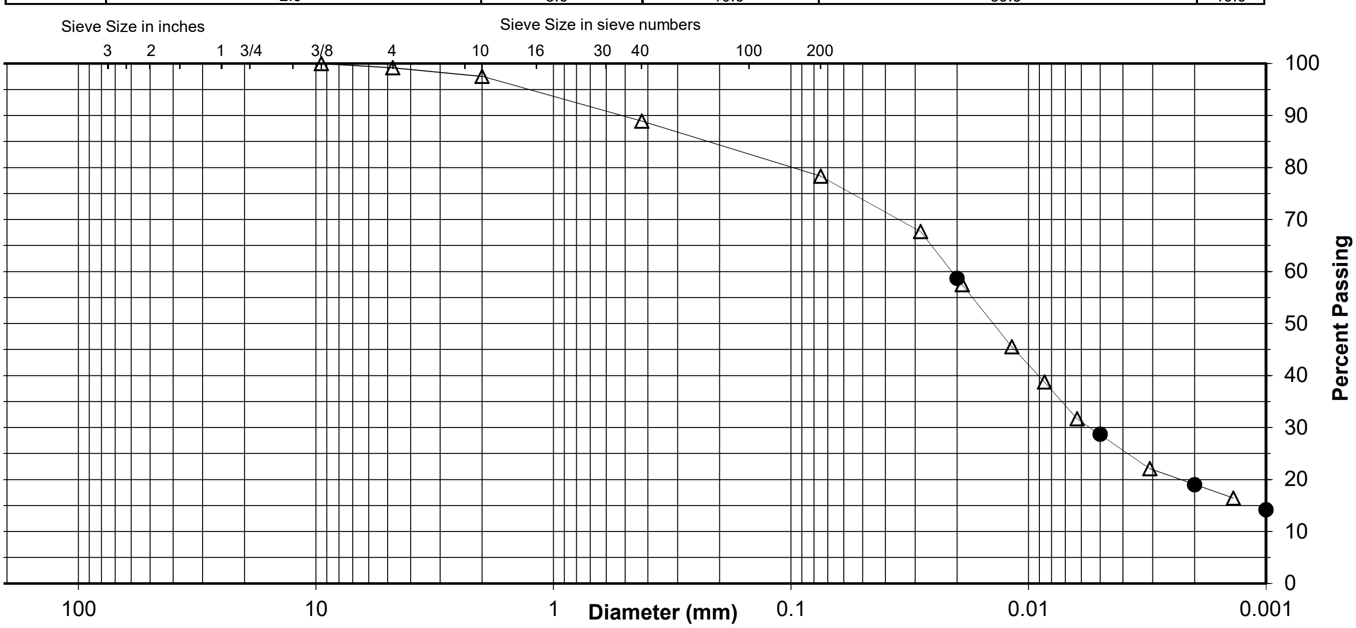
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	88.9
No. 200	78.3
0.02 mm	58.7
0.005 mm	28.7
0.002 mm	19.0
0.001 mm	14.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.8	1.7	8.6	10.6	49.6	28.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	2.5	8.6	10.6	59.3	19.0



Comments ______________________

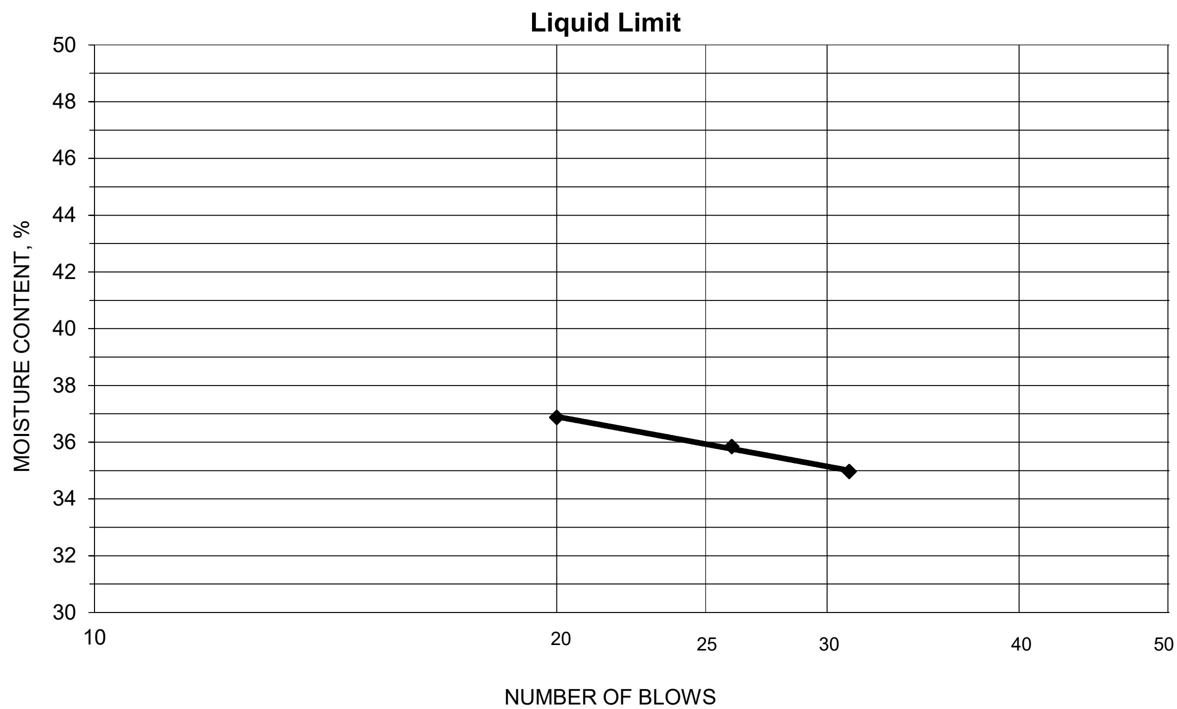
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B15-SS39bG, 101.1'-101.5' &	Lab ID	640
	CUF-GT-B15-SS40aG, 102.5'-103.4'	% + No. 40	11
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.04	16.25	11.13	31	35.0	36
18.03	16.17	10.98	26	35.8	
20.83	18.19	11.03	20	36.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.76	16.47	11.14	24.2	24	12
17.70	16.48	11.40	24.0		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS41G, 105.0'-106.5'	Lab ID	644
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 30.8

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.5
No. 4	4.75	98.3
No. 10	2	96.9
No. 40	0.425	88.9
No. 200	0.075	69.3
	0.02	40.0
	0.005	19.2
	0.002	13.9
estimated	0.001	10.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	1.7	3.1
Coarse Sand	1.4	8.0
Medium Sand	8.0	---
Fine Sand	19.6	19.6
Silt	50.1	55.4
Clay	19.2	13.9

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 32

Plastic Limit: 25

Plasticity Index: 7

Activity Index: 0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.61

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (4)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B15-SS41G, 105.0'-106.5'	Lab ID	644

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.5
No. 4	98.3
No. 10	96.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.61

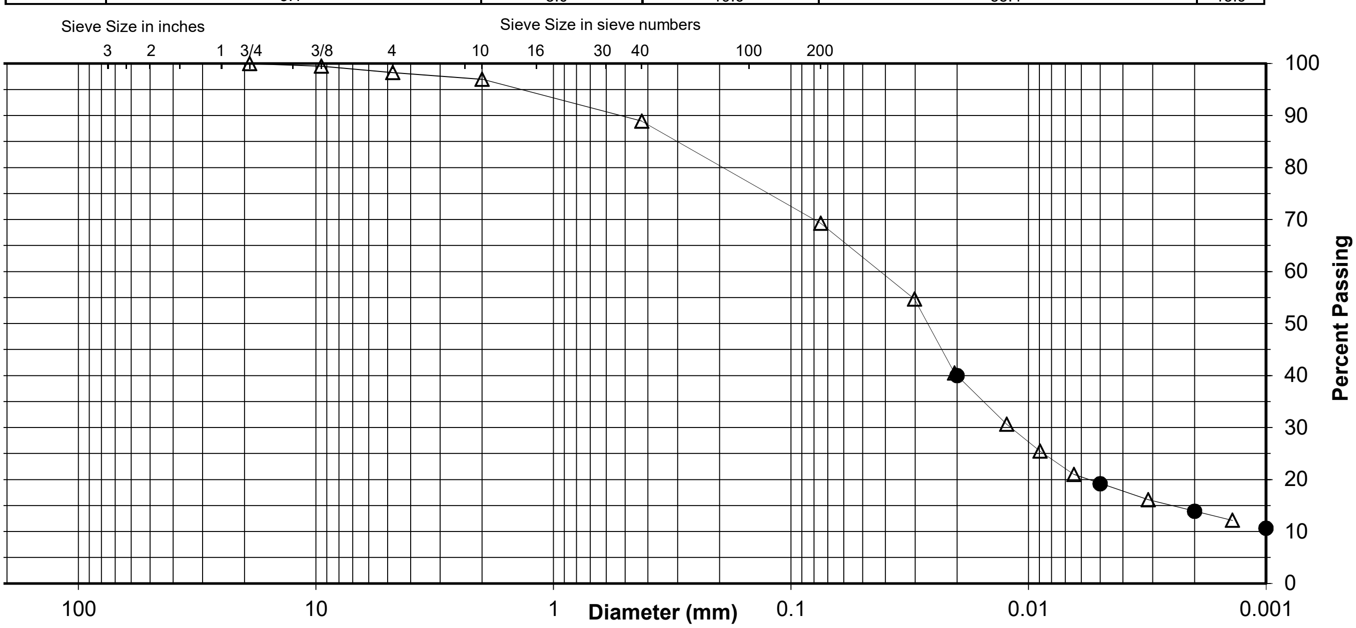
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	88.9
No. 200	69.3
0.02 mm	40.0
0.005 mm	19.2
0.002 mm	13.9
0.001 mm	10.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.7	1.4	8.0	19.6	50.1	19.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	3.1	8.0	19.6	55.4	13.9



Comments ____________________

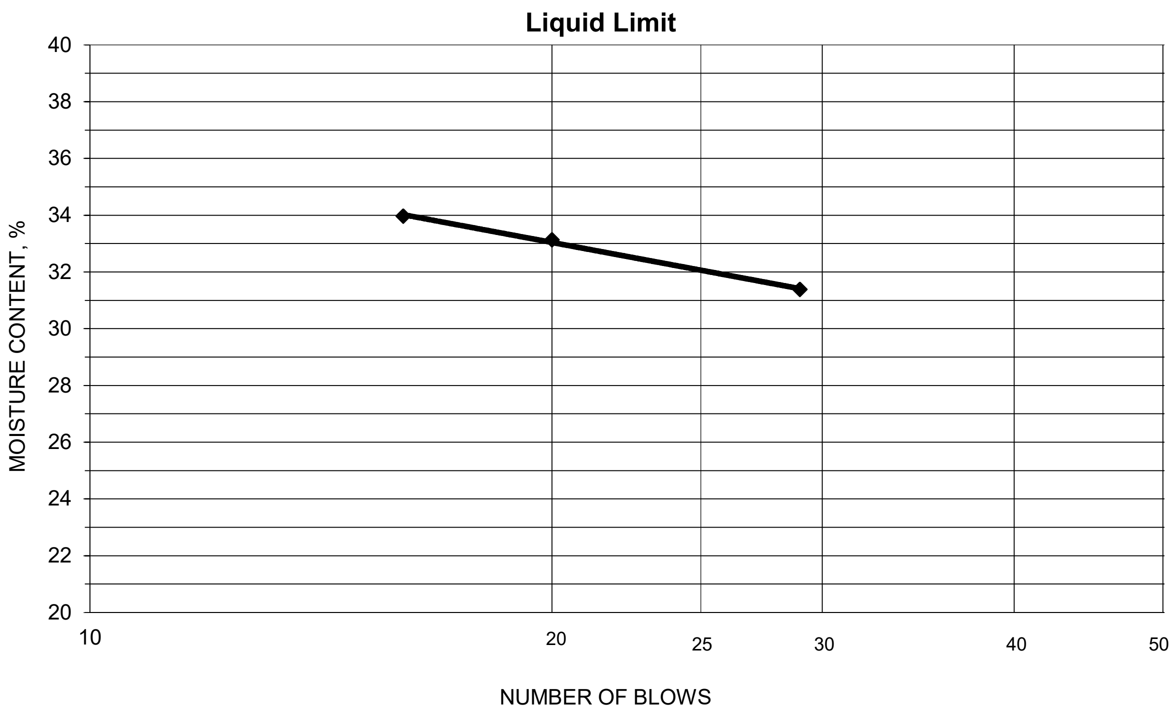
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B15-SS41G, 105.0'-106.5'	Lab ID	644
		% + No. 40	11
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.12	15.62	10.84	29	31.4	
18.10	16.51	11.71	20	33.1	
19.25	17.28	11.48	16	34.0	32



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.71	16.49	11.61	25.0	25	7
18.76	17.38	11.73	24.4		

Remarks: ______

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B15-SS43G, 112.5'-114.0' & CUF-GT-B15-SS44G, 115.0'-116.5' & CUF-GT-B15-SS45G, 117.5'-119.0'
Lab ID: 649

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	75.9
3/8"	54.5
No. 4	40.9
No. 10	28.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.66

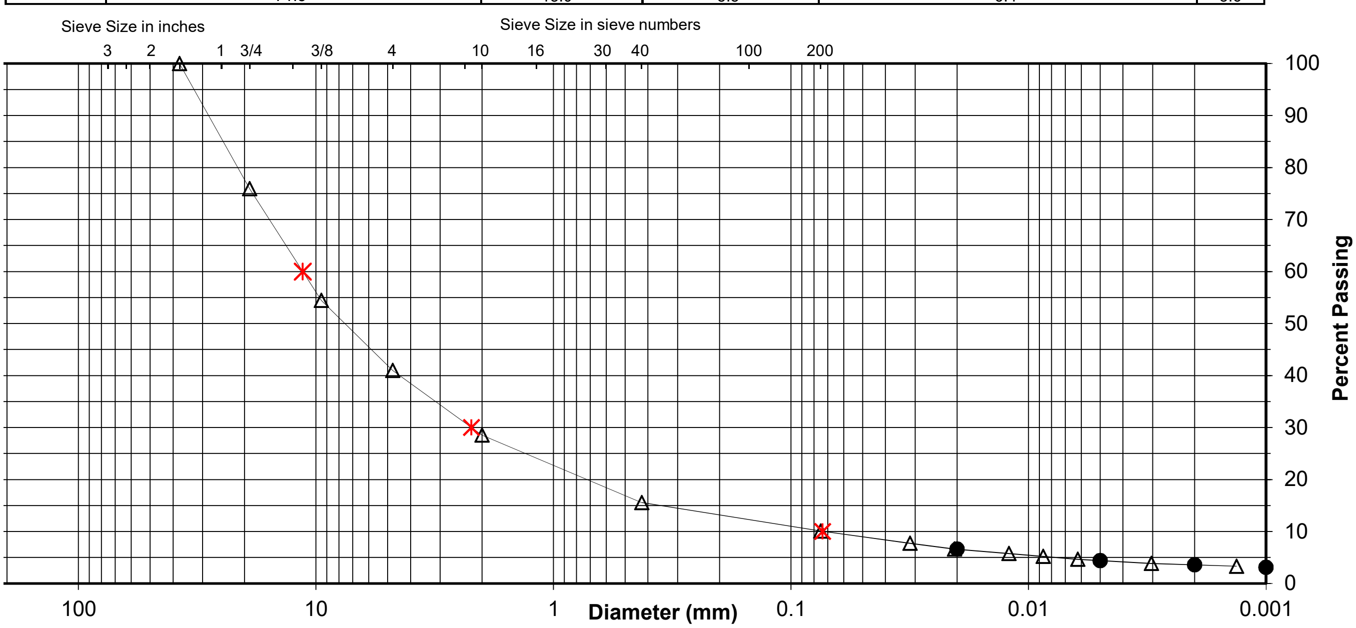
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	15.5
No. 200	10.0
0.02 mm	6.6
0.005 mm	4.4
0.002 mm	3.6
0.001 mm	3.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	24.1	35.0	12.4	13.0	5.5	5.6	4.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	71.5	13.0	5.5	6.4	3.6



Comments ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B18-SS05G, 10.0'-11.5'	Lab ID	660
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.6

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.0
No. 4	4.75	96.6
No. 10	2	95.0
No. 40	0.425	94.6
No. 200	0.075	90.5
	0.02	60.5
	0.005	42.6
	0.002	34.8
estimated	0.001	31.0

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	3.4	5.0
Coarse Sand	1.6	0.4
Medium Sand	0.4	---
Fine Sand	4.1	4.1
Silt	47.9	55.7
Clay	42.6	34.8

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 42

Plastic Limit: 19

Plasticity Index: 23

Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.74

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-7-6 (21)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B18-SS05G, 10.0'-11.5'
Lab ID: 660

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.0
No. 4	96.6
No. 10	95.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.74

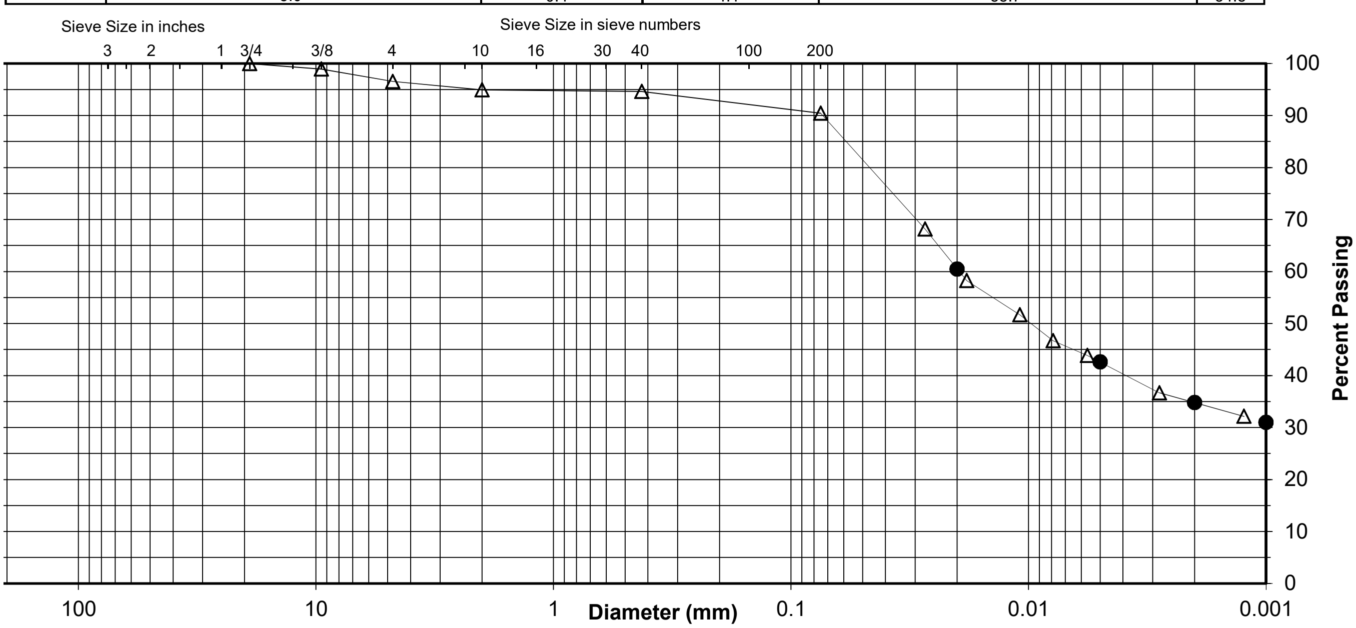
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	94.6
No. 200	90.5
0.02 mm	60.5
0.005 mm	42.6
0.002 mm	34.8
0.001 mm	31.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	3.4	1.6	0.4	4.1	47.9	42.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	5.0	0.4	4.1	55.7	34.8



Comments ______

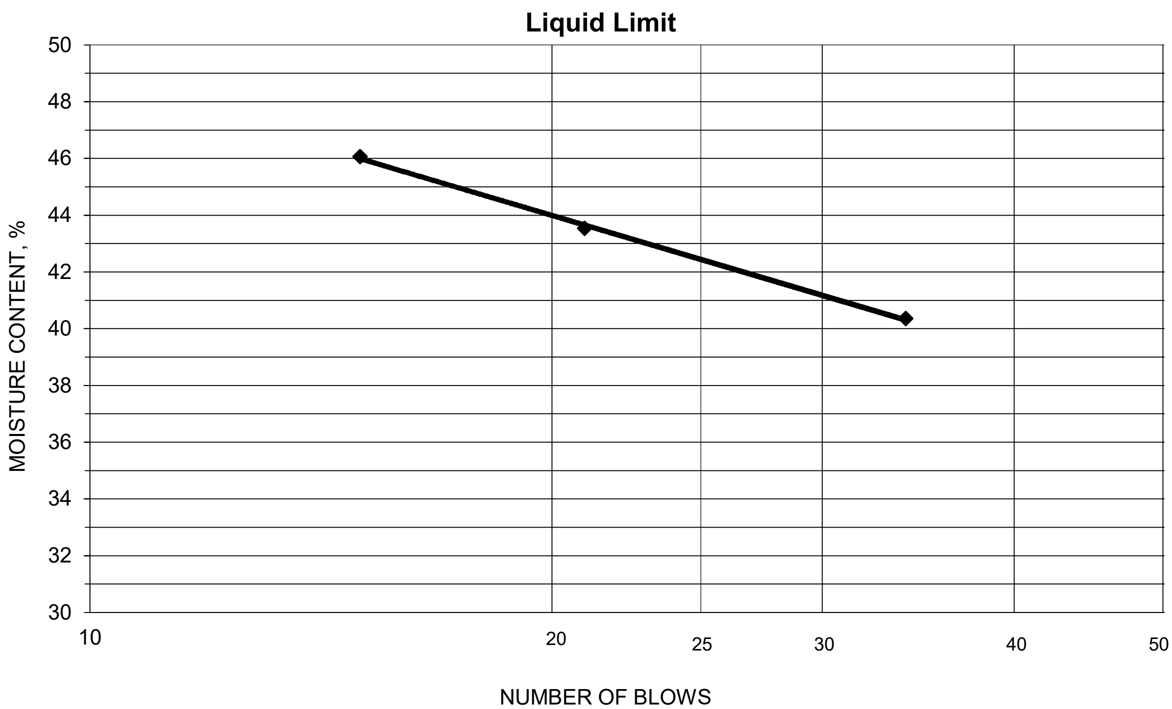
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B18-SS05G, 10.0'-11.5'	Lab ID	660
		% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.51	15.69	11.18	34	40.4	42
18.57	16.28	11.02	21	43.5	
17.86	15.58	10.63	15	46.1	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.96	16.94	11.53	18.9	19	23
18.16	17.08	11.65	19.9		

Remarks: ______

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B18-SS07G, 17.5'-19.0'
Lab ID: 663

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	83.9
3/8"	70.6
No. 4	59.3
No. 10	51.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

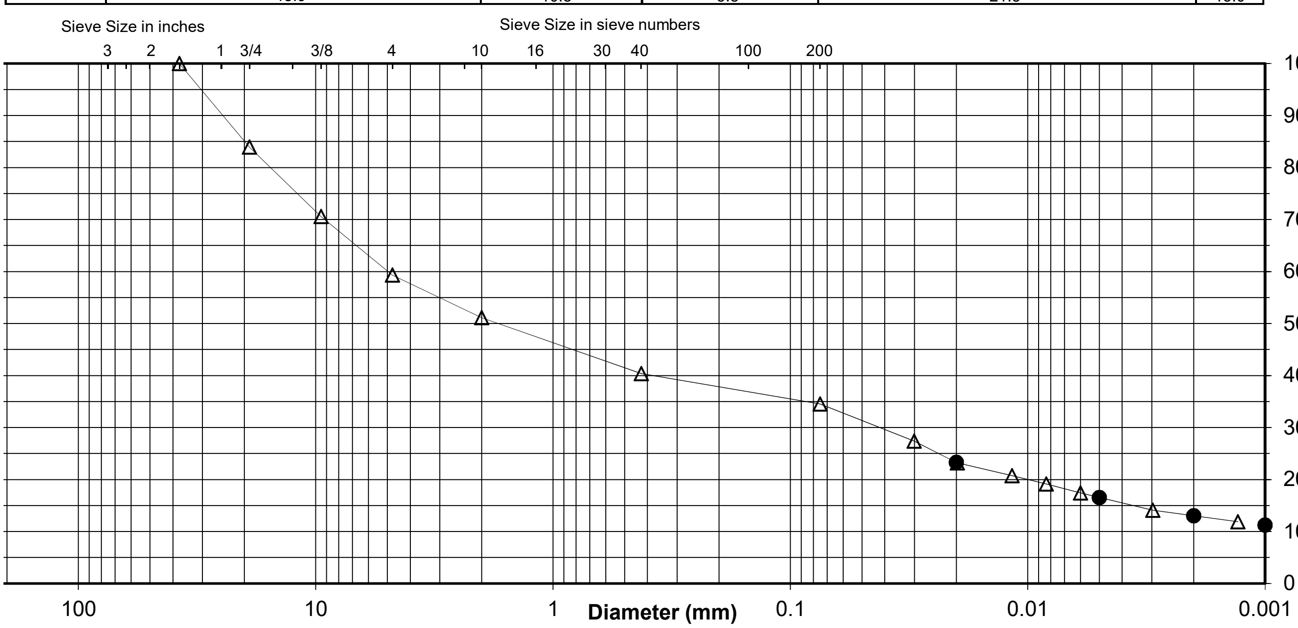
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	40.3
No. 200	34.5
0.02 mm	23.3
0.005 mm	16.5
0.002 mm	13.0
0.001 mm	11.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	16.1	24.6	8.2	10.8	5.8	18.0	16.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	48.9	10.8	5.8	21.5	13.0



Comments ______

Reviewed By: RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B18-ST02, 26.0'-26.3'
Lab ID: 666
Sample Type: ST
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.5
No. 200	0.075	88.1
	0.02	70.7
	0.005	23.5
	0.002	9.1
estimated	0.001	2.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.5
Medium Sand	0.5	---
Fine Sand	11.4	11.4
Silt	64.6	79.0
Clay	23.5	9.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.28

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B18-ST02, 26.0'-26.3'	Lab ID	666

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: KWS
Test Date: 06-14-2019
Date Received: 05-28-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.28

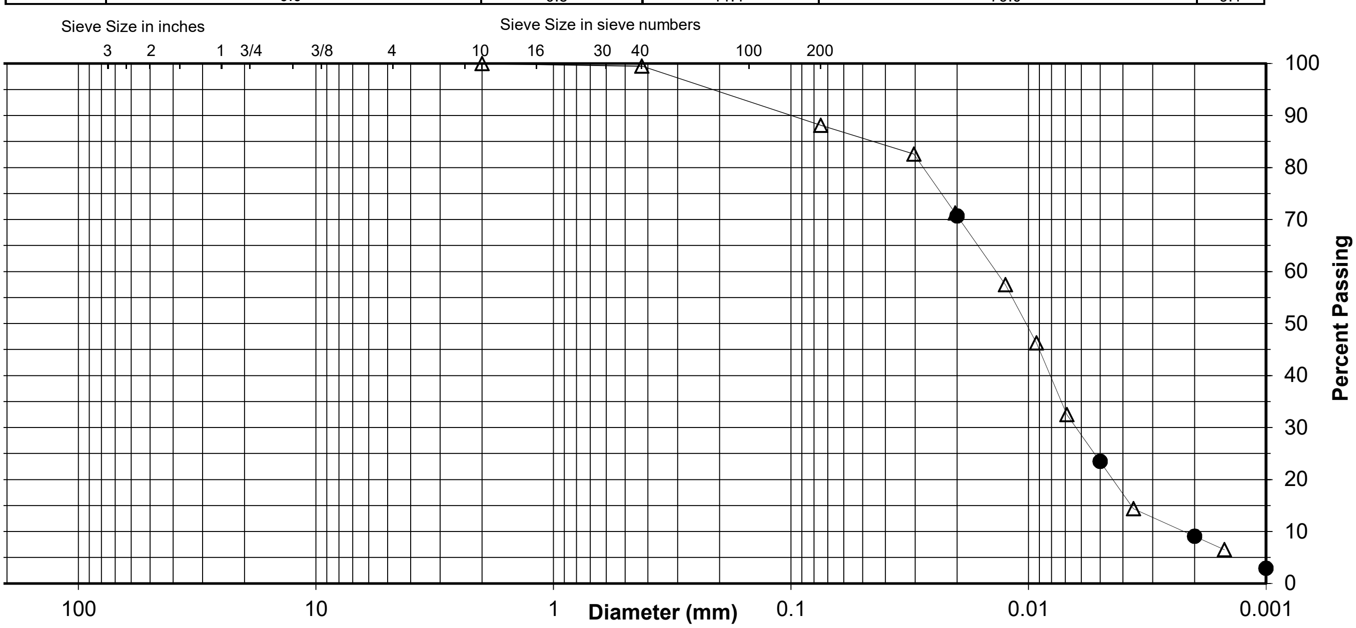
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.5
No. 200	88.1
0.02 mm	70.7
0.005 mm	23.5
0.002 mm	9.1
0.001 mm	2.9

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.5	11.4	64.6	23.5

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.5	11.4	79.0	9.1



Comments ______

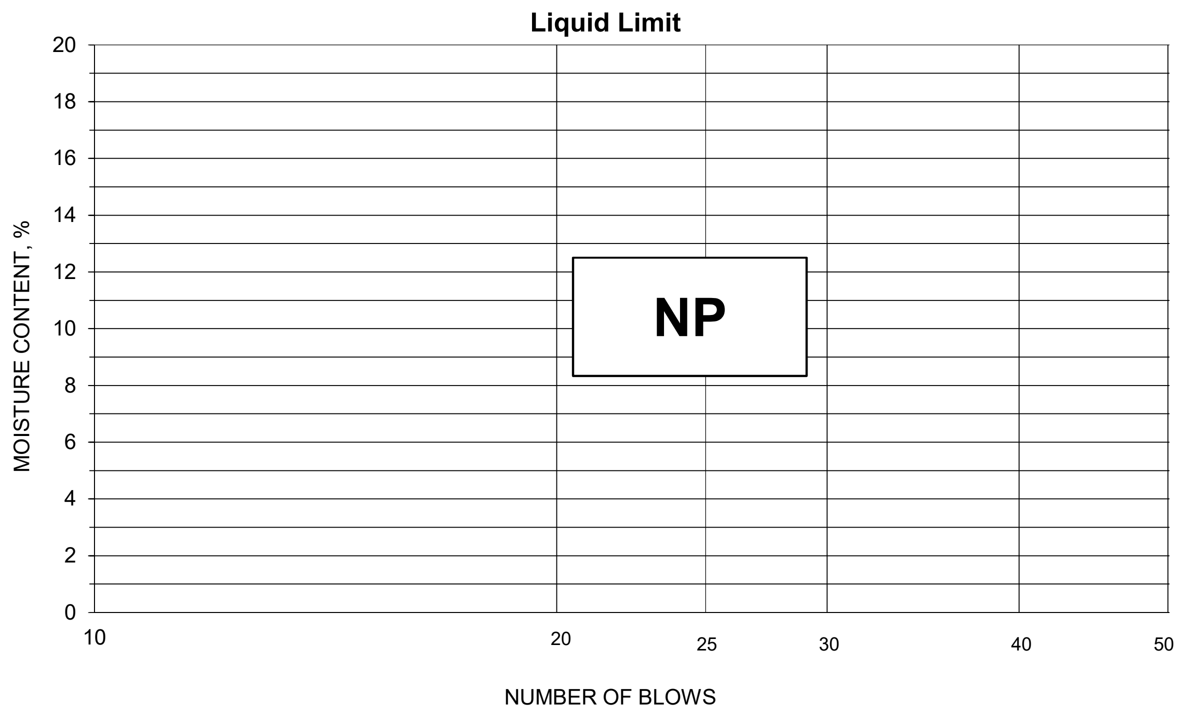
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B18-ST02, 26.0'-26.3'	Lab ID	666
		% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-18-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B18-ST03, 38.0'-38.3'
Lab ID: 672

Sample Type: ST
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.7
No. 10	2	90.3
No. 40	0.425	88.2
No. 200	0.075	81.9
	0.02	59.5
	0.005	39.9
	0.002	33.5
estimated	0.001	29.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.3	9.7
Coarse Sand	9.4	2.1
Medium Sand	2.1	---
Fine Sand	6.3	6.3
Silt	42.0	48.4
Clay	39.9	33.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 43
Plastic Limit: 18
Plasticity Index: 25
Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.64

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-7-6 (20)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B18-ST03, 38.0'-38.3'	Lab ID	672

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: KWS
Test Date: 06-14-2019
Date Received: 05-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.7
No. 10	90.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.64

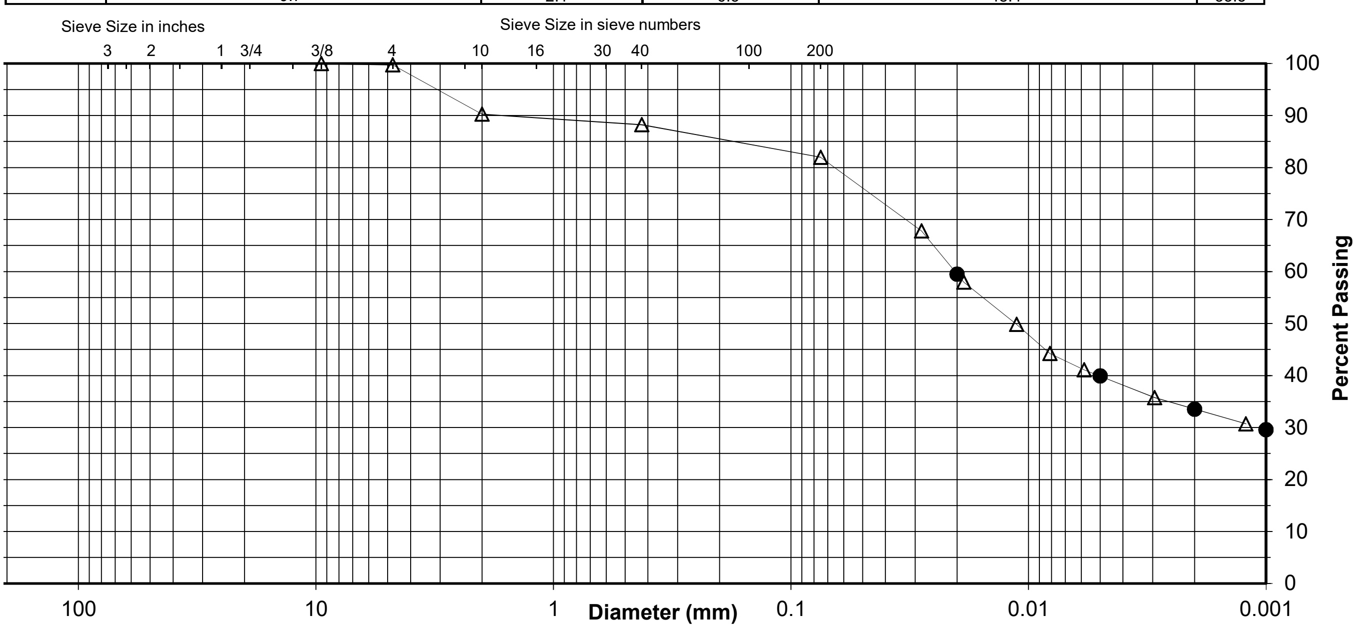
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	88.2
No. 200	81.9
0.02 mm	59.5
0.005 mm	39.9
0.002 mm	33.5
0.001 mm	29.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.3	9.4	2.1	6.3	42.0	39.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	9.7	2.1	6.3	48.4	33.5



Comments ______

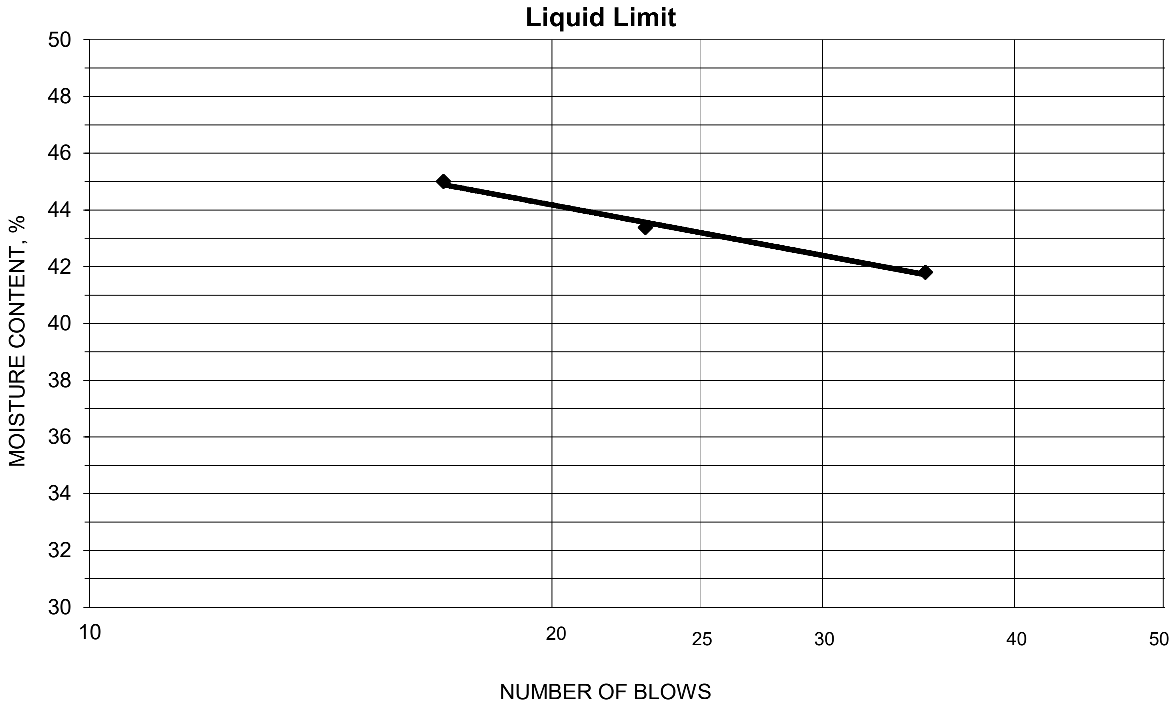
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B18-ST03, 38.0'-38.3'	Lab ID	672
		% + No. 40	12
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-18-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.39	16.14	11.14	17	45.0	43
18.57	16.18	10.67	23	43.4	
17.11	15.30	10.97	35	41.8	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.54	16.63	11.43	17.5	18	25
17.75	16.75	11.22	18.1		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B19-SS04G, 7.5'-9.0'	Lab ID	677
Sample Type	SS	Date Received	5-28-19
		Date Reported	7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 17.8

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	99.2
No. 40	0.425	97.6
No. 200	0.075	95.2
	0.02	68.2
	0.005	46.9
	0.002	38.2
estimated	0.001	33.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.2	0.8
Coarse Sand	0.6	1.6
Medium Sand	1.6	---
Fine Sand	2.4	2.4
Silt	48.3	57.0
Clay	46.9	38.2

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 43

Plastic Limit: 18

Plasticity Index: 25

Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-7-6 (25)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B19-SS04G, 7.5'-9.0'
Lab ID: 677

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	99.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

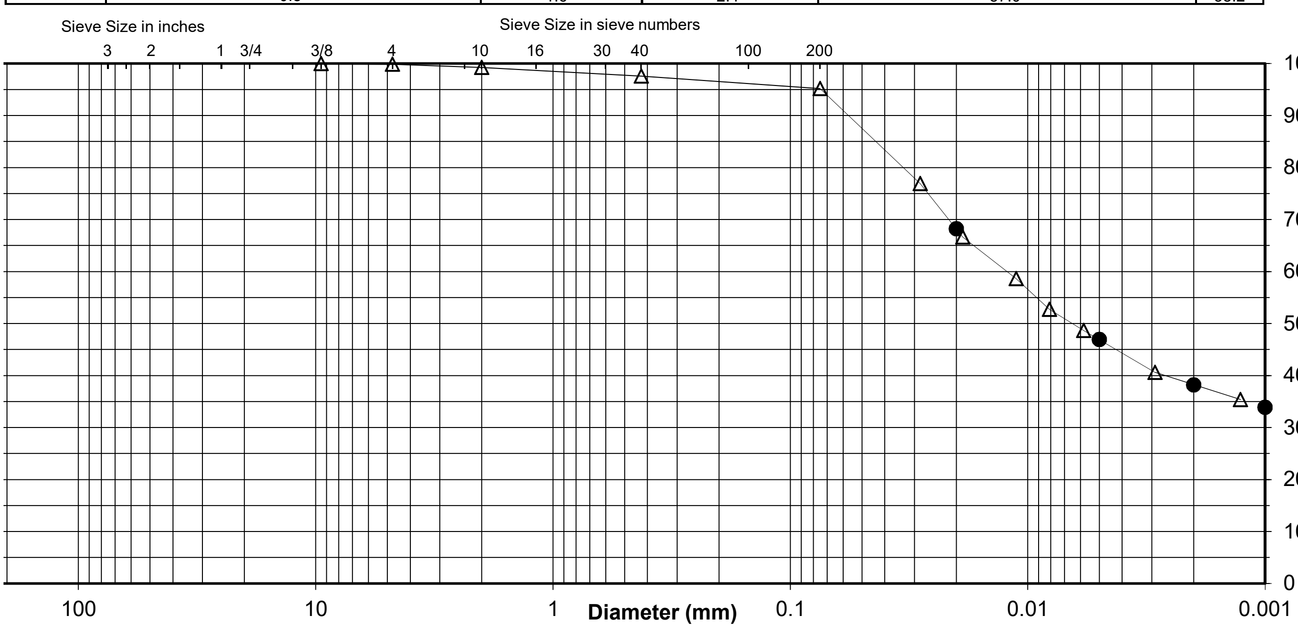
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	97.6
No. 200	95.2
0.02 mm	68.2
0.005 mm	46.9
0.002 mm	38.2
0.001 mm	33.9

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.2	0.6	1.6	2.4	48.3	46.9

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.8	1.6	2.4	57.0	38.2



Comments ______

Reviewed By: RJ

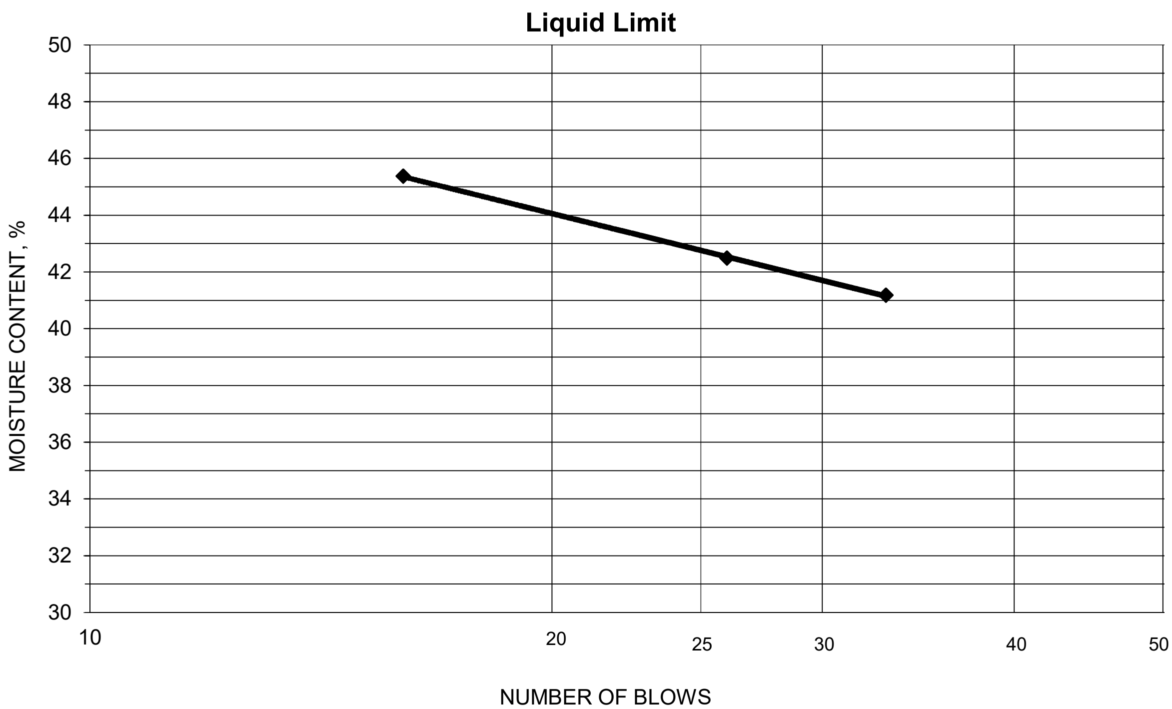
Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B19-SS04G, 7.5'-9.0'	Lab ID	677
		% + No. 40	2
Tested By	KWS	Date Received	05-28-2019
Test Date	06-11-2019		

Test Method: ASTM D 4318 Method A
Prepared: Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.66	15.63	10.70	33	41.2	43
18.30	16.15	11.09	26	42.5	
18.91	16.46	11.06	16	45.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.96	16.94	11.27	18.0	18	25
17.16	16.25	11.00	17.3		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B19-ST02, 28.7'-29.0'
Lab ID: 686

Sample Type: ST
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Not Performed
Moisture Content (%): N/A

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.7
No. 200	0.075	85.5
	0.02	46.5
	0.005	16.1
	0.002	7.2
estimated	0.001	3.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.3
Medium Sand	0.3	---
Fine Sand	14.2	14.2
Silt	69.4	78.3
Clay	16.1	7.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.42

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B19-ST02, 28.7'-29.0'
Project Number: 175568209
Lab ID: 686

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: KWS
Test Date: 06-14-2019
Date Received: 05-28-2019

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.42

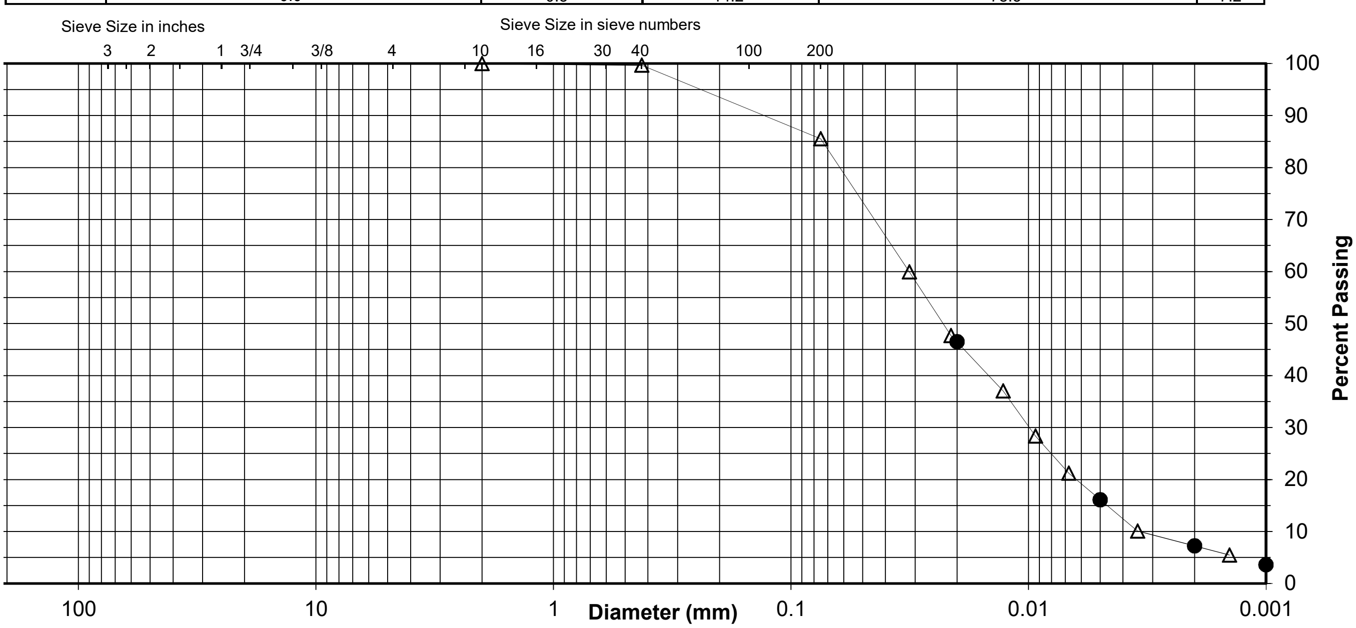
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.7
No. 200	85.5
0.02 mm	46.5
0.005 mm	16.1
0.002 mm	7.2
0.001 mm	3.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.3	14.2	69.4	16.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.3	14.2	78.3	7.2



Comments ______

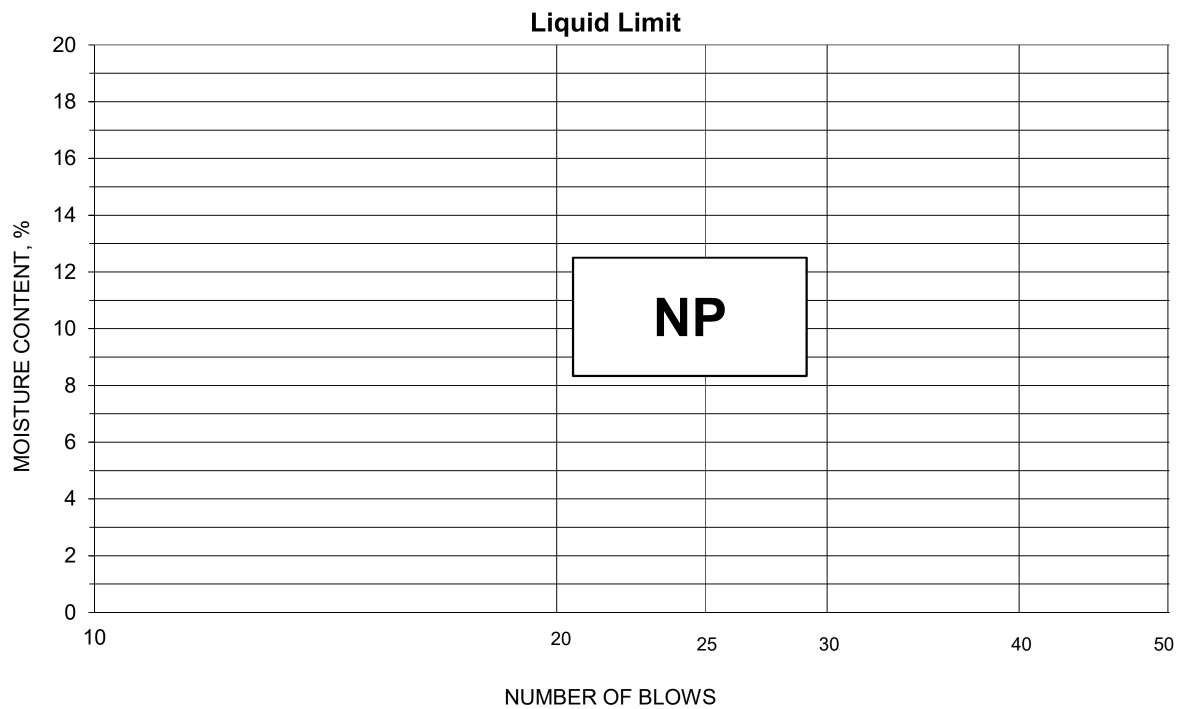
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B19-ST02, 28.7'-29.0'	Lab ID	686
		% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-18-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B19-SS11bG, 30.5'-31.5'	Lab ID	688

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	61.5
3/8"	36.9
No. 4	22.3
No. 10	12.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.6

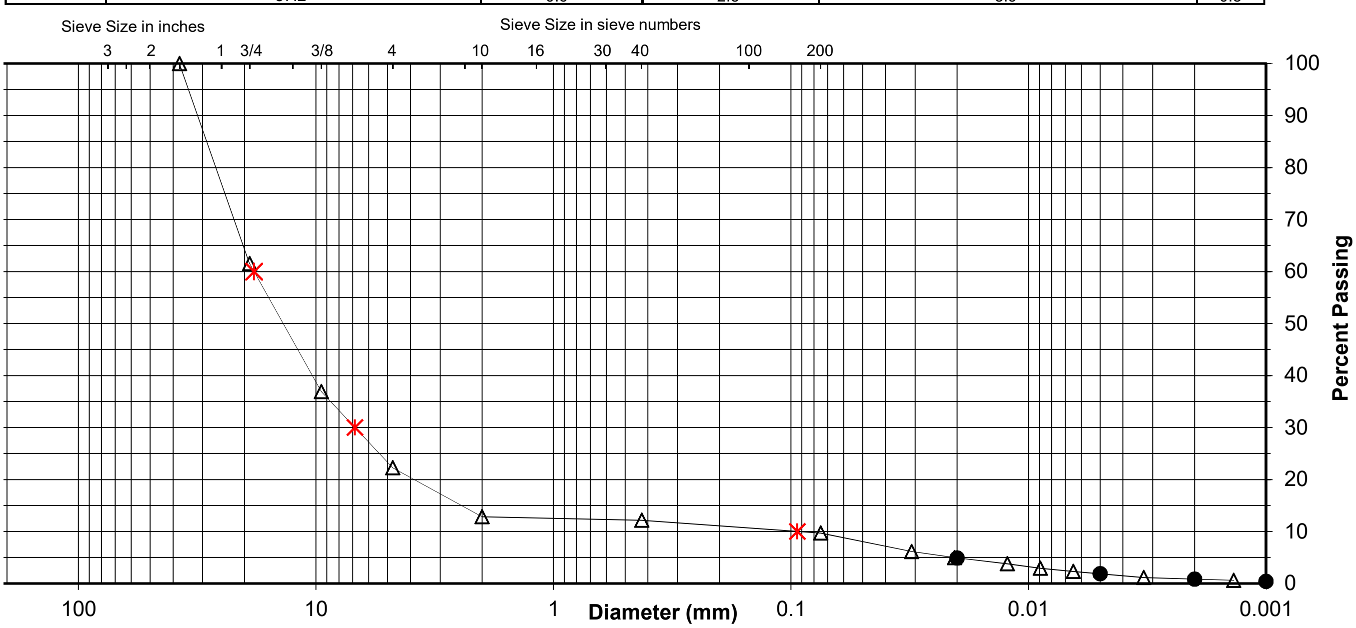
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	12.2
No. 200	9.7
0.02 mm	4.9
0.005 mm	1.9
0.002 mm	0.8
0.001 mm	0.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	38.5	39.2	9.5	0.6	2.5	7.8	1.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	87.2	0.6	2.5	8.9	0.8



Comments ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B19-SS12G, 32.5'-34.0'
Lab ID: 689

Sample Type: SS
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 21.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.5
No. 10	2	99.1
No. 40	0.425	96.4
No. 200	0.075	90.3
	0.02	63.0
	0.005	31.3
	0.002	24.2
estimated	0.001	20.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.5	0.9
Coarse Sand	0.4	2.7
Medium Sand	2.7	---
Fine Sand	6.1	6.1
Silt	59.0	66.1
Clay	31.3	24.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 33
Plastic Limit: 19
Plasticity Index: 14
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.65

Classification

Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-6 (12)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B19-SS12G, 32.5'-34.0'	Lab ID	689

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.5
No. 10	99.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.65

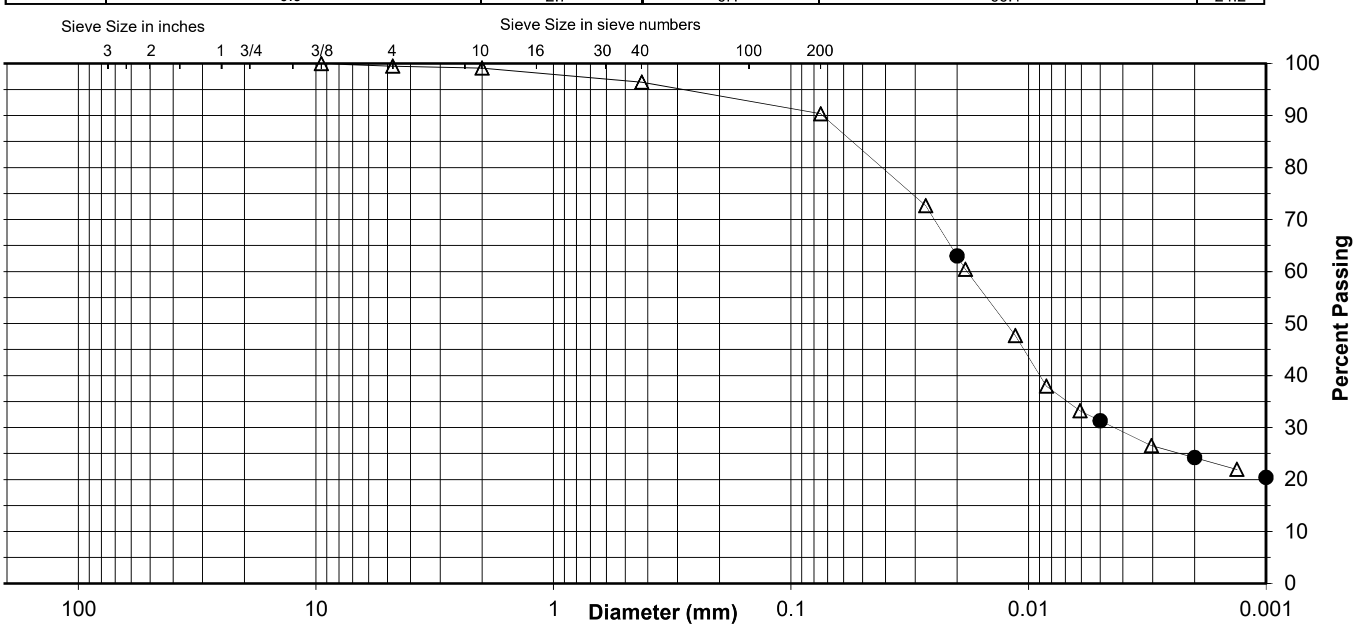
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	96.4
No. 200	90.3
0.02 mm	63.0
0.005 mm	31.3
0.002 mm	24.2
0.001 mm	20.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.5	0.4	2.7	6.1	59.0	31.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.9	2.7	6.1	66.1	24.2



Comments ______

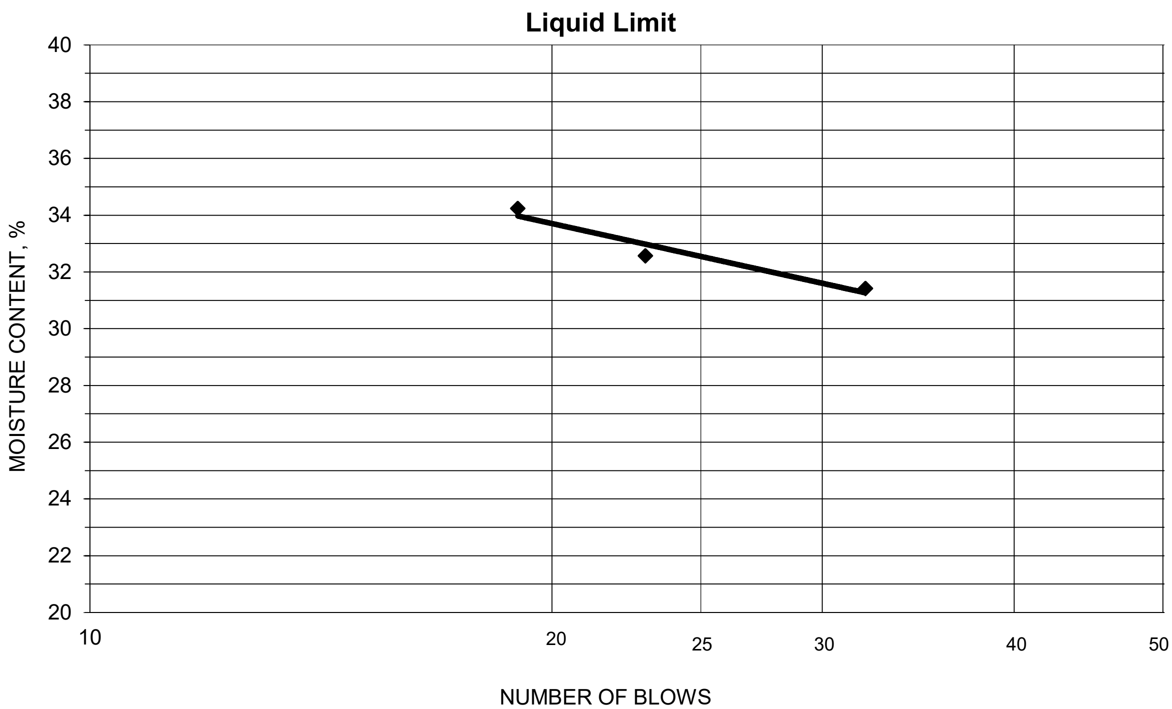
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B19-SS12G, 32.5'-34.0'	Lab ID	689
		% + No. 40	4
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.43	16.68	11.11	32	31.4	
17.63	16.07	11.28	23	32.6	
18.34	16.44	10.89	19	34.2	33



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.57	16.56	11.26	19.1	19	14
17.75	16.67	10.84	18.5		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B19-SS14G, 40.0'-41.5'
Lab ID: 691

Sample Type: SS
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 26.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.7
No. 10	2	98.1
No. 40	0.425	96.6
No. 200	0.075	75.3
	0.02	53.7
	0.005	40.3
	0.002	33.8
estimated	0.001	29.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.3	1.9
Coarse Sand	1.6	1.5
Medium Sand	1.5	---
Fine Sand	21.3	21.3
Silt	35.0	41.5
Clay	40.3	33.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 39
Plastic Limit: 13
Plasticity Index: 26
Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.62

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-6 (17)

Comments:

Reviewed By RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 07/26/2019

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B19-SS14G, 40.0'-41.5'	Lab ID	691

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.7
No. 10	98.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.62

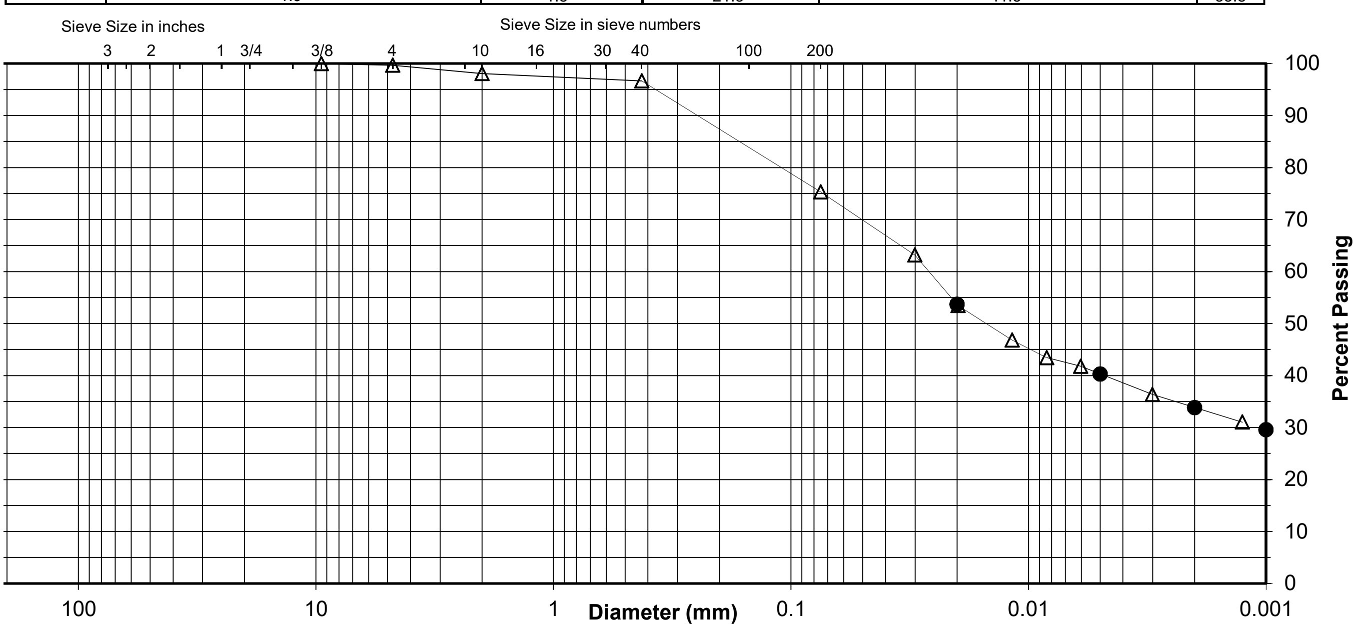
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	96.6
No. 200	75.3
0.02 mm	53.7
0.005 mm	40.3
0.002 mm	33.8
0.001 mm	29.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.3	1.6	1.5	21.3	35.0	40.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	1.9	1.5	21.3	41.5	33.8



Comments ______________________

Reviewed By RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

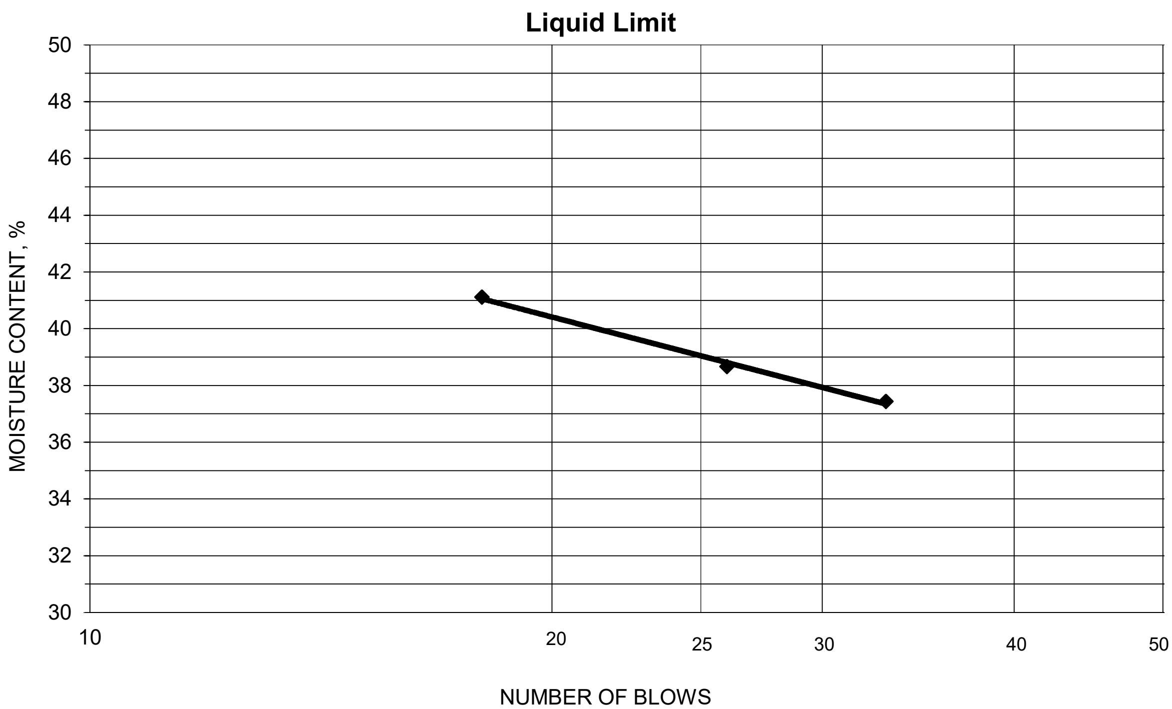
Reported By: RJ
Report Date: 07/26/2019

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B19-SS14G, 40.0'-41.5'	Lab ID	691
		% + No. 40	3
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.03	16.96	11.43	33	37.4	39
18.40	16.37	11.12	26	38.7	
17.67	15.82	11.32	18	41.1	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.15	16.47	11.35	13.3	13	26
16.82	16.09	10.67	13.5		

Remarks: ____________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B19-SS15G, 42.5'-44.0'
Lab ID: 692

Sample Type: SS
Date Received: 5-28-19
Date Reported: 7-10-19

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 9.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	93.8
3/8"	9.5	93.8
No. 4	4.75	93.6
No. 10	2	92.7
No. 40	0.425	91.1
No. 200	0.075	38.8
	0.02	24.4
	0.005	11.7
	0.002	7.5
estimated	0.001	5.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	6.4	7.3
Coarse Sand	0.9	1.6
Medium Sand	1.6	---
Fine Sand	52.3	52.3
Silt	27.1	31.3
Clay	11.7	7.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854
Prepared: Dry
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand

AASHTO Classification: A-4 (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name CUF TDEC Order — Project Number 175568209
Source CUF-GT-B19-SS15G, 42.5'-44.0' — Lab ID 692

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DB
Test Date: 06-09-2019
Date Received: 05-28-2019

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	93.8
3/8"	93.8
No. 4	93.6
No. 10	92.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

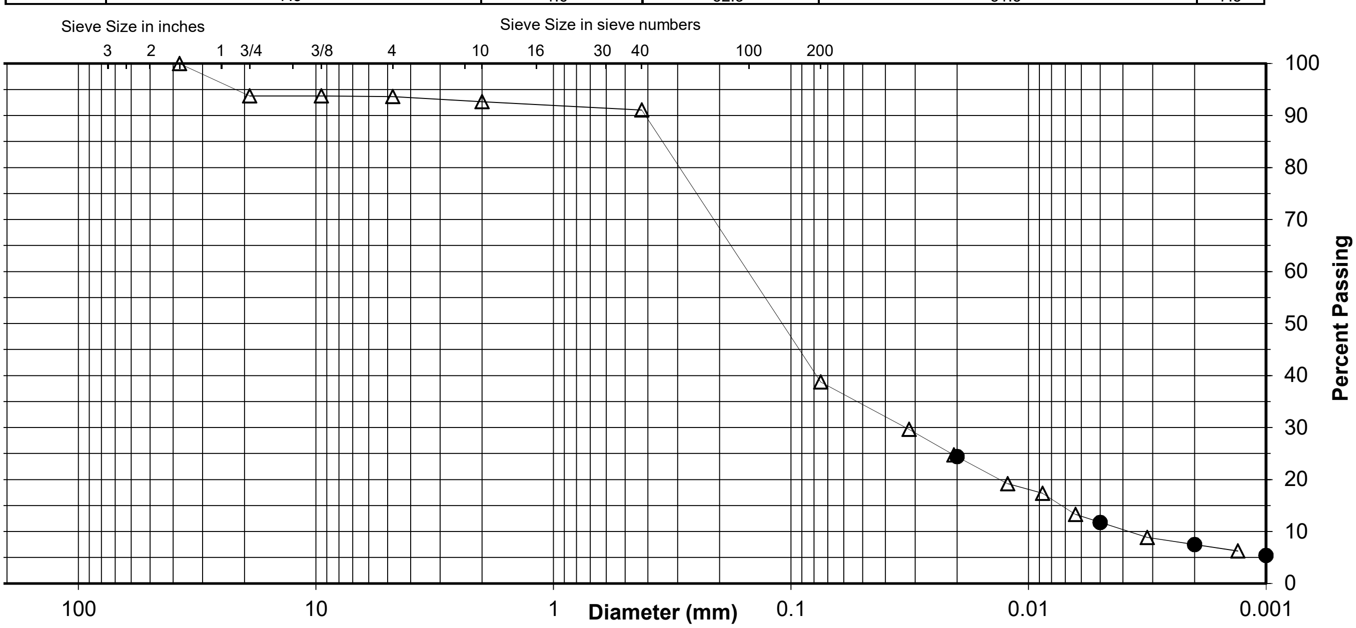
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	91.1
No. 200	38.8
0.02 mm	24.4
0.005 mm	11.7
0.002 mm	7.5
0.001 mm	5.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	6.2	0.2	0.9	1.6	52.3	27.1	11.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	7.3	1.6	52.3	31.3	7.5



Comments ______

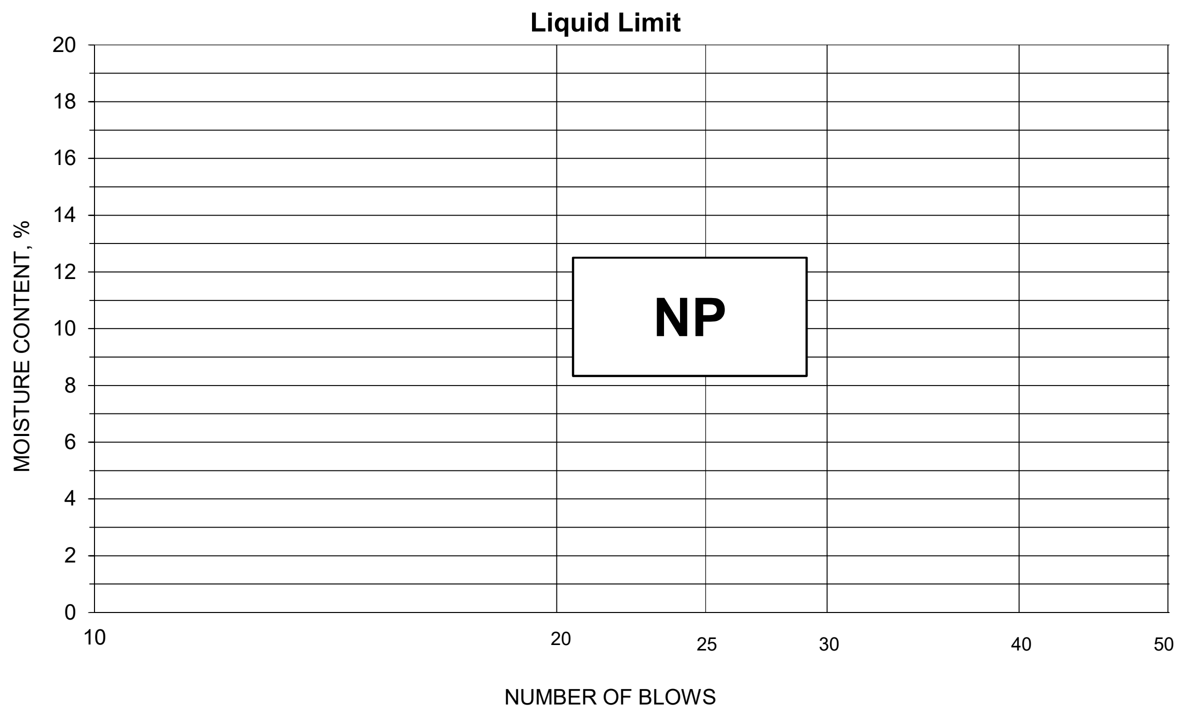
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B19-SS15G, 42.5'-44.0'	Lab ID	692
		% + No. 40	9
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	05-28-2019		
Test Date	06-11-2019	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B20-SS03G, 5.0'-6.5'
Lab ID: 695

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 33.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	96.1
No. 4	4.75	84.5
No. 10	2	61.3
No. 40	0.425	59.7
No. 200	0.075	57.6
	0.02	45.6
	0.005	37.5
	0.002	33.0
estimated	0.001	29.7

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	15.5	38.7
Coarse Sand	23.2	1.6
Medium Sand	1.6	---
Fine Sand	2.1	2.1
Silt	20.1	24.6
Clay	37.5	33.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 60
Plastic Limit: 17
Plasticity Index: 43
Activity Index: 1.3

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CH
Group Name: Sandy fat clay with gravel

AASHTO Classification: A-7-6 (21)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B20-SS03G, 5.0'-6.5'	Lab ID	695

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-01-2020
Date Received: 08-31-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.1
No. 4	84.5
No. 10	61.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

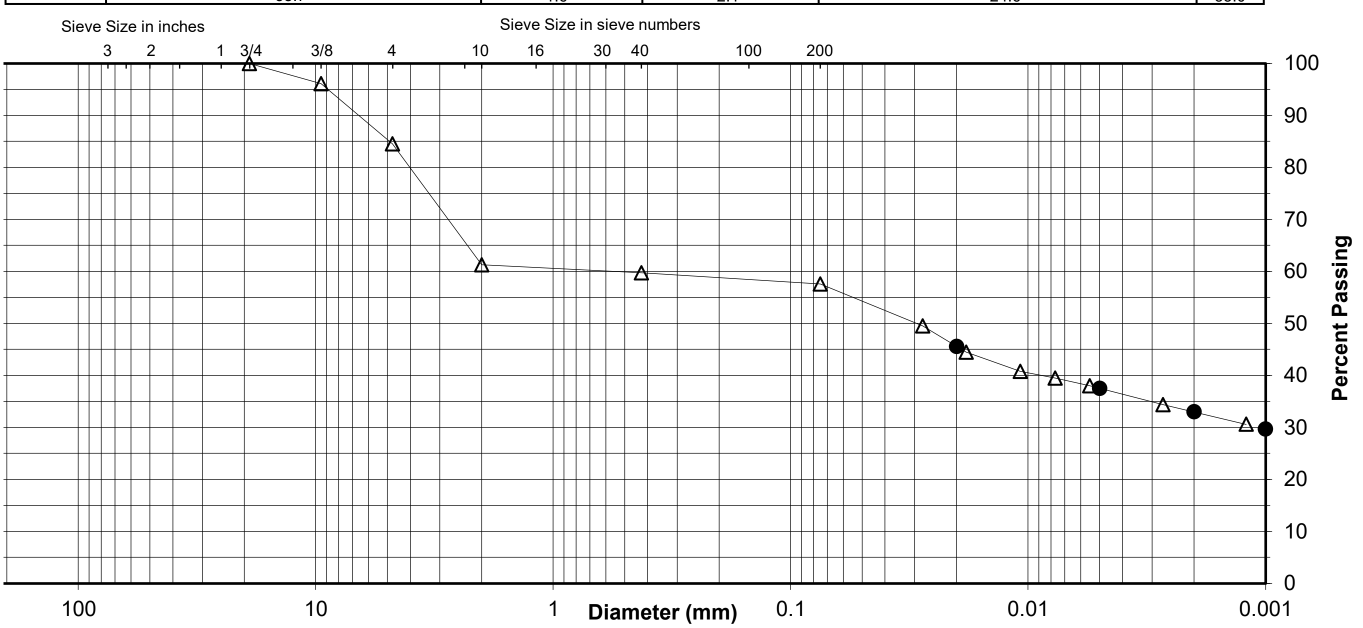
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	59.7
No. 200	57.6
0.02 mm	45.6
0.005 mm	37.5
0.002 mm	33.0
0.001 mm	29.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	15.5	23.2	1.6	2.1	20.1	37.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	38.7	1.6	2.1	24.6	33.0



Comments ______

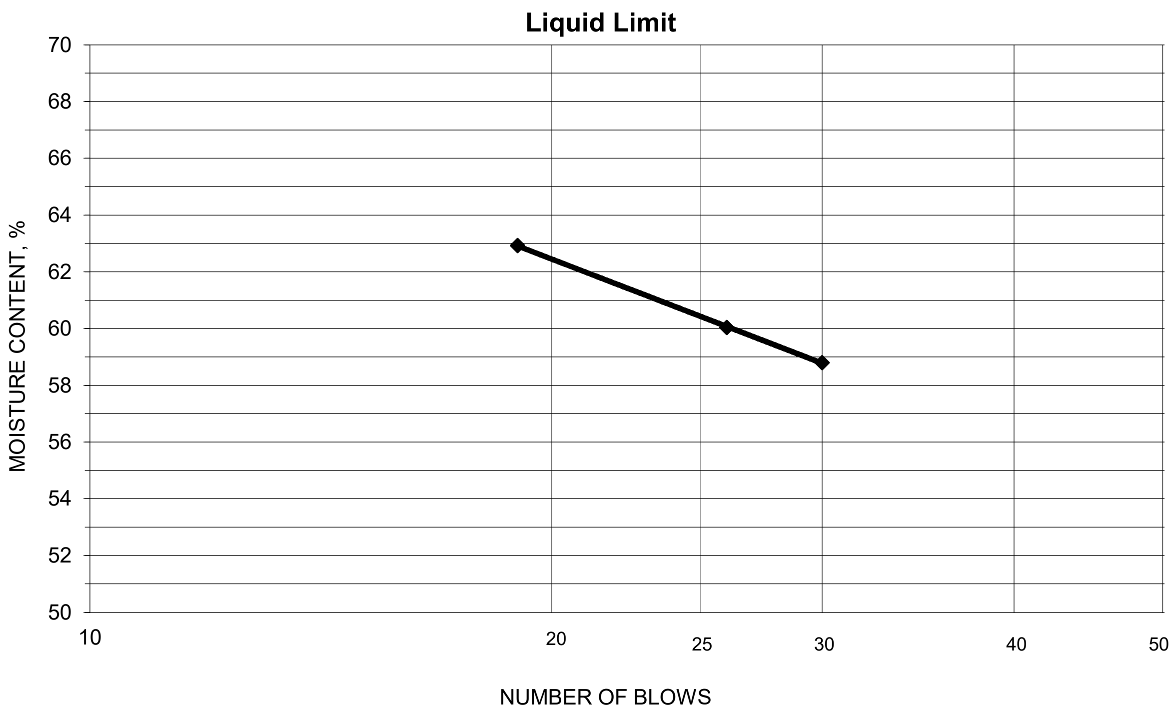
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B20-SS03G, 5.0'-6.5'	Lab ID	695
		% + No. 40	40
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-08-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.31	16.78	11.17	19	62.9	60
19.92	16.48	10.75	26	60.0	
19.99	16.55	10.70	30	58.8	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.01	17.82	10.88	17.1	17	43
18.14	17.10	10.93	16.9		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B20-SS08G, 14.5'-16.0'
Lab ID: 702
Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-15-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 26.5

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 52
Plastic Limit: 16
Plasticity Index: 36
Activity Index: 1.1

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	89.3
No. 4	4.75	86.2
No. 10	2	65.6
No. 40	0.425	63.5
No. 200	0.075	60.8
	0.02	52.3
	0.005	41.8
	0.002	34.1
estimated	0.001	28.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	13.8	34.4
Coarse Sand	20.6	2.1
Medium Sand	2.1	---
Fine Sand	2.7	2.7
Silt	19.0	26.7
Clay	41.8	34.1

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: CH
Group Name: Sandy fat clay
AASHTO Classification: A-7-6 (19)

Comments:

Reviewed By: RJ

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Version: 20170217
Approved By: RJ

Reported By: RJ
Report Date: 09/16/2020

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B20-SS08G, 14.5'-16.0'
Lab ID: 702

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-01-2020
Date Received: 08-31-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	89.3
No. 4	86.2
No. 10	65.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

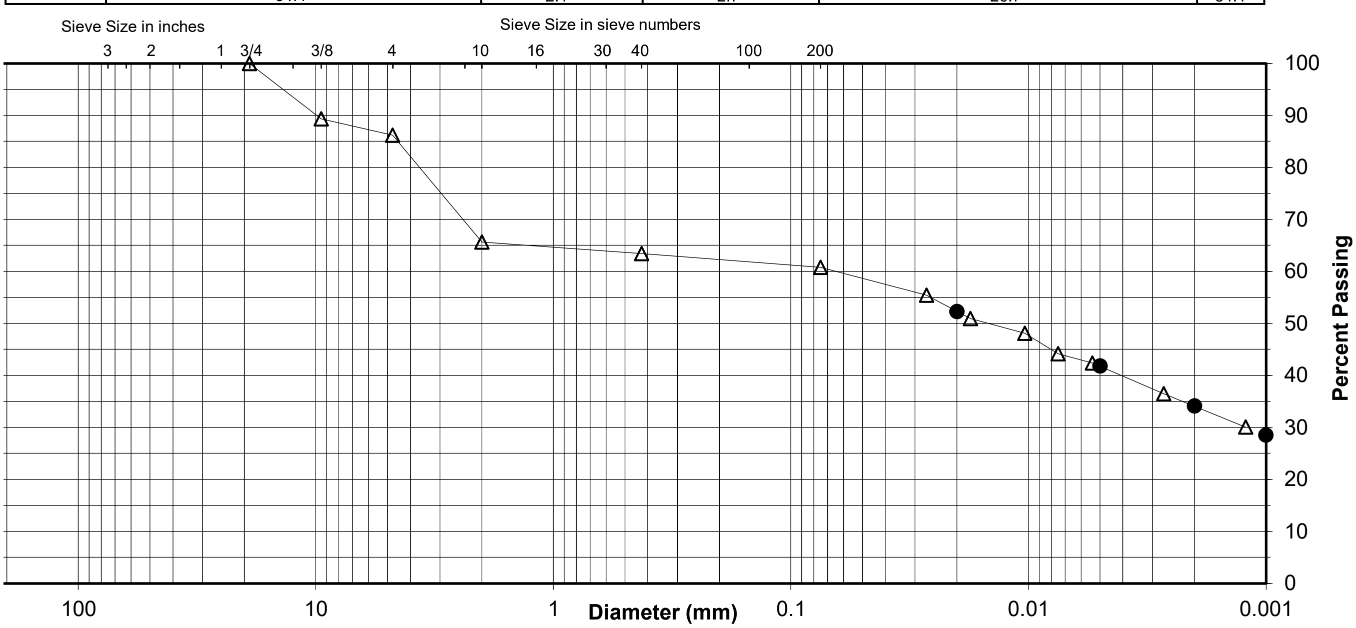
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	63.5
No. 200	60.8
0.02 mm	52.3
0.005 mm	41.8
0.002 mm	34.1
0.001 mm	28.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	13.8	20.6	2.1	2.7	19.0	41.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	34.4	2.1	2.7	26.7	34.1



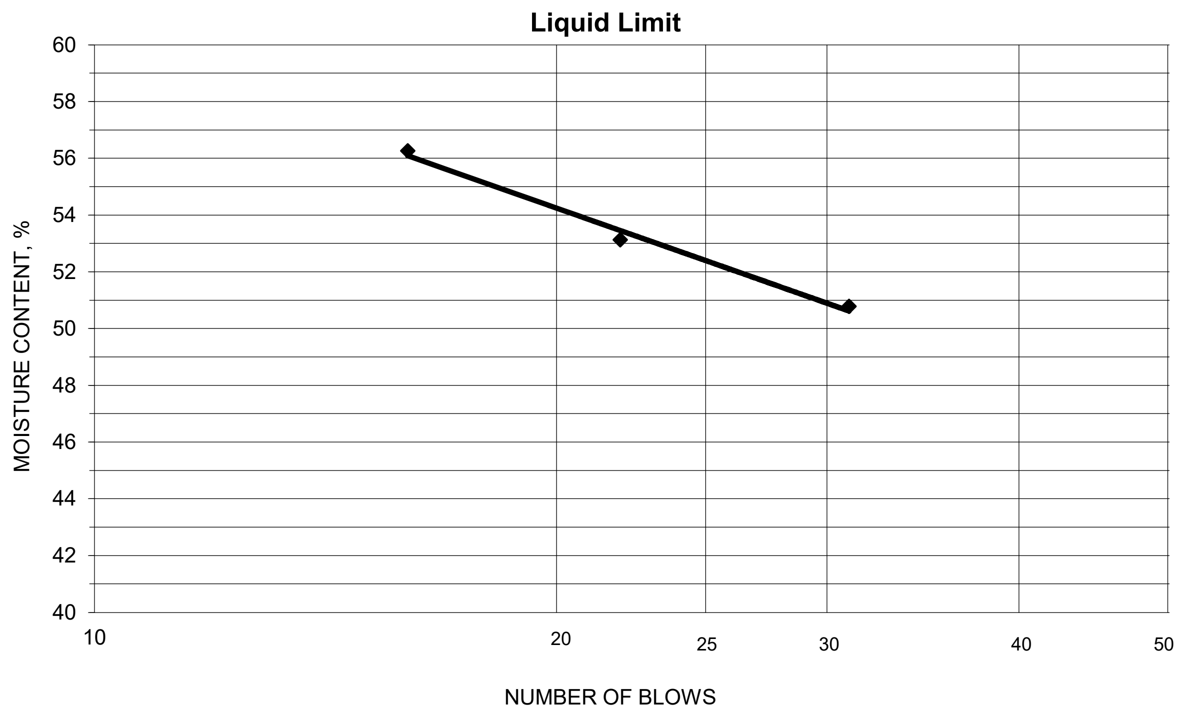
Comments ____________________

Reviewed By RJ

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B20-SS08G, 14.5'-16.0'	Lab ID	702
		% + No. 40	37
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-08-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.04	16.76	10.93	16	56.3	52
20.34	17.11	11.03	22	53.1	
20.66	17.41	11.01	31	50.8	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.21	18.07	11.08	16.3	16	36
18.98	17.84	10.87	16.4		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B20-SS16G, 26.5'-28.0'
Lab ID: 710

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-15-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 26.3

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	86.5
No. 4	4.75	79.6
No. 10	2	63.4
No. 40	0.425	57.0
No. 200	0.075	52.6
	0.02	40.2
	0.005	30.6
	0.002	25.0
estimated	0.001	21.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	20.4	36.6
Coarse Sand	16.2	6.4
Medium Sand	6.4	---
Fine Sand	4.4	4.4
Silt	22.0	27.6
Clay	30.6	25.0

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 43
Plastic Limit: 15
Plasticity Index: 28
Activity Index: 1.1

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: CL
Group Name: Sandy lean clay with gravel

AASHTO Classification: A-7-6 (11)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B20-SS16G, 26.5'-28.0'	Lab ID	710

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-01-2020
Date Received: 08-31-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	86.5
No. 4	79.6
No. 10	63.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

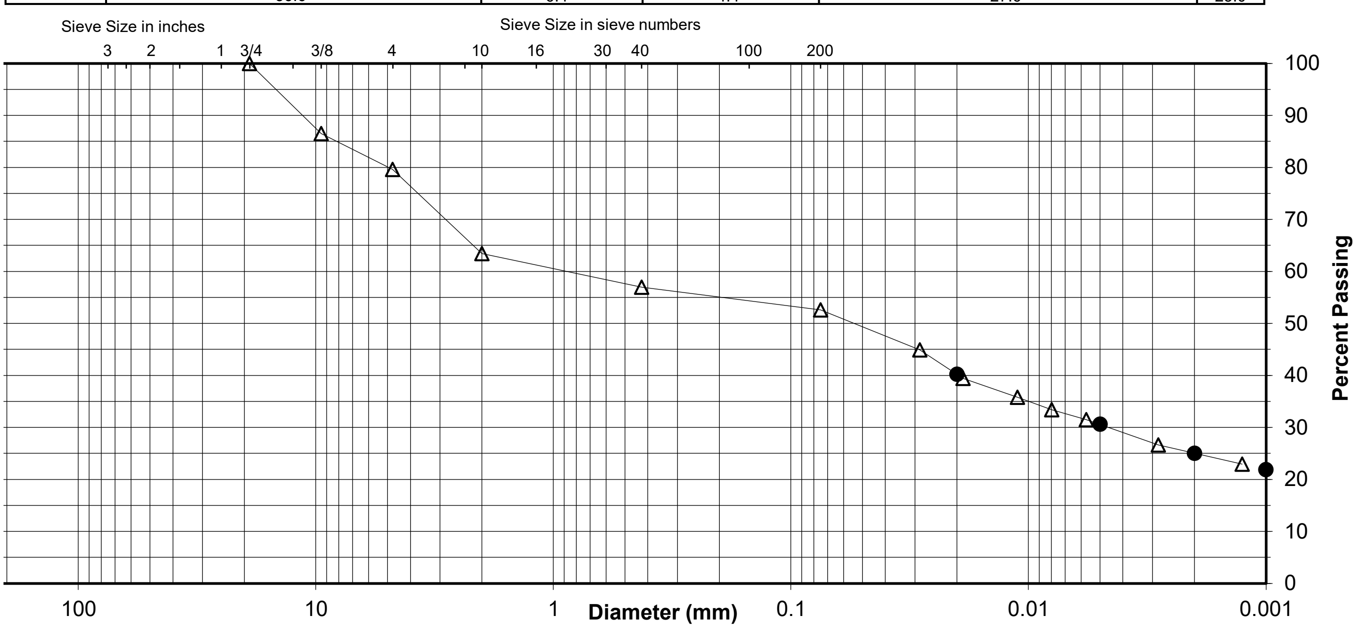
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	57.0
No. 200	52.6
0.02 mm	40.2
0.005 mm	30.6
0.002 mm	25.0
0.001 mm	21.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	20.4	16.2	6.4	4.4	22.0	30.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	36.6	6.4	4.4	27.6	25.0



Comments ______

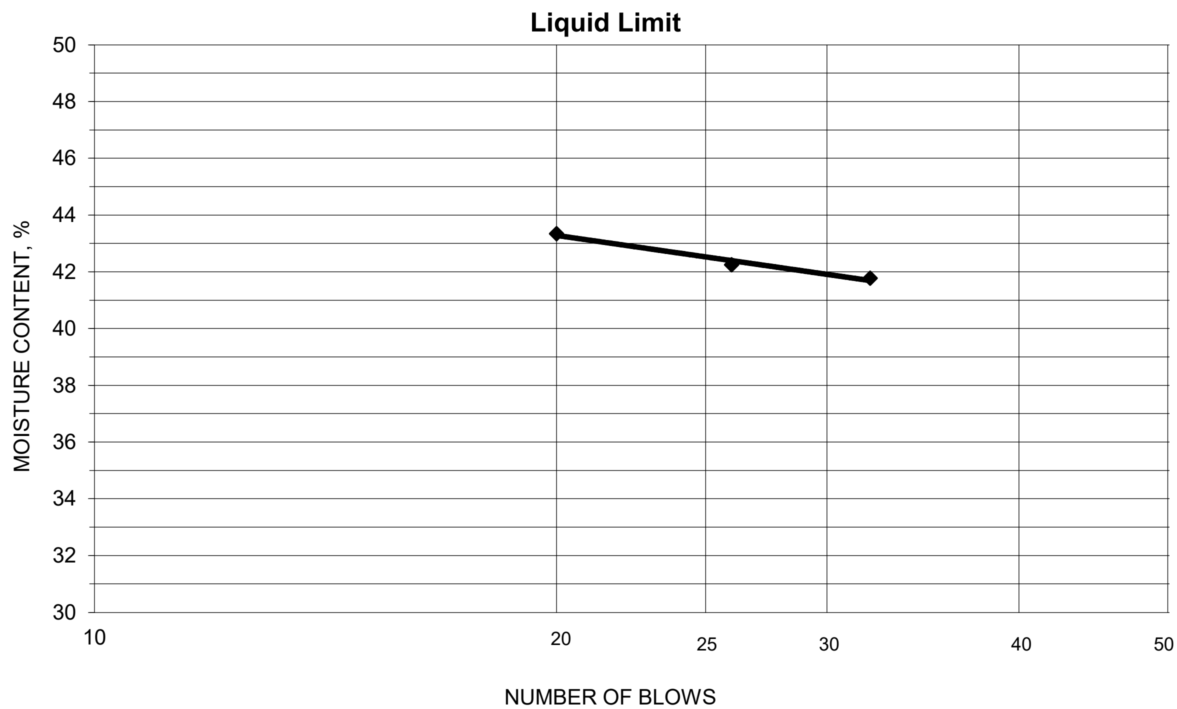
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B20-SS16G, 26.5'-28.0'	Lab ID	710
		% + No. 40	43
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-08-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.06	18.03	11.04	20	43.3	43
20.83	17.86	10.83	26	42.2	
20.95	18.03	11.04	32	41.8	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.77	17.75	11.08	15.3	15	28
19.14	18.05	11.11	15.7		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B20-SS24G, 38.5'-40.0'	Lab ID	718
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 31.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	99.3
No. 200	0.075	96.9
	0.02	68.9
	0.005	35.1
	0.002	24.3
estimated	0.001	18.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.1
Coarse Sand	0.1	0.6
Medium Sand	0.6	---
Fine Sand	2.4	2.4
Silt	61.8	72.6
Clay	35.1	24.3

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 32

Plastic Limit: 18

Plasticity Index: 14

Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (13)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B20-SS24G, 38.5'-40.0'	Lab ID	718

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: MW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

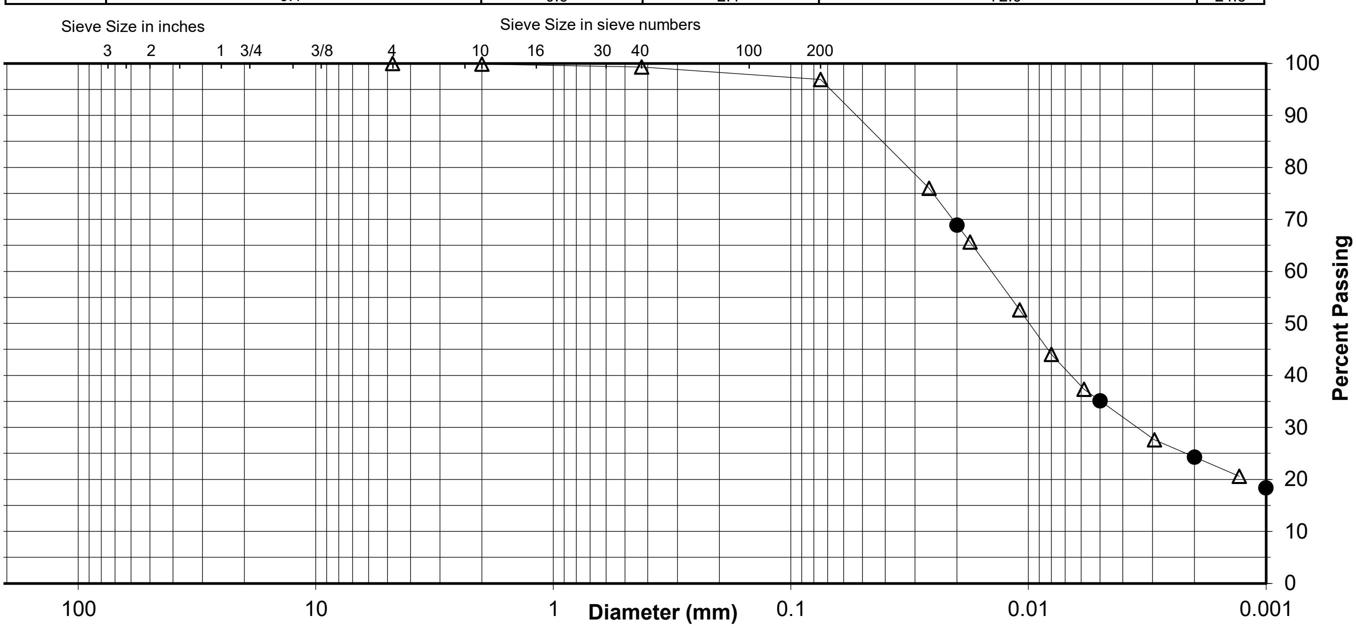
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.3
No. 200	96.9
0.02 mm	68.9
0.005 mm	35.1
0.002 mm	24.3
0.001 mm	18.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.1	0.6	2.4	61.8	35.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.1	0.6	2.4	72.6	24.3



Comments ______

Reviewed By RJ

Stantec

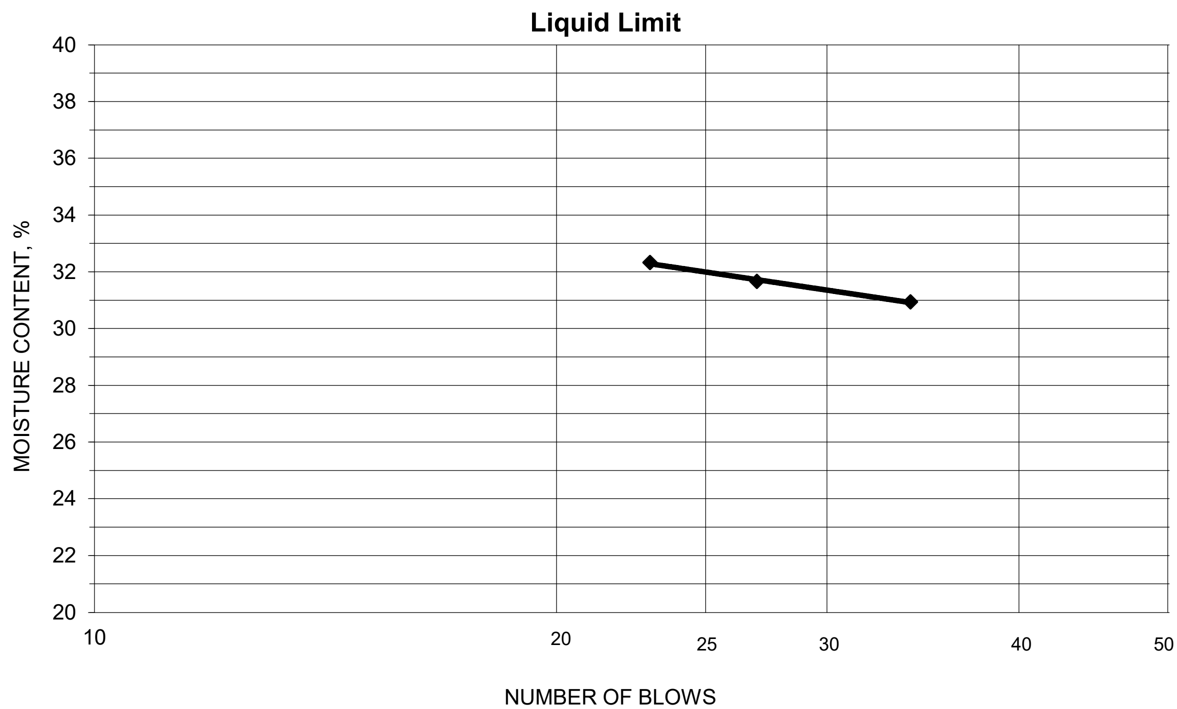
ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B20-SS24G, 38.5'-40.0'	Lab ID	718
		% + No. 40	1
Tested By	DB	Date Received	08-31-2020
Test Date	09-08-2020		

Test Method: ASTM D 4318 Method A

Prepared: Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.91	18.56	11.29	23	32.3	32
22.56	19.85	11.29	27	31.7	
23.01	20.25	11.33	34	30.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.47	19.07	11.37	18.2	18	14
21.63	20.06	11.52	18.4		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B20-SS28G, 44.5'-46.0'
Lab ID: 722
Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 28.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.8
No. 4	4.75	84.6
No. 10	2	67.9
No. 40	0.425	27.9
No. 200	0.075	17.9
	0.02	12.6
	0.005	8.1
	0.002	5.6
estimated	0.001	4.1

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	15.4	32.1
Coarse Sand	16.7	40.0
Medium Sand	40.0	---
Fine Sand	10.0	10.0
Silt	9.8	12.3
Clay	8.1	5.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: SM
Group Name: Silty sand with gravel
AASHTO Classification: A-1-b (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B20-SS28G, 44.5'-46.0'
Lab ID: 722

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: MW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.8
No. 4	84.6
No. 10	67.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

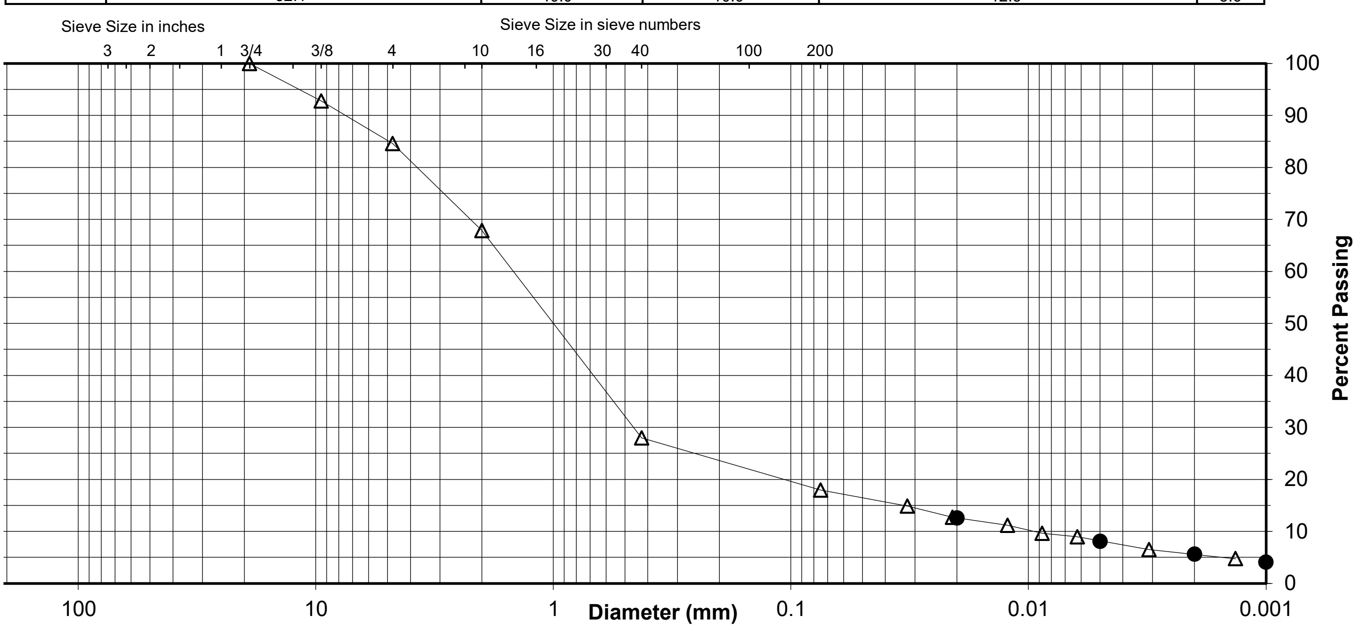
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	27.9
No. 200	17.9
0.02 mm	12.6
0.005 mm	8.1
0.002 mm	5.6
0.001 mm	4.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	15.4	16.7	40.0	10.0	9.8	8.1

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	32.1	40.0	10.0	12.3	5.6



Comments

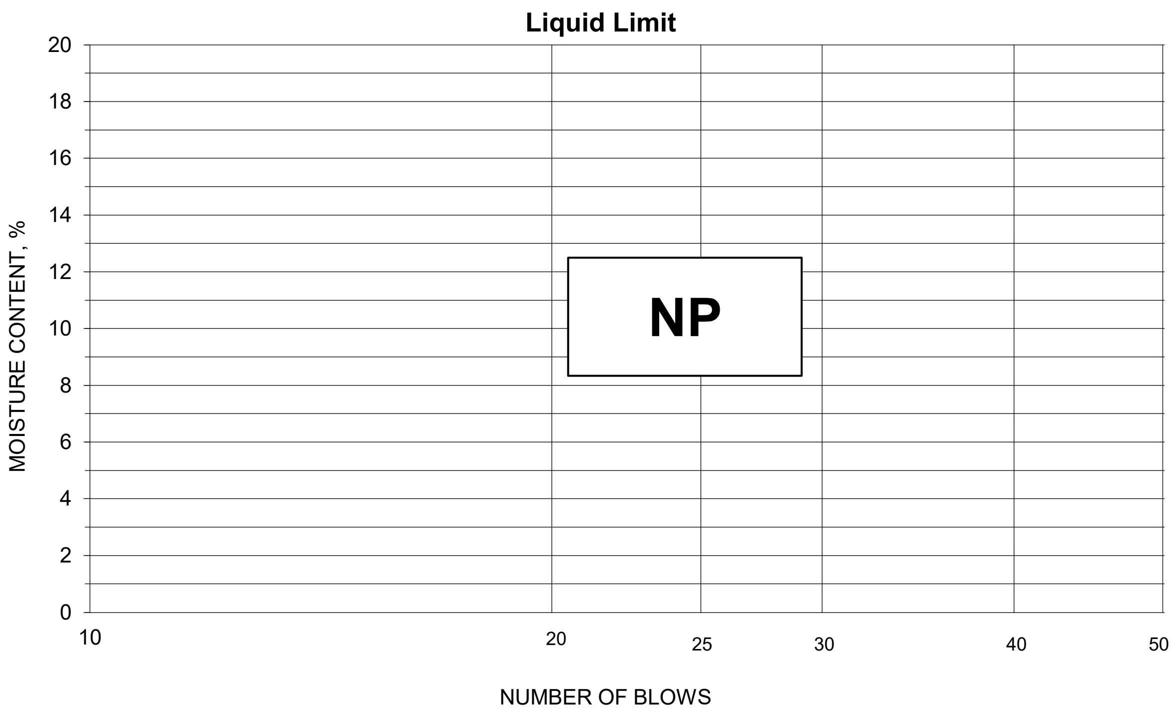
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B20-SS28G, 44.5'-46.0'	Lab ID	722
		% + No. 40	72
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-14-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B20-SS32G, 55.0'-56.5'	Lab ID	726
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 31.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size: Sieve Size	Particle Size: (mm)	% Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.2
No. 4	4.75	87.6
No. 10	2	79.7
No. 40	0.425	71.4
No. 200	0.075	62.2
	0.02	54.3
	0.005	46.9
	0.002	43.1
estimated	0.001	40.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	12.4	20.3
Coarse Sand	7.9	8.3
Medium Sand	8.3	---
Fine Sand	9.2	9.2
Silt	15.3	19.1
Clay	46.9	43.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 57
Plastic Limit: 17
Plasticity Index: 40
Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CH
Group Name: Sandy fat clay

AASHTO Classification: A-7-6 (22)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B20-SS32G, 55.0'-56.5'

Project Number: 175568209
Lab ID: 726

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.2
No. 4	87.6
No. 10	79.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

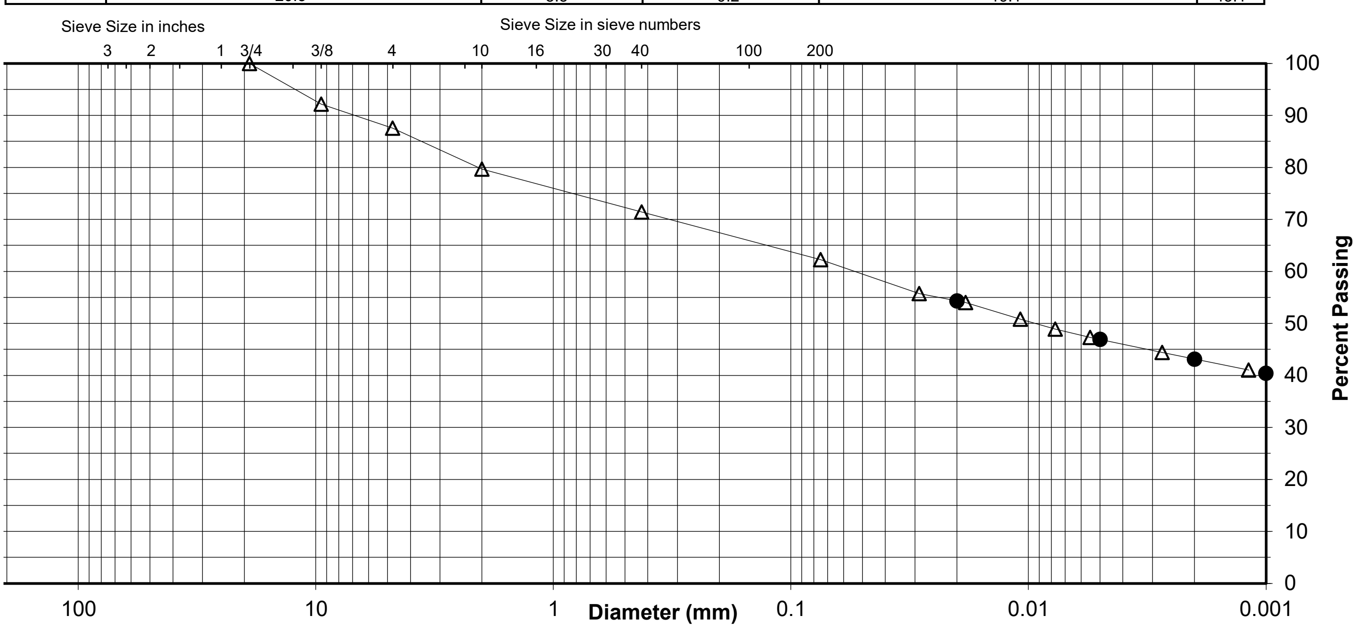
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	71.4
No. 200	62.2
0.02 mm	54.3
0.005 mm	46.9
0.002 mm	43.1
0.001 mm	40.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	12.4	7.9	8.3	9.2	15.3	46.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	20.3	8.3	9.2	19.1	43.1



Comments ____

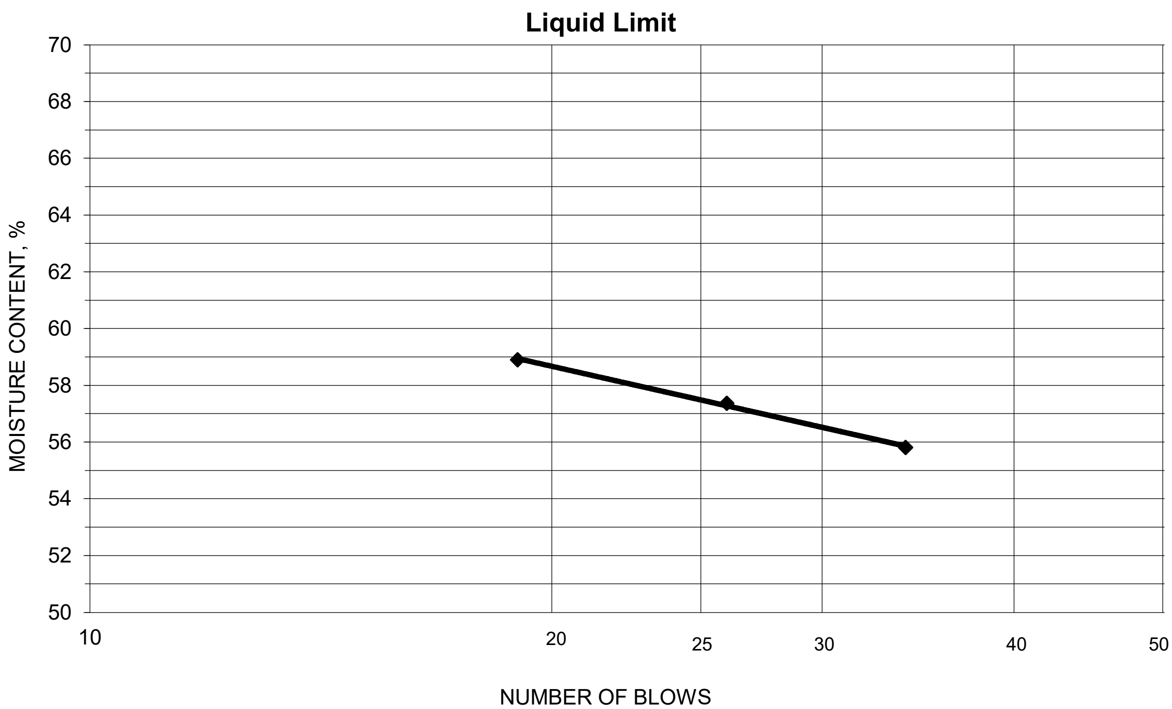
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B20-SS32G, 55.0'-56.5'	Lab ID	726
		% + No. 40	29
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-08-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.67	17.13	11.12	19	58.9	
19.97	16.66	10.89	26	57.4	
21.31	17.61	10.98	34	55.8	57



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.48	17.37	10.74	16.7	17	40
18.14	17.08	10.92	17.2		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B20-SS34G, 65.0'-66.5'	Lab ID	728
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 32.0

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	87.6
3/8"	9.5	84.2
No. 4	4.75	81.7
No. 10	2	77.4
No. 40	0.425	70.8
No. 200	0.075	62.6
	0.02	53.8
	0.005	48.0
	0.002	43.7
estimated	0.001	40.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	18.3	22.6
Coarse Sand	4.3	6.6
Medium Sand	6.6	---
Fine Sand	8.2	8.2
Silt	14.6	18.9
Clay	48.0	43.7

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 59

Plastic Limit: 17

Plasticity Index: 42

Activity Index: 1.0

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CH

Group Name: Sandy fat clay with gravel

AASHTO Classification: A-7-6 (24)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B20-SS34G, 65.0'-66.5'

Project Number: 175568209
Lab ID: 728

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	87.6
3/8"	84.2
No. 4	81.7
No. 10	77.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

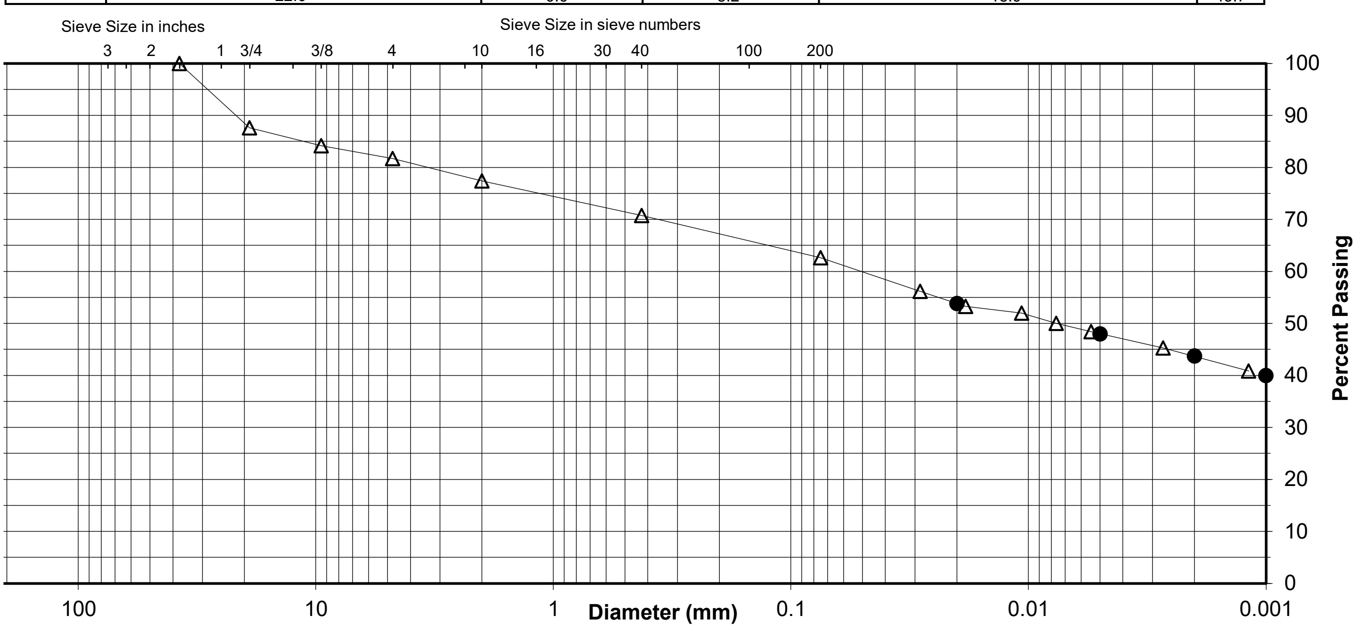
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	70.8
No. 200	62.6
0.02 mm	53.8
0.005 mm	48.0
0.002 mm	43.7
0.001 mm	40.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	12.4	5.9	4.3	6.6	8.2	14.6	48.0

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	22.6	6.6	8.2	18.9	43.7



Comments

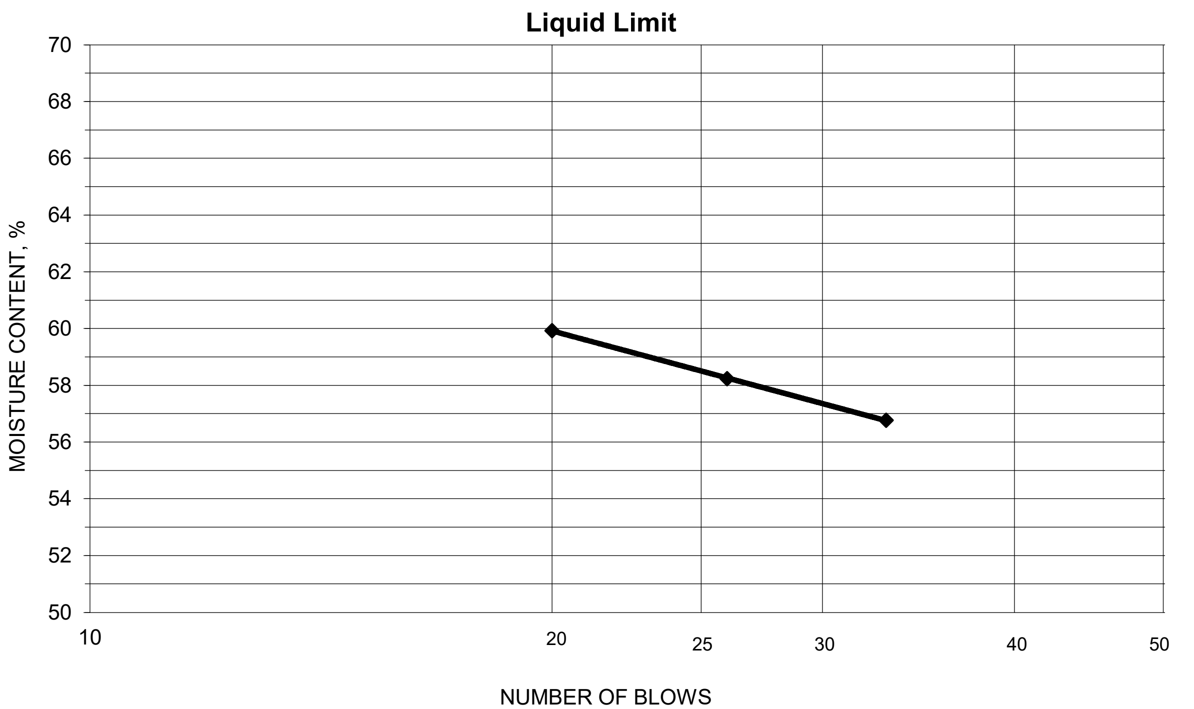
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B20-SS34G, 65.0'-66.5'	Lab ID	728
		% + No. 40	29
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-08-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.97	16.62	11.03	20	59.9	59
21.07	17.57	11.56	26	58.2	
20.91	17.47	11.41	33	56.8	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.24	18.10	11.46	17.2	17	42
19.14	18.03	11.64	17.4		

Remarks: ______________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B21-SS02G, 2.5'-4.0'
Lab ID: 732

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 21.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	90.8
3/8"	9.5	89.2
No. 4	4.75	88.4
No. 10	2	86.2
No. 40	0.425	80.8
No. 200	0.075	76.8
	0.02	55.3
	0.005	42.3
	0.002	35.5
estimated	0.001	32.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	11.6	13.8
Coarse Sand	2.2	5.4
Medium Sand	5.4	---
Fine Sand	4.0	4.0
Silt	34.5	41.3
Clay	42.3	35.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 47
Plastic Limit: 16
Plasticity Index: 31
Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Lean clay with gravel

AASHTO Classification: A-7-6 (23)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B21-SS02G, 2.5'-4.0'	Lab ID	732

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Rounded and Angular
Particle Hardness: Hard and Durable

Tested By: MW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	90.8
3/8"	89.2
No. 4	88.4
No. 10	86.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

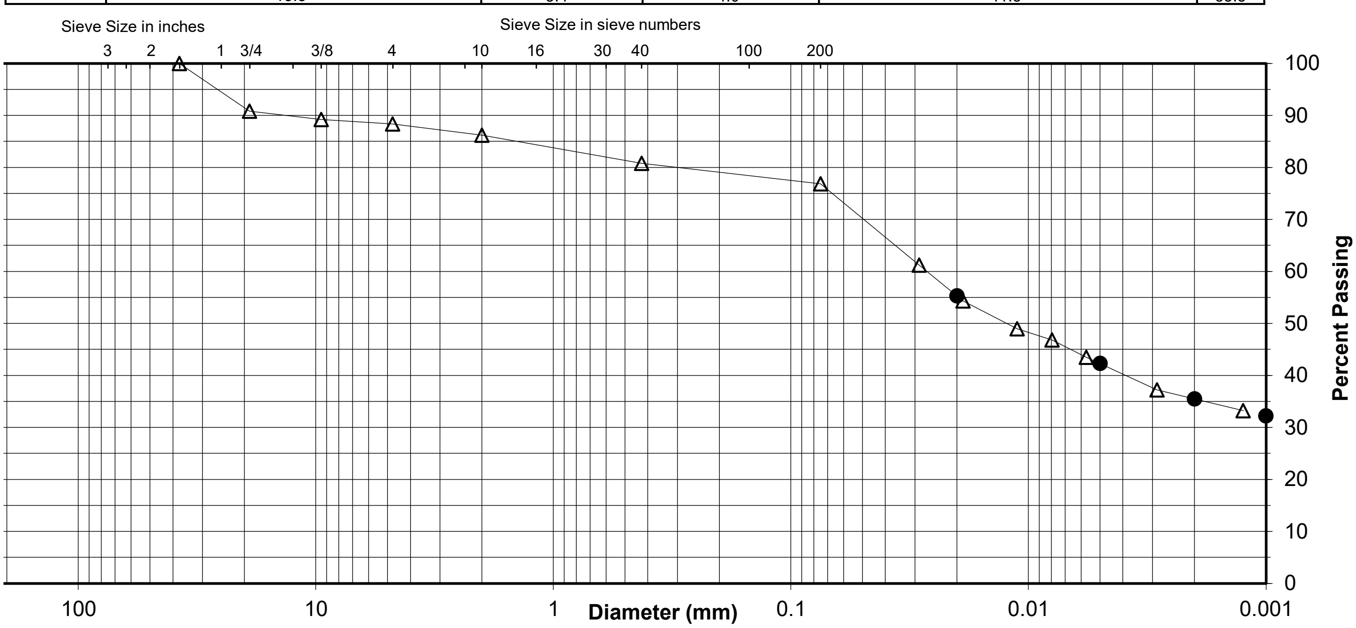
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	80.8
No. 200	76.8
0.02 mm	55.3
0.005 mm	42.3
0.002 mm	35.5
0.001 mm	32.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	9.2	2.4	2.2	5.4	4.0	34.5	42.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	13.8	5.4	4.0	41.3	35.5



Comments ____

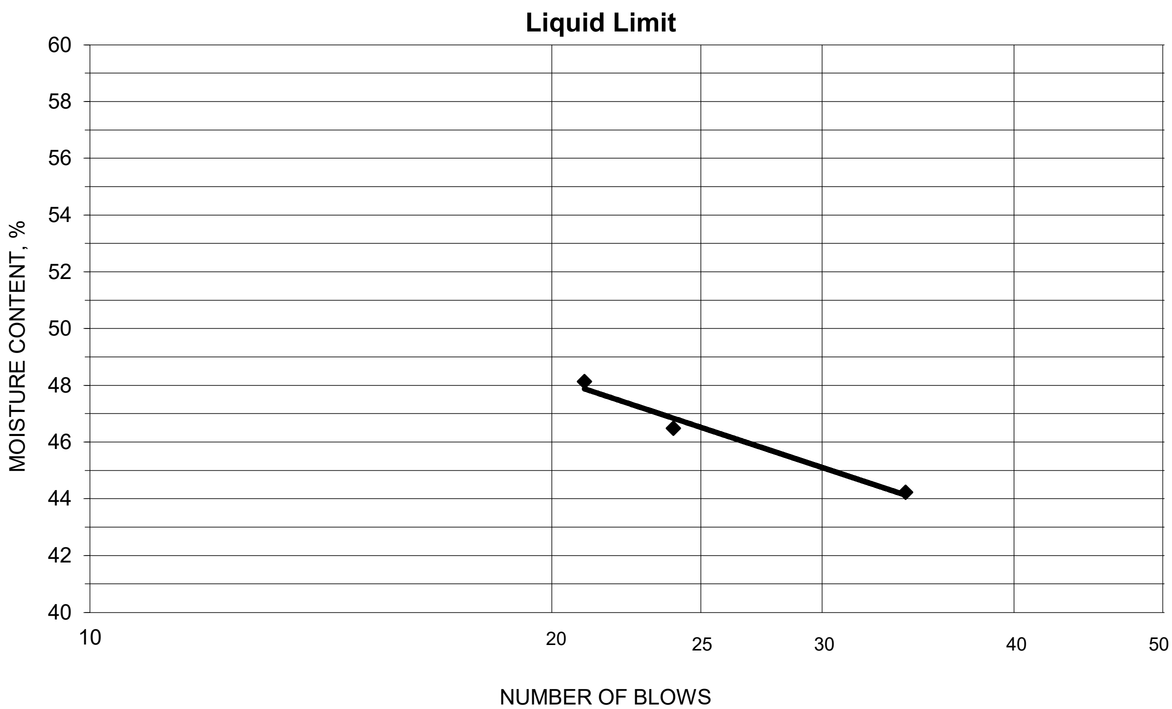
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B21-SS02G, 2.5'-4.0'	Lab ID	732
		% + No. 40	19
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-09-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.28	17.93	10.97	21	48.1	47
21.20	17.96	10.99	24	46.5	
21.42	18.24	11.05	34	44.2	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.56	16.63	10.91	16.3	16	31
17.07	16.23	10.92	15.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B21-SS05G, 10.0'-11.5'
Lab ID: 736
Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 18.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	89.2
3/8"	9.5	84.1
No. 4	4.75	83.4
No. 10	2	82.0
No. 40	0.425	78.0
No. 200	0.075	72.2
	0.02	58.0
	0.005	40.3
	0.002	31.2
estimated	0.001	25.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	16.6	18.0
Coarse Sand	1.4	4.0
Medium Sand	4.0	---
Fine Sand	5.8	5.8
Silt	31.9	41.0
Clay	40.3	31.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 38
Plastic Limit: 15
Plasticity Index: 23
Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Lean clay with gravel

AASHTO Classification: A-6 (14)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B21-SS05G, 10.0'-11.5'

Project Number: 175568209
Lab ID: 736

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	89.2
3/8"	84.1
No. 4	83.4
No. 10	82.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

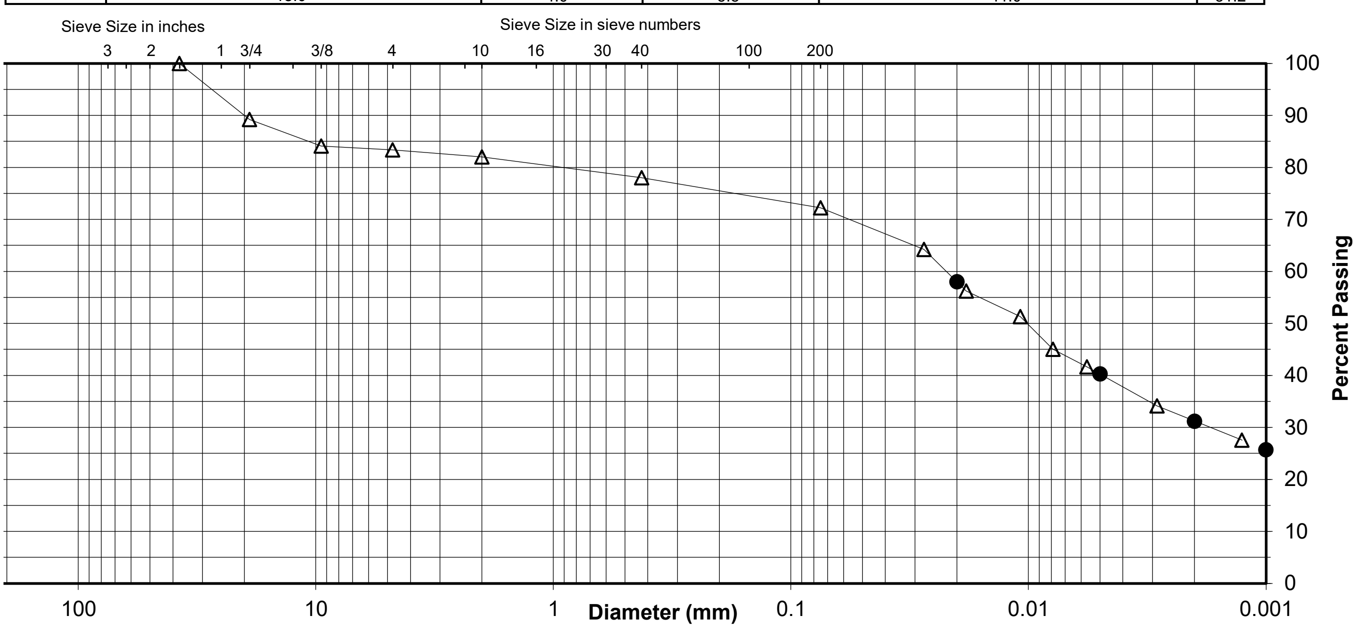
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	78.0
No. 200	72.2
0.02 mm	58.0
0.005 mm	40.3
0.002 mm	31.2
0.001 mm	25.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	10.8	5.8	1.4	4.0	5.8	31.9	40.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	18.0	4.0	5.8	41.0	31.2



Comments ______

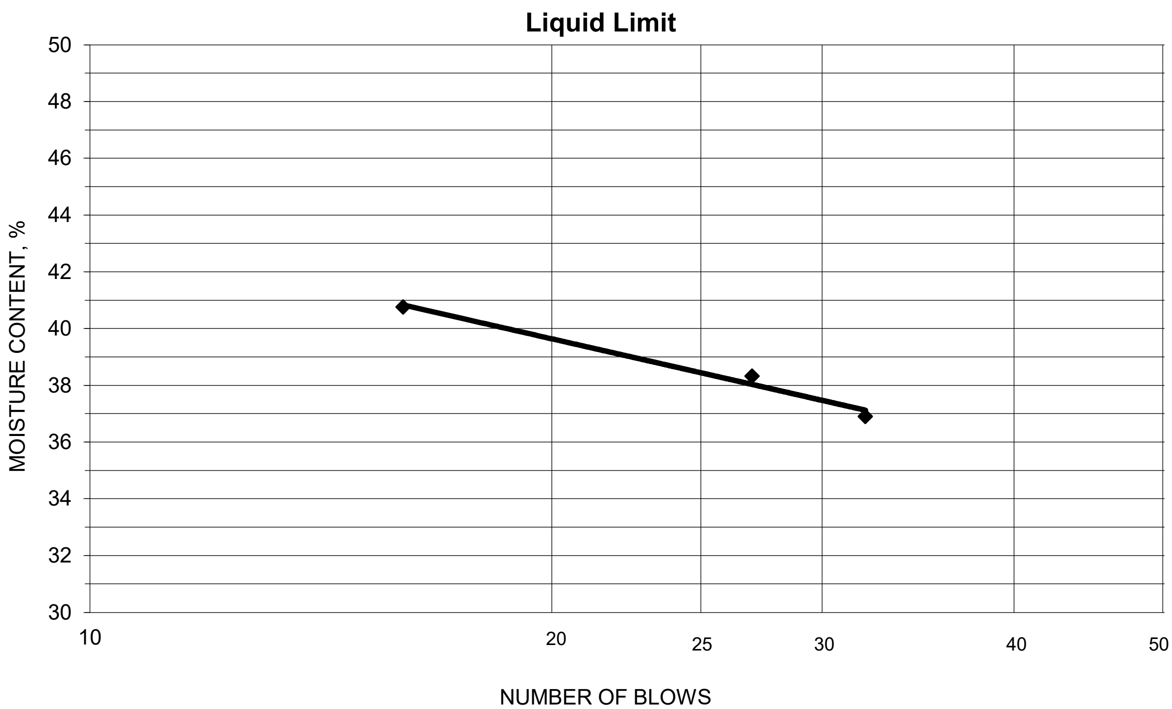
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B21-SS05G, 10.0'-11.5'	Lab ID	736
		% + No. 40	22
Tested By	DB — Test Method: ASTM D 4318 Method A	Date Received	08-31-2020
Test Date	09-09-2020 — Prepared: Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.43	18.43	11.07	16	40.8	38
20.30	17.74	11.06	27	38.3	
21.13	18.34	10.78	32	36.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.33	16.52	11.12	15.0	15	23
18.32	17.33	10.76	15.1		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B21-SS12G, 20.5'-22.0'
Lab ID: 743

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-15-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 27.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.3
3/8"	9.5	94.5
No. 4	4.75	89.8
No. 10	2	83.6
No. 40	0.425	82.3
No. 200	0.075	80.9
	0.02	69.0
	0.005	51.3
	0.002	45.2
estimated	0.001	40.7

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	10.2	16.4
Coarse Sand	6.2	1.3
Medium Sand	1.3	---
Fine Sand	1.4	1.4
Silt	29.6	35.7
Clay	51.3	45.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 55
Plastic Limit: 17
Plasticity Index: 38
Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CH
Group Name: Fat clay with gravel

AASHTO Classification: A-7-6 (31)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B21-SS12G, 20.5'-22.0'	Lab ID	743

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.3
3/8"	94.5
No. 4	89.8
No. 10	83.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

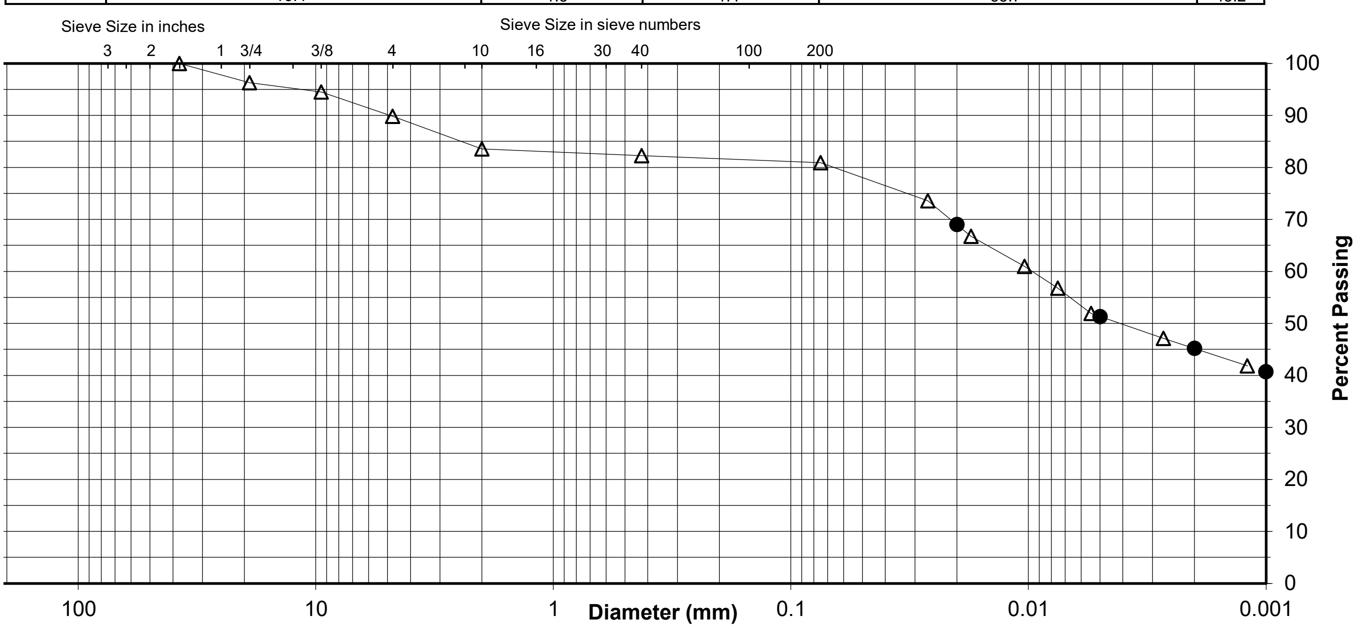
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	82.3
No. 200	80.9
0.02 mm	69.0
0.005 mm	51.3
0.002 mm	45.2
0.001 mm	40.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.7	6.5	6.2	1.3	1.4	29.6	51.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	16.4	1.3	1.4	35.7	45.2



Comments ____________________

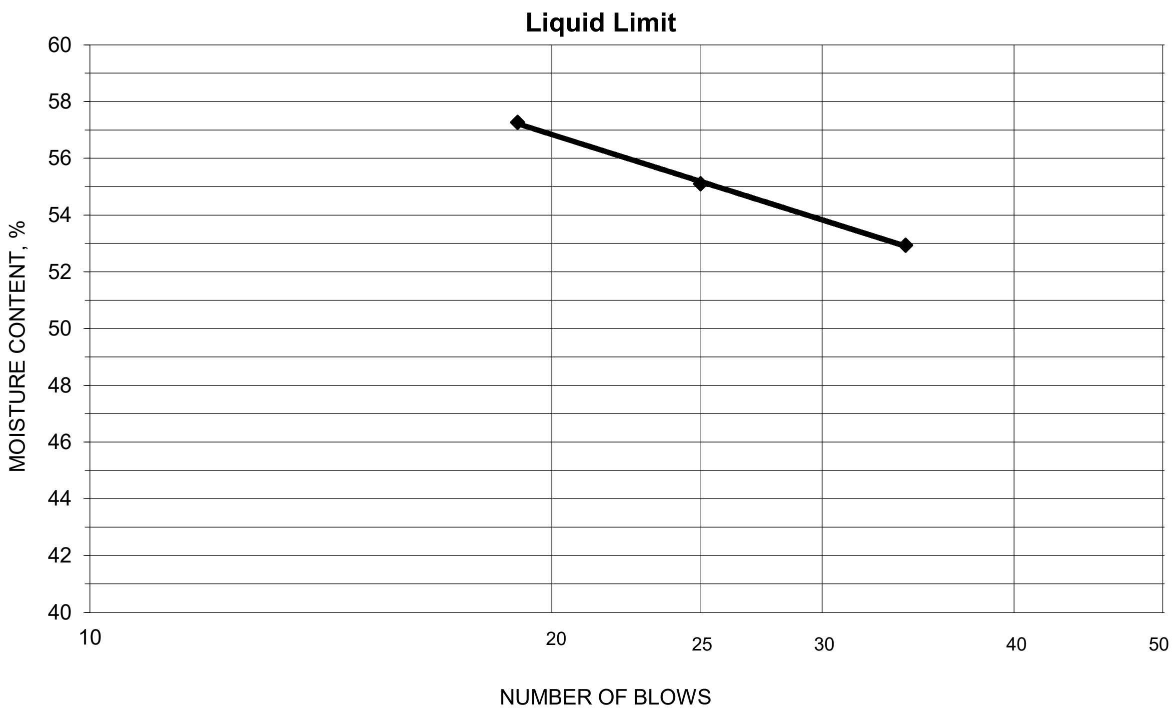
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B21-SS12G, 20.5'-22.0'	Lab ID	743
		% + No. 40	18
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-09-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.02	16.63	10.71	19	57.3	55
20.41	17.06	10.98	25	55.1	
20.41	17.08	10.79	34	52.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.83	17.70	11.13	17.2	17	38
18.60	17.50	11.10	17.2		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B21-SS22G, 35.5'-37.0'
Lab ID: 753

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 34.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.6
3/8"	9.5	90.3
No. 4	4.75	86.1
No. 10	2	83.1
No. 40	0.425	78.4
No. 200	0.075	75.0
	0.02	65.0
	0.005	52.2
	0.002	46.5
estimated	0.001	43.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	13.9	16.9
Coarse Sand	3.0	4.7
Medium Sand	4.7	---
Fine Sand	3.4	3.4
Silt	22.8	28.5
Clay	52.2	46.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 63
Plastic Limit: 18
Plasticity Index: 45
Activity Index: 1.0

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CH
Group Name: Fat clay with gravel

AASHTO Classification: A-7-6 (34)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B21-SS22G, 35.5'-37.0'
Project Number: 175568209
Lab ID: 753

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: MW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.6
3/8"	90.3
No. 4	86.1
No. 10	83.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

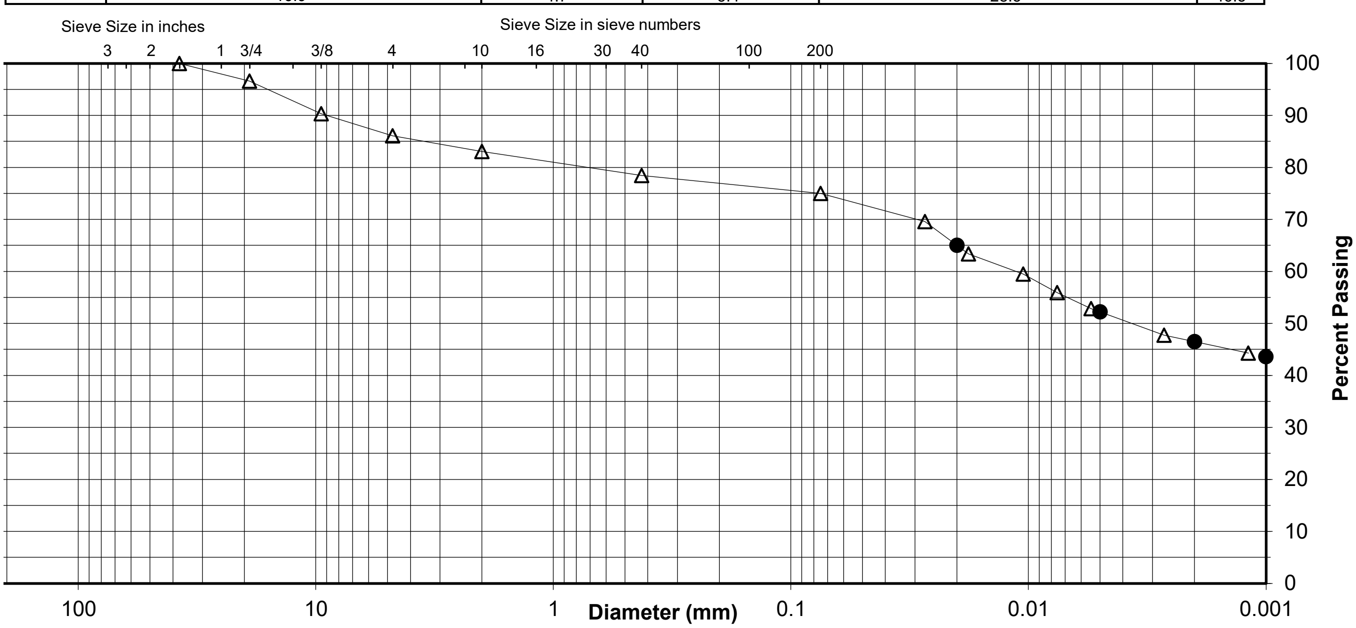
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	78.4
No. 200	75.0
0.02 mm	65.0
0.005 mm	52.2
0.002 mm	46.5
0.001 mm	43.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.4	10.5	3.0	4.7	3.4	22.8	52.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	16.9	4.7	3.4	28.5	46.5



Comments:

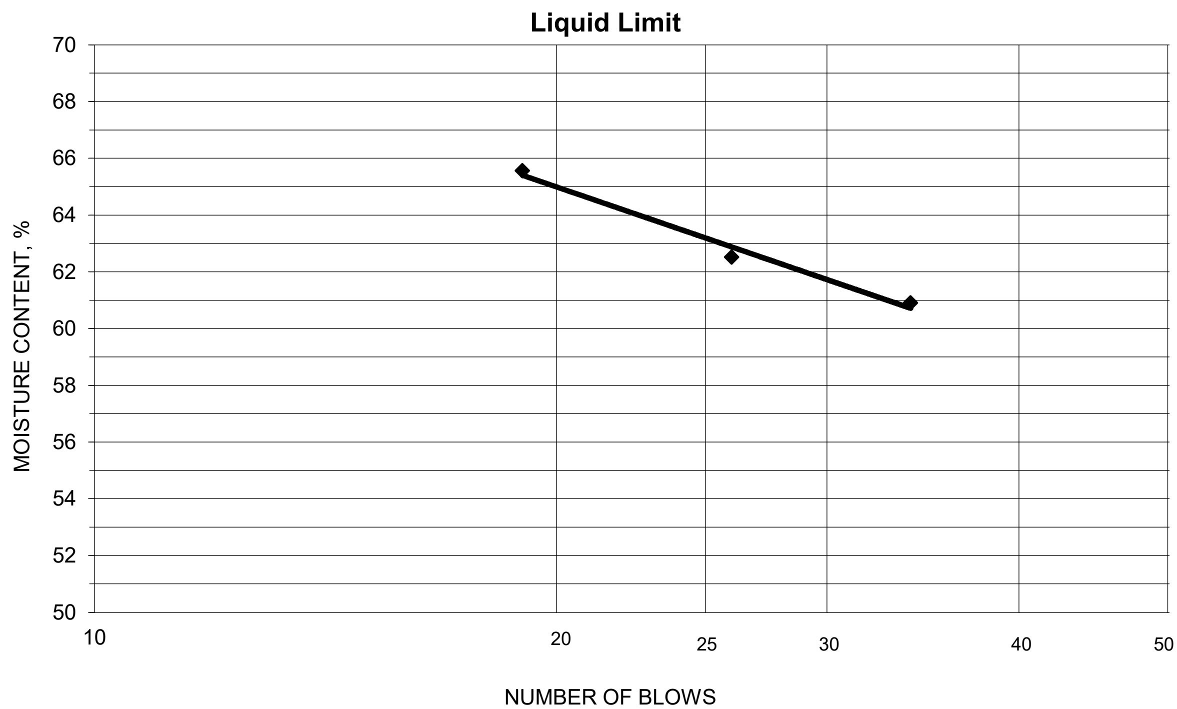
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B21-SS22G, 35.5'-37.0'	Lab ID	753
		% + No. 40	22
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-09-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.54	17.56	11.49	19	65.6	63
20.52	17.00	11.37	26	62.5	
20.37	17.02	11.52	34	60.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
20.72	19.31	11.41	17.8	18	45
18.58	17.50	11.30	17.4		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B21-SS26G, 41.5'-43.0'	Lab ID	758
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.8

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.8
No. 200	0.075	93.3
	0.02	62.6
	0.005	30.5
	0.002	21.6
estimated	0.001	17.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.2
Medium Sand	0.2	---
Fine Sand	6.5	6.5
Silt	62.8	71.7
Clay	30.5	21.6

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 28

Plastic Limit: 17

Plasticity Index: 11

Activity Index: 0.5

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (9)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B21-SS26G, 41.5'-43.0'	Lab ID	758

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: MW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

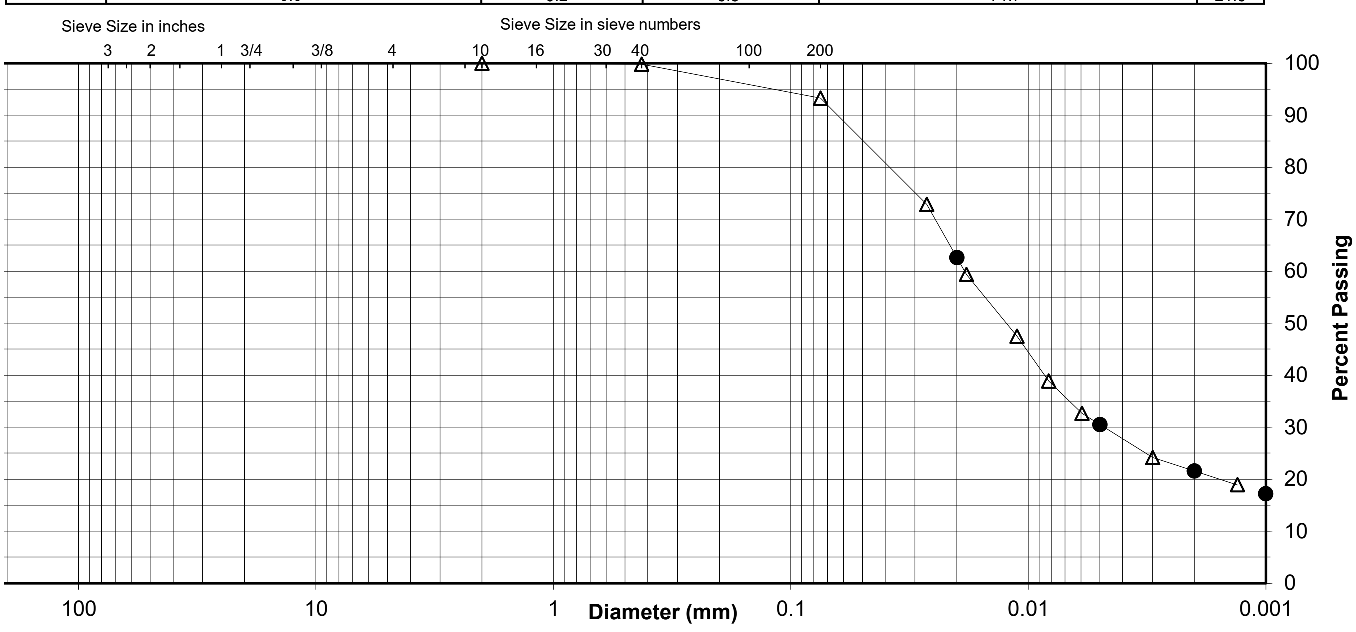
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.8
No. 200	93.3
0.02 mm	62.6
0.005 mm	30.5
0.002 mm	21.6
0.001 mm	17.2

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.0	0.2	6.5	62.8	30.5

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.0	0.2	6.5	71.7	21.6



Comments ____________________

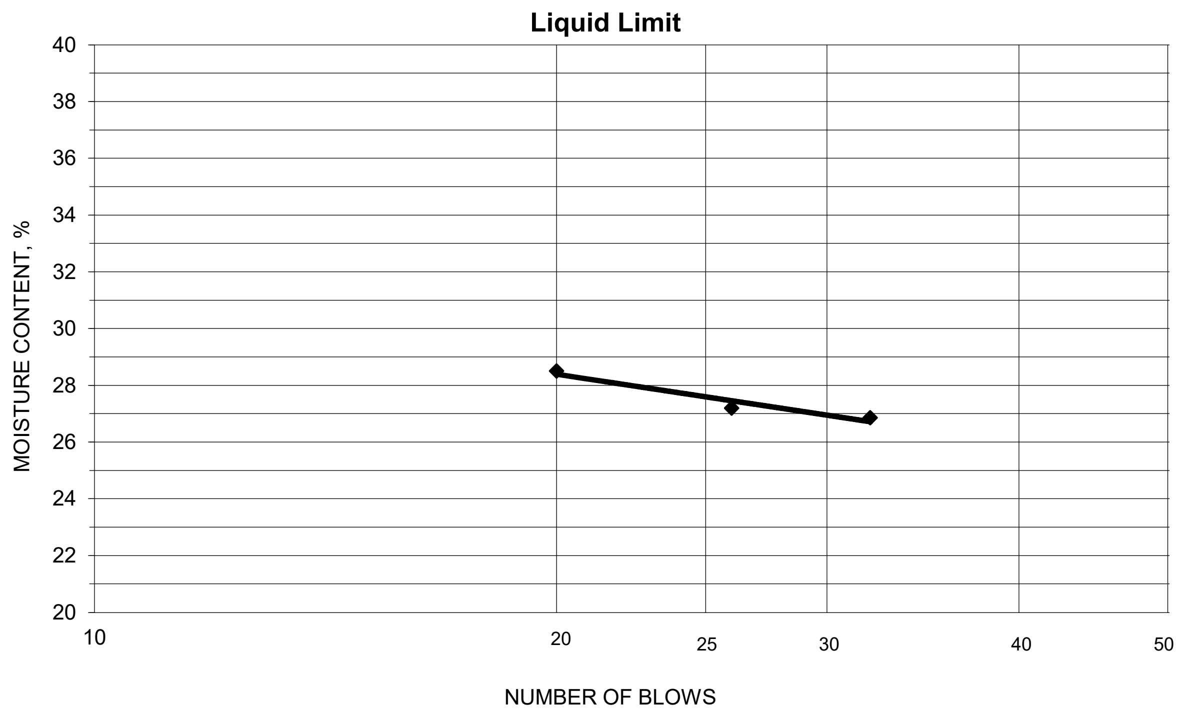
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B21-SS26G, 41.5'-43.0'	Lab ID	758
		% + No. 40	0
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-09-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
22.27	19.89	11.54	20	28.5	
22.39	20.04	11.40	26	27.2	
22.48	20.10	11.24	32	26.9	28



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.64	17.56	11.37	17.4	17	11
19.52	18.32	11.46	17.5		

Remarks:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B21-SS28bG, 45.0'-46.0'
Project Number: 175568209
Lab ID: 761

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.5
3/8"	86.0
No. 4	78.4
No. 10	73.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

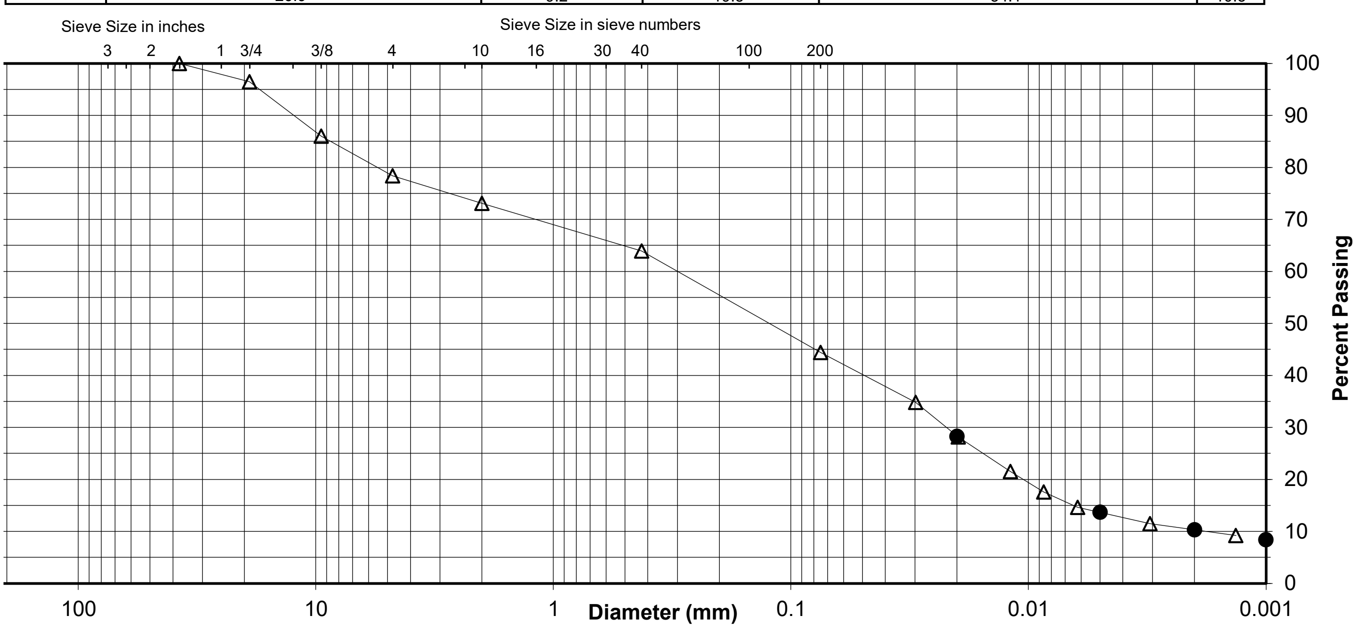
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	63.9
No. 200	44.4
0.02 mm	28.3
0.005 mm	13.7
0.002 mm	10.3
0.001 mm	8.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.5	18.1	5.3	9.2	19.5	30.7	13.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	26.9	9.2	19.5	34.1	10.3



Comments ____

Reviewed By: RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B21-SS32G, 55.0'-56.5'	Lab ID	766
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 34.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size Sieve Size	Particle Size (mm)	% Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	56.2
3/8"	9.5	46.1
No. 4	4.75	39.7
No. 10	2	29.6
No. 40	0.425	23.1
No. 200	0.075	20.7
	0.02	18.7
	0.005	16.8
	0.002	14.7
estimated	0.001	12.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	60.3	70.4
Coarse Sand	10.1	6.5
Medium Sand	6.5	---
Fine Sand	2.4	2.4
Silt	3.9	6.0
Clay	16.8	14.7

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 51

Plastic Limit: 19

Plasticity Index: 32

Activity Index: 2.2

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: GC

Group Name: Clayey gravel with sand

AASHTO Classification: A-2-7 (1)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B21-SS32G, 55.0'-56.5'	Lab ID	766

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: MW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	56.2
3/8"	46.1
No. 4	39.7
No. 10	29.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

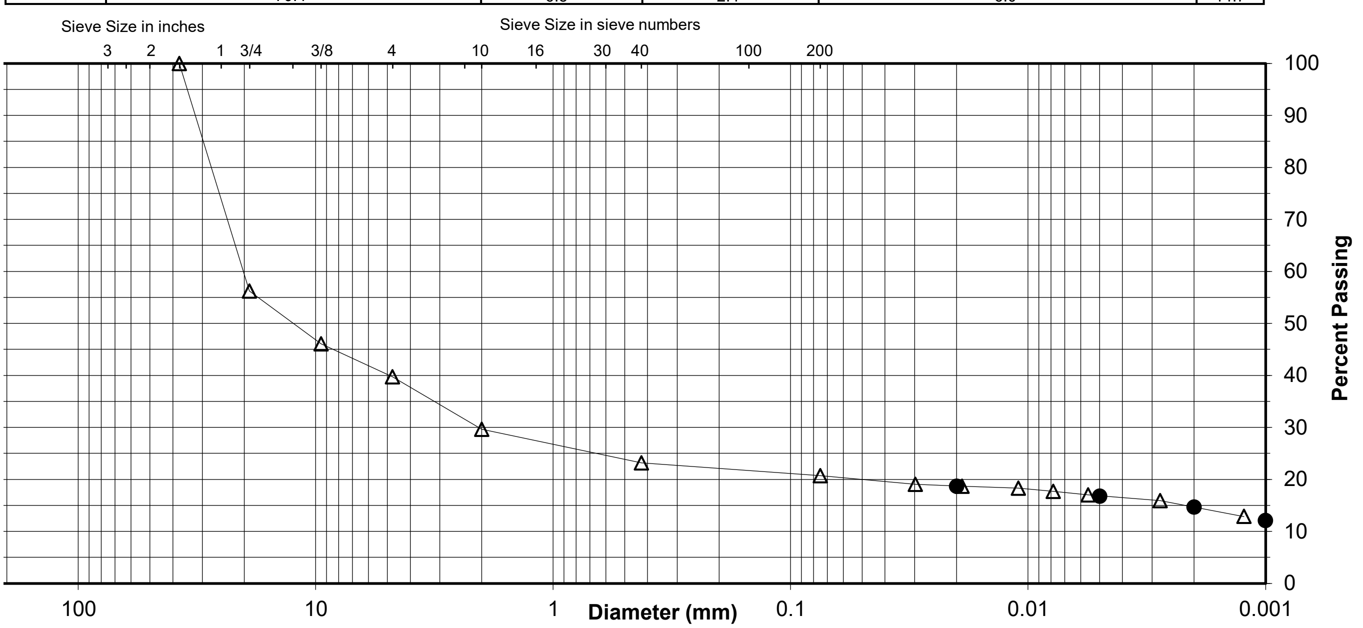
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	23.1
No. 200	20.7
0.02 mm	18.7
0.005 mm	16.8
0.002 mm	14.7
0.001 mm	12.1

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	43.8	16.5	10.1	6.5	2.4	3.9	16.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	70.4	6.5	2.4	6.0	14.7



Comments ______________________

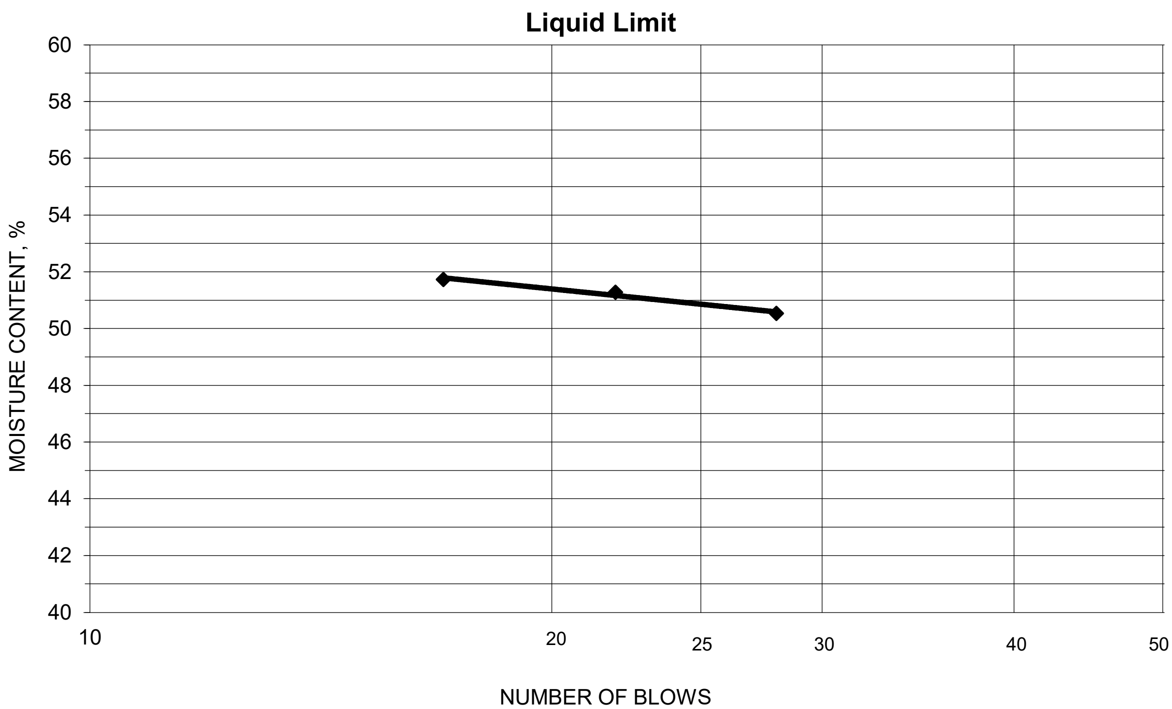
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B21-SS32G, 55.0'-56.5'	Lab ID	766
		% + No. 40	77
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-09-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.78	17.65	11.60	17	51.7	
20.03	16.81	10.53	22	51.3	
19.54	16.69	11.05	28	50.5	51



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.34	18.04	11.18	19.0	19	32
18.82	17.64	11.40	18.9		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B22-SS02G, 2.5'-4.0'
Lab ID: 772

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 17.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.8
No. 4	4.75	92.3
No. 10	2	78.3
No. 40	0.425	76.2
No. 200	0.075	73.2
	0.02	57.1
	0.005	34.6
	0.002	26.2
estimated	0.001	20.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	7.7	21.7
Coarse Sand	14.0	2.1
Medium Sand	2.1	---
Fine Sand	3.0	3.0
Silt	38.6	47.0
Clay	34.6	26.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 37
Plastic Limit: 16
Plasticity Index: 21
Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-6 (13)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B22-SS02G, 2.5'-4.0'
Lab ID: 772

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-02-2020
Date Received: 08-31-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.8
No. 4	92.3
No. 10	78.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

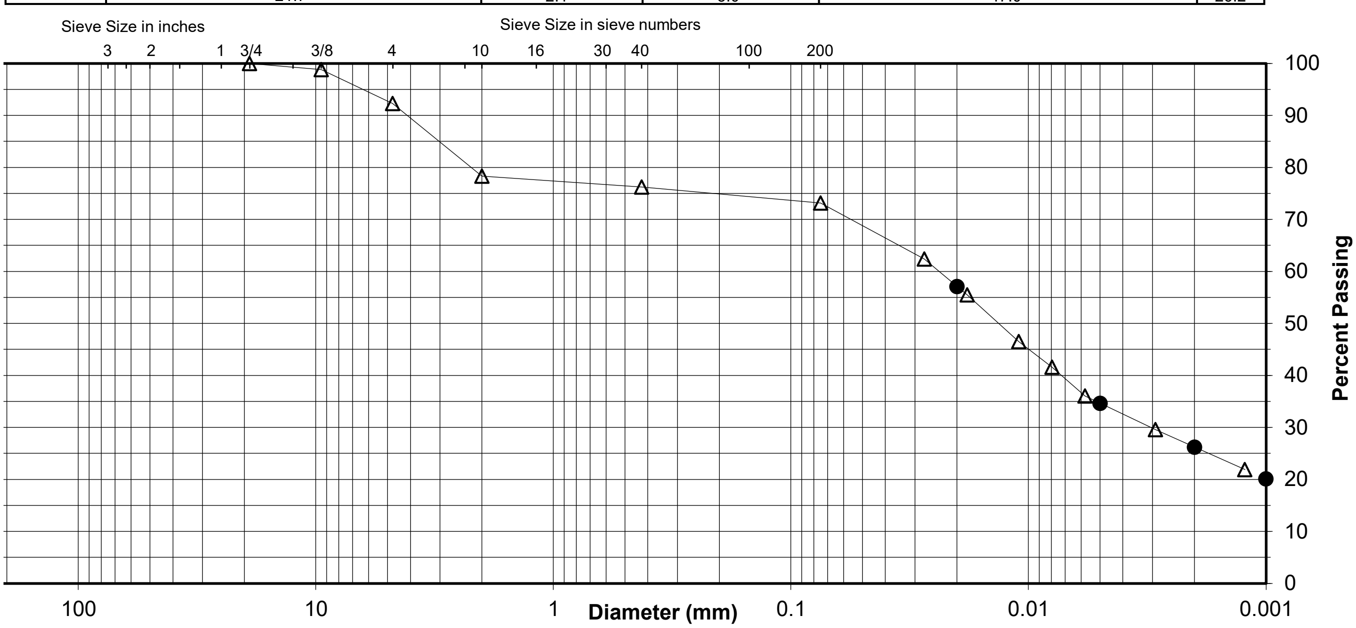
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	76.2
No. 200	73.2
0.02 mm	57.1
0.005 mm	34.6
0.002 mm	26.2
0.001 mm	20.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	7.7	14.0	2.1	3.0	38.6	34.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	21.7	2.1	3.0	47.0	26.2



Comments:

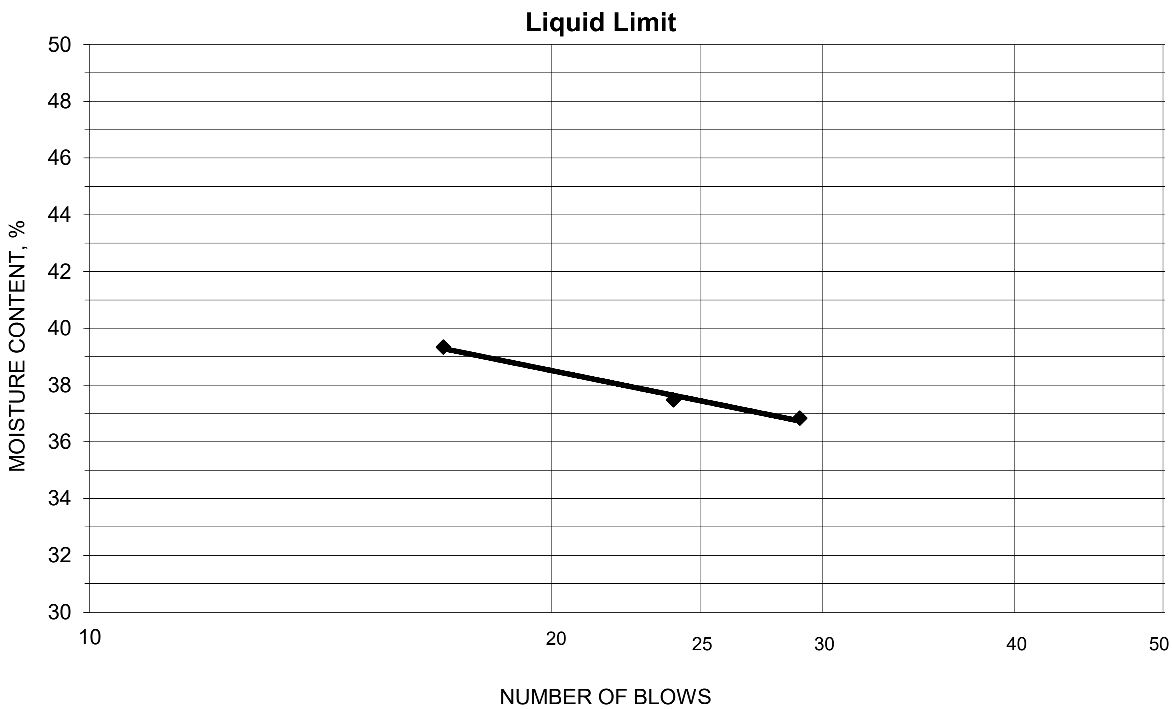
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS02G, 2.5'-4.0'	Lab ID	772
		% + No. 40	24
Tested By	DB Test Method ASTM D 4318 Method A	Date Received	08-31-2020
Test Date	09-11-2020 Prepared Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.31	17.69	11.03	17	39.3	
21.38	18.55	11.00	24	37.5	
20.83	18.20	11.06	29	36.8	37



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.98	17.03	10.99	15.7	16	21
18.45	17.43	10.99	15.8		

Remarks: ______________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B22-SS05G, 10.0'-11.5'
Lab ID: 774

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 17.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	97.3
3/8"	9.5	90.9
No. 4	4.75	88.6
No. 10	2	85.5
No. 40	0.425	81.5
No. 200	0.075	75.7
	0.02	56.5
	0.005	38.2
	0.002	30.6
estimated	0.001	26.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	11.4	14.5
Coarse Sand	3.1	4.0
Medium Sand	4.0	---
Fine Sand	5.8	5.8
Silt	37.5	45.1
Clay	38.2	30.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 38
Plastic Limit: 15
Plasticity Index: 23
Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-6 (16)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order | Project Number: 175568209
Source: CUF-GT-B22-SS05G, 10.0'-11.5' | Lab ID: 774

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-03-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	97.3
3/8"	90.9
No. 4	88.6
No. 10	85.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

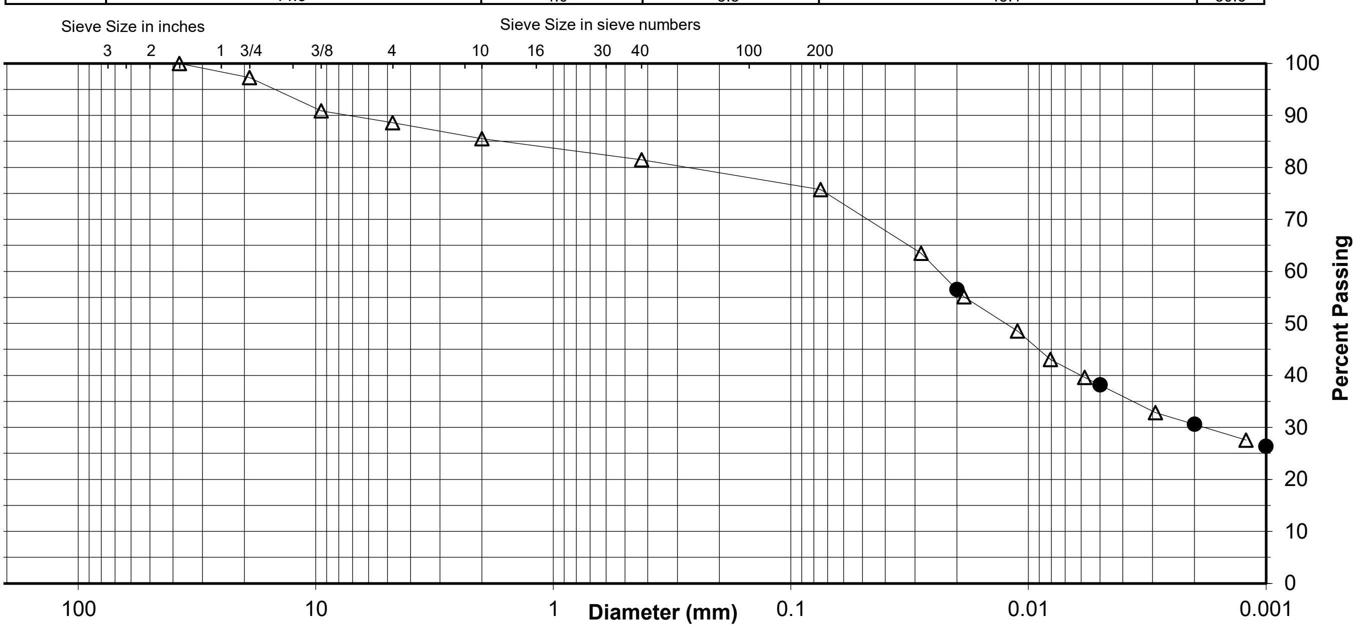
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	81.5
No. 200	75.7
0.02 mm	56.5
0.005 mm	38.2
0.002 mm	30.6
0.001 mm	26.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	2.7	8.7	3.1	4.0	5.8	37.5	38.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	14.5	4.0	5.8	45.1	30.6



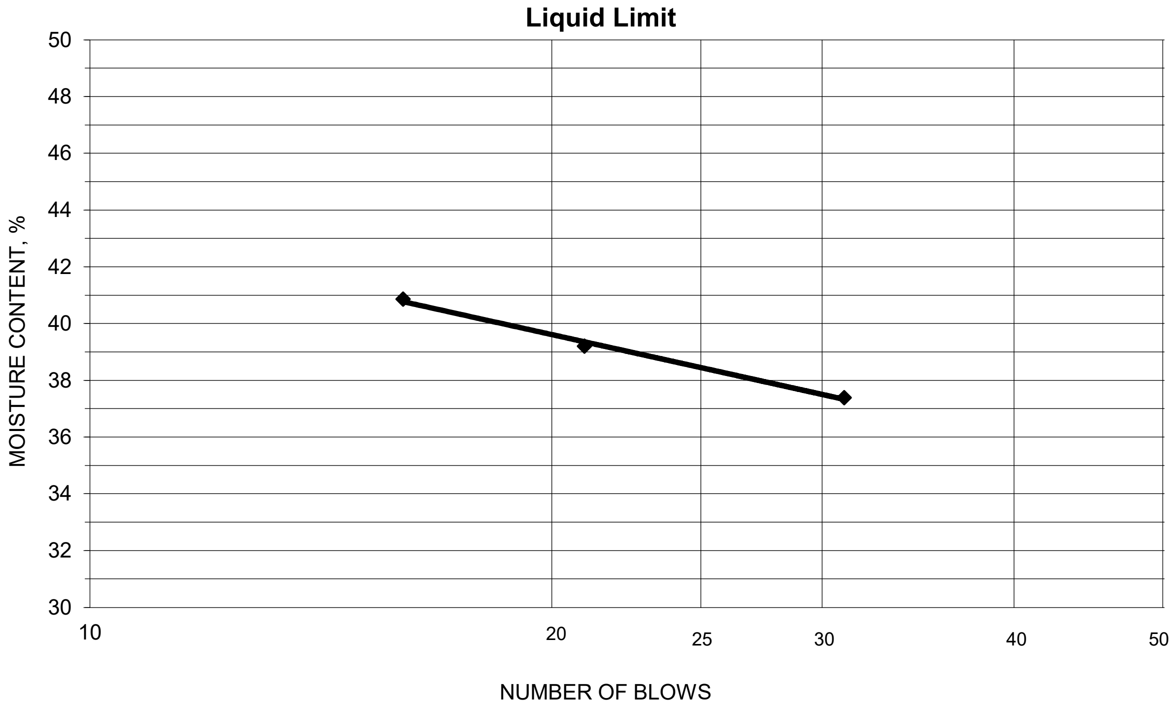
Comments ______ Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS05G, 10.0'-11.5'	Lab ID	774
		% + No. 40	19
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-10-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.43	18.39	10.95	16	40.9	
21.33	18.46	11.14	21	39.2	
20.90	18.29	11.31	31	37.4	38



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
22.02	20.67	11.50	14.7	15	23
18.29	17.33	10.77	14.6		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B22-SS10G, 17.5'-19.0'	Lab ID	780
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 26.3

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	97.0
3/8"	9.5	95.3
No. 4	4.75	93.4
No. 10	2	89.3
No. 40	0.425	86.1
No. 200	0.075	81.6
	0.02	63.5
	0.005	40.7
	0.002	31.4
estimated	0.001	24.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	6.6	10.7
Coarse Sand	4.1	3.2
Medium Sand	3.2	---
Fine Sand	4.5	4.5
Silt	40.9	50.2
Clay	40.7	31.4

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 40

Plastic Limit: 17

Plasticity Index: 23

Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay with sand

AASHTO Classification: A-6 (18)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B22-SS10G, 17.5'-19.0'	Lab ID	780

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-03-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	97.0
3/8"	95.3
No. 4	93.4
No. 10	89.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

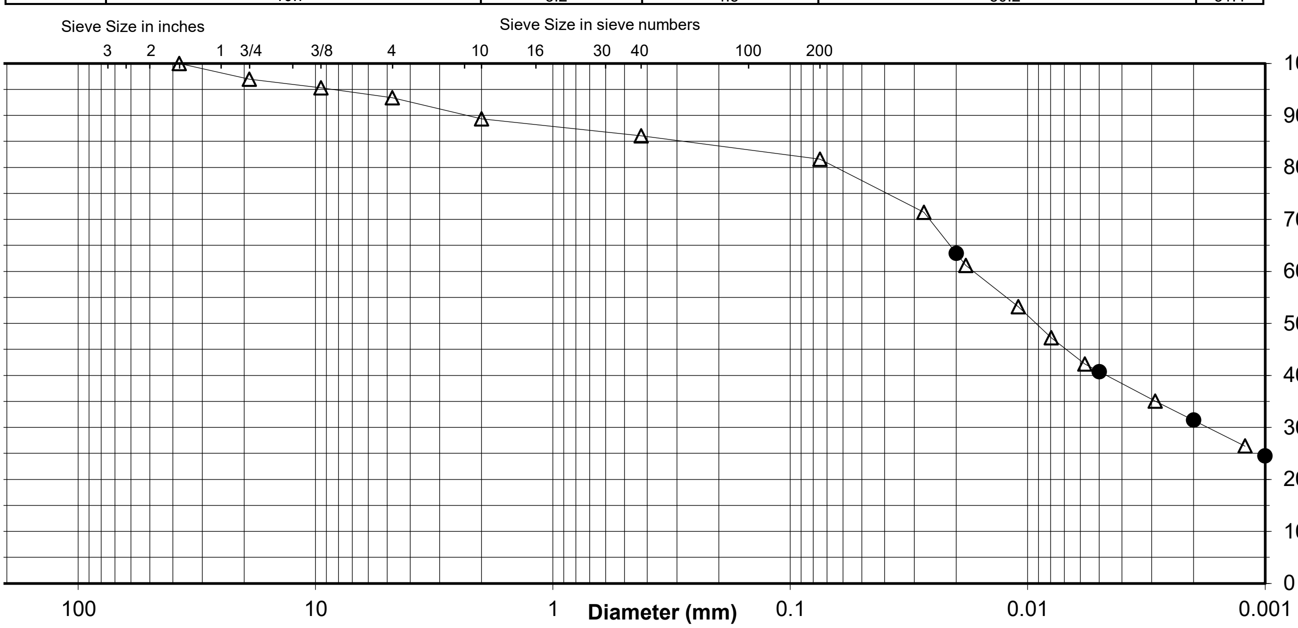
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	86.1
No. 200	81.6
0.02 mm	63.5
0.005 mm	40.7
0.002 mm	31.4
0.001 mm	24.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.0	3.6	4.1	3.2	4.5	40.9	40.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	10.7	3.2	4.5	50.2	31.4



Comments ____________________

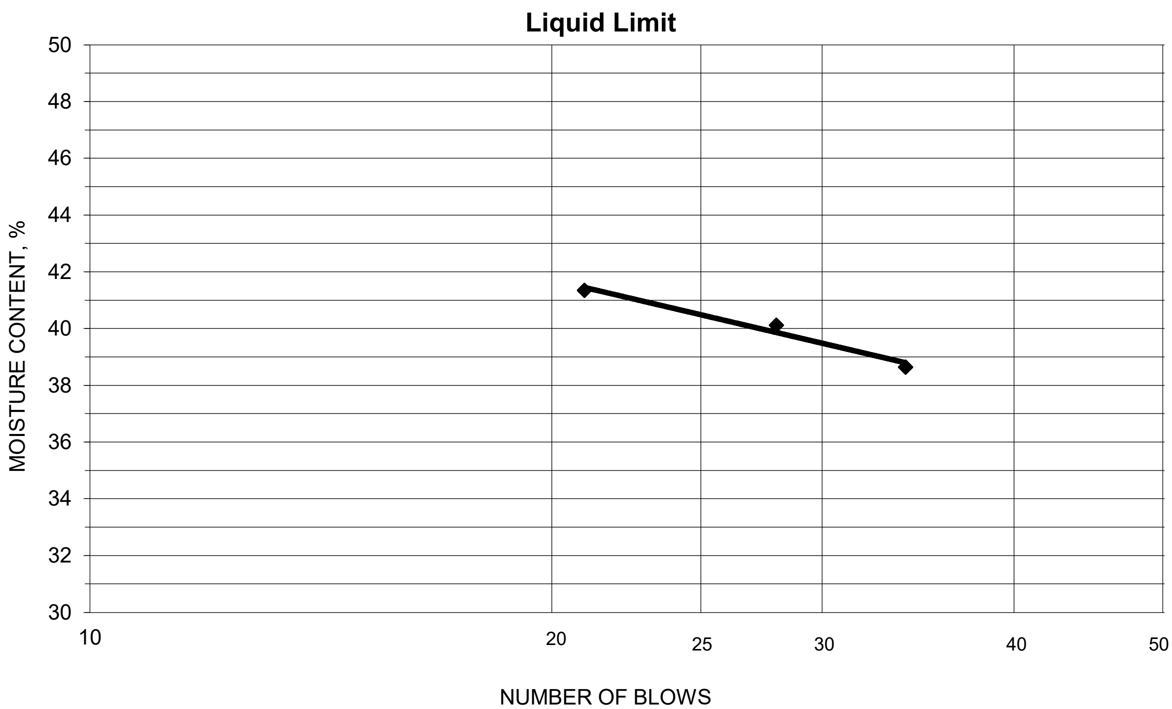
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS10G, 17.5'-19.0'	Lab ID	780
		% + No. 40	14
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-10-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.59	17.77	10.95	21	41.3	40
20.90	18.08	11.05	28	40.1	
21.11	18.32	11.10	34	38.6	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.59	17.52	11.18	16.9	17	23
19.04	17.86	10.94	17.1		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B22-SS13G, 22.0'-23.5'	Lab ID	783
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 23.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.2
No. 10	2	97.3
No. 40	0.425	95.4
No. 200	0.075	91.9
	0.02	64.8
	0.005	39.1
	0.002	29.0
estimated	0.001	23.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.8	2.7
Coarse Sand	1.9	1.9
Medium Sand	1.9	---
Fine Sand	3.5	3.5
Silt	52.8	62.9
Clay	39.1	29.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 35
Plastic Limit: 16
Plasticity Index: 19
Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Lean clay

AASHTO Classification: A-6 (17)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B22-SS13G, 22.0'-23.5'	Lab ID	783

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-03-2020
Date Received: 08-31-2020

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.2
No. 10	97.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

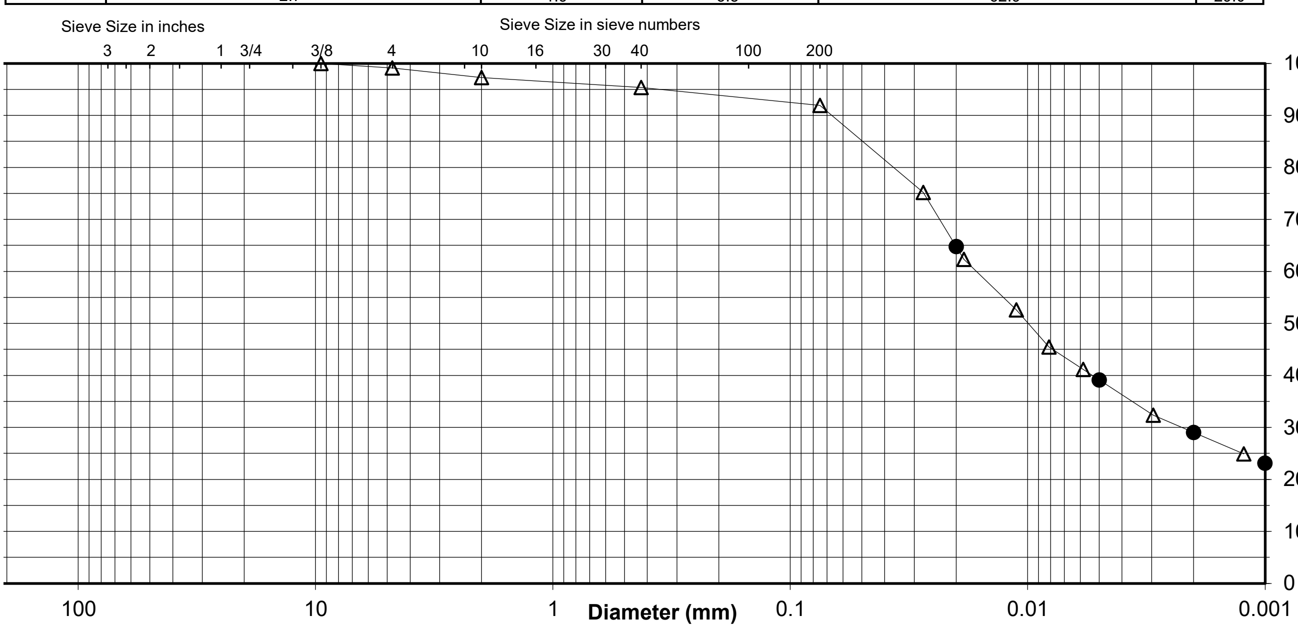
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	95.4
No. 200	91.9
0.02 mm	64.8
0.005 mm	39.1
0.002 mm	29.0
0.001 mm	23.1

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.8	1.9	1.9	3.5	52.8	39.1

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	2.7	1.9	3.5	62.9	29.0



Comments ______

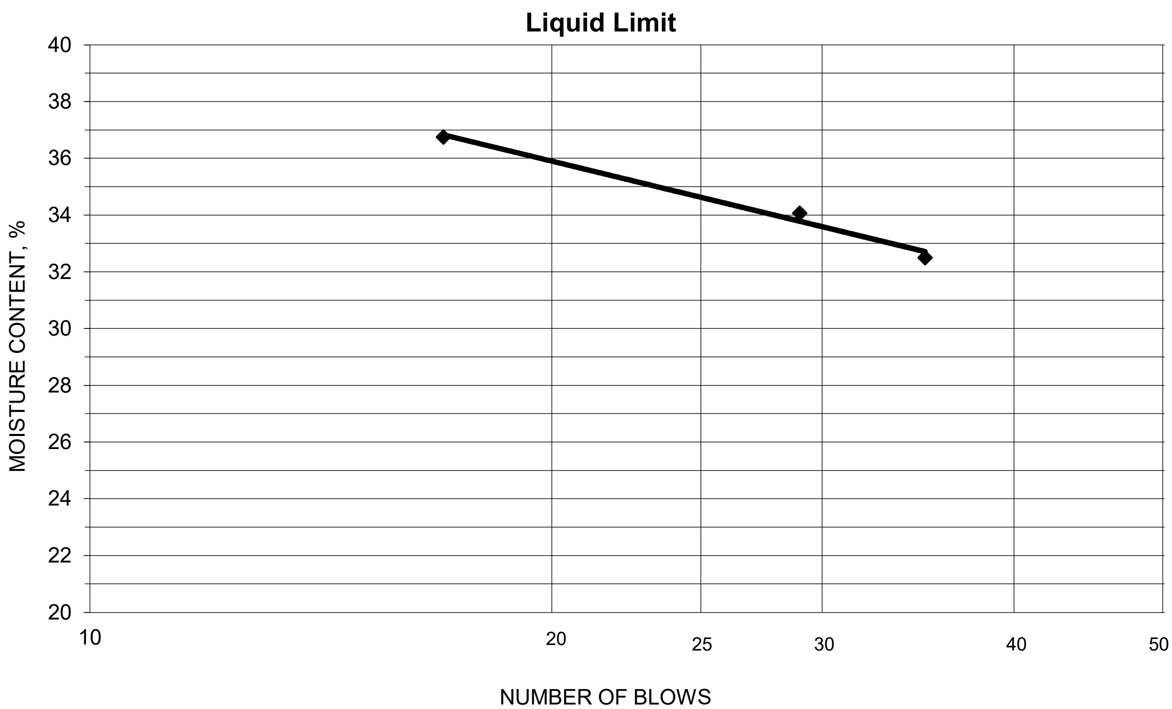
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS13G, 22.0'-23.5'	Lab ID	783
		% + No. 40	5
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-10-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.52	17.94	10.92	17	36.8	
20.61	18.14	10.89	29	34.1	
20.88	18.41	10.81	35	32.5	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
21.28	19.84	10.94	16.2	16	19
18.35	17.34	10.97	15.9		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B22-SS19G, 31.0'-32.5'	Lab ID	789
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 28.8

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.2
No. 4	4.75	98.2
No. 10	2	97.7
No. 40	0.425	96.0
No. 200	0.075	93.2
	0.02	70.0
	0.005	40.4
	0.002	29.4
estimated	0.001	23.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	1.8	2.3
Coarse Sand	0.5	1.7
Medium Sand	1.7	---
Fine Sand	2.8	2.8
Silt	52.8	63.8
Clay	40.4	29.4

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 35

Plastic Limit: 18

Plasticity Index: 17

Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-6 (16)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B22-SS19G, 31.0'-32.5'
Lab ID: 789

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-03-2020
Date Received: 08-31-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.2
No. 4	98.2
No. 10	97.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

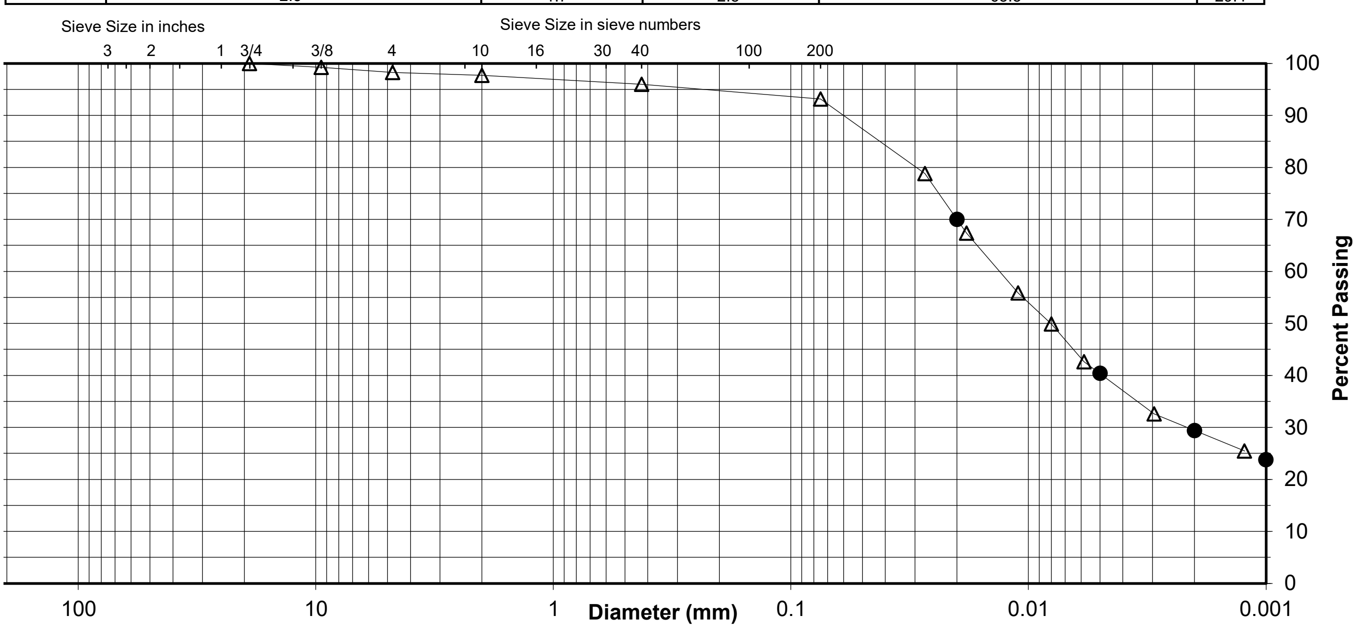
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	96.0
No. 200	93.2
0.02 mm	70.0
0.005 mm	40.4
0.002 mm	29.4
0.001 mm	23.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.8	0.5	1.7	2.8	52.8	40.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	2.3	1.7	2.8	63.8	29.4



Comments ______

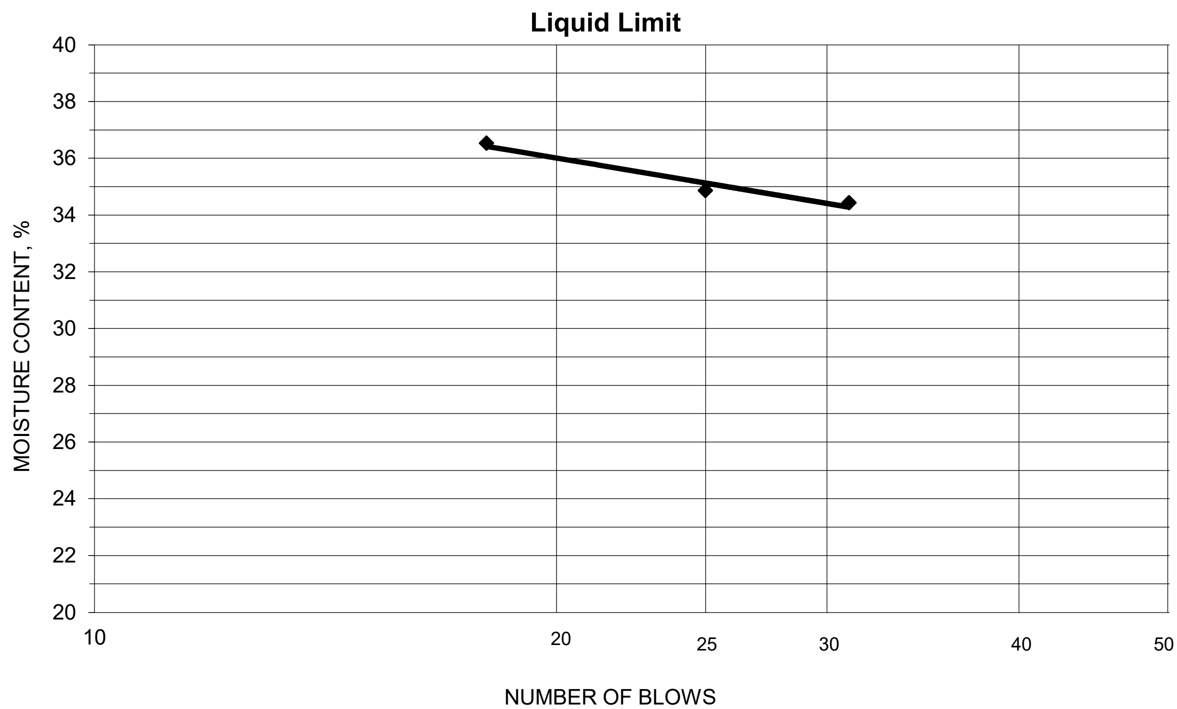
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS19G, 31.0'-32.5'	Lab ID	789
		% + No. 40	4
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-11-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.80	18.21	11.12	18	36.5	
20.97	18.39	10.99	25	34.9	
22.11	19.31	11.18	31	34.4	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.71	18.47	11.50	17.8	18	17
20.06	18.74	11.39	18.0		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B22-SS22G, 35.5'-37.0'	Lab ID	792
Sample Type	SS	Date Received	8-31-20
		Date Reported	9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	86.4
3/8"	9.5	73.0
No. 4	4.75	66.1
No. 10	2	60.0
No. 40	0.425	50.9
No. 200	0.075	44.9
	0.02	31.0
	0.005	17.3
	0.002	12.6
estimated	0.001	9.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	33.9	40.0
Coarse Sand	6.1	9.1
Medium Sand	9.1	---
Fine Sand	6.0	6.0
Silt	27.6	32.3
Clay	17.3	12.6

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 30

Plastic Limit: 18

Plasticity Index: 12

Activity Index: 1.0

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: GC

Group Name: Clayey gravel with sand

AASHTO Classification: A-6 (2)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B22-SS22G, 35.5'-37.0'	Lab ID	792

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-03-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	86.4
3/8"	73.0
No. 4	66.1
No. 10	60.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

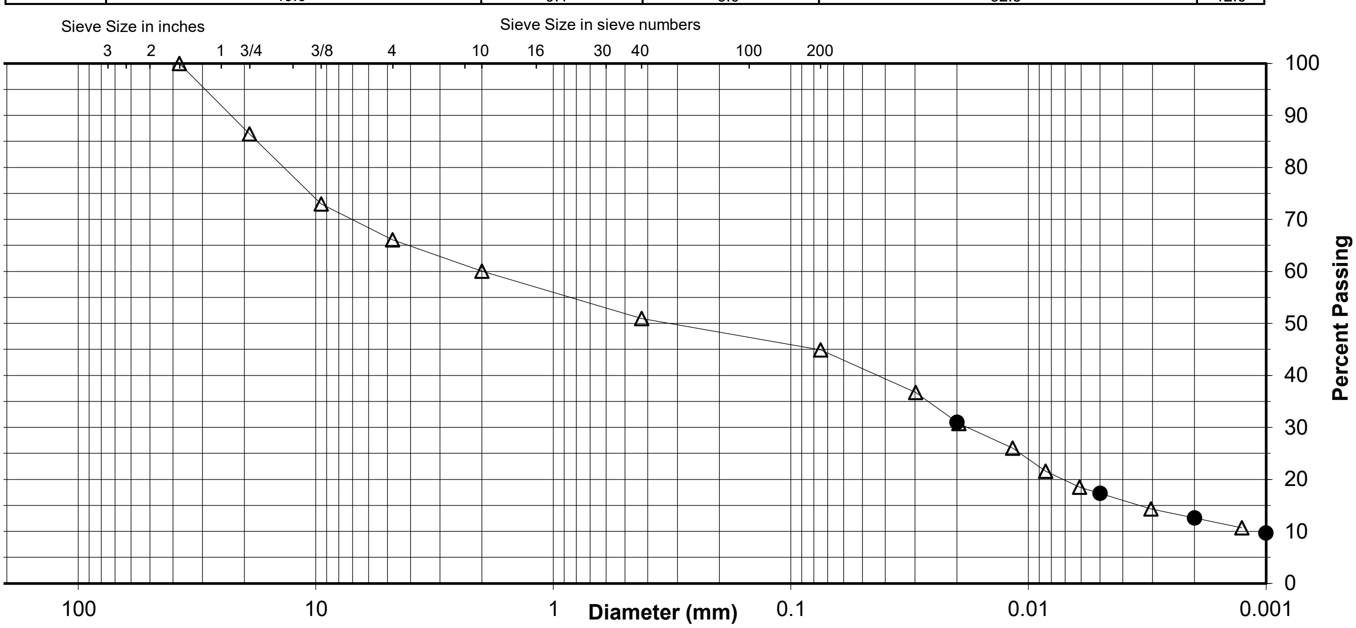
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	50.9
No. 200	44.9
0.02 mm	31.0
0.005 mm	17.3
0.002 mm	12.6
0.001 mm	9.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	13.6	20.3	6.1	9.1	6.0	27.6	17.3

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	40.0	9.1	6.0	32.3	12.6



Comments ______

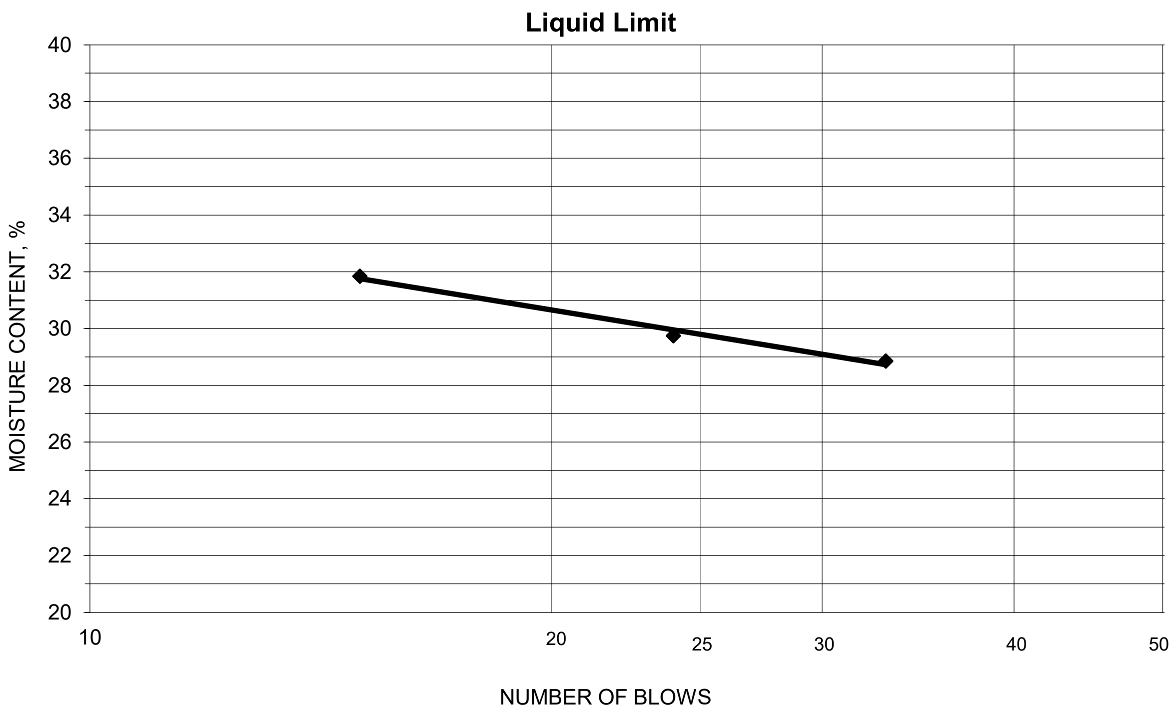
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS22G, 35.5'-37.0'	Lab ID	792
		% + No. 40	49
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-11-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.62	19.06	11.02	15	31.8	
20.95	18.68	11.05	24	29.8	
21.56	19.20	11.02	33	28.9	30



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
21.60	19.96	11.09	18.5	18	12
18.98	17.78	11.17	18.2		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B22-SS33G, 55.0'-56.5'
Lab ID: 803

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 22.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	97.7
3/8"	9.5	89.8
No. 4	4.75	82.8
No. 10	2	72.5
No. 40	0.425	60.5
No. 200	0.075	53.9
	0.02	40.7
	0.005	28.7
	0.002	22.0
estimated	0.001	17.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	17.2	27.5
Coarse Sand	10.3	12.0
Medium Sand	12.0	---
Fine Sand	6.6	6.6
Silt	25.2	31.9
Clay	28.7	22.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 37
Plastic Limit: 18
Plasticity Index: 19
Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Sandy lean clay with gravel

AASHTO Classification: A-6 (7)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B22-SS33G, 55.0'-56.5'
Lab ID: 803

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-03-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	97.7
3/8"	89.8
No. 4	82.8
No. 10	72.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

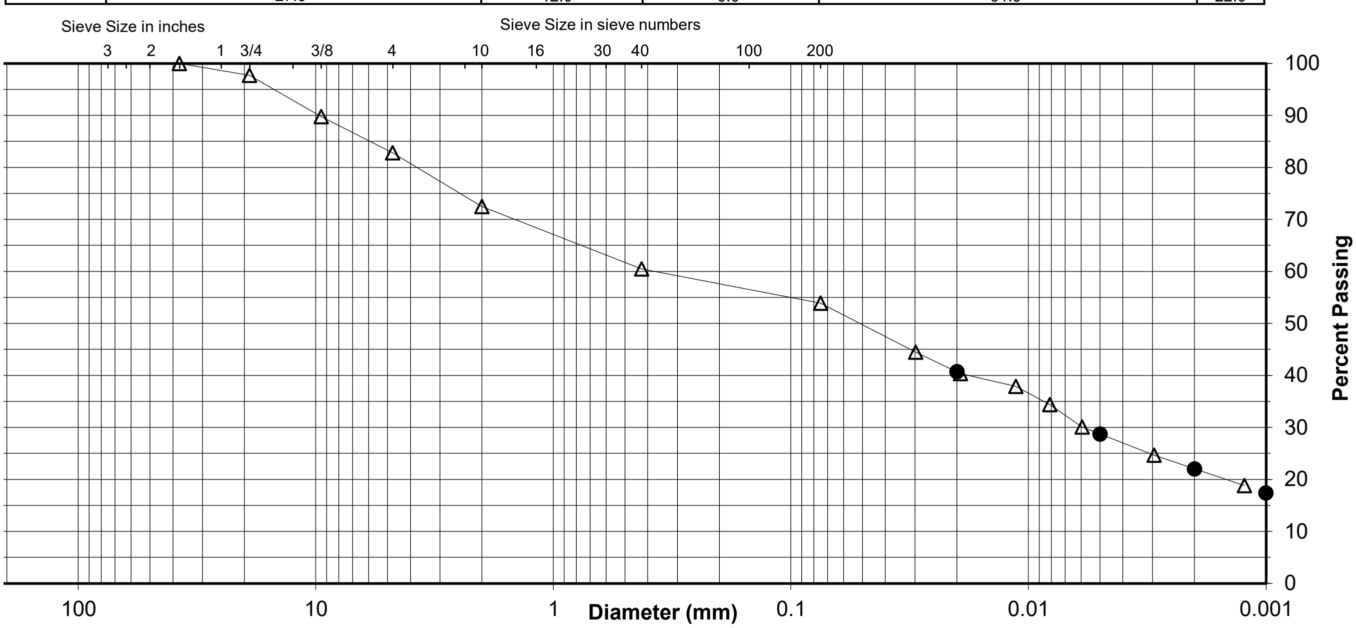
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	60.5
No. 200	53.9
0.02 mm	40.7
0.005 mm	28.7
0.002 mm	22.0
0.001 mm	17.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	2.3	14.9	10.3	12.0	6.6	25.2	28.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	27.5	12.0	6.6	31.9	22.0



Comments

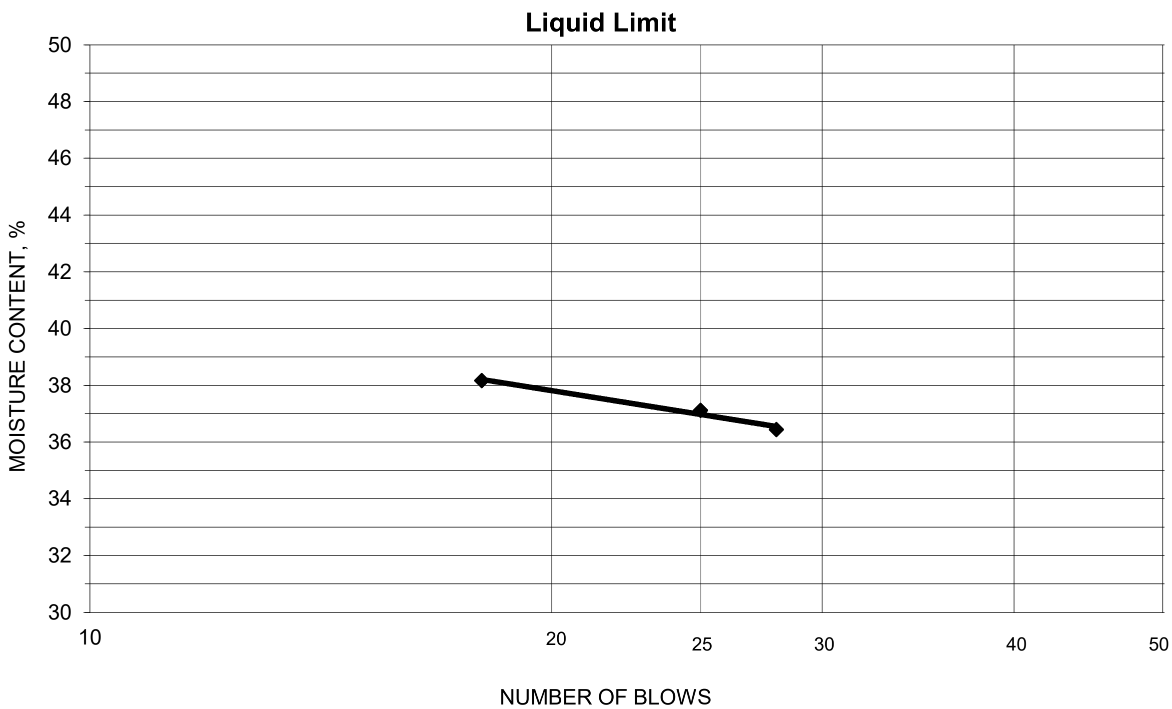
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS33G, 55.0'-56.5'	Lab ID	803
		% + No. 40	40
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-14-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.61	17.90	10.80	18	38.2	37
20.87	18.16	10.86	25	37.1	
21.00	18.30	10.89	28	36.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
19.09	17.83	10.76	17.8	18	19
19.77	18.43	10.99	18.0		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B22-SS37G, 75.0'-76.5'
Lab ID: 807
Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 40.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	89.7
3/8"	9.5	86.8
No. 4	4.75	82.1
No. 10	2	70.8
No. 40	0.425	65.4
No. 200	0.075	60.9
	0.02	49.2
	0.005	38.5
	0.002	31.1
estimated	0.001	25.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	17.9	29.2
Coarse Sand	11.3	5.4
Medium Sand	5.4	---
Fine Sand	4.5	4.5
Silt	22.4	29.8
Clay	38.5	31.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 44
Plastic Limit: 18
Plasticity Index: 26
Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Sandy lean clay with gravel

AASHTO Classification: A-7-6 (13)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B22-SS37G, 75.0'-76.5'	Lab ID	807

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: DW
Test Date: 09-04-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	89.7
3/8"	86.8
No. 4	82.1
No. 10	70.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

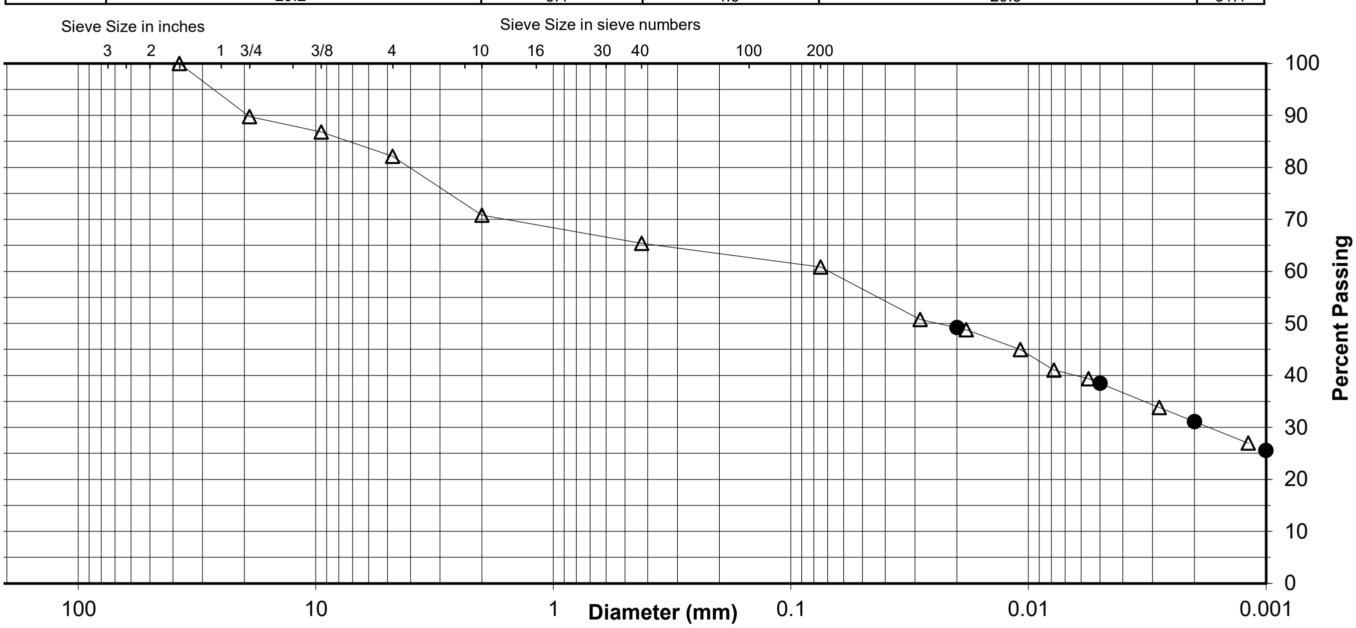
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	65.4
No. 200	60.9
0.02 mm	49.2
0.005 mm	38.5
0.002 mm	31.1
0.001 mm	25.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	10.3	7.6	11.3	5.4	4.5	22.4	38.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	29.2	5.4	4.5	29.8	31.1



Comments ____________________

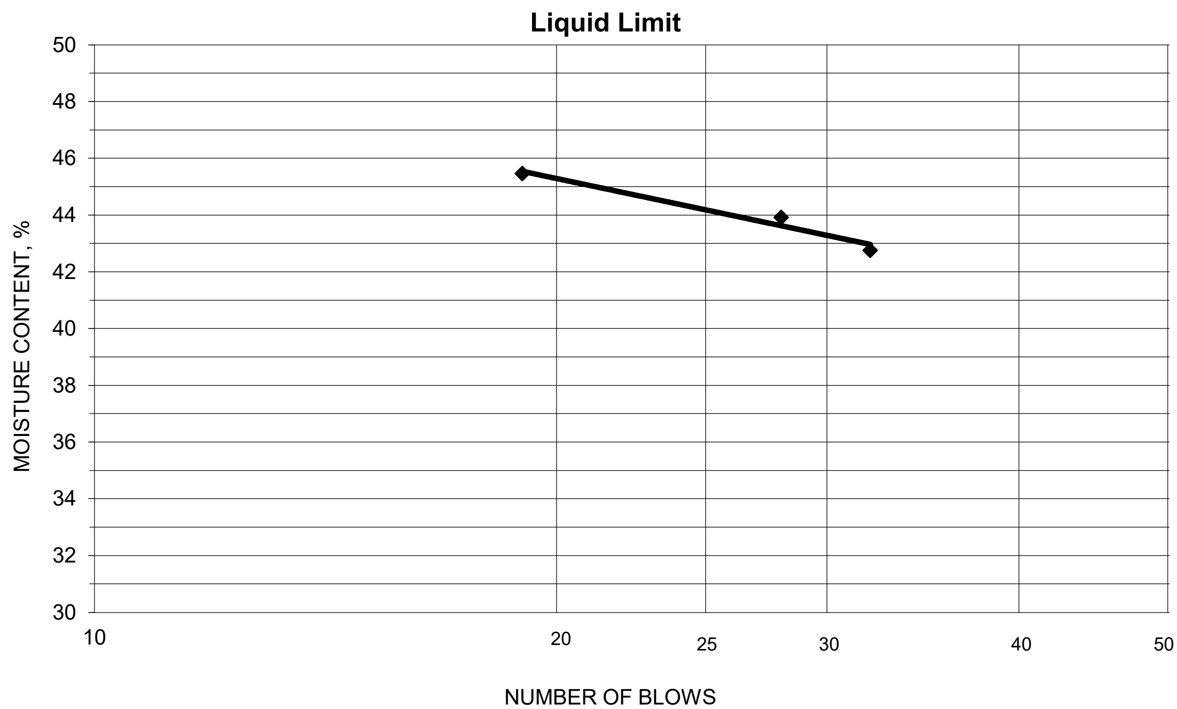
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS37G, 75.0'-76.5'	Lab ID	807
		% + No. 40	35
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-14-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.82	17.76	11.03	19	45.5	44
20.78	17.75	10.85	28	43.9	
21.04	18.15	11.39	32	42.8	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.77	17.61	11.09	17.8	18	26
19.27	18.02	11.02	17.9		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B22-SS40G, 90.0'-91.5'
Lab ID: 811

Sample Type: SS
Date Received: 8-31-20
Date Reported: 9-16-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 46.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	97.3
3/8"	9.5	89.6
No. 4	4.75	88.1
No. 10	2	70.0
No. 40	0.425	54.8
No. 200	0.075	41.1
	0.02	34.1
	0.005	25.3
	0.002	17.2
estimated	0.001	8.8

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	11.9	30.0
Coarse Sand	18.1	15.2
Medium Sand	15.2	---
Fine Sand	13.7	13.7
Silt	15.8	23.9
Clay	25.3	17.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 33
Plastic Limit: 23
Plasticity Index: 10
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: SC
Group Name: Clayey sand

AASHTO Classification: A-4 (1)

Comments:

Reviewed By: RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Reported By: RJ
Report Date: 09/16/2020

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B22-SS40G, 90.0'-91.5'

Project Number: 175568209
Lab ID: 811

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: DW
Test Date: 09-04-2020
Date Received: 08-31-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	97.3
3/8"	89.6
No. 4	88.1
No. 10	70.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

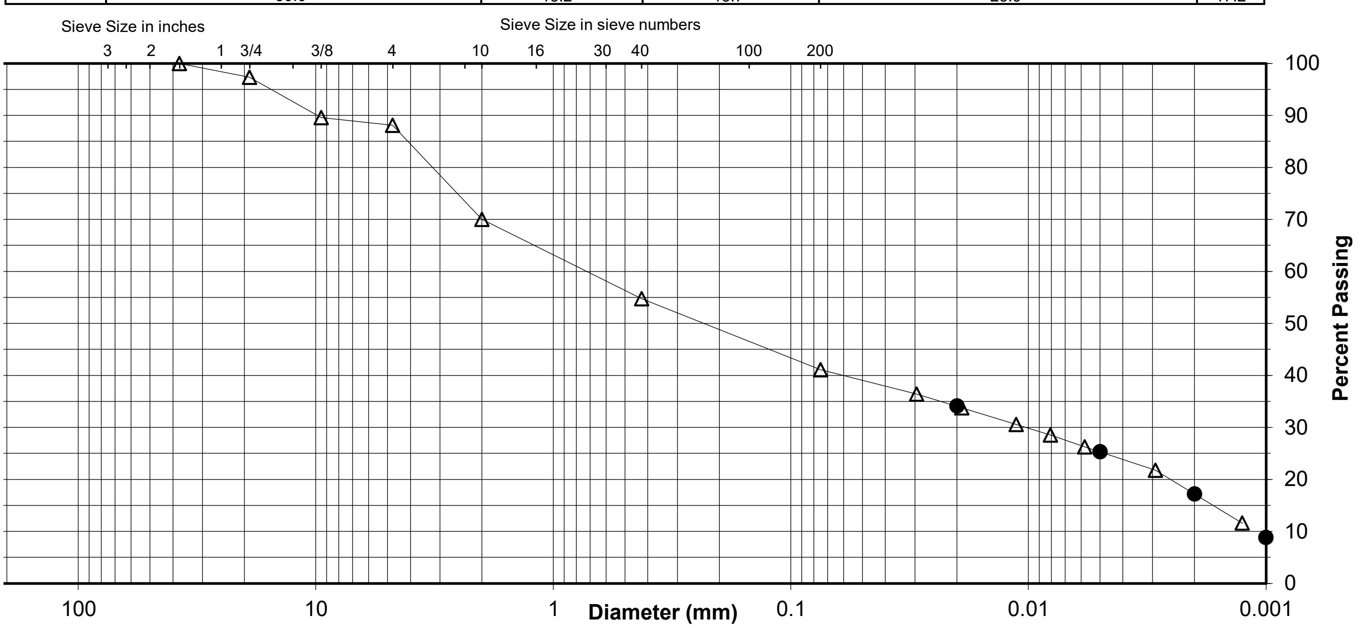
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	54.8
No. 200	41.1
0.02 mm	34.1
0.005 mm	25.3
0.002 mm	17.2
0.001 mm	8.8

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	2.7	9.2	18.1	15.2	13.7	15.8	25.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	30.0	15.2	13.7	23.9	17.2



Comments ______

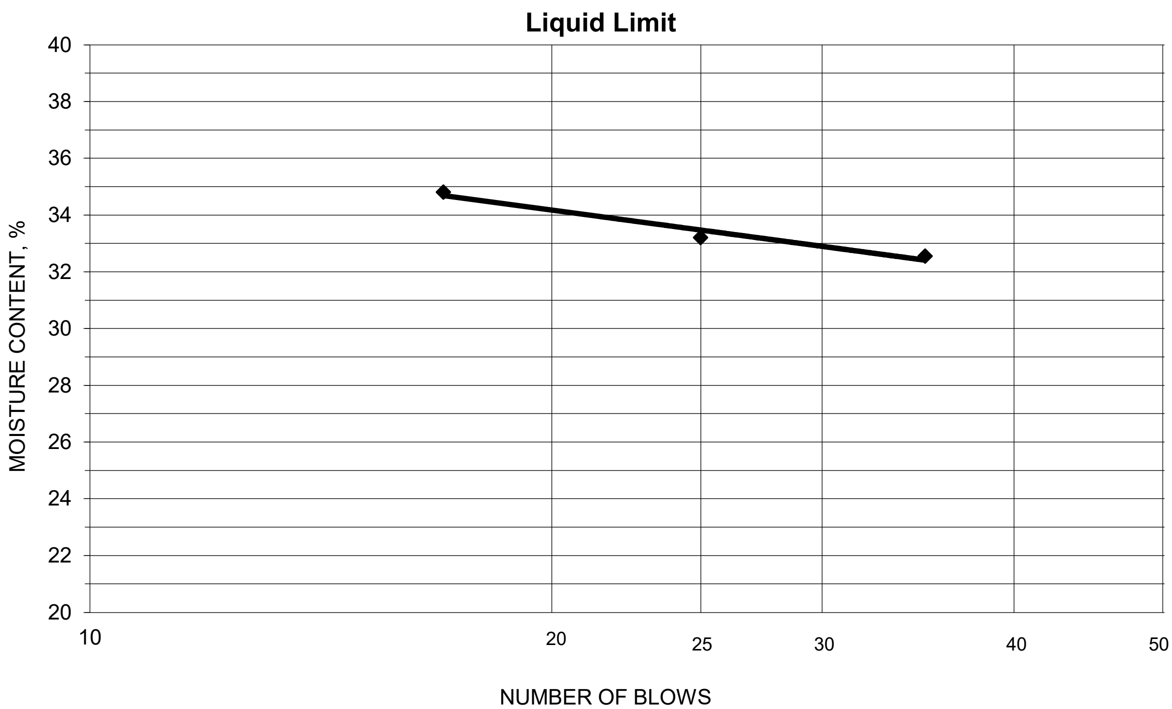
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B22-SS40G, 90.0'-91.5'	Lab ID	811
		% + No. 40	45
Tested By	DB	Test Method	ASTM D 4318 Method A
Date Received	08-31-2020		
Test Date	09-14-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.73	18.98	11.08	17	34.8	
21.60	18.90	10.77	25	33.2	
21.14	18.64	10.96	35	32.6	33



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
21.10	19.15	10.62	22.9	23	10
19.08	17.55	10.85	22.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS03G, 5.0'-6.5'	Lab ID	817
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 16.2

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.0
No. 4	4.75	84.4
No. 10	2	67.1
No. 40	0.425	61.5
No. 200	0.075	56.8
	0.02	42.2
	0.005	25.5
	0.002	18.8
estimated	0.001	16.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	15.6	32.9
Coarse Sand	17.3	5.6
Medium Sand	5.6	---
Fine Sand	4.7	4.7
Silt	31.3	38.0
Clay	25.5	18.8

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 39

Plastic Limit: 19

Plasticity Index: 20

Activity Index: 1.1

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay with gravel

AASHTO Classification: A-6 (8)

Comments:

Reviewed By RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 11/30/2020

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS03G, 5.0'-6.5'	Lab ID	817

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-16-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.0
No. 4	84.4
No. 10	67.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

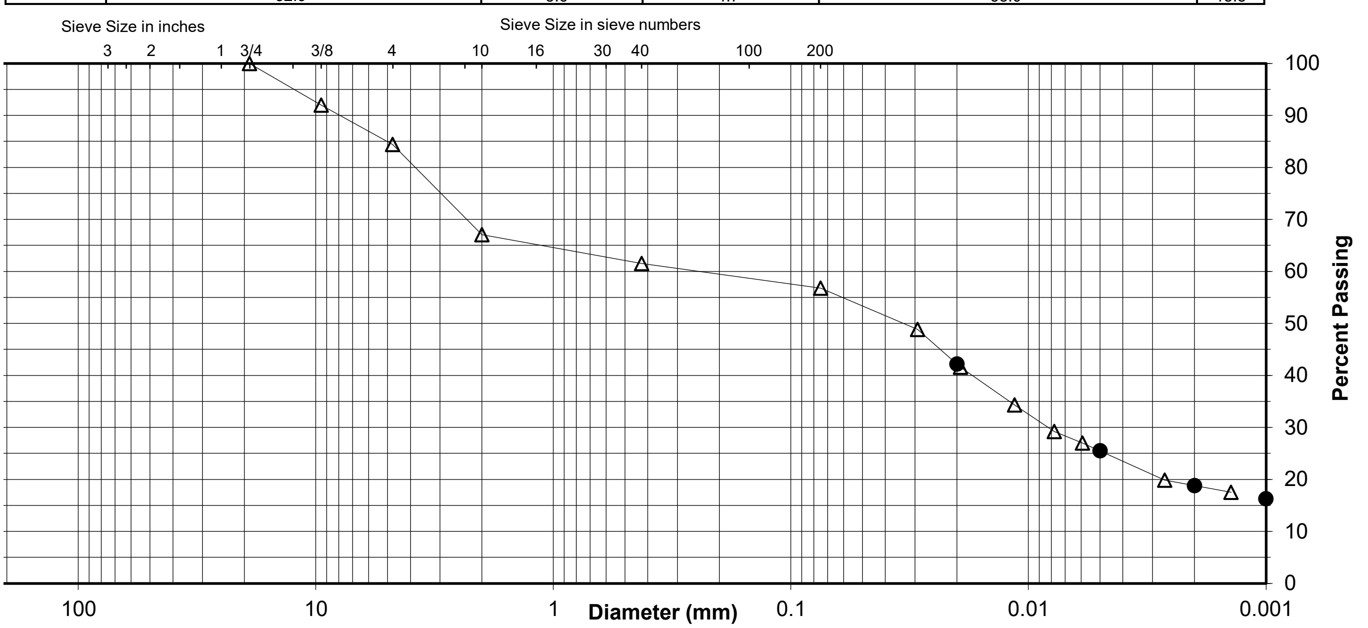
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	61.5
No. 200	56.8
0.02 mm	42.2
0.005 mm	25.5
0.002 mm	18.8
0.001 mm	16.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	15.6	17.3	5.6	4.7	31.3	25.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	32.9	5.6	4.7	38.0	18.8



Comments ______________________

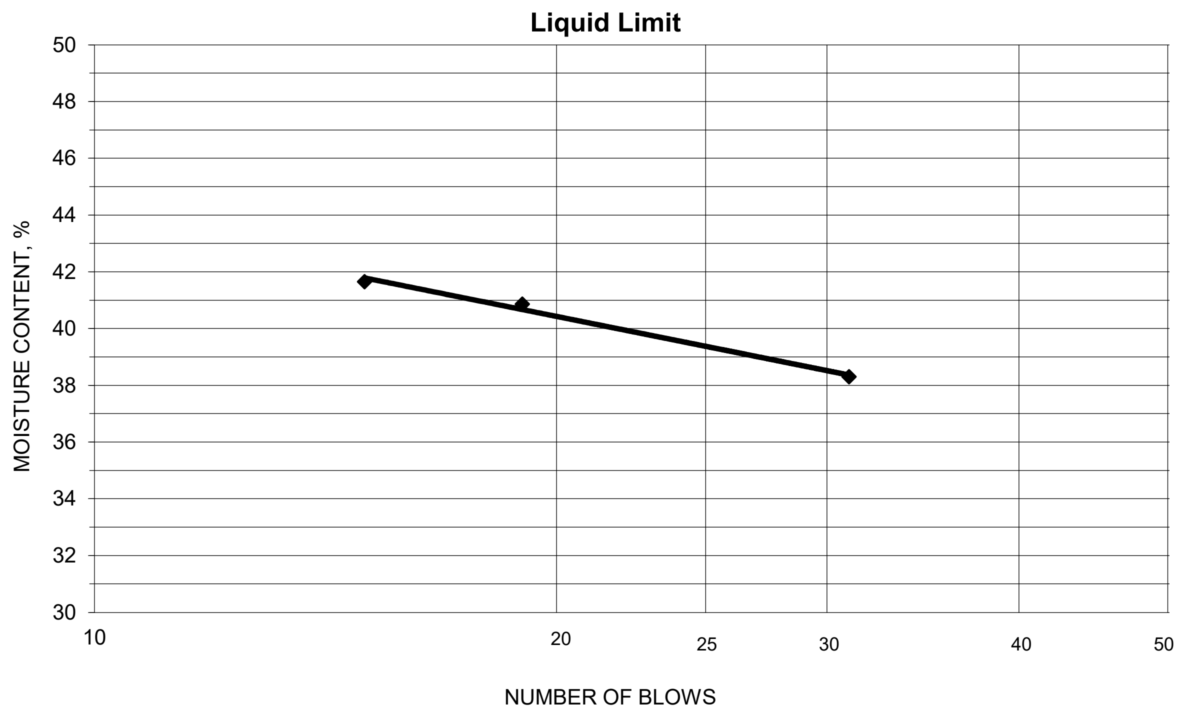
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS03G, 5.0'-6.5'	Lab ID	817
		% + No. 40	38
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-23-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.27	17.00	11.55	15	41.7	39
17.40	15.61	11.23	19	40.9	
17.95	16.15	11.45	31	38.3	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.94	16.91	11.40	18.7	19	20
17.66	16.56	10.76	19.0		

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B24-SS08G, 17.5'-19.0'
Lab ID: 822

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 22.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	97.7
No. 4	4.75	95.6
No. 10	2	88.7
No. 40	0.425	82.8
No. 200	0.075	78.1
	0.02	56.3
	0.005	36.8
	0.002	29.5
estimated	0.001	25.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	4.4	11.3
Coarse Sand	6.9	5.9
Medium Sand	5.9	---
Fine Sand	4.7	4.7
Silt	41.3	48.6
Clay	36.8	29.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 48
Plastic Limit: 20
Plasticity Index: 28
Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-7-6 (22)

Comments:

Reviewed By: RJ

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS08G, 17.5'-19.0'	Lab ID	822

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-16-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	97.7
No. 4	95.6
No. 10	88.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

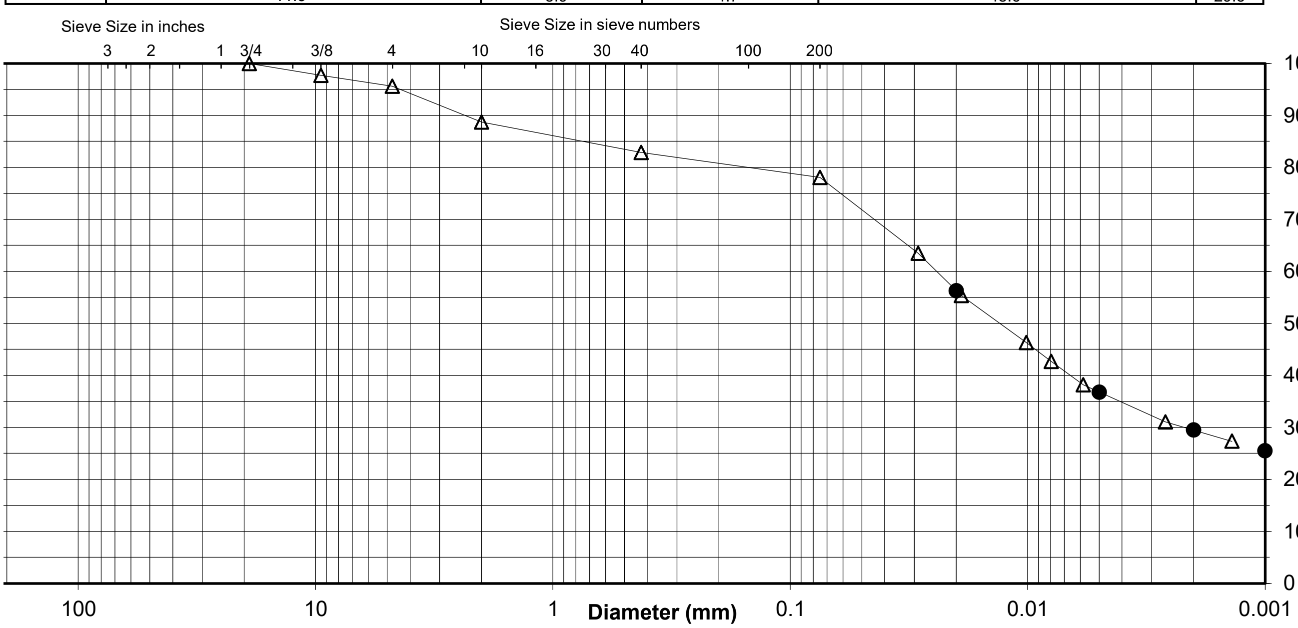
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	82.8
No. 200	78.1
0.02 mm	56.3
0.005 mm	36.8
0.002 mm	29.5
0.001 mm	25.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	4.4	6.9	5.9	4.7	41.3	36.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	11.3	5.9	4.7	48.6	29.5



Comments ______________________

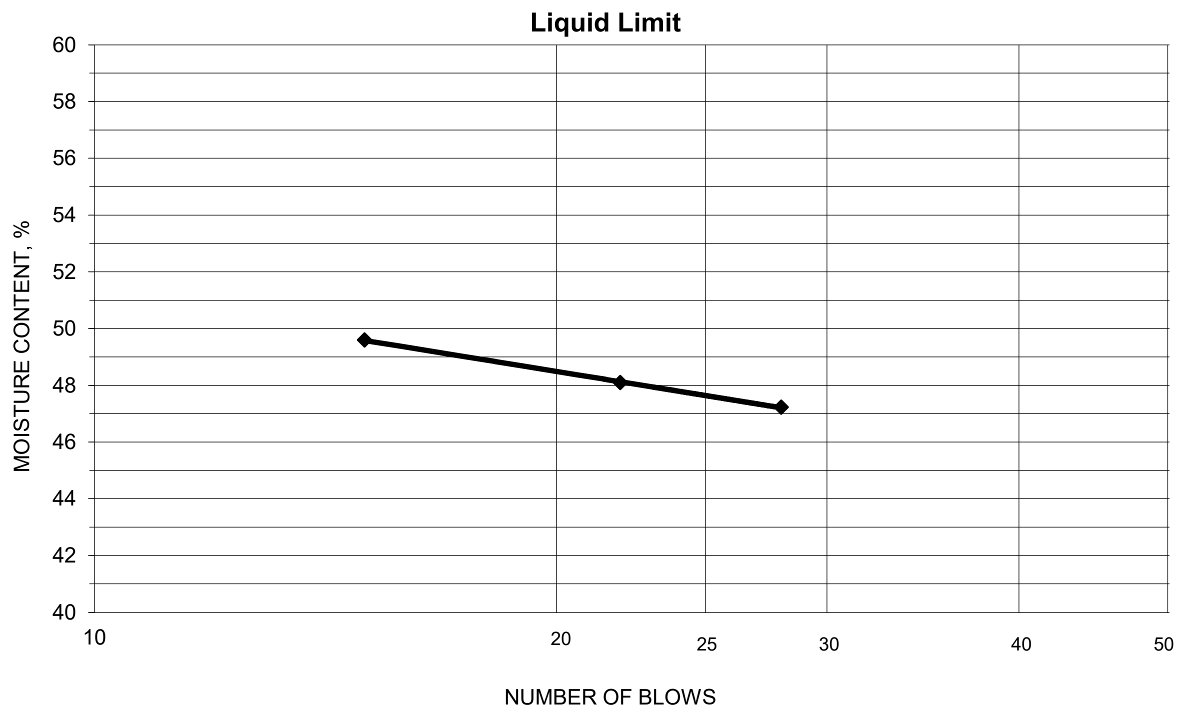
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS08G, 17.5'-19.0'	Lab ID	822
		% + No. 40	17
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-17-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
13.56	10.58	4.27	28	47.2	48
11.74	9.34	4.35	22	48.1	
11.64	9.20	4.28	15	49.6	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.34	10.18	4.33	19.8	20	28
12.48	11.06	4.27	20.9		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B24-SS11G, 23.0'-24.5'
Lab ID: 826
Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 13.9

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 33
Plastic Limit: 18
Plasticity Index: 15
Activity Index: 1.4

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	88.2
3/8"	9.5	74.9
No. 4	4.75	65.4
No. 10	2	53.3
No. 40	0.425	39.7
No. 200	0.075	32.4
	0.02	22.4
	0.005	15.0
	0.002	10.5
estimated	0.001	9.4

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	34.6	46.7
Coarse Sand	12.1	13.6
Medium Sand	13.6	---
Fine Sand	7.3	7.3
Silt	17.4	21.9
Clay	15.0	10.5

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: GC
Group Name: Clayey gravel with sand
AASHTO Classification: A-2-6 (1)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B24-SS11G, 23.0'-24.5'

Project Number: 175568209
Lab ID: 826

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-16-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	88.2
3/8"	74.9
No. 4	65.4
No. 10	53.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

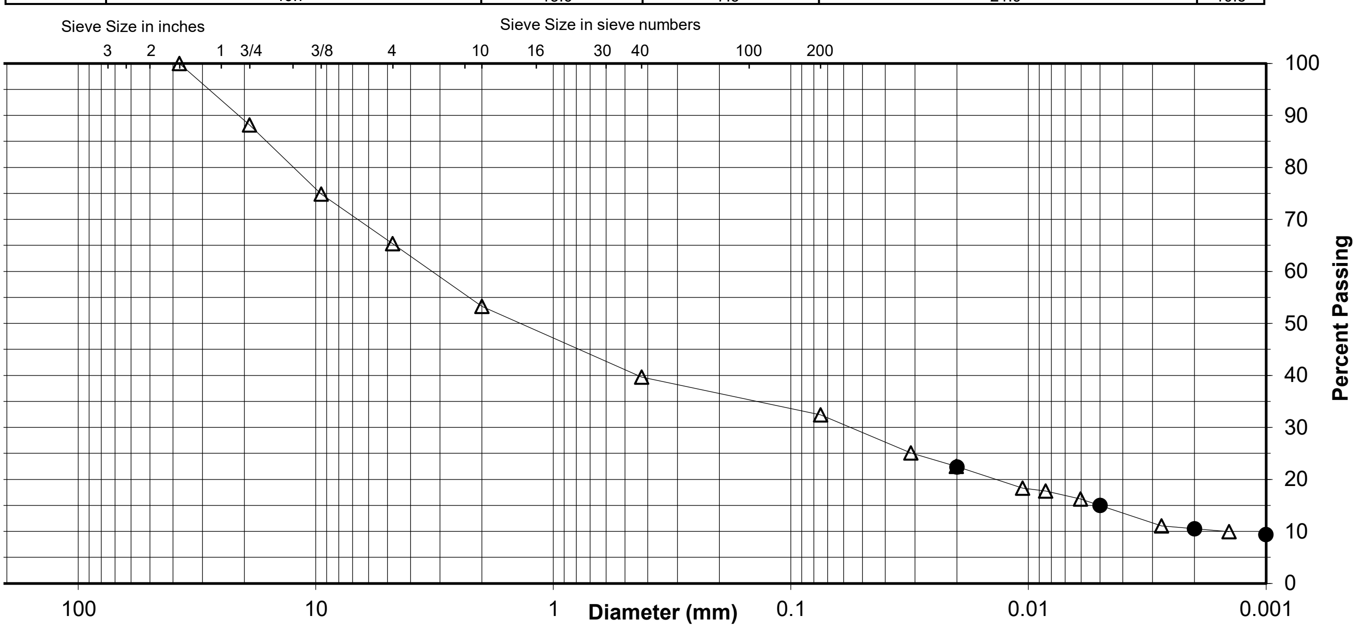
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	39.7
No. 200	32.4
0.02 mm	22.4
0.005 mm	15.0
0.002 mm	10.5
0.001 mm	9.4

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	11.8	22.8	12.1	13.6	7.3	17.4	15.0

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	46.7	13.6	7.3	21.9	10.5



Comments ______

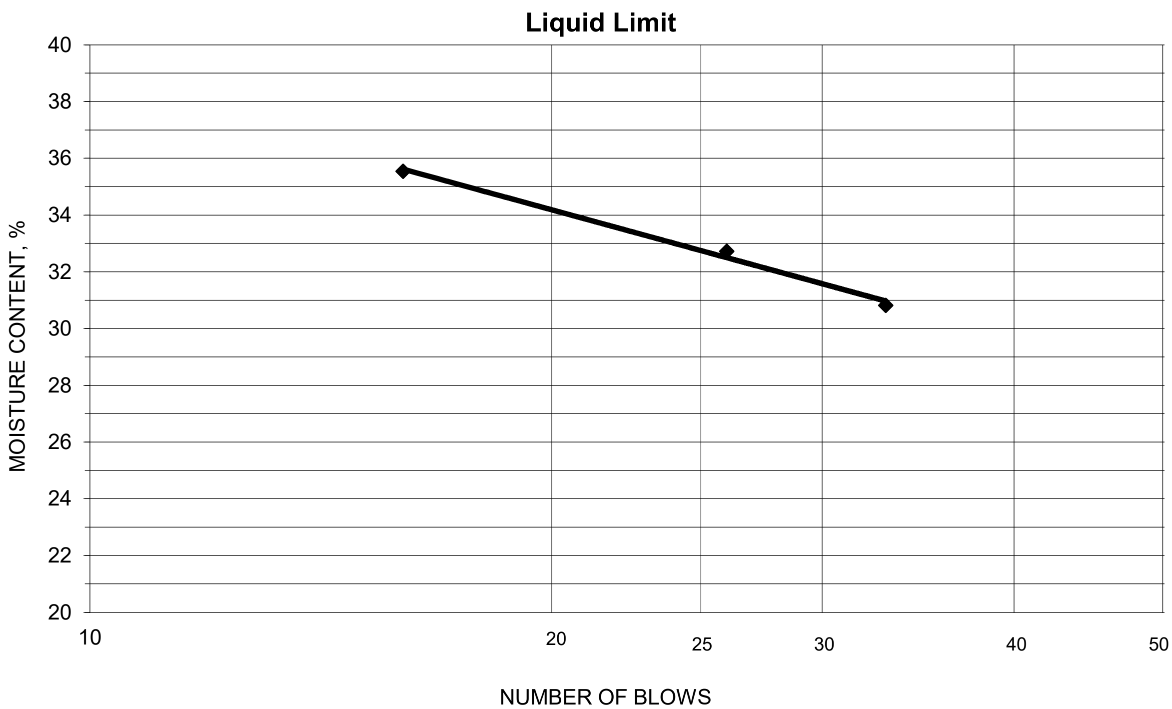
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS11G, 23.0'-24.5'	Lab ID	826
		% + No. 40	60
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-17-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
14.16	11.83	4.27	33	30.8	33
12.25	10.29	4.30	26	32.7	
12.89	10.64	4.31	16	35.5	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
12.05	10.83	4.27	18.6	18	15
11.86	10.69	4.30	18.3		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS13G, 26.0'-27.5'	Lab ID	828
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 31.6

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.8
No. 4	4.75	77.1
No. 10	2	61.0
No. 40	0.425	48.4
No. 200	0.075	40.1
	0.02	27.2
	0.005	18.4
	0.002	14.1
estimated	0.001	11.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	22.9	39.0
Coarse Sand	16.1	12.6
Medium Sand	12.6	---
Fine Sand	8.3	8.3
Silt	21.7	26.0
Clay	18.4	14.1

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 34
Plastic Limit: 19
Plasticity Index: 15
Activity Index: 1.1

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: SC
Group Name: Clayey sand with gravel
AASHTO Classification: A-6 (2)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS13G, 26.0'-27.5'	Lab ID	828

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-16-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.8
No. 4	77.1
No. 10	61.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

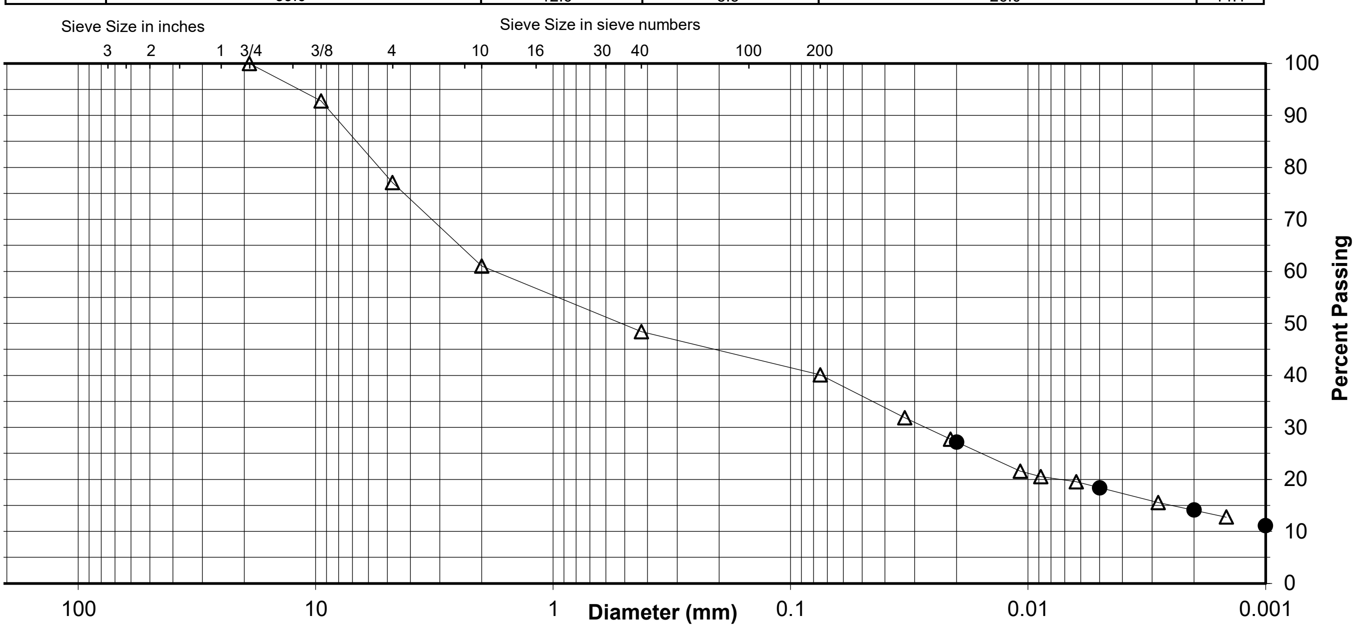
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	48.4
No. 200	40.1
0.02 mm	27.2
0.005 mm	18.4
0.002 mm	14.1
0.001 mm	11.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	22.9	16.1	12.6	8.3	21.7	18.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	39.0	12.6	8.3	26.0	14.1



Comments ______

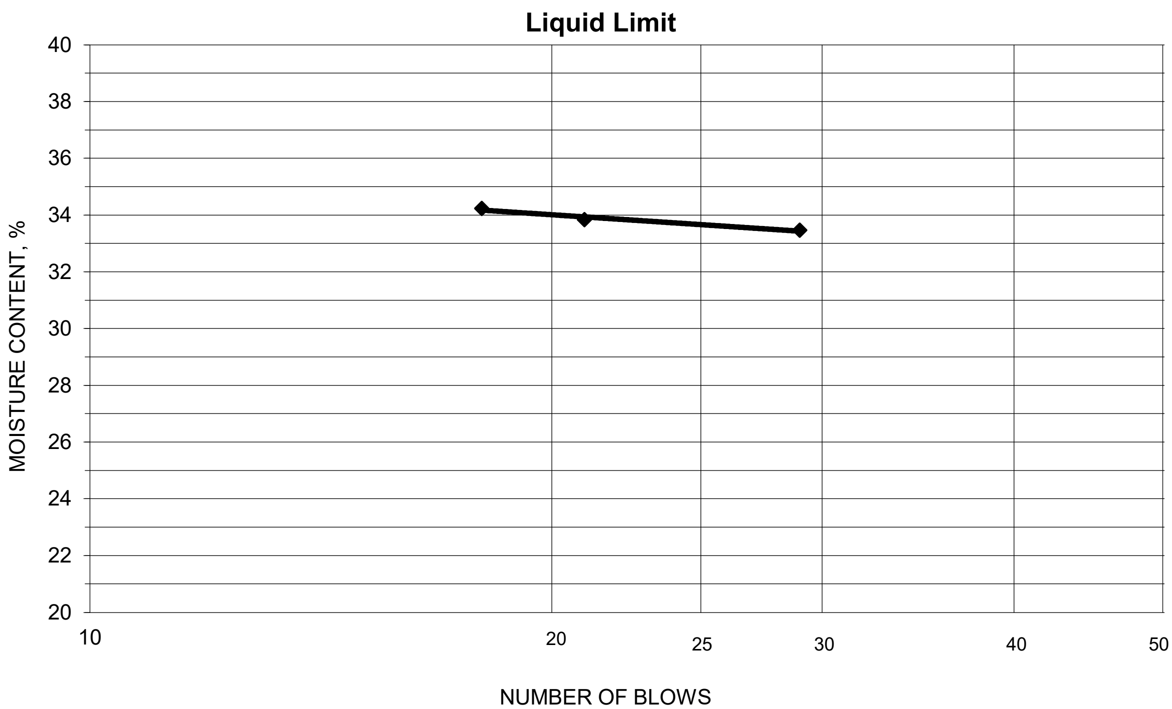
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS13G, 26.0'-27.5'	Lab ID	828
		% + No. 40	52
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-23-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.11	17.84	11.21	18	34.2	34
18.36	16.59	11.36	21	33.8	
17.97	16.25	11.11	29	33.5	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.64	16.67	11.35	18.2	19	15
17.68	16.60	11.06	19.5		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B24-SS14G, 27.5'-29.0'
Lab ID: 829

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 27.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	78.6
No. 40	0.425	78.3
No. 200	0.075	74.8
	0.02	49.5
	0.005	22.3
	0.002	16.4
estimated	0.001	14.7

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	21.4
Coarse Sand	21.4	0.3
Medium Sand	0.3	---
Fine Sand	3.5	3.5
Silt	52.5	58.4
Clay	22.3	16.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 33
Plastic Limit: 19
Plasticity Index: 14
Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-6 (9)

Comments:

Reviewed By RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 12/09/2020

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS14G, 27.5'-29.0'	Lab ID	829

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-16-2020
Date Received: 11-13-2020

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	78.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

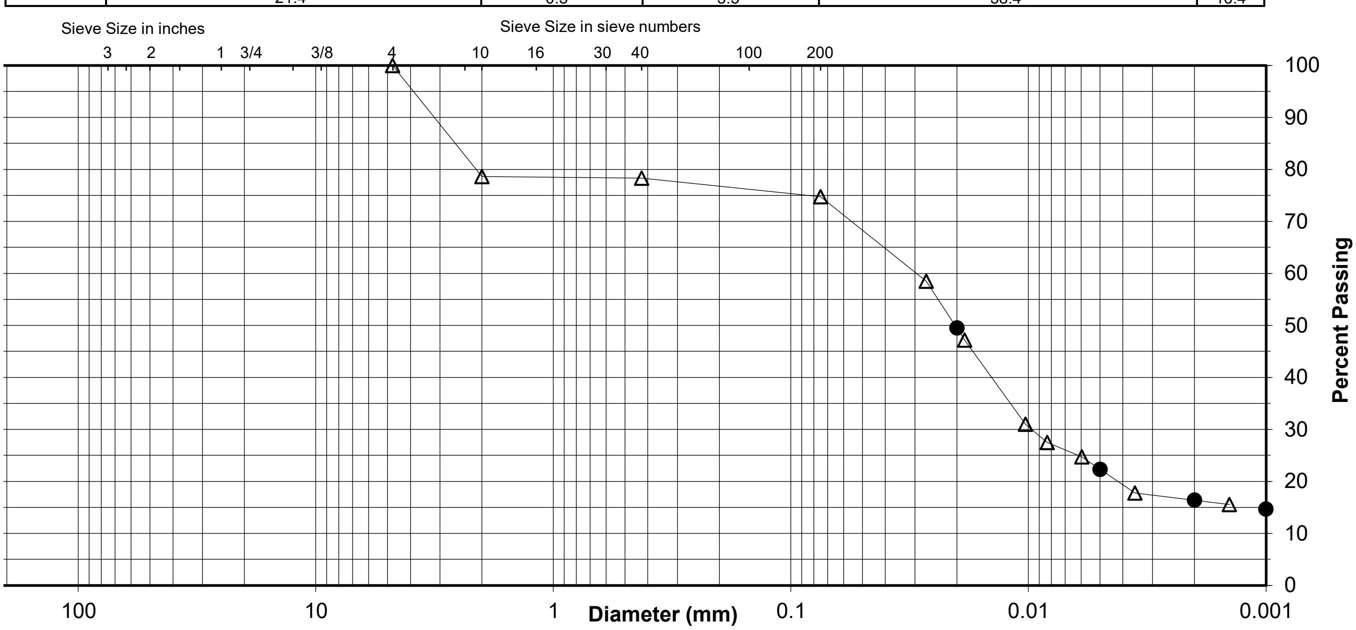
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	78.3
No. 200	74.8
0.02 mm	49.5
0.005 mm	22.3
0.002 mm	16.4
0.001 mm	14.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	21.4	0.3	3.5	52.5	22.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	21.4	0.3	3.5	58.4	16.4



Comments ______

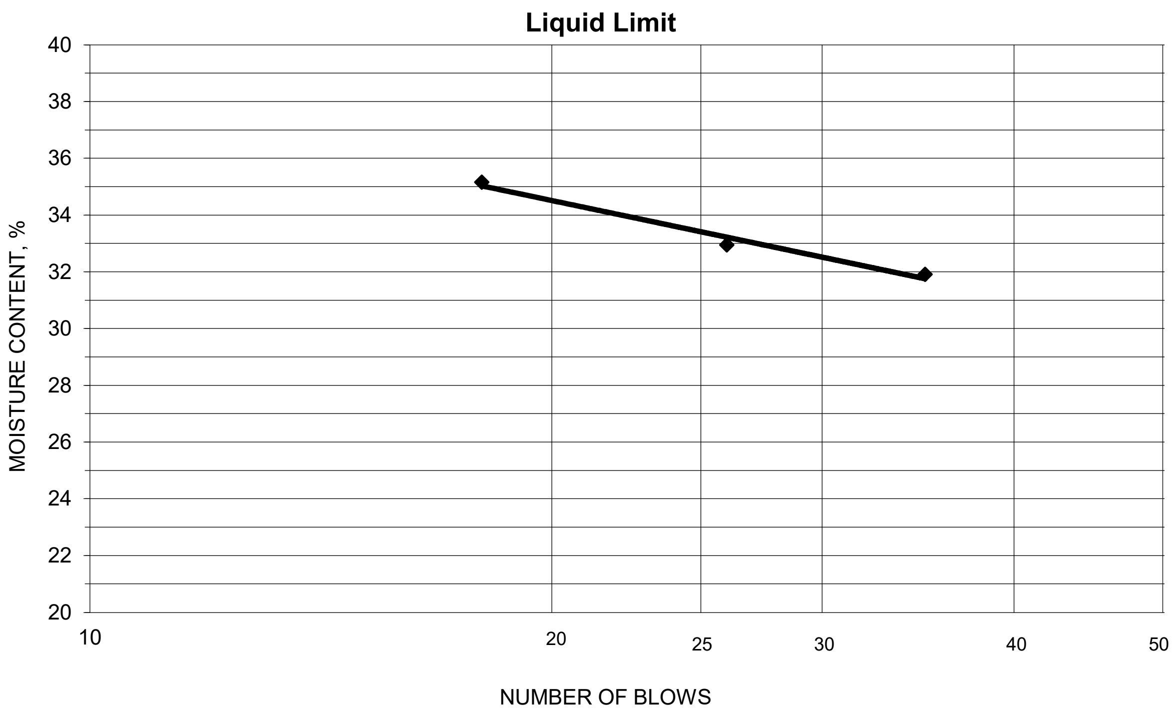
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS14G, 27.5'-29.0'	Lab ID	829
		% + No. 40	22
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-17-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
11.39	9.67	4.28	35	31.9	33
12.25	10.28	4.30	26	32.9	
11.69	9.76	4.27	18	35.2	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
13.99	12.46	4.28	18.7	19	14
11.73	10.58	4.30	18.3		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS16aG, 30.5'-31.1'	Lab ID	831
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.0

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	79.3
No. 4	4.75	68.2
No. 10	2	43.5
No. 40	0.425	39.4
No. 200	0.075	36.8
	0.02	24.3
	0.005	10.4
	0.002	7.6
estimated	0.001	6.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	31.8	56.5
Coarse Sand	24.7	4.1
Medium Sand	4.1	---
Fine Sand	2.6	2.6
Silt	26.4	29.2
Clay	10.4	7.6

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 31

Plastic Limit: 20

Plasticity Index: 11

Activity Index: 1.4

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: GC

Group Name: Clayey gravel with sand

AASHTO Classification: A-6 (1)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order | Project Number: 175568209
Source: CUF-GT-B24-SS16aG, 30.5'-31.1' | Lab ID: 831

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-16-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	79.3
No. 4	68.2
No. 10	43.5

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

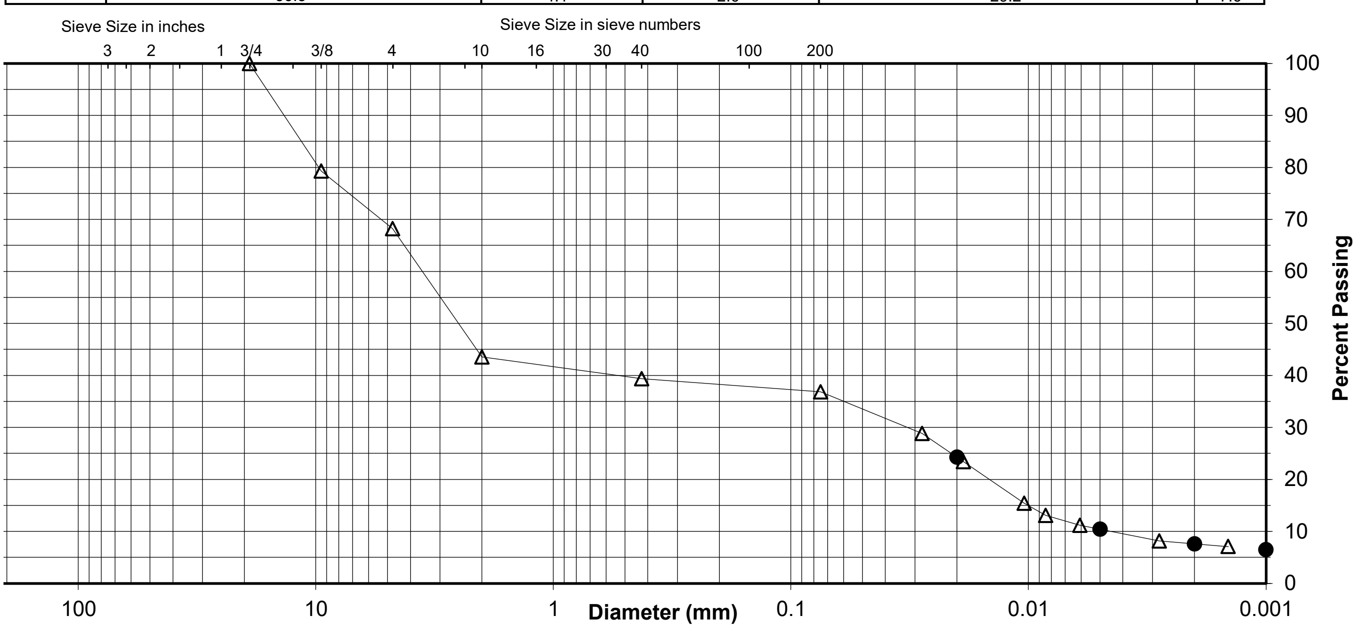
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	39.4
No. 200	36.8
0.02 mm	24.3
0.005 mm	10.4
0.002 mm	7.6
0.001 mm	6.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	31.8	24.7	4.1	2.6	26.4	10.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	56.5	4.1	2.6	29.2	7.6



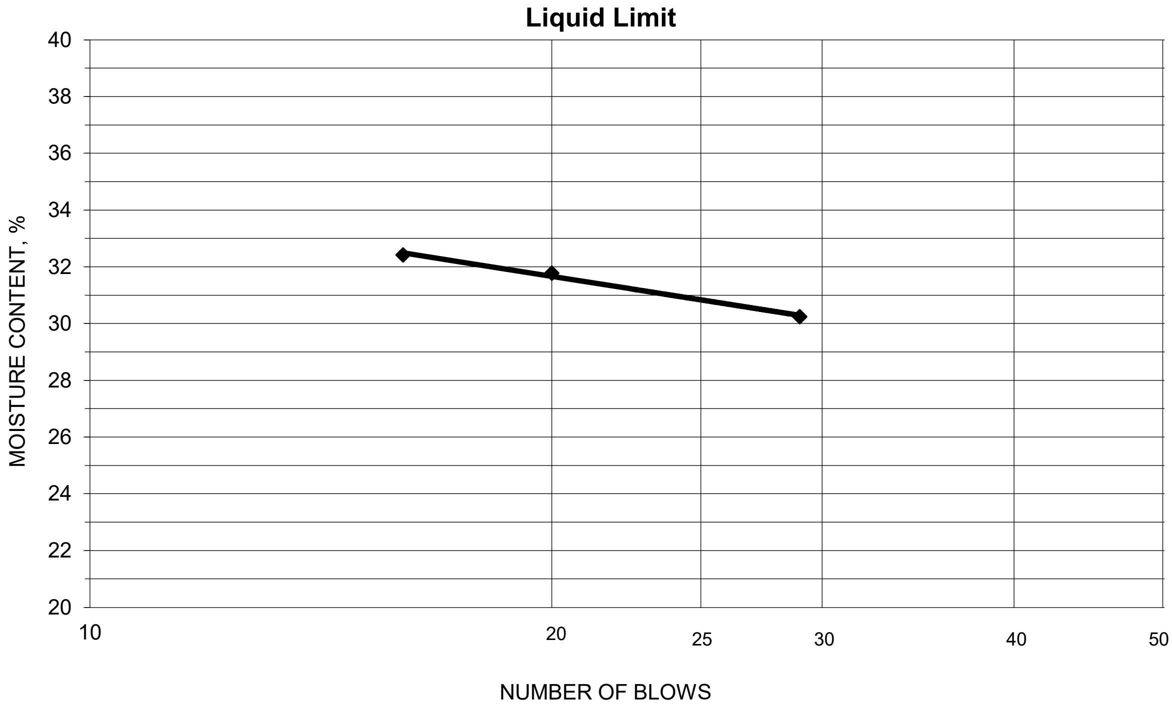
Comments ____________________ Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS16aG, 30.5'-31.1'	Lab ID	831
		% + No. 40	61
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-23-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.69	16.03	10.91	16	32.4	31
17.54	15.98	11.07	20	31.8	
17.61	16.14	11.28	29	30.2	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.83	16.74	11.25	19.9	20	11
16.83	15.80	10.59	19.8		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS19G, 35.0'-36.5'	Lab ID	835
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 26.4

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.6
No. 200	0.075	98.3
	0.02	77.3
	0.005	32.8
	0.002	23.6
estimated	0.001	20.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.4
Medium Sand	0.4	---
Fine Sand	1.3	1.3
Silt	65.5	74.7
Clay	32.8	23.6

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 34
Plastic Limit: 19
Plasticity Index: 15
Activity Index: 0.6

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: CL
Group Name: Lean clay
AASHTO Classification: A-6 (15)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B24-SS19G, 35.0'-36.5'
Lab ID: 835

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: N/A
Particle Hardness: N/A

Tested By: JMB
Test Date: 11-16-2020
Date Received: 11-13-2020

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

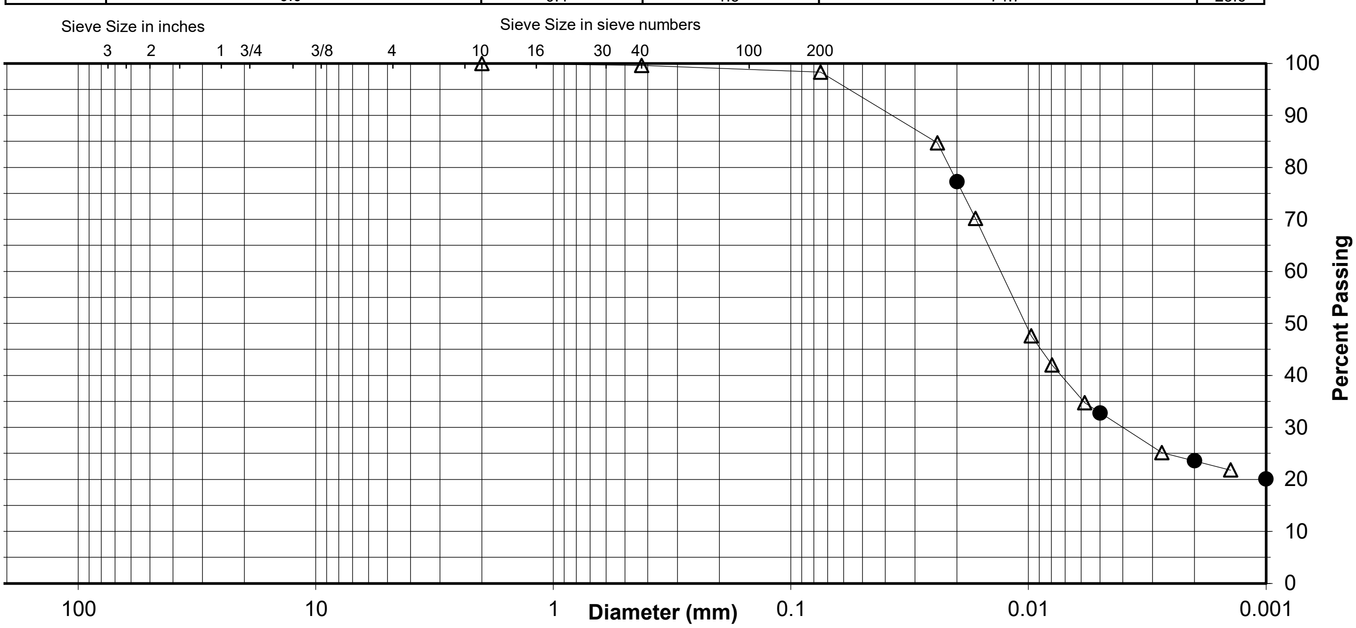
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.6
No. 200	98.3
0.02 mm	77.3
0.005 mm	32.8
0.002 mm	23.6
0.001 mm	20.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.4	1.3	65.5	32.8

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	0.0	0.4	1.3	74.7	23.6



Comments

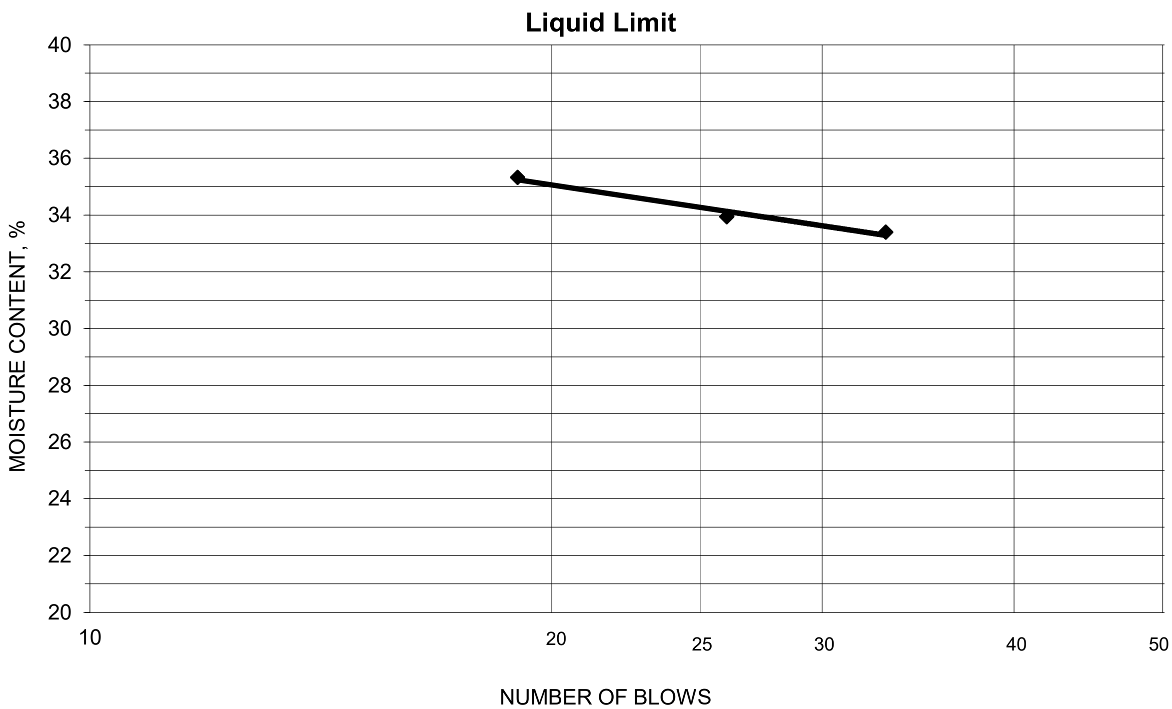
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS19G, 35.0'-36.5'	Lab ID	835
		% + No. 40	0
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-24-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.28	16.48	11.09	33	33.4	34
19.63	17.57	11.50	26	33.9	
18.26	16.31	10.79	19	35.3	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.75	16.65	10.94	19.3	19	15
17.43	16.37	10.97	19.6		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B24-SS24G, 42.5'-44.0'
Lab ID: 841

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 25.1

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	70.6
No. 4	4.75	57.1
No. 10	2	43.0
No. 40	0.425	22.0
No. 200	0.075	12.8
	0.02	9.0
	0.005	5.6
	0.002	4.2
estimated	0.001	3.7

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	42.9	57.0
Coarse Sand	14.1	21.0
Medium Sand	21.0	---
Fine Sand	9.2	9.2
Silt	7.2	8.6
Clay	5.6	4.2

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 25
Plastic Limit: 21
Plasticity Index: 4
Activity Index: 1.0

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: SC-SM
Group Name: Silty, clayey sand with gravel

AASHTO Classification: A-1-a (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS24G, 42.5'-44.0'	Lab ID	841

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-20-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	70.6
No. 4	57.1
No. 10	43.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

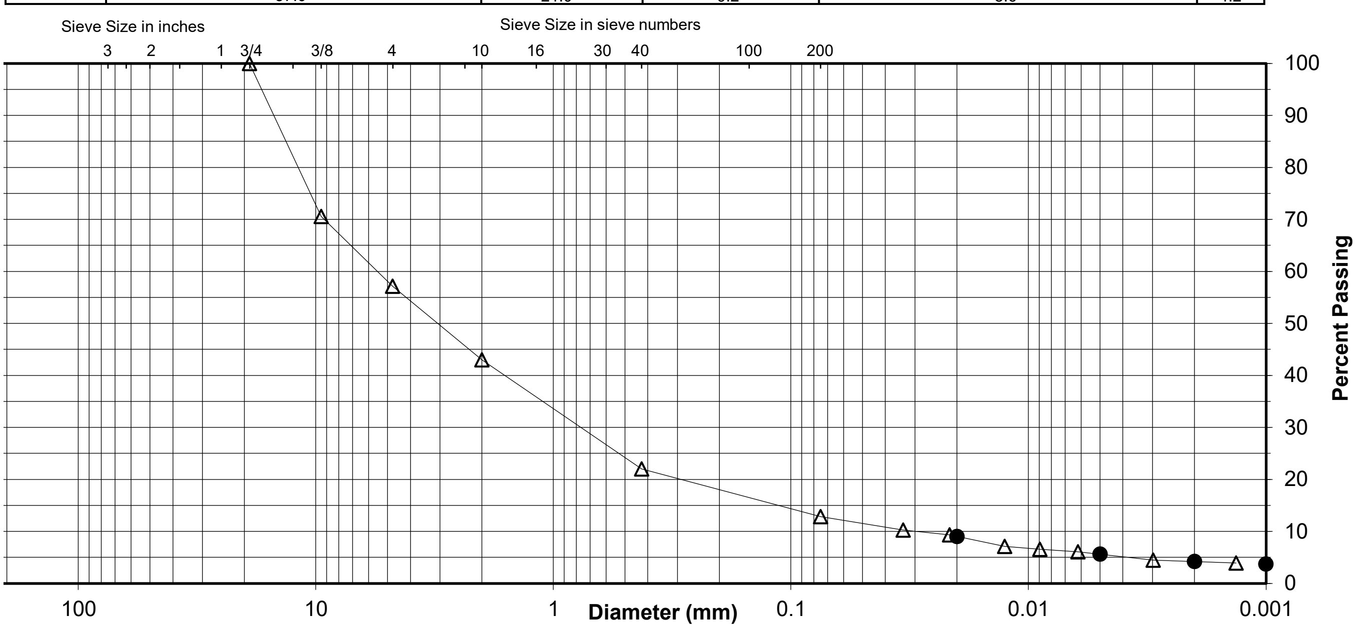
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	22.0
No. 200	12.8
0.02 mm	9.0
0.005 mm	5.6
0.002 mm	4.2
0.001 mm	3.7

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	42.9	14.1	21.0	9.2	7.2	5.6

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	57.0	21.0	9.2	8.6	4.2



Comments ______

Reviewed By RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

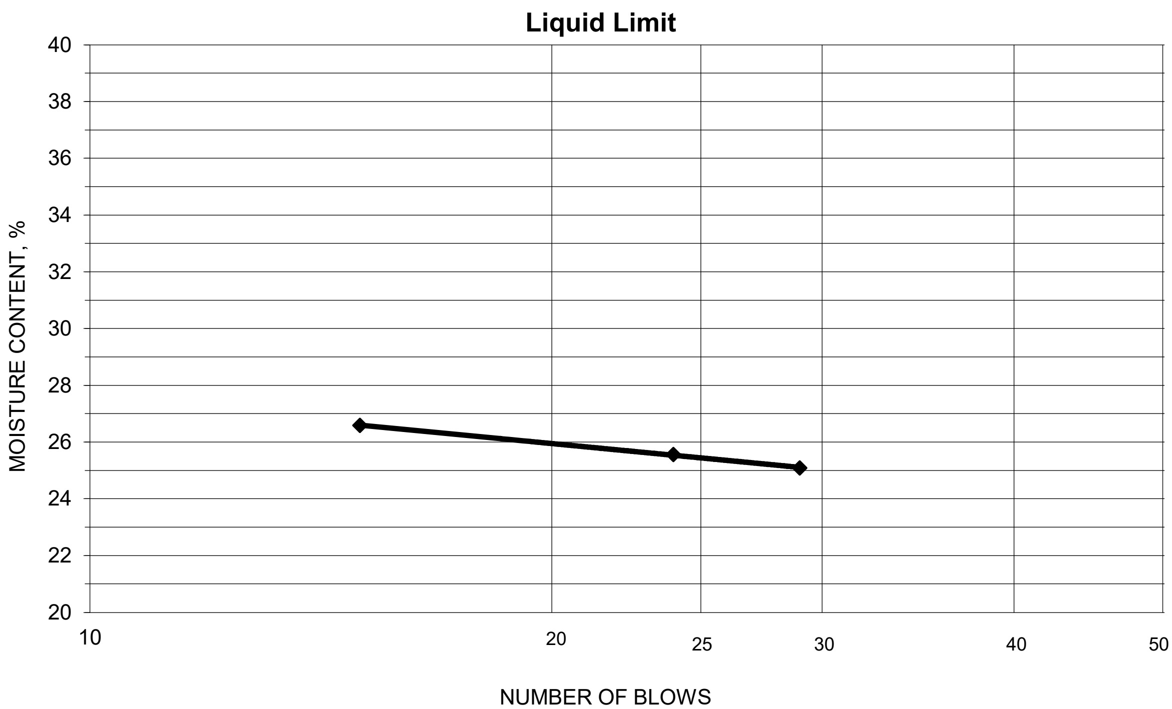
Reported By: RJ
Report Date: 12/09/2020

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS24G, 42.5'-44.0'	Lab ID	841
		% + No. 40	78
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-25-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
14.64	13.91	11.00	29	25.1	25
14.75	13.96	10.87	24	25.6	
16.32	15.19	10.94	15	26.6	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.88	16.80	11.63	20.9	21	4
17.32	16.28	11.49	21.7		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B24-SS28G, 48.5'-50.0'
Lab ID: 846

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 26.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	90.2
3/8"	9.5	66.6
No. 4	4.75	50.5
No. 10	2	38.6
No. 40	0.425	24.4
No. 200	0.075	18.1
	0.02	11.1
	0.005	5.5
	0.002	4.2
estimated	0.001	2.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	49.5	61.4
Coarse Sand	11.9	14.2
Medium Sand	14.2	---
Fine Sand	6.3	6.3
Silt	12.6	13.9
Clay	5.5	4.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 29
Plastic Limit: 20
Plasticity Index: 9
Activity Index: 2.1

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: GC
Group Name: Clayey gravel with sand

AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS28G, 48.5'-50.0'	Lab ID	846

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-18-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	90.2
3/8"	66.6
No. 4	50.5
No. 10	38.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

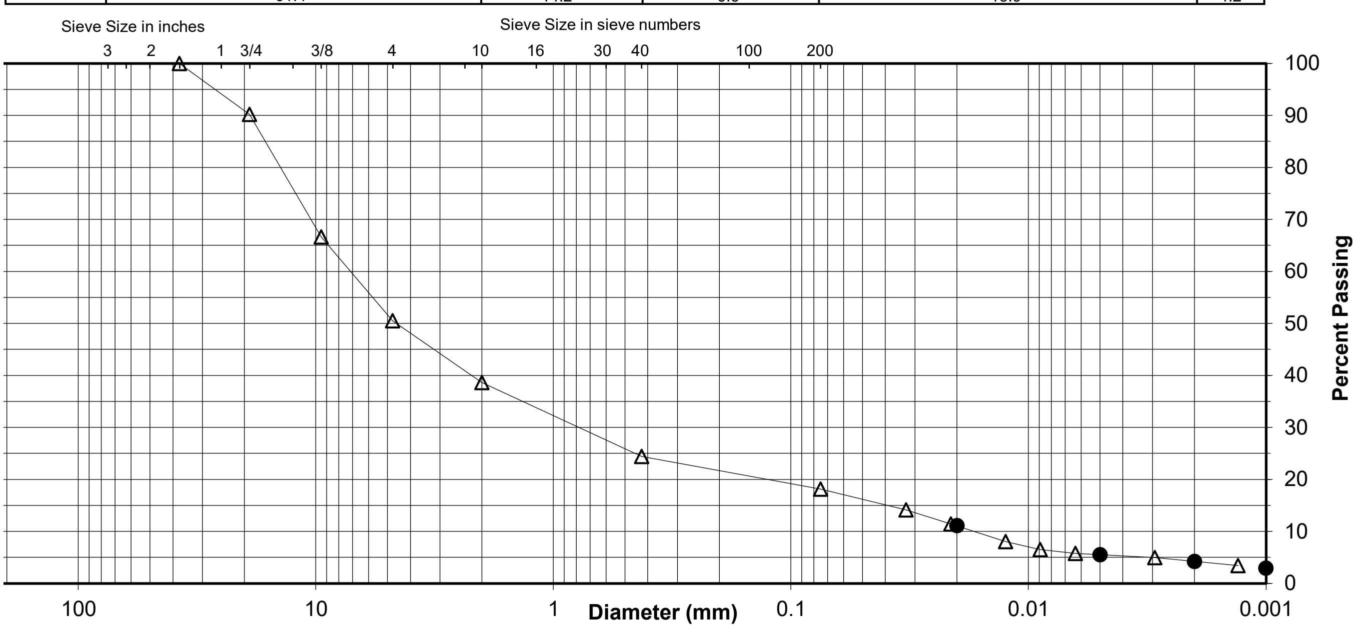
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	24.4
No. 200	18.1
0.02 mm	11.1
0.005 mm	5.5
0.002 mm	4.2
0.001 mm	2.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	9.8	39.7	11.9	14.2	6.3	12.6	5.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	61.4	14.2	6.3	13.9	4.2



Comments ______

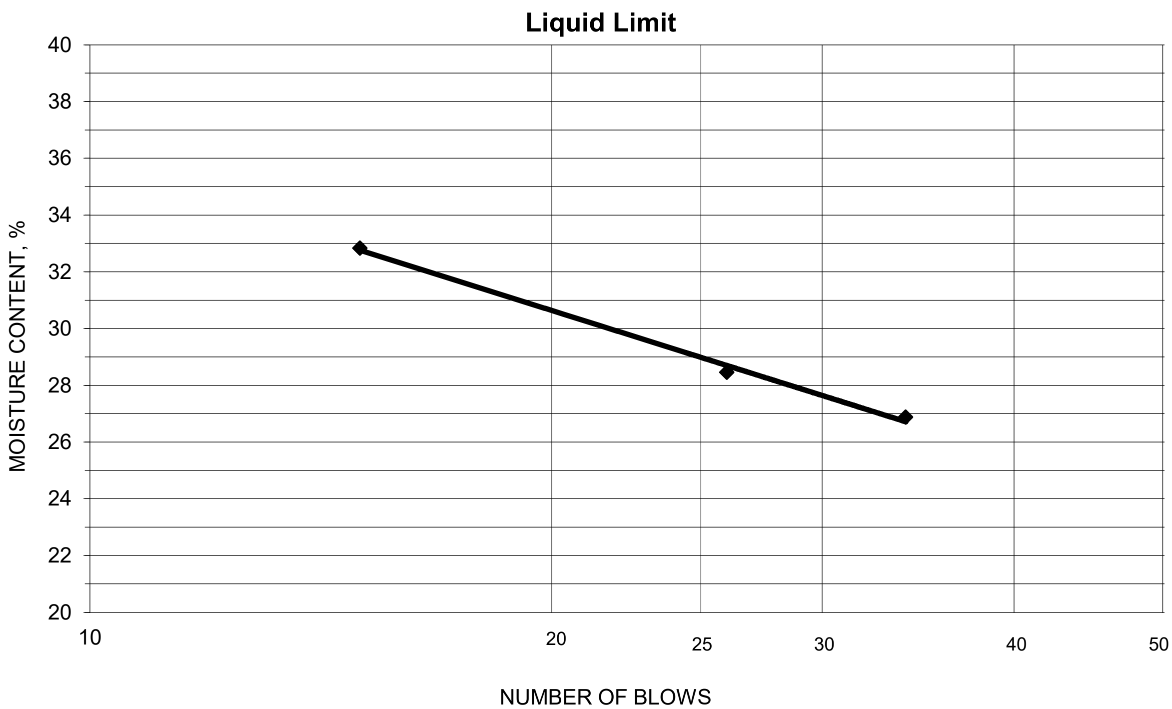
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS28G, 48.5'-50.0'	Lab ID	846
		% + No. 40	76
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-20-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
9.05	8.05	4.33	34	26.9	
9.07	8.02	4.33	26	28.5	
8.80	7.69	4.31	15	32.8	29



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
13.13	11.65	4.32	20.2	20	9
11.88	10.62	4.29	19.9		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B24-SS30G, 60.0'-61.5'
Lab ID: 848

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 24.3

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	92.0
3/8"	9.5	69.8
No. 4	4.75	56.9
No. 10	2	42.6
No. 40	0.425	20.2
No. 200	0.075	11.7
	0.02	7.6
	0.005	4.9
	0.002	4.3
estimated	0.001	4.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	43.1	57.4
Coarse Sand	14.3	22.4
Medium Sand	22.4	---
Fine Sand	8.5	8.5
Silt	6.8	7.4
Clay	4.9	4.3

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 28
Plastic Limit: 20
Plasticity Index: 8
Activity Index: 1.9

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: SP-SC
Group Name: Poorly graded sand with clay and gravel (or silty clay and gravel)
AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By: RJ

Template: tmp_sum_input.xlsm
Version: 20170217
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: RJ
Report Date: 12/09/2020

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B24-SS30G, 60.0'-61.5'	Lab ID	848

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-17-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	92.0
3/8"	69.8
No. 4	56.9
No. 10	42.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

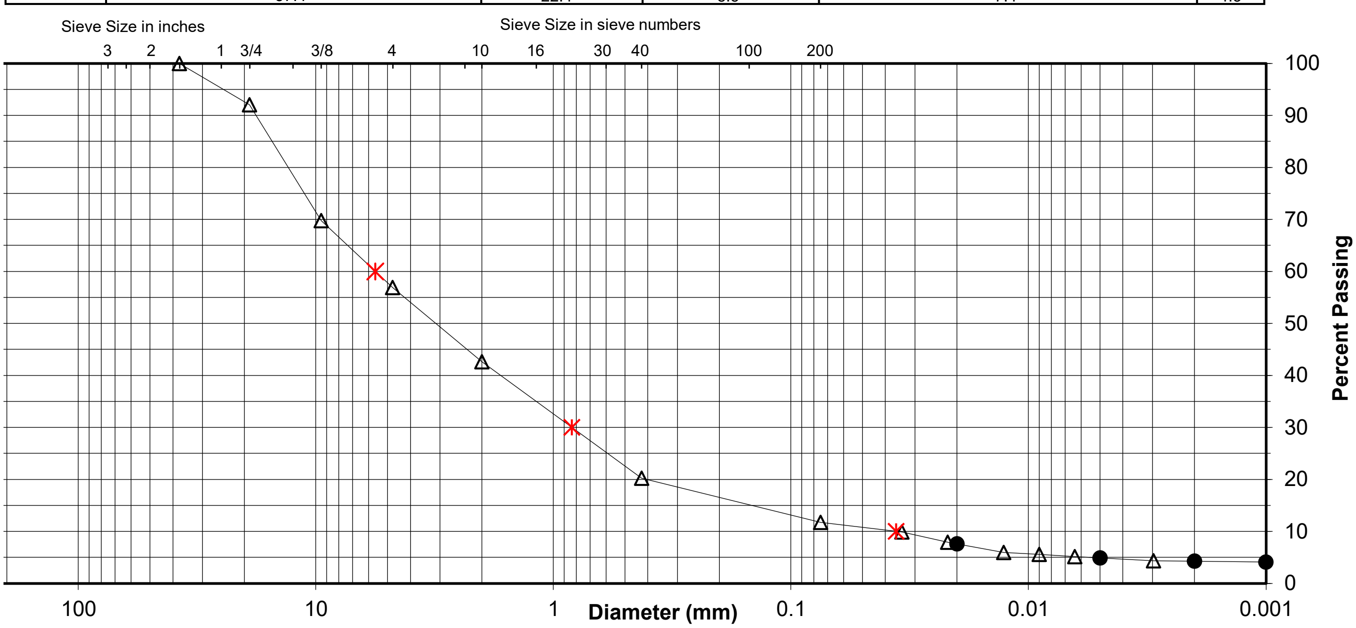
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	20.2
No. 200	11.7
0.02 mm	7.6
0.005 mm	4.9
0.002 mm	4.3
0.001 mm	4.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	8.0	35.1	14.3	22.4	8.5	6.8	4.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	57.4	22.4	8.5	7.4	4.3



Comments ______

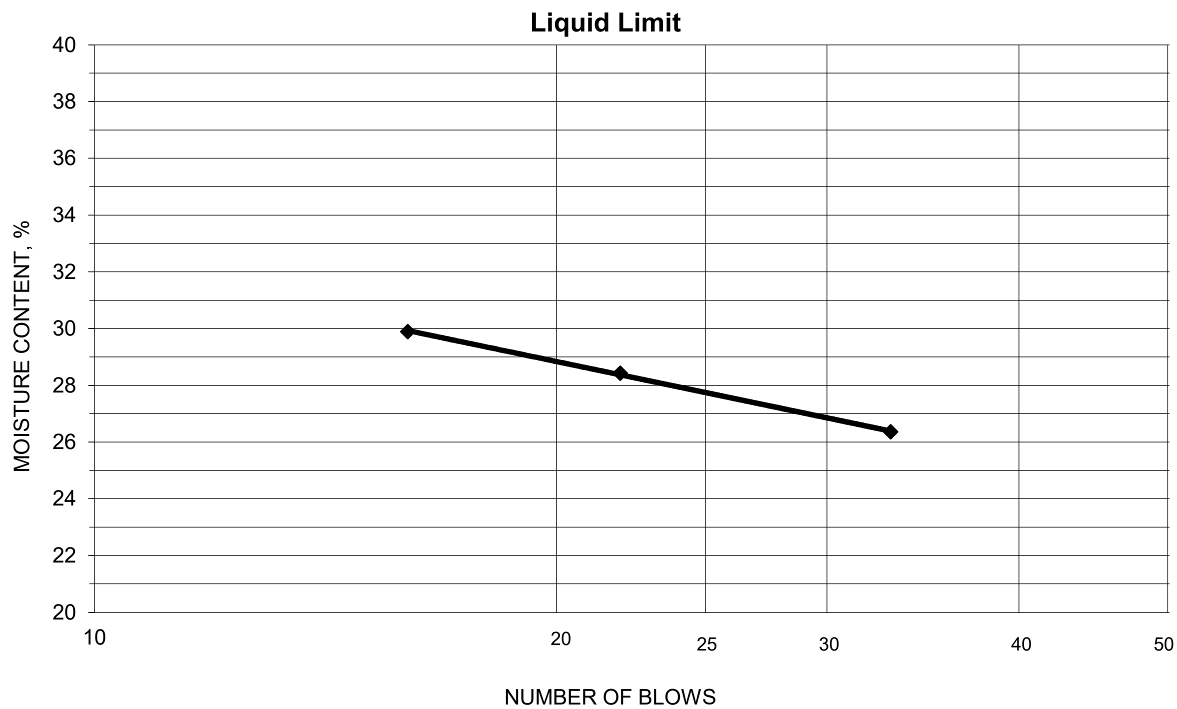
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B24-SS30G, 60.0'-61.5'	Lab ID	848
		% + No. 40	80
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-20-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
13.11	11.27	4.29	33	26.4	
10.78	9.35	4.32	22	28.4	
13.11	11.08	4.29	16	29.9	28



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
9.68	8.78	4.28	20.0	20	8
9.40	8.54	4.30	20.3		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B25-SS01G, 0.0'-1.5'
Lab ID: 852

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 19.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.3
No. 4	4.75	97.9
No. 10	2	94.9
No. 40	0.425	90.5
No. 200	0.075	84.8
	0.02	65.8
	0.005	42.3
	0.002	34.1
estimated	0.001	26.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	2.1	5.1
Coarse Sand	3.0	4.4
Medium Sand	4.4	---
Fine Sand	5.7	5.7
Silt	42.5	50.7
Clay	42.3	34.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 43
Plastic Limit: 17
Plasticity Index: 26
Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Lean clay with sand

AASHTO Classification: A-7-6 (22)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B25-SS01G, 0.0'-1.5'	Lab ID	852

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-18-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.3
No. 4	97.9
No. 10	94.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

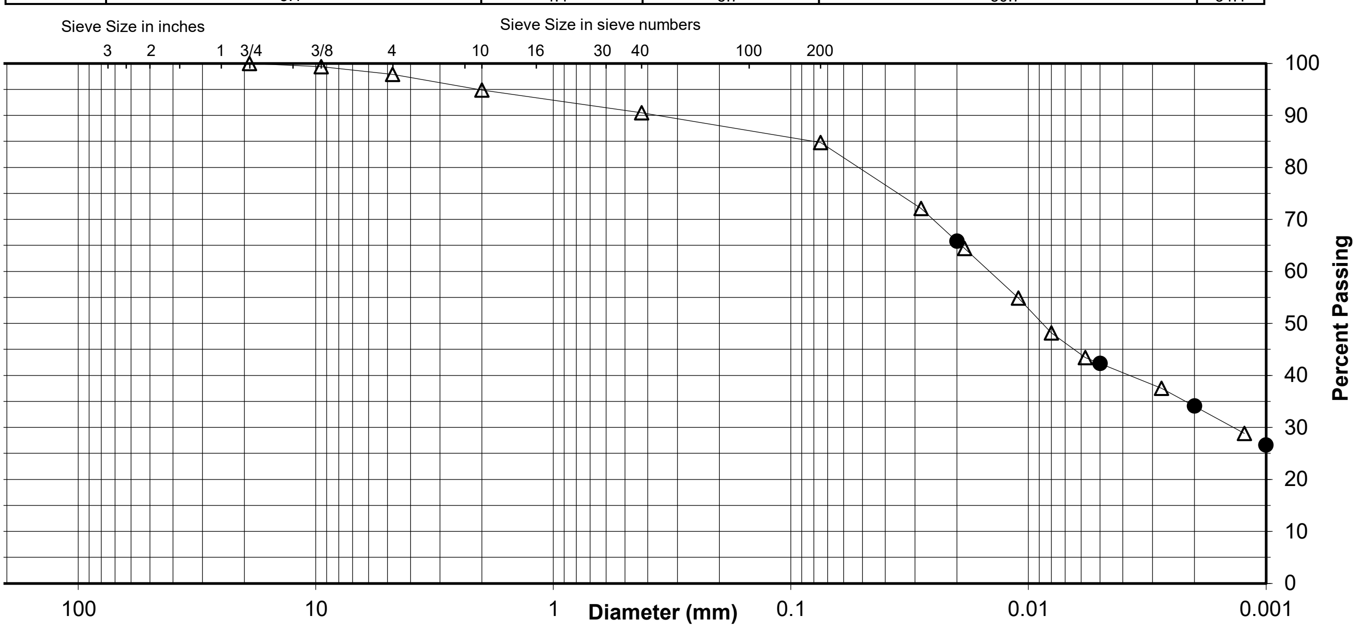
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	90.5
No. 200	84.8
0.02 mm	65.8
0.005 mm	42.3
0.002 mm	34.1
0.001 mm	26.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.1	3.0	4.4	5.7	42.5	42.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	5.1	4.4	5.7	50.7	34.1



Comments ______

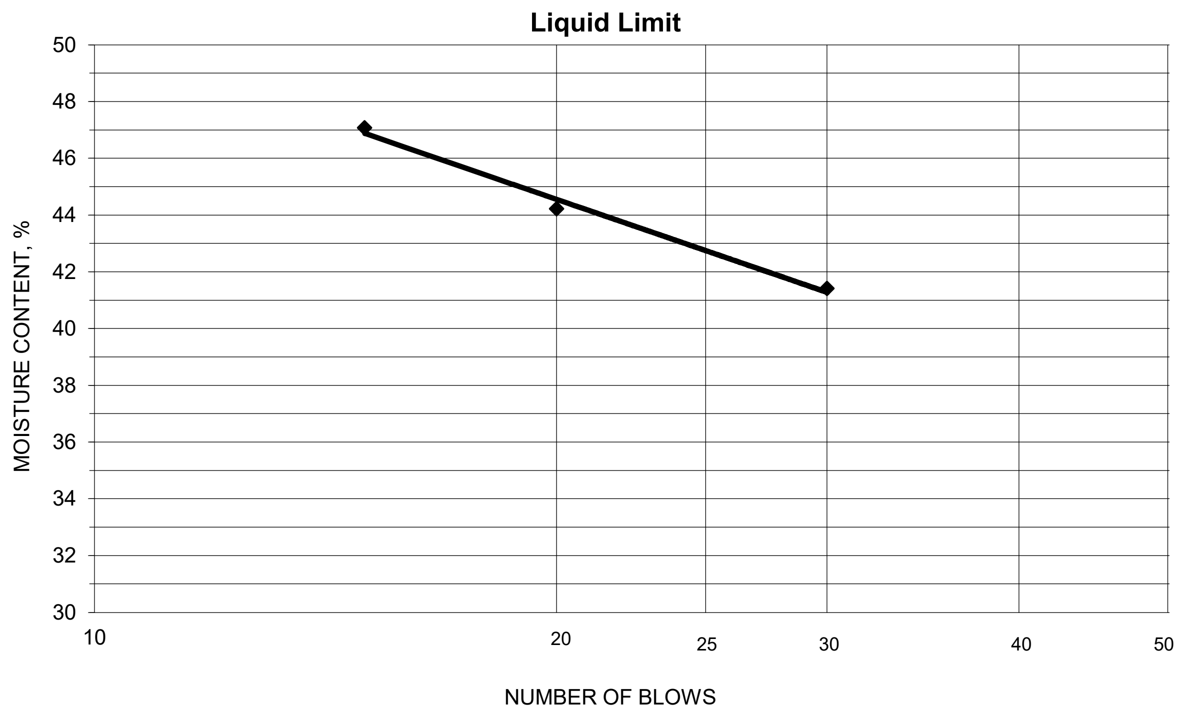
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS01G, 0.0'-1.5'	Lab ID	852
		% + No. 40	9
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-20-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
11.28	9.23	4.28	30	41.4	43
9.43	7.86	4.31	20	44.2	
11.09	8.92	4.31	15	47.1	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.74	10.67	4.33	16.9	17	26
11.52	10.47	4.28	17.0		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B25-SS06G, 12.5'-14.0'	Lab ID	857
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.1

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	96.9
No. 4	4.75	96.7
No. 10	2	94.2
No. 40	0.425	91.7
No. 200	0.075	85.9
	0.02	66.9
	0.005	44.3
	0.002	37.2
estimated	0.001	31.7

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	3.3	5.8
Coarse Sand	2.5	2.5
Medium Sand	2.5	---
Fine Sand	5.8	5.8
Silt	41.6	48.7
Clay	44.3	37.2

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 45

Plastic Limit: 18

Plasticity Index: 27

Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Lean clay

AASHTO Classification: A-7-6 (24)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils

ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B25-SS06G, 12.5'-14.0'
Lab ID: 857

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-17-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.9
No. 4	96.7
No. 10	94.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

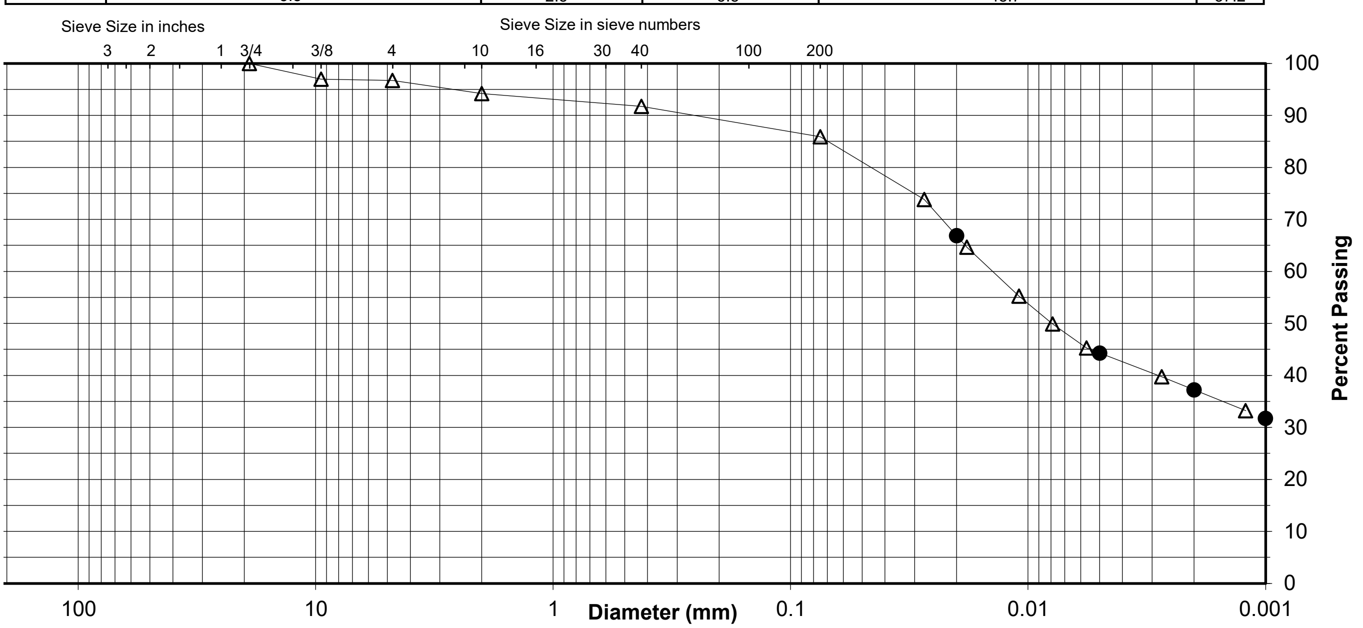
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	91.7
No. 200	85.9
0.02 mm	66.9
0.005 mm	44.3
0.002 mm	37.2
0.001 mm	31.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	3.3	2.5	2.5	5.8	41.6	44.3

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	5.8	2.5	5.8	48.7	37.2



Comments

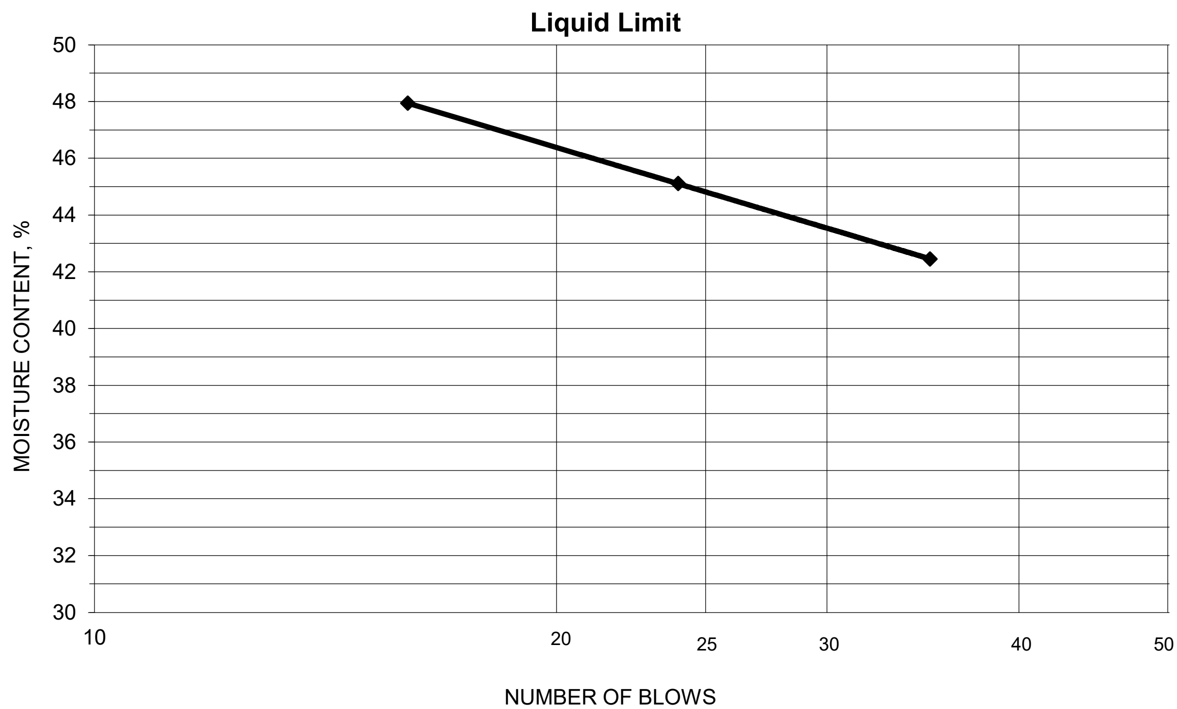
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS06G, 12.5'-14.0'	Lab ID	857
		% + No. 40	8
Tested By	JMB Test Method ASTM D 4318 Method A	Date Received	11-13-2020
Test Date	11-20-2020 Prepared Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
9.31	7.82	4.31	35	42.5	45
10.52	8.58	4.28	24	45.1	
10.41	8.43	4.30	16	47.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
12.57	11.32	4.28	17.8	18	27
12.08	10.92	4.28	17.5		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B25-SS09G, 20.0'-21.5'	Lab ID	860
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.6

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	96.9
No. 4	4.75	94.9
No. 10	2	91.6
No. 40	0.425	88.9
No. 200	0.075	77.4
	0.02	62.6
	0.005	49.7
	0.002	45.3
estimated	0.001	40.6

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	5.1	8.4
Coarse Sand	3.3	2.7
Medium Sand	2.7	---
Fine Sand	11.5	11.5
Silt	27.7	32.1
Clay	49.7	45.3

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 52

Plastic Limit: 19

Plasticity Index: 33

Activity Index: 0.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CH

Group Name: Fat clay with sand

AASHTO Classification: A-7-6 (25)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B25-SS09G, 20.0'-21.5'
Project Number: 175568209
Lab ID: 860

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-17-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.9
No. 4	94.9
No. 10	91.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

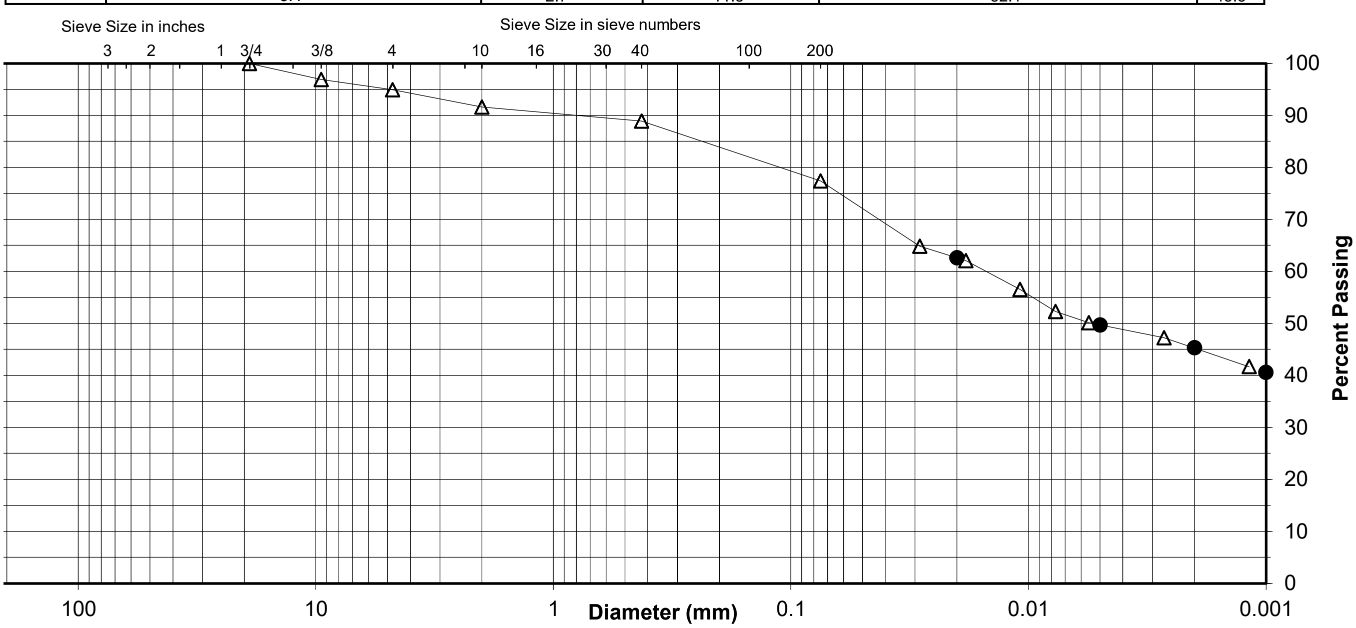
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	88.9
No. 200	77.4
0.02 mm	62.6
0.005 mm	49.7
0.002 mm	45.3
0.001 mm	40.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	5.1	3.3	2.7	11.5	27.7	49.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	8.4	2.7	11.5	32.1	45.3



Comments

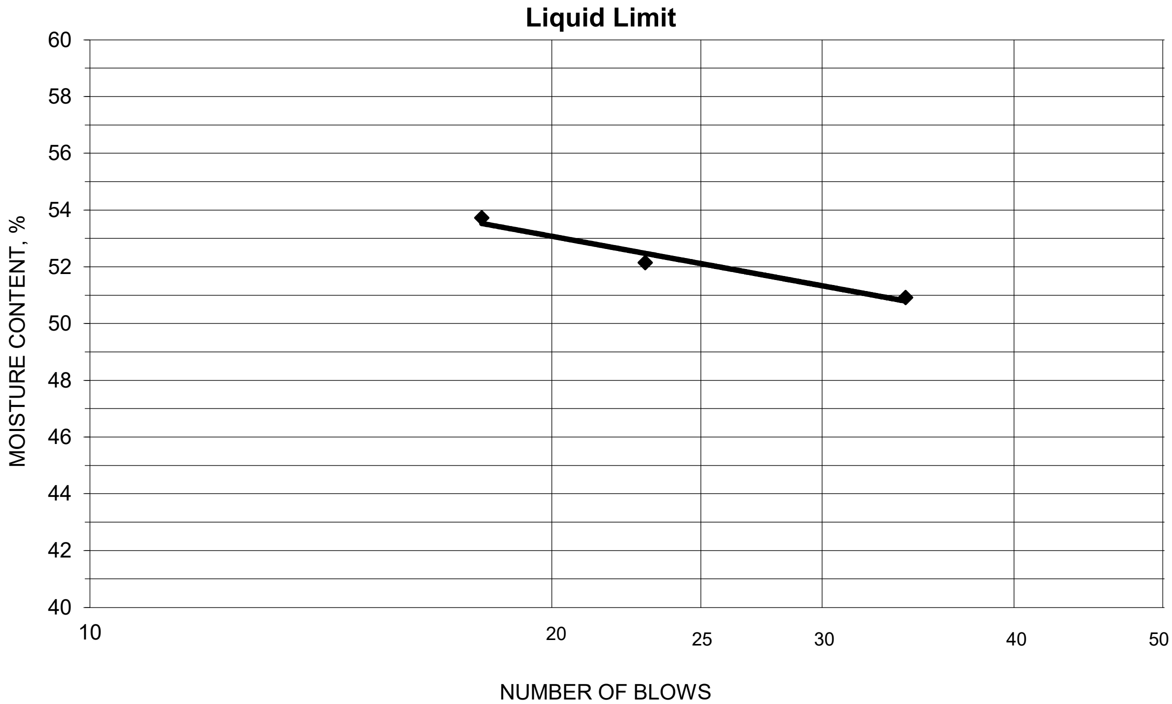
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS09G, 20.0'-21.5'	Lab ID	860
		% + No. 40	11
Tested By	KWS	Test Method ASTM D 4318 Method A	Date Received 11-13-2020
Test Date	11-24-2020	Prepared Dry	

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.14	15.65	10.76	34	50.9	52
17.87	15.44	10.78	23	52.1	
17.44	15.28	11.26	18	53.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.39	16.40	11.10	18.7	19	33
17.49	16.45	10.91	18.8		

Remarks: ____________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B25-SS12G, 27.5'-29.0'	Lab ID	862
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.5

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	88.0
No. 4	4.75	84.0
No. 10	2	76.3
No. 40	0.425	68.2
No. 200	0.075	59.1
	0.02	45.1
	0.005	31.5
	0.002	25.6
estimated	0.001	21.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	16.0	23.7
Coarse Sand	7.7	8.1
Medium Sand	8.1	---
Fine Sand	9.1	9.1
Silt	27.6	33.5
Clay	31.5	25.6

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 42

Plastic Limit: 18

Plasticity Index: 24

Activity Index: 0.9

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay with gravel

AASHTO Classification: A-7-6 (11)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B25-SS12G, 27.5'-29.0'
Project Number: 175568209
Lab ID: 862

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-17-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	88.0
No. 4	84.0
No. 10	76.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

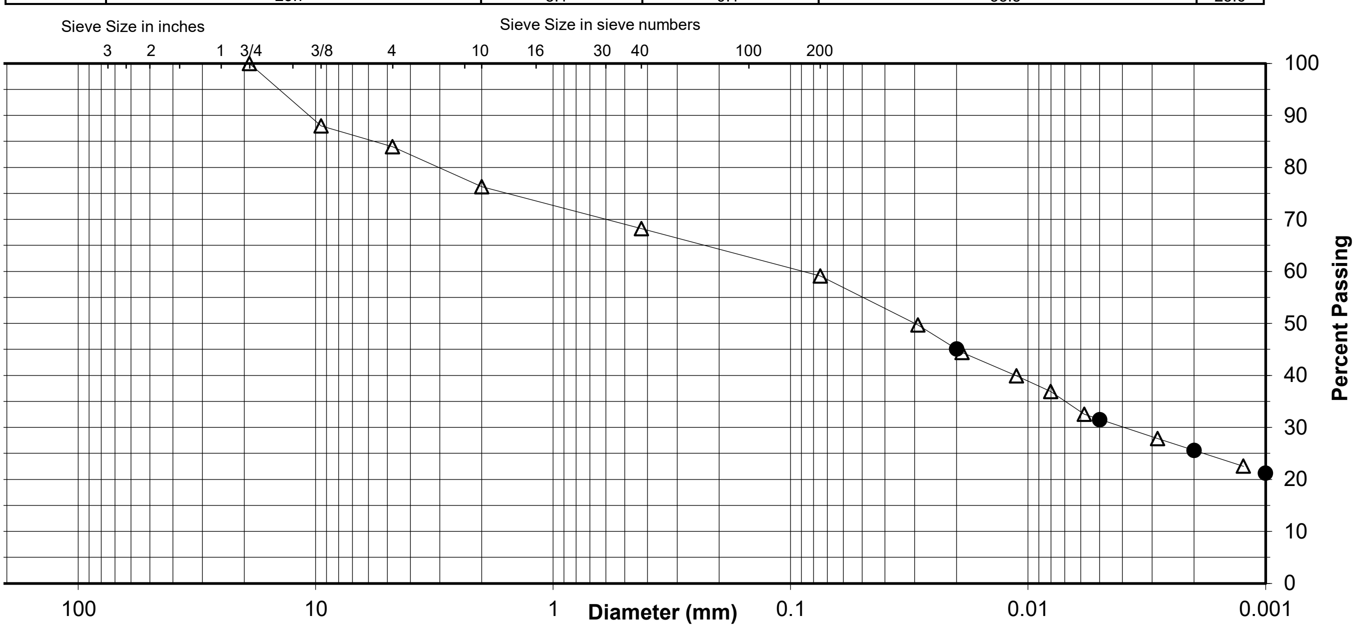
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	68.2
No. 200	59.1
0.02 mm	45.1
0.005 mm	31.5
0.002 mm	25.6
0.001 mm	21.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	16.0	7.7	8.1	9.1	27.6	31.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	23.7	8.1	9.1	33.5	25.6



Comments ______

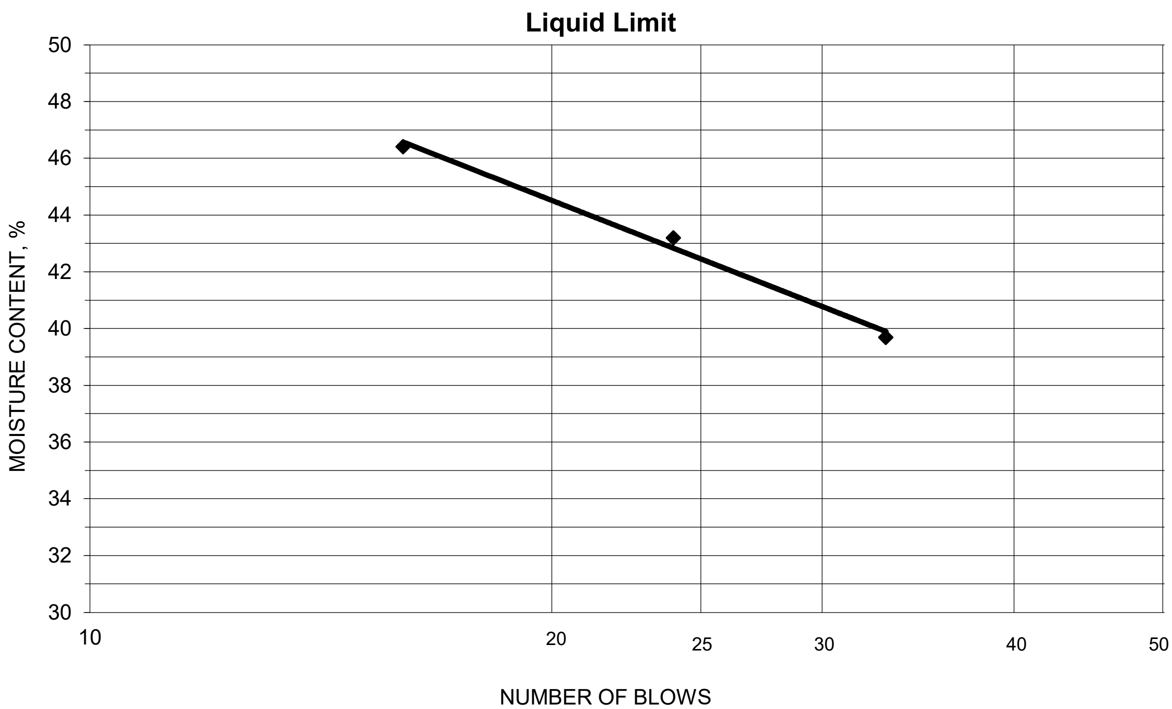
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS12G, 27.5'-29.0'	Lab ID	862
		% + No. 40	32
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-20-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
11.62	9.54	4.30	33	39.7	42
12.74	10.20	4.32	24	43.2	
11.68	9.35	4.33	16	46.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.03	10.00	4.28	18.0	18	24
11.20	10.14	4.32	18.2		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B25-SS18G, 36.5'-38.0'
Lab ID: 869

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 33.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	100.0
No. 10	2	99.9
No. 40	0.425	96.8
No. 200	0.075	79.9
	0.02	55.6
	0.005	24.3
	0.002	14.7
estimated	0.001	11.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.0	0.1
Coarse Sand	0.1	3.1
Medium Sand	3.1	---
Fine Sand	16.9	16.9
Silt	55.6	65.2
Clay	24.3	14.7

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 32
Plastic Limit: 26
Plasticity Index: 6
Activity Index: 0.4

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: ML
Group Name: Silt with sand

AASHTO Classification: A-4 (5)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B25-SS18G, 36.5'-38.0'	Lab ID	869

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-17-2020
Date Received: 11-13-2020

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	100.0
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

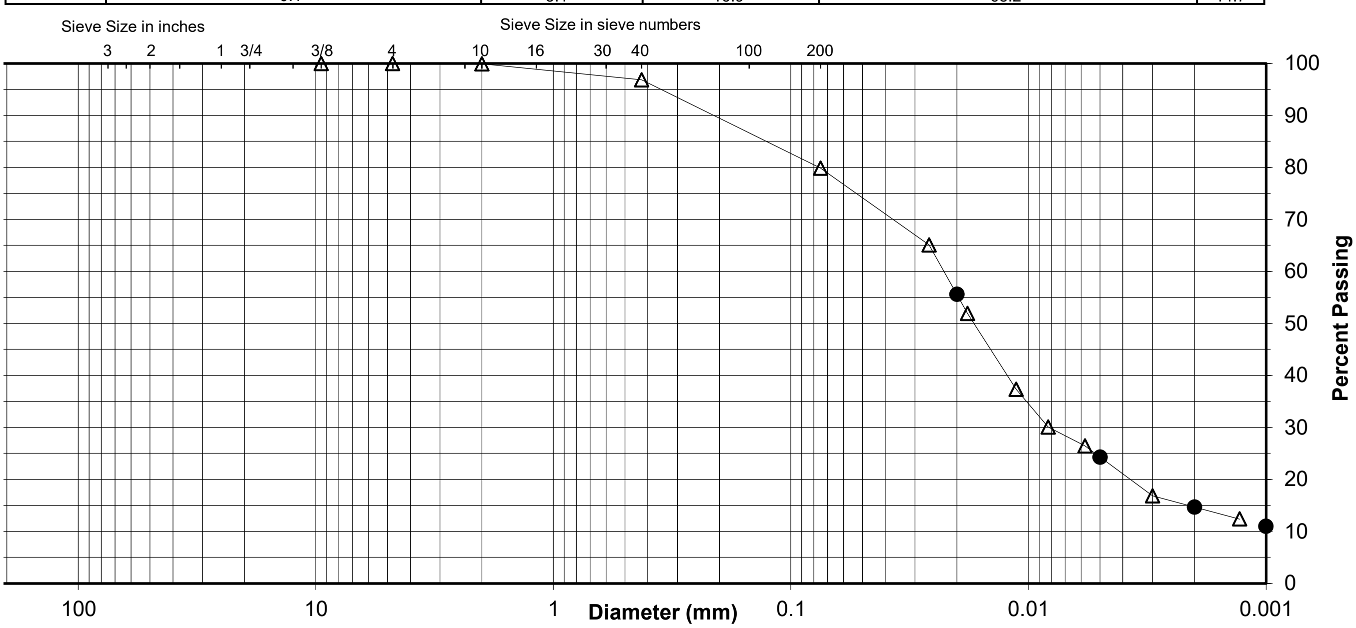
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	96.8
No. 200	79.9
0.02 mm	55.6
0.005 mm	24.3
0.002 mm	14.7
0.001 mm	11.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.0	0.1	3.1	16.9	55.6	24.3

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	0.1	3.1	16.9	65.2	14.7



Comments ______

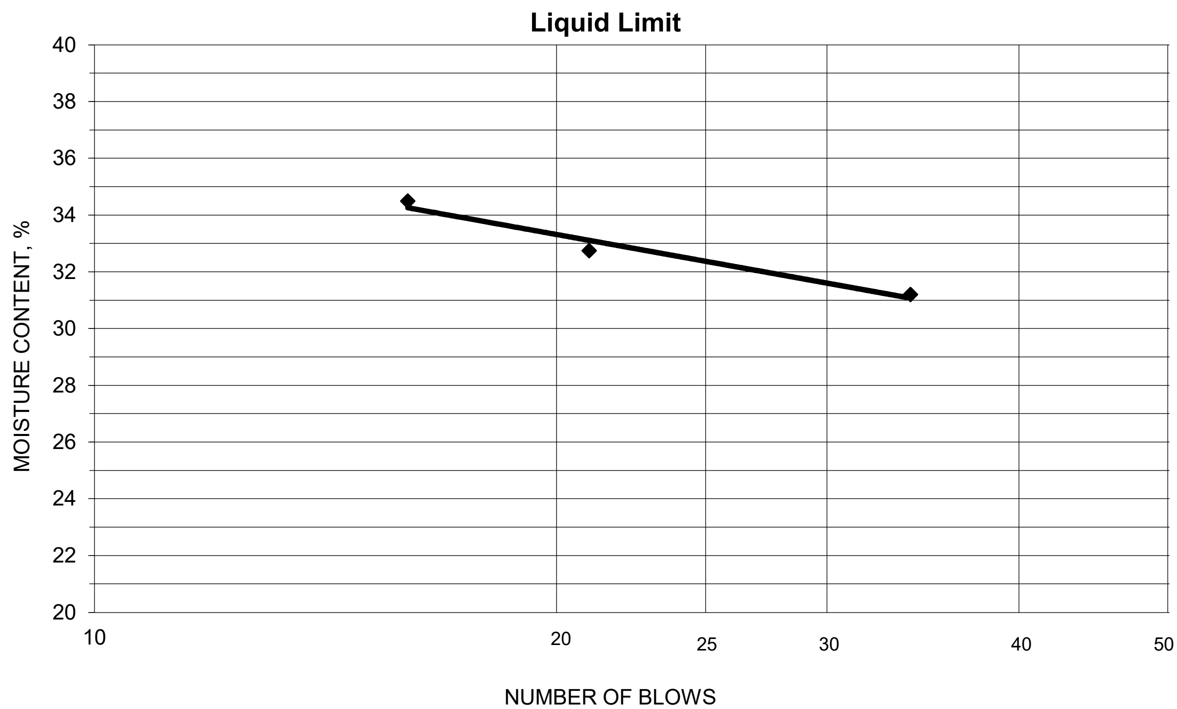
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS18G, 36.5'-38.0'	Lab ID	869
		% + No. 40	3
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-26-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.25	15.66	11.05	16	34.5	32
17.60	16.11	11.56	21	32.7	
18.12	16.46	11.14	34	31.2	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.52	16.31	11.60	25.7	26	6
16.43	15.23	10.62	26.0		

Remarks: ______

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B25-SS21G, 41.0'-42.5'	Lab ID	873
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 37.7

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	93.7
3/8"	9.5	89.0
No. 4	4.75	81.1
No. 10	2	67.6
No. 40	0.425	32.5
No. 200	0.075	19.0
	0.02	12.3
	0.005	5.7
	0.002	4.0
estimated	0.001	2.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	18.9	32.4
Coarse Sand	13.5	35.1
Medium Sand	35.1	---
Fine Sand	13.5	13.5
Silt	13.3	15.0
Clay	5.7	4.0

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: 29
Plastic Limit: 25
Plasticity Index: 4
Activity Index: 1.0

Moisture-Density Relationship
Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: SM
Group Name: Silty sand with gravel

AASHTO Classification: A-1-b (0)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B25-SS21G, 41.0'-42.5'
Lab ID: 873

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-17-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	93.7
3/8"	89.0
No. 4	81.1
No. 10	67.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

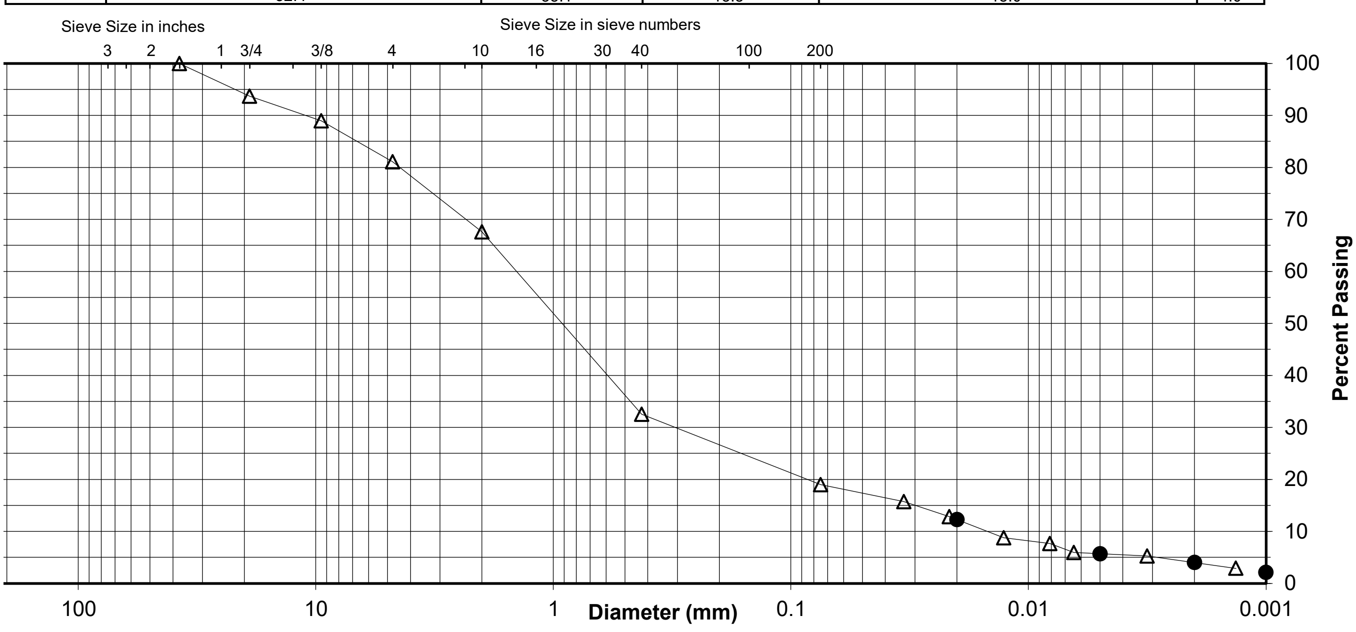
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	32.5
No. 200	19.0
0.02 mm	12.3
0.005 mm	5.7
0.002 mm	4.0
0.001 mm	2.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	6.3	12.6	13.5	35.1	13.5	13.3	5.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	32.4	35.1	13.5	15.0	4.0



Comments

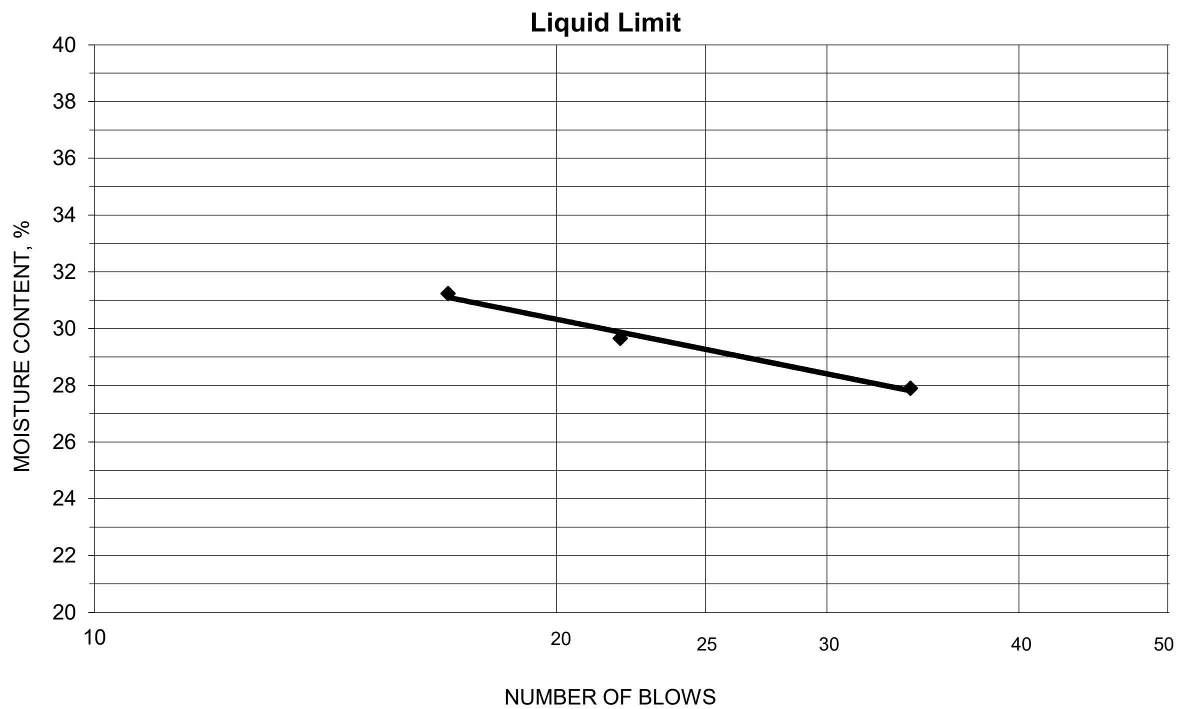
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS21G, 41.0'-42.5'	Lab ID	873
		% + No. 40	67
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-24-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
16.77	15.38	10.93	17	31.2	29
16.95	15.58	10.96	22	29.7	
16.69	15.46	11.05	34	27.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.63	16.36	11.32	25.2	25	4
17.06	15.88	11.14	24.9		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B25-SS24bG, 46.1'-47.0'
Lab ID: 878
Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 20.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	97.4
3/8"	9.5	85.2
No. 4	4.75	79.1
No. 10	2	70.3
No. 40	0.425	40.3
No. 200	0.075	30.8
	0.02	20.7
	0.005	11.7
	0.002	9.2
estimated	0.001	8.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	20.9	29.7
Coarse Sand	8.8	30.0
Medium Sand	30.0	---
Fine Sand	9.5	9.5
Silt	19.1	21.6
Clay	11.7	9.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 28
Plastic Limit: 18
Plasticity Index: 10
Activity Index: 1.1

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: SC
Group Name: Clayey sand with gravel
AASHTO Classification: A-2-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B25-SS24bG, 46.1'-47.0'
Lab ID: 878

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-19-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	97.4
3/8"	85.2
No. 4	79.1
No. 10	70.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

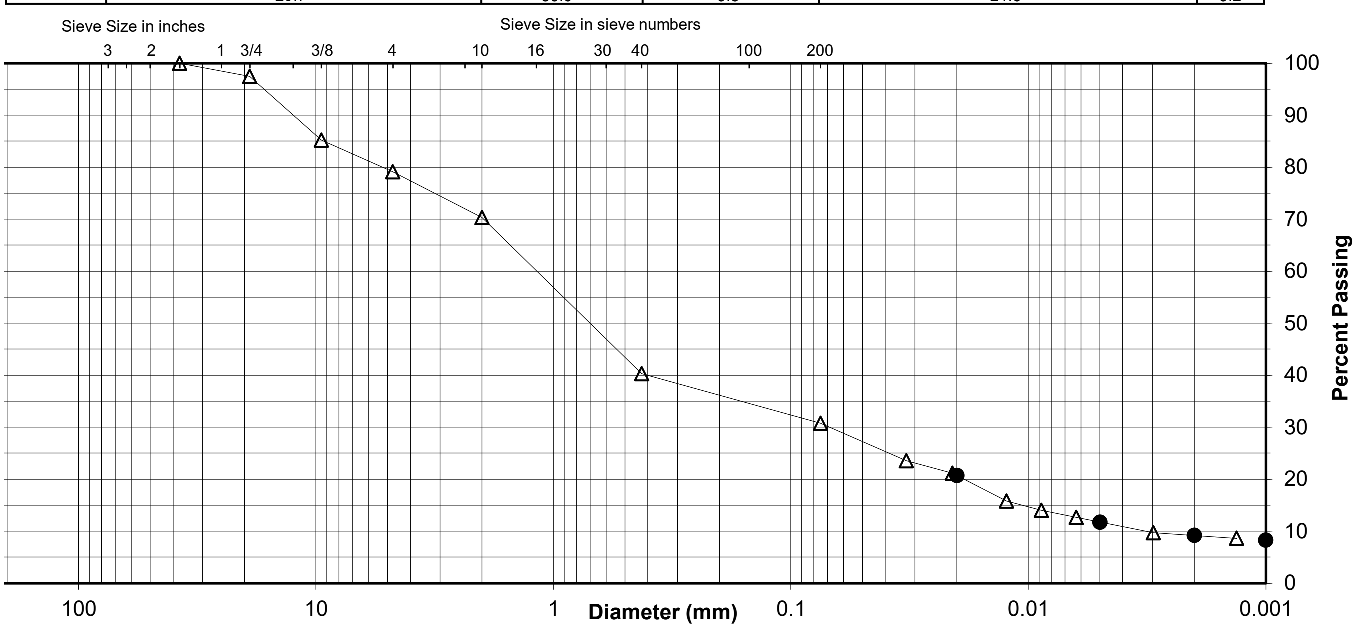
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	40.3
No. 200	30.8
0.02 mm	20.7
0.005 mm	11.7
0.002 mm	9.2
0.001 mm	8.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	2.6	18.3	8.8	30.0	9.5	19.1	11.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	29.7	30.0	9.5	21.6	9.2



Comments

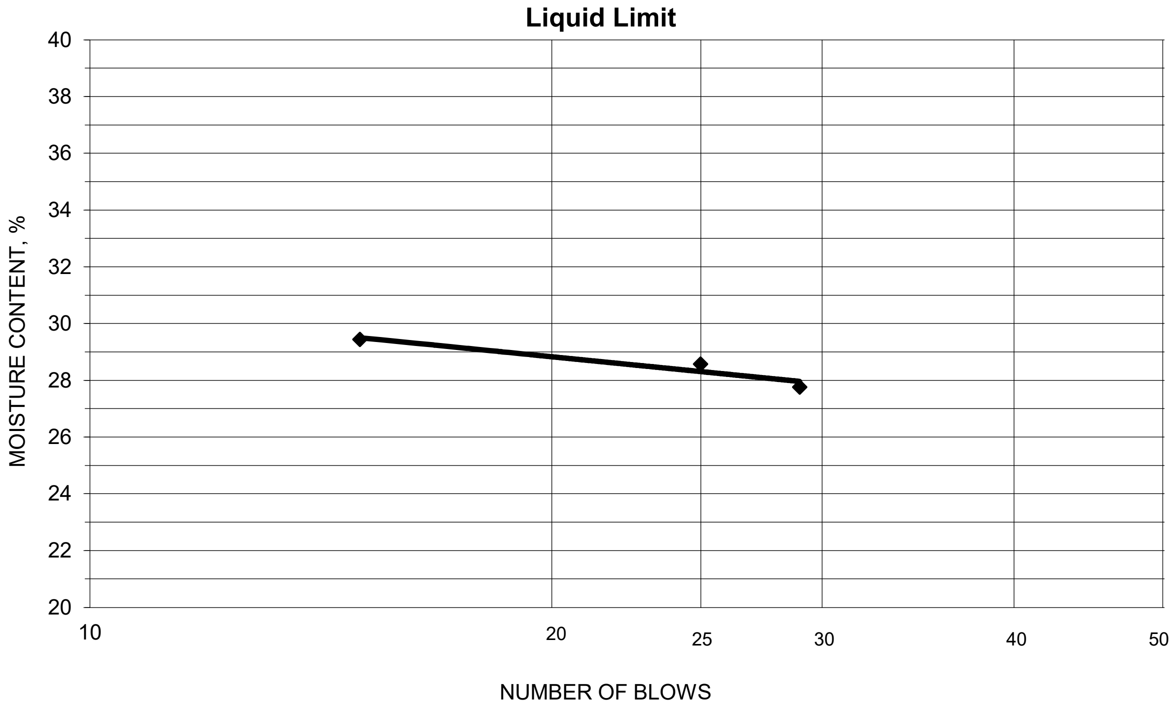
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS24bG, 46.1'-47.0'	Lab ID	878
		% + No. 40	60
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-20-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
11.52	9.96	4.34	29	27.8	28
11.43	9.85	4.32	25	28.6	
11.75	10.06	4.32	15	29.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.15	10.10	4.32	18.2	18	10
11.80	10.64	4.33	18.4		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B25-SS26G, 48.5'-50.0'
Lab ID: 881
Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 26.5

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 31
Plastic Limit: 17
Plasticity Index: 14
Activity Index: 1.1

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.7
3/8"	9.5	86.2
No. 4	4.75	79.7
No. 10	2	72.9
No. 40	0.425	53.1
No. 200	0.075	42.4
	0.02	31.2
	0.005	16.4
	0.002	12.8
estimated	0.001	11.5

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	20.3	27.1
Coarse Sand	6.8	19.8
Medium Sand	19.8	---
Fine Sand	10.7	10.7
Silt	26.0	29.6
Clay	16.4	12.8

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: SC
Group Name: Clayey sand with gravel

AASHTO Classification: A-6 (2)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B25-SS26G, 48.5'-50.0'	Lab ID	881

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-18-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.7
3/8"	86.2
No. 4	79.7
No. 10	72.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

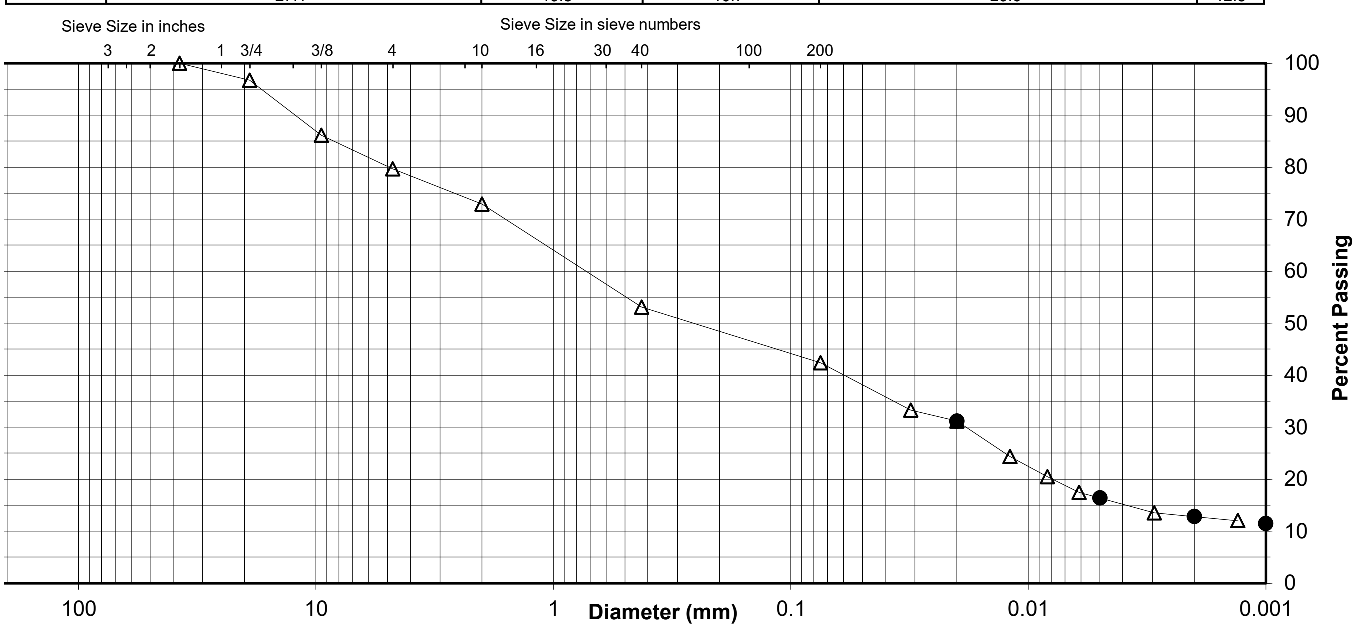
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	53.1
No. 200	42.4
0.02 mm	31.2
0.005 mm	16.4
0.002 mm	12.8
0.001 mm	11.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.3	17.0	6.8	19.8	10.7	26.0	16.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	27.1	19.8	10.7	29.6	12.8



Comments ______

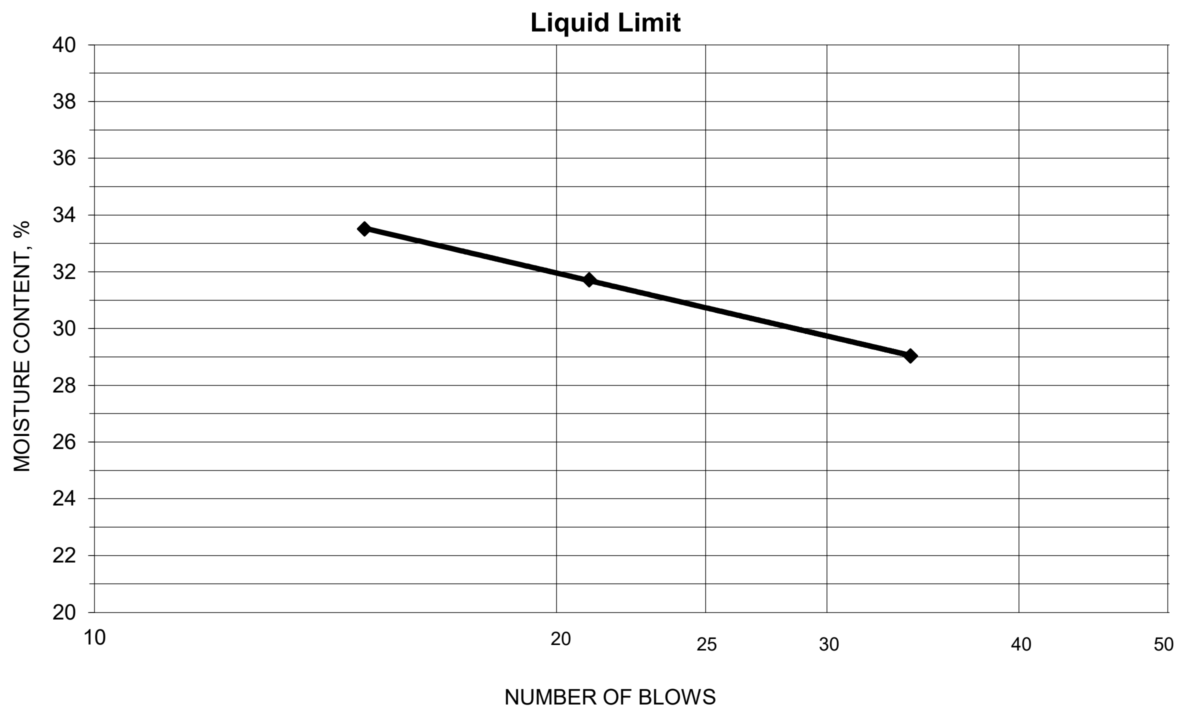
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS26G, 48.5'-50.0'	Lab ID	881
		% + No. 40	47
Tested By	JMB	Test Method ASTM D 4318 Method A	Date Received 11-13-2020
Test Date	11-20-2020	Prepared Dry	

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
10.61	9.19	4.30	34	29.0	31
10.57	9.06	4.30	21	31.7	
11.61	9.77	4.28	15	33.5	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
12.03	10.89	4.32	17.4	17	14
11.51	10.45	4.26	17.1		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B25-SS30G, 70.0'-71.5'
Lab ID: 885
Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 43.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.8
No. 10	2	98.9
No. 40	0.425	98.7
No. 200	0.075	98.4
	0.02	92.1
	0.005	83.9
	0.002	69.8
estimated	0.001	61.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	0.2	1.1
Coarse Sand	0.9	0.2
Medium Sand	0.2	---
Fine Sand	0.3	0.3
Silt	14.5	28.6
Clay	83.9	69.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 64
Plastic Limit: 20
Plasticity Index: 44
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CH
Group Name: Fat clay
AASHTO Classification: A-7-6 (48)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B25-SS30G, 70.0'-71.5'	Lab ID	885

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-16-2020
Date Received: 11-13-2020

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.8
No. 10	98.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

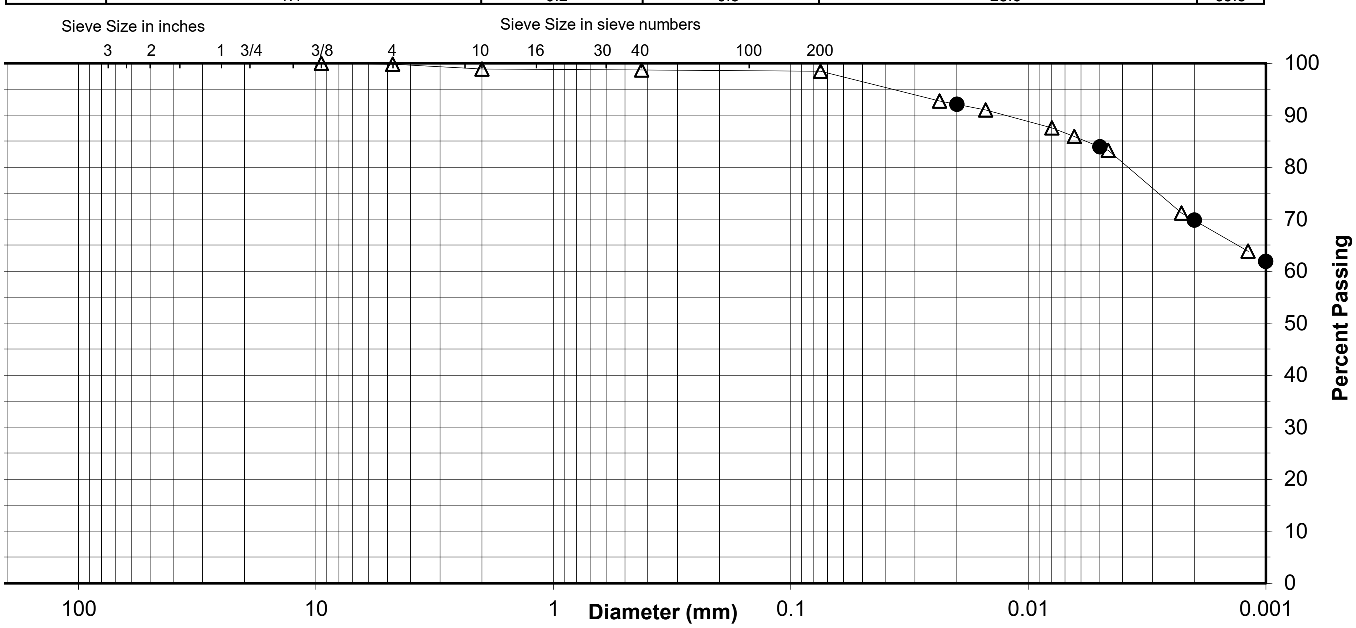
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.7
No. 200	98.4
0.02 mm	92.1
0.005 mm	83.9
0.002 mm	69.8
0.001 mm	61.9

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.2	0.9	0.2	0.3	14.5	83.9

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	1.1	0.2	0.3	28.6	69.8



Comments ____________________

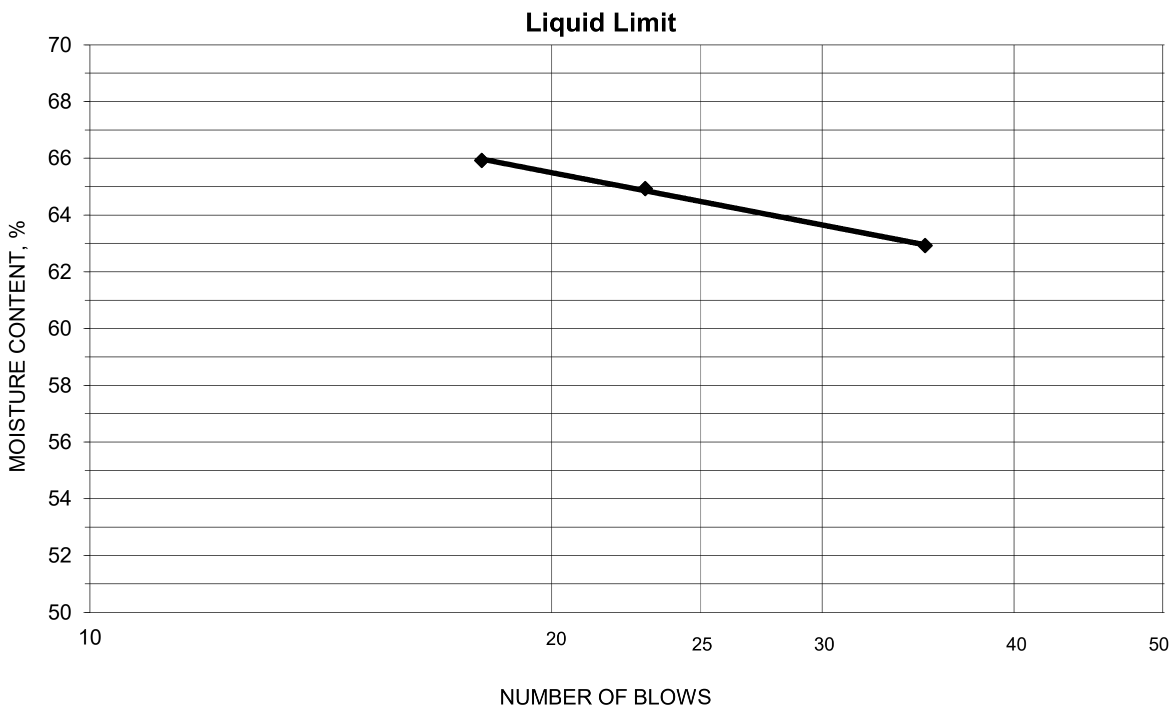
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B25-SS30G, 70.0'-71.5'	Lab ID	885
		% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-24-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
16.73	14.49	10.93	35	62.9	64
17.86	15.23	11.18	23	64.9	
17.28	14.92	11.34	18	65.9	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.91	16.86	11.62	20.0	20	44
17.73	16.70	11.59	20.2		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS03G, 5.0'-6.5'	Lab ID	892
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 22.4

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	95.0
No. 4	4.75	91.6
No. 10	2	86.3
No. 40	0.425	80.0
No. 200	0.075	68.1
	0.02	56.6
	0.005	43.6
	0.002	36.7
estimated	0.001	33.1

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	8.4	13.7
Coarse Sand	5.3	6.3
Medium Sand	6.3	---
Fine Sand	11.9	11.9
Silt	24.5	31.4
Clay	43.6	36.7

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 49

Plastic Limit: 18

Plasticity Index: 31

Activity Index: 0.8

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL

Group Name: Sandy lean clay

AASHTO Classification: A-7-6 (19)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS03G, 5.0'-6.5'	Lab ID	892

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-17-2020
Date Received: 11-13-2020

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	95.0
No. 4	91.6
No. 10	86.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

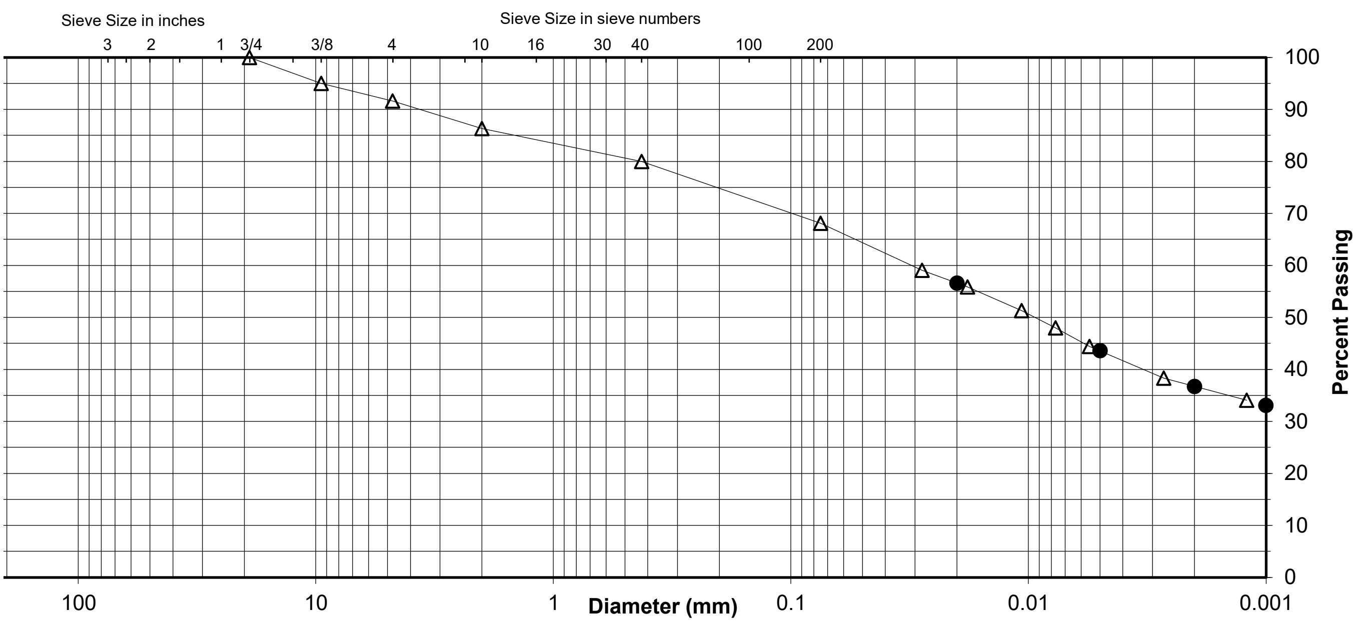
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	80.0
No. 200	68.1
0.02 mm	56.6
0.005 mm	43.6
0.002 mm	36.7
0.001 mm	33.1

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	8.4	5.3	6.3	11.9	24.5	43.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	13.7	6.3	11.9	31.4	36.7



Comments ______

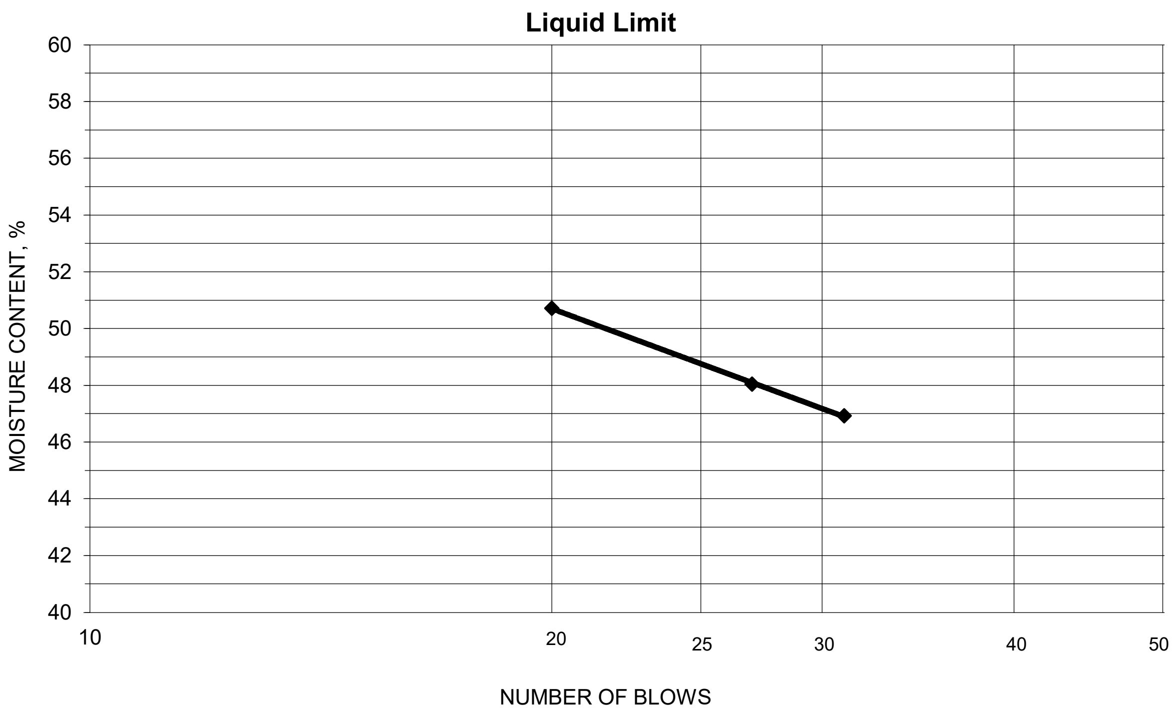
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS03G, 5.0'-6.5'	Lab ID	892
		% + No. 40	20
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-24-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
16.76	14.85	10.78	31	46.9	49
18.84	16.26	10.89	27	48.0	
18.83	16.35	11.46	20	50.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.50	16.56	11.18	17.5	18	31
17.44	16.43	10.95	18.4		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B23-SS12G, 22.5'-24.0'
Lab ID: 901

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 21.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	95.0
3/8"	9.5	83.5
No. 4	4.75	78.6
No. 10	2	70.3
No. 40	0.425	58.9
No. 200	0.075	53.0
	0.02	41.0
	0.005	34.4
	0.002	30.1
estimated	0.001	27.6

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	21.4	29.7
Coarse Sand	8.3	11.4
Medium Sand	11.4	---
Fine Sand	5.9	5.9
Silt	18.6	22.9
Clay	34.4	30.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 47
Plastic Limit: 16
Plasticity Index: 31
Activity Index: 1.0

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Sandy lean clay with gravel

AASHTO Classification: A-7-6 (12)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS12G, 22.5'-24.0'	Lab ID	901

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: TRH
Test Date: 11-18-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	95.0
3/8"	83.5
No. 4	78.6
No. 10	70.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

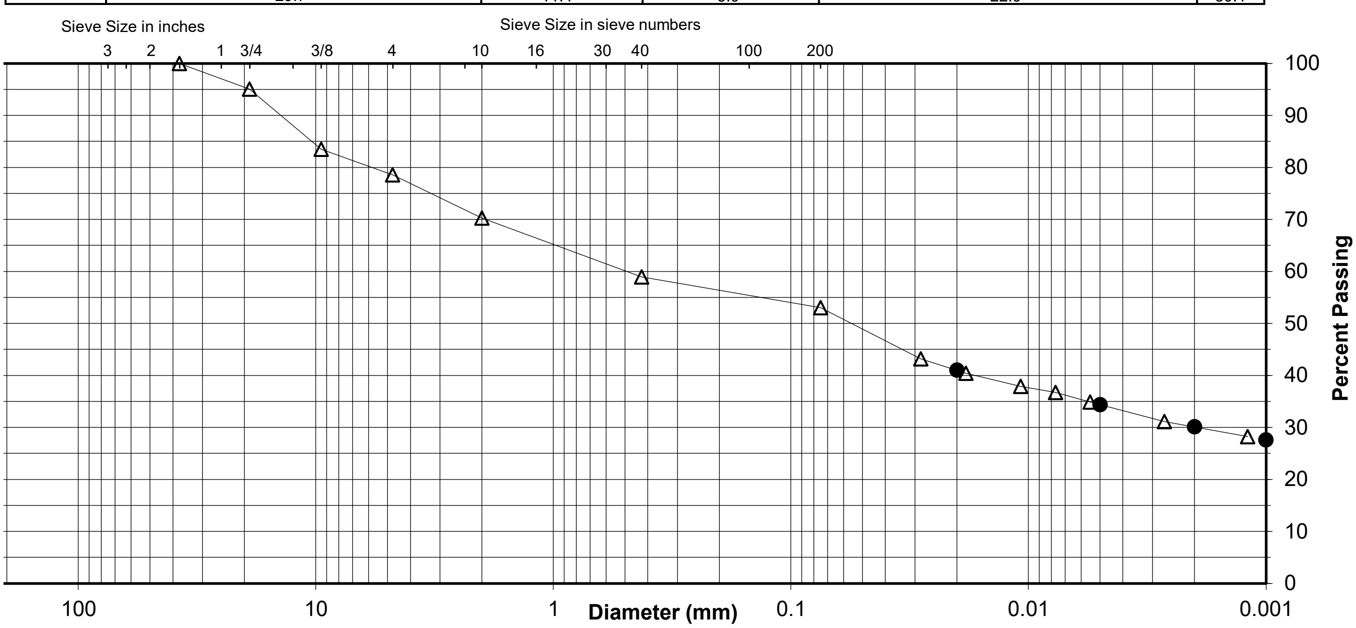
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	58.9
No. 200	53.0
0.02 mm	41.0
0.005 mm	34.4
0.002 mm	30.1
0.001 mm	27.6

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	5.0	16.4	8.3	11.4	5.9	18.6	34.4

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	29.7	11.4	5.9	22.9	30.1



Comments ______

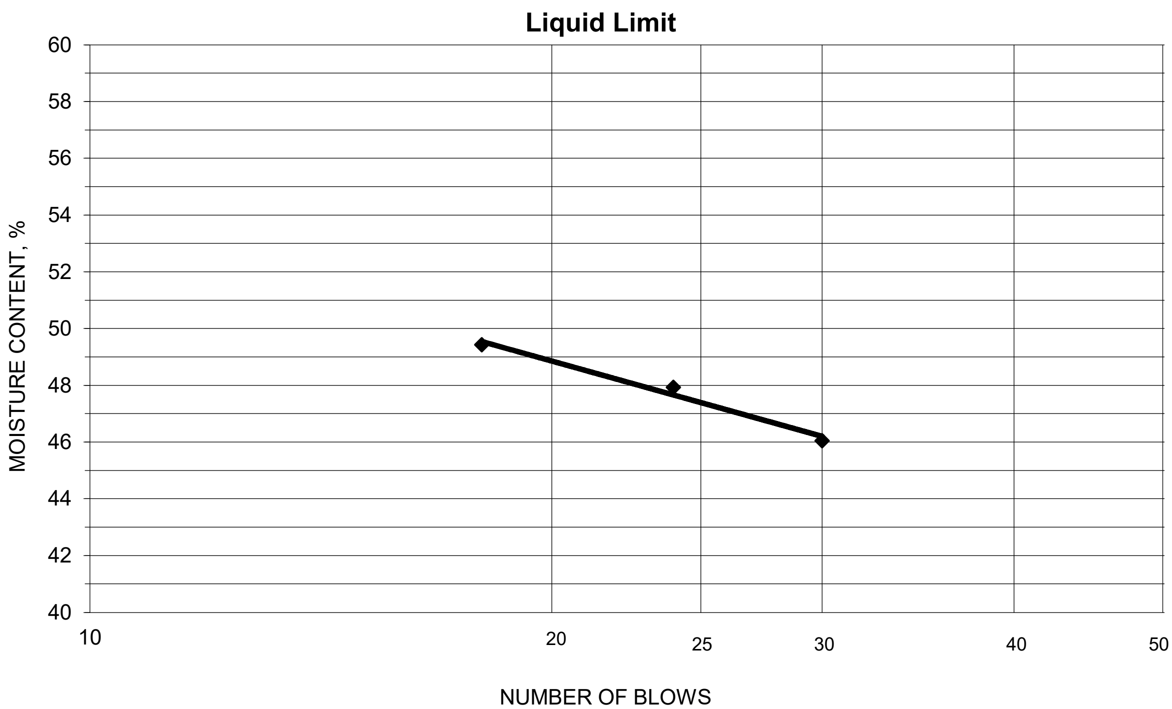
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS12G, 22.5'-24.0'	Lab ID	901
		% + No. 40	41
Tested By	JMB	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-20-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
10.75	8.71	4.28	30	46.0	47
13.18	10.29	4.26	24	47.9	
12.06	9.47	4.23	18	49.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
11.99	10.90	4.29	16.5	16	31
11.44	10.44	4.26	16.2		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B23-SS18G, 31.5'-33.0'
Lab ID: 907

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 54.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	97.1
No. 10	2	96.6
No. 40	0.425	96.3
No. 200	0.075	90.6
	0.02	64.1
	0.005	24.5
	0.002	9.1
estimated	0.001	2.3

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	2.9	3.4
Coarse Sand	0.5	0.3
Medium Sand	0.3	---
Fine Sand	5.7	5.7
Silt	66.1	81.5
Clay	24.5	9.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: ML
Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS18G, 31.5'-33.0'	Lab ID	907

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-20-2020
Date Received: 11-13-2020

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	97.1
No. 10	96.6

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

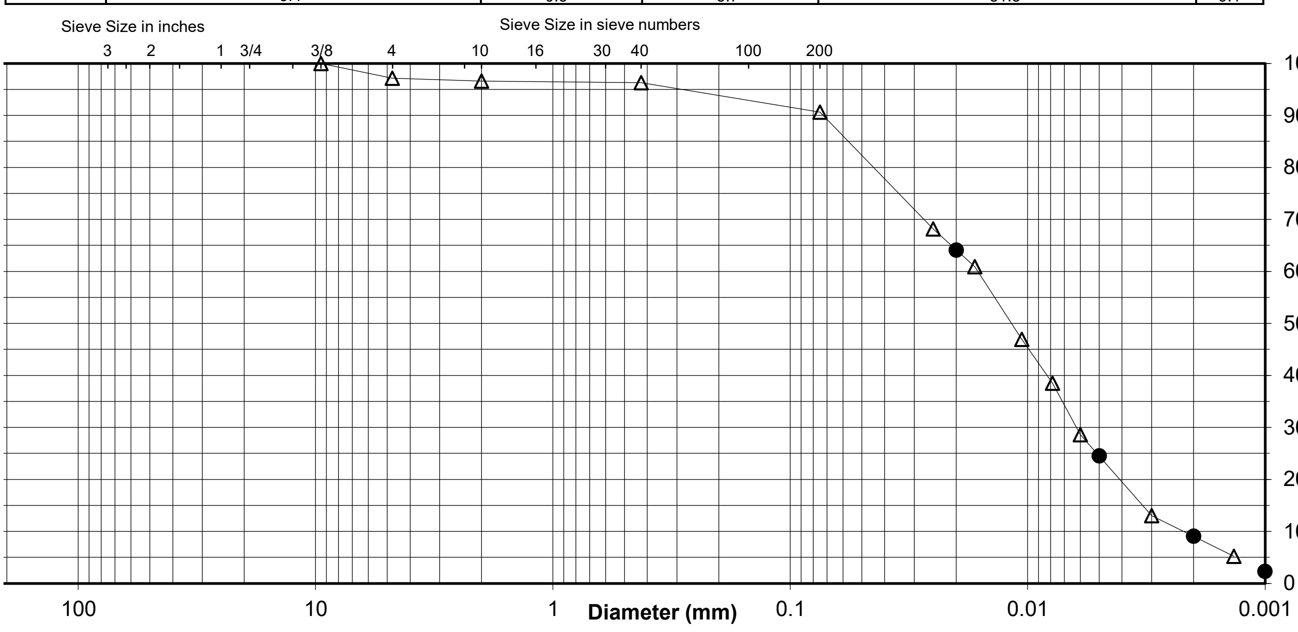
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	96.3
No. 200	90.6
0.02 mm	64.1
0.005 mm	24.5
0.002 mm	9.1
0.001 mm	2.3

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.9	0.5	0.3	5.7	66.1	24.5

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	3.4	0.3	5.7	81.5	9.1



Comments

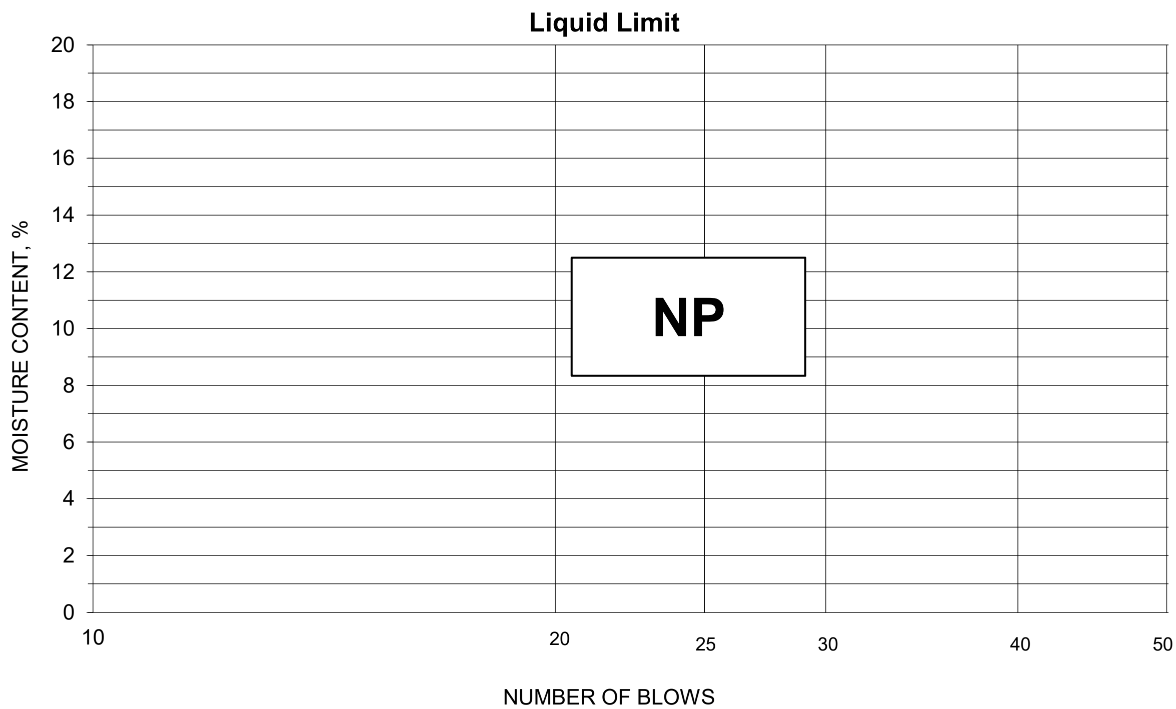
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS18G, 31.5'-33.0'	Lab ID	907
		% + No. 40	4
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-24-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B23-SS22G, 37.5'-39.0'
Lab ID: 912

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 29.4

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	85.5
3/8"	9.5	82.0
No. 4	4.75	80.0
No. 10	2	69.7
No. 40	0.425	66.3
No. 200	0.075	63.1
	0.02	49.1
	0.005	30.7
	0.002	24.2
estimated	0.001	20.5

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	20.0	30.3
Coarse Sand	10.3	3.4
Medium Sand	3.4	---
Fine Sand	3.2	3.2
Silt	32.4	38.9
Clay	30.7	24.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 41
Plastic Limit: 18
Plasticity Index: 23
Activity Index: 1.0

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: CL
Group Name: Gravelly lean clay with sand
AASHTO Classification: A-7-6 (12)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS22G, 37.5'-39.0'	Lab ID	912

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-20-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	85.5
3/8"	82.0
No. 4	80.0
No. 10	69.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

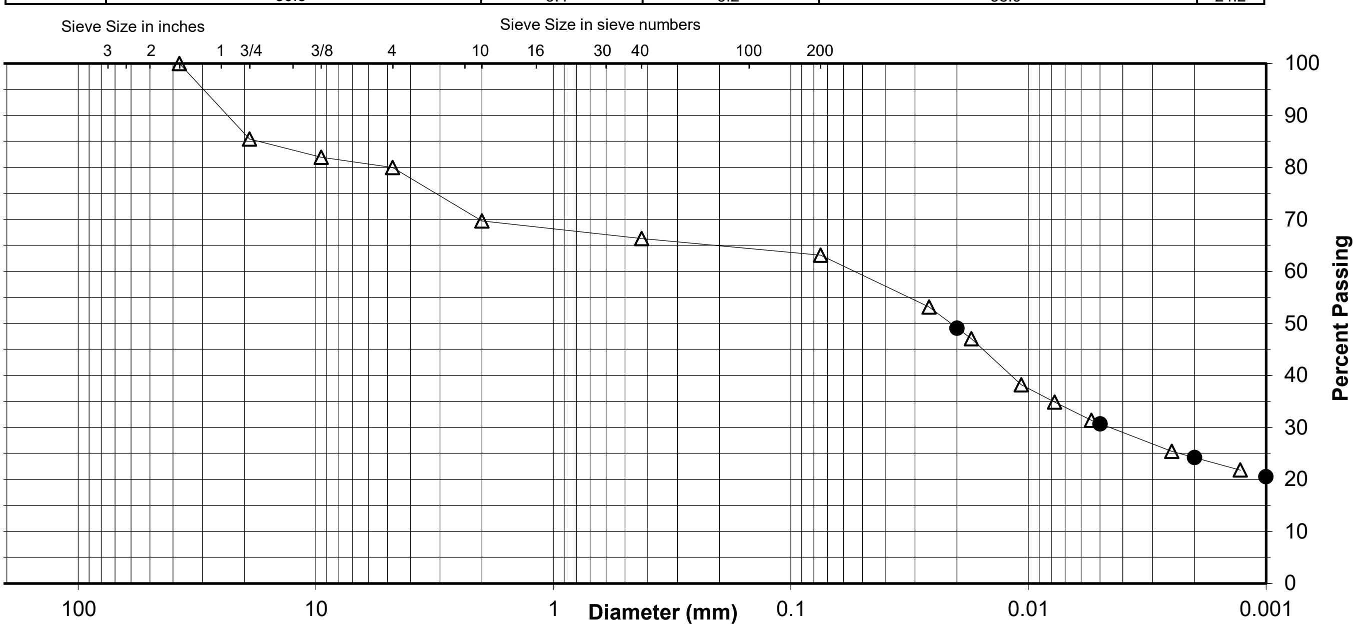
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	66.3
No. 200	63.1
0.02 mm	49.1
0.005 mm	30.7
0.002 mm	24.2
0.001 mm	20.5

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	14.5	5.5	10.3	3.4	3.2	32.4	30.7

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	30.3	3.4	3.2	38.9	24.2



Comments ______

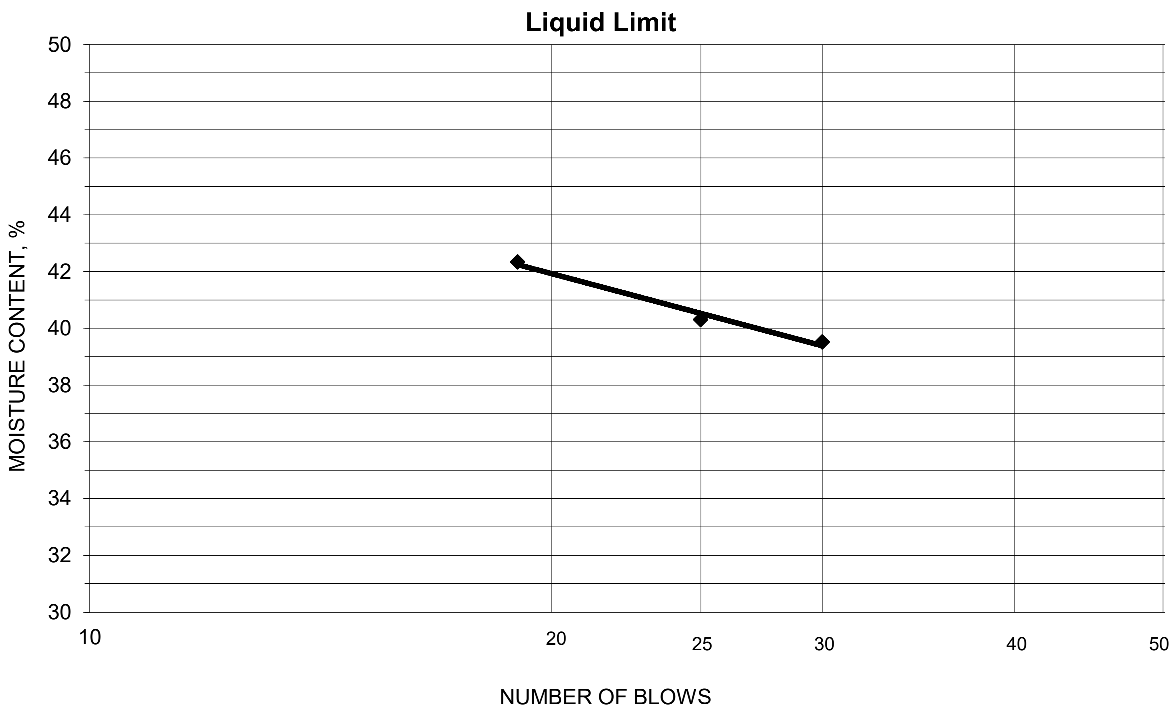
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS22G, 37.5'-39.0'	Lab ID	912
		% + No. 40	34
Tested By	KW	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-24-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.46	16.33	10.94	30	39.5	41
18.70	16.60	11.39	25	40.3	
17.70	15.85	11.48	19	42.3	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.20	16.23	10.91	18.2	18	23
17.80	16.81	11.36	18.2		

Remarks: ____________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS24G, 40.5'-41.6'	Lab ID	914
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 28.0

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	78.9
3/8"	9.5	69.9
No. 4	4.75	62.2
No. 10	2	51.0
No. 40	0.425	44.8
No. 200	0.075	40.8
	0.02	33.9
	0.005	26.9
	0.002	23.0
estimated	0.001	21.7

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	37.8	49.0
Coarse Sand	11.2	6.2
Medium Sand	6.2	---
Fine Sand	4.0	4.0
Silt	13.9	17.8
Clay	26.9	23.0

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 56

Plastic Limit: 20

Plasticity Index: 36

Activity Index: 1.6

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: GC

Group Name: Clayey gravel with sand

AASHTO Classification: A-7-6 (8)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B23-SS24G, 40.5'-41.6'
Project Number: 175568209
Lab ID: 914

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-20-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	78.9
3/8"	69.9
No. 4	62.2
No. 10	51.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

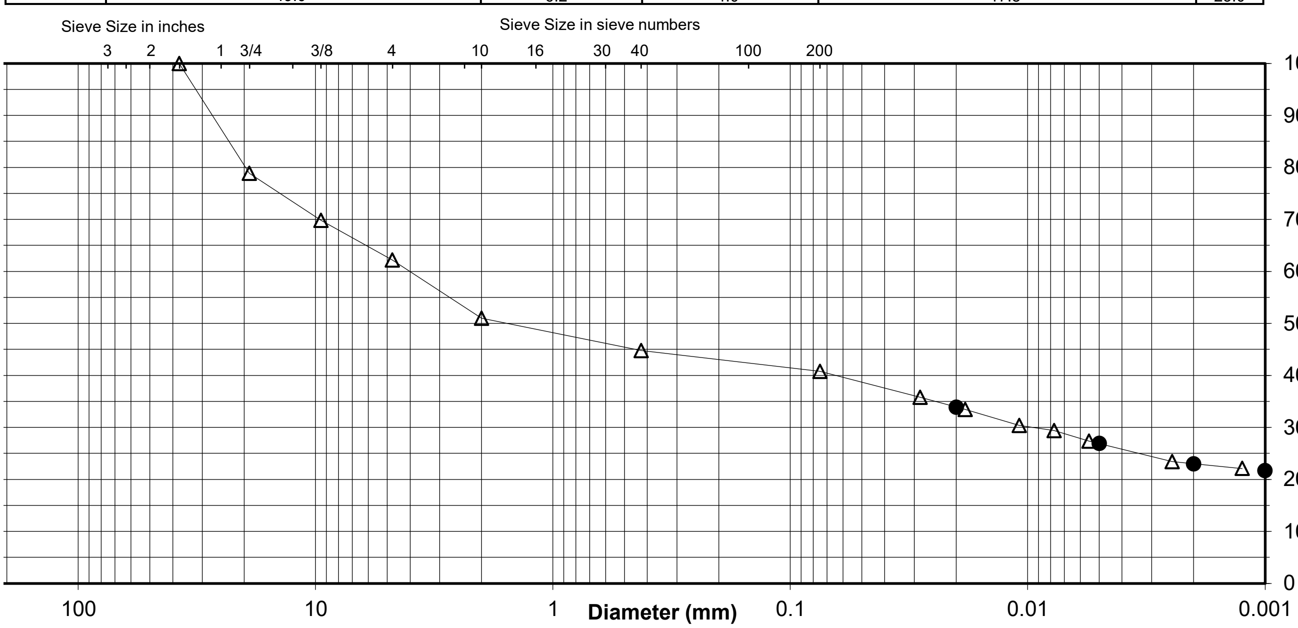
Dispersed using Apparatus A - Mechanical, for 1 minute

Sieve Size	% Passing
No. 40	44.8
No. 200	40.8
0.02 mm	33.9
0.005 mm	26.9
0.002 mm	23.0
0.001 mm	21.7

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	21.1	16.7	11.2	6.2	4.0	13.9	26.9

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	49.0	6.2	4.0	17.8	23.0



Comments ______

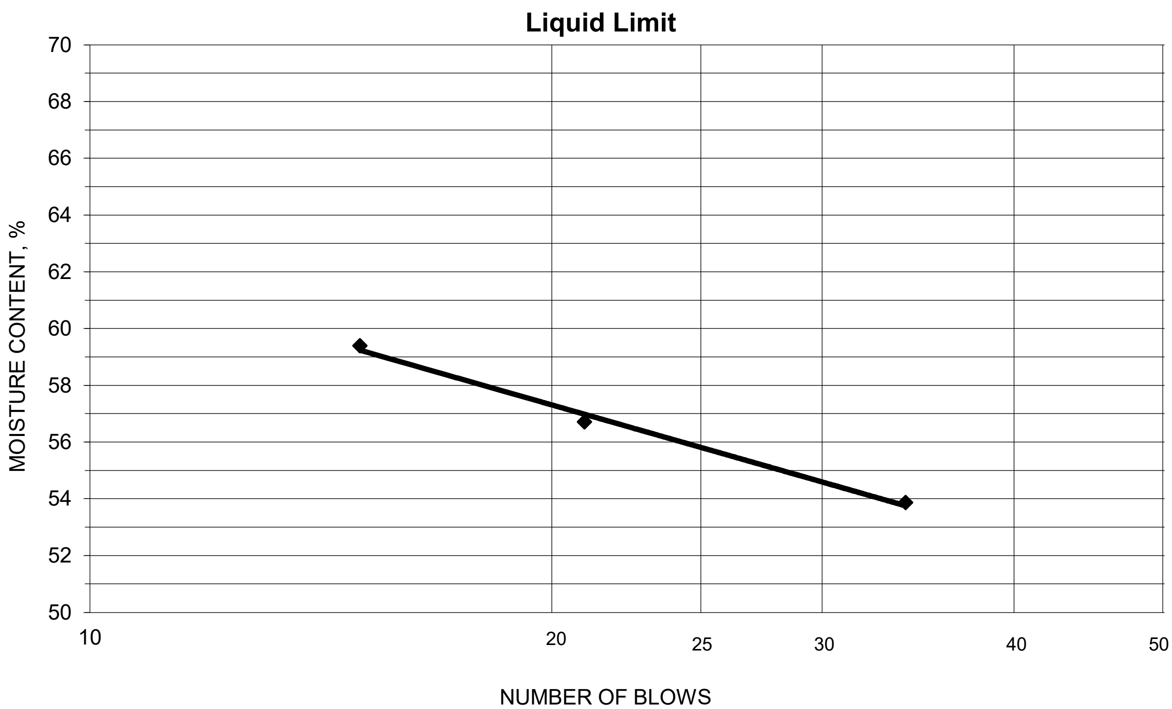
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS24G, 40.5'-41.6'	Lab ID	914
		% + No. 40	55
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-25-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.07	14.91	10.90	34	53.9	56
17.74	15.50	11.55	21	56.7	
18.10	15.54	11.23	15	59.4	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.27	16.27	11.24	19.9	20	36
17.62	16.59	11.47	20.1		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B23-SS26G, SS27G, SS28G, 43.5'-47.9'
Lab ID: 918

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content
Test Method: ASTM D 2216
Moisture Content (%): 24.5

Particle Size Analysis
Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	78.7
3/8"	9.5	56.8
No. 4	4.75	44.8
No. 10	2	31.8
No. 40	0.425	21.2
No. 200	0.075	17.2
	0.02	13.6
	0.005	9.6
	0.002	7.7
estimated	0.001	6.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	55.2	68.2
Coarse Sand	13.0	10.6
Medium Sand	10.6	---
Fine Sand	4.0	4.0
Silt	7.6	9.5
Clay	9.6	7.7

Atterberg Limits
Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 38
Plastic Limit: 17
Plasticity Index: 21
Activity Index: 2.7

Moisture-Density Relationship
Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio
Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity
Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification
Unified Group Symbol: GC
Group Name: Clayey gravel with sand

AASHTO Classification: A-2-6 (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS26G, SS27G, SS28G, 43.5'-47.9'	Lab ID	918

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-20-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	78.7
3/8"	56.8
No. 4	44.8
No. 10	31.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

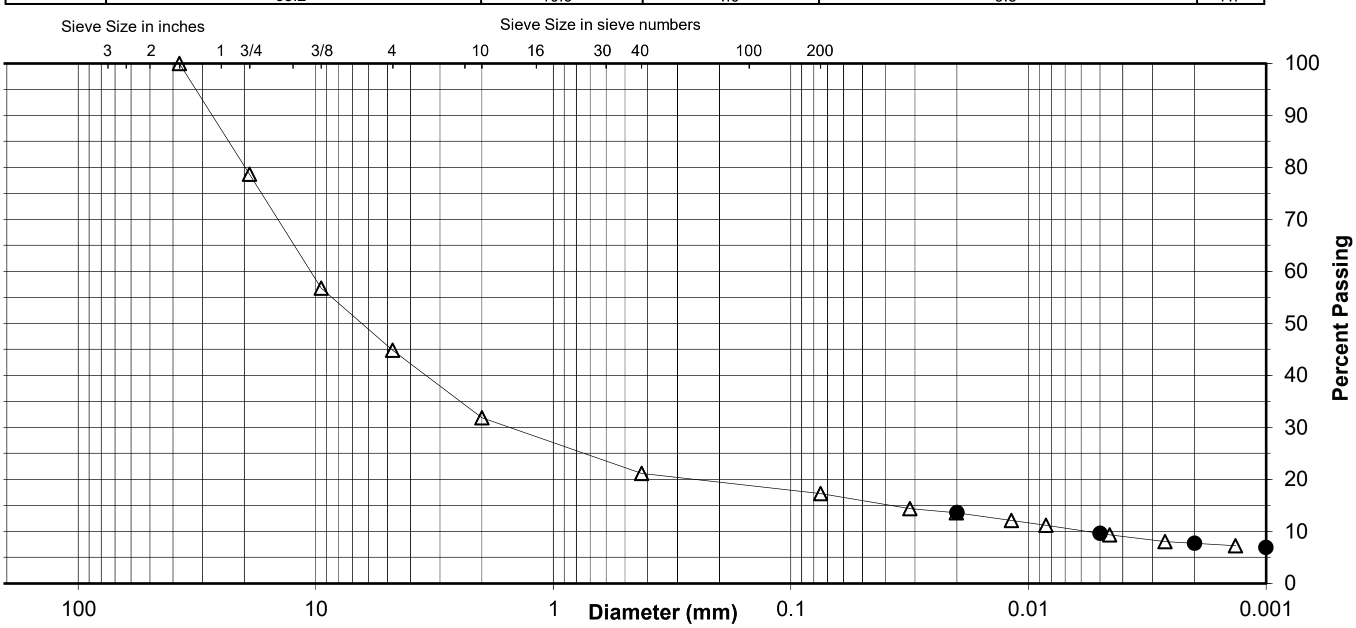
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	21.2
No. 200	17.2
0.02 mm	13.6
0.005 mm	9.6
0.002 mm	7.7
0.001 mm	6.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	21.3	33.9	13.0	10.6	4.0	7.6	9.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	68.2	10.6	4.0	9.5	7.7



Comments ______

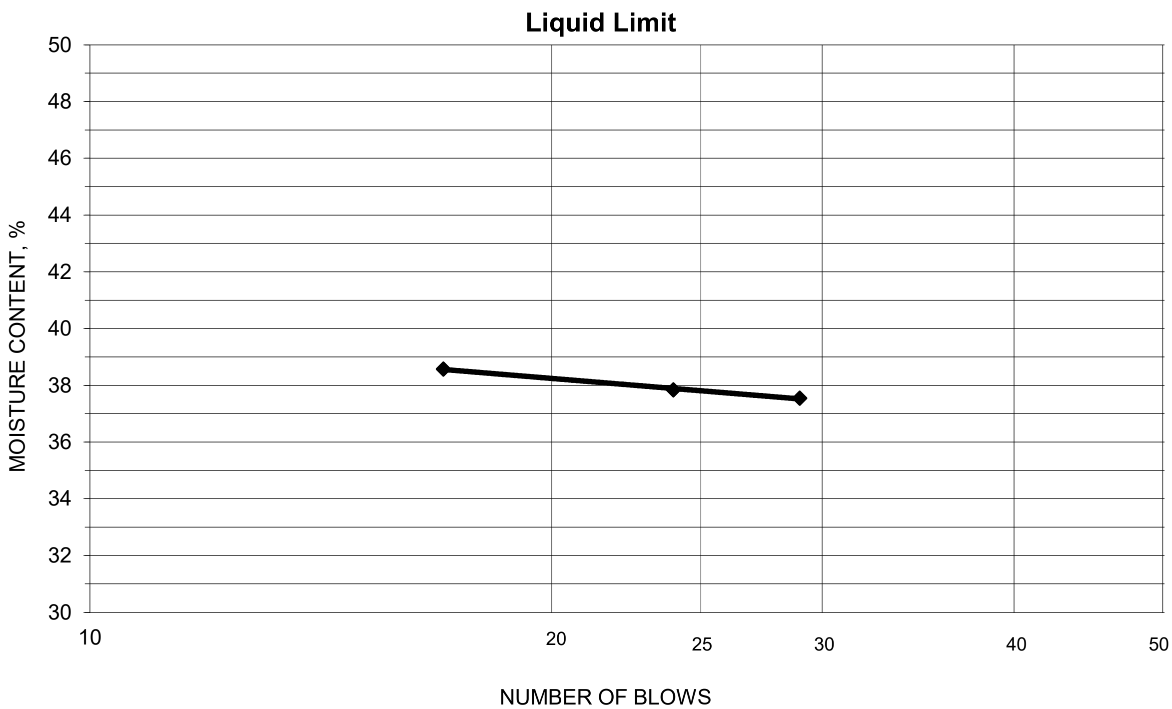
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS26G, SS27G, SS28G, 43.5'-47.9'	Lab ID	918
		% + No. 40	79
Tested By	KWS Test Method ASTM D 4318 Method A	Date Received	11-13-2020
Test Date	11-25-2020 Prepared Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.20	15.36	10.59	17	38.6	38
17.55	15.76	11.03	24	37.8	
18.01	16.14	11.16	29	37.6	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
16.73	15.87	10.98	17.6	17	21
16.60	15.78	10.76	16.3		

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B23-SS31G, 51.0'-52.5'
Lab ID: 921

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 36.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	98.5
No. 10	2	95.2
No. 40	0.425	92.1
No. 200	0.075	88.6
	0.02	67.9
	0.005	28.0
	0.002	18.0
estimated	0.001	14.9

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	1.5	4.8
Coarse Sand	3.3	3.1
Medium Sand	3.1	---
Fine Sand	3.5	3.5
Silt	60.6	70.6
Clay	28.0	18.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry
Liquid Limit: 36
Plastic Limit: 25
Plasticity Index: 11
Activity Index: 0.6

Moisture-Density Relationship

Test Not Performed
Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed
Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated
Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: ML
Group Name: Silt
AASHTO Classification: A-6 (10)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS31G, 51.0'-52.5'	Lab ID	921

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: NM
Test Date: 11-20-2020
Date Received: 11-13-2020

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	98.5
No. 10	95.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

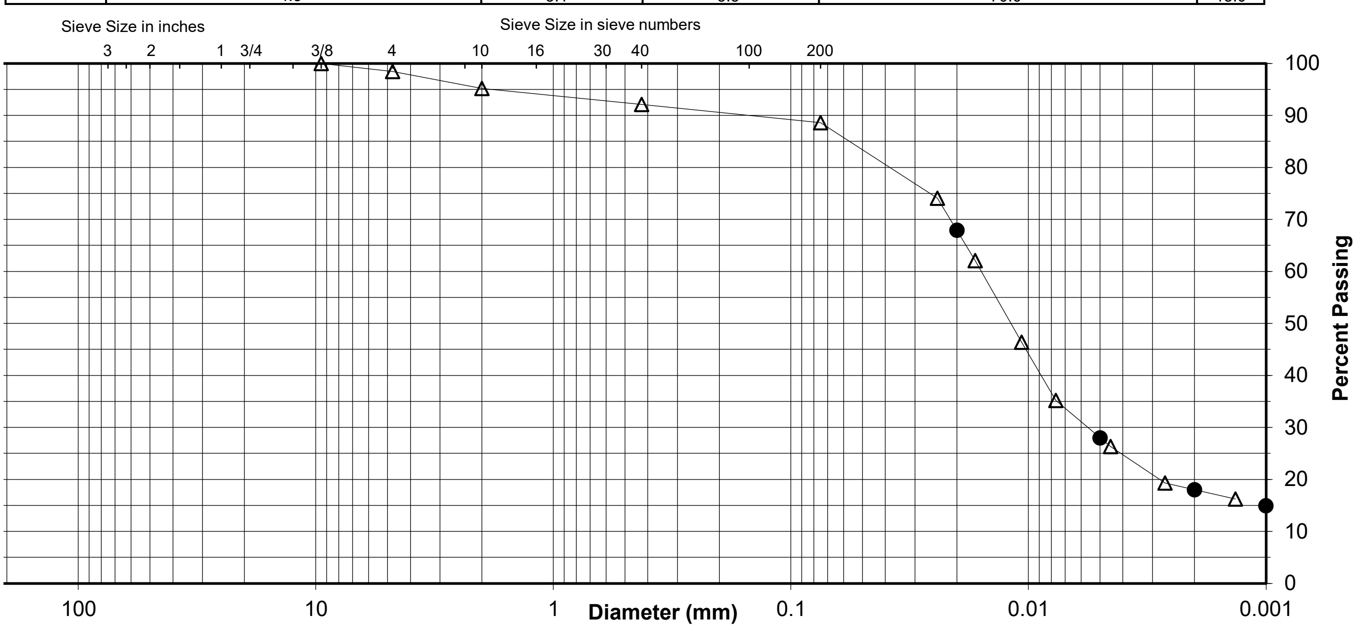
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	92.1
No. 200	88.6
0.02 mm	67.9
0.005 mm	28.0
0.002 mm	18.0
0.001 mm	14.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.5	3.3	3.1	3.5	60.6	28.0

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	4.8	3.1	3.5	70.6	18.0



Comments ______________________

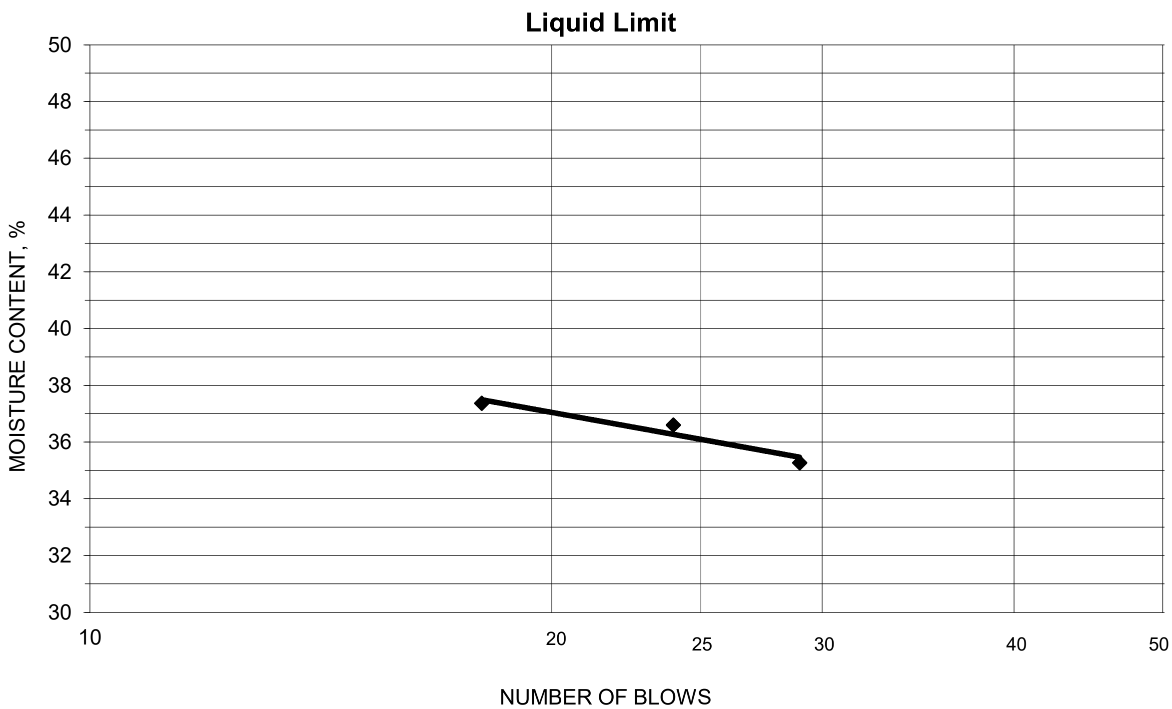
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS31G, 51.0'-52.5'	Lab ID	921
		% + No. 40	8
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-25-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
16.80	15.10	10.55	18	37.4	
16.86	15.29	11.00	24	36.6	
17.73	16.03	11.21	29	35.3	36



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.20	15.92	10.83	25.1	25	11
18.16	16.82	11.48	25.1		

Remarks: ____________________

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name: CUF TDEC Order
Project Number: 175568209
Source: CUF-GT-B23-SS35G, 65.0'-66.5'
Lab ID: 925

Sample Type: SS
Date Received: 11-13-20
Date Reported: 11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216
Moisture Content (%): 19.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	93.0
3/8"	9.5	66.1
No. 4	4.75	48.7
No. 10	2	34.9
No. 40	0.425	17.6
No. 200	0.075	9.9
	0.02	6.6
	0.005	3.6
	0.002	2.6
estimated	0.001	1.9

Plus 3 in. material, not included: 0 (%)

	ASTM	AASHTO
Range	(%)	(%)
Gravel	51.3	65.1
Coarse Sand	13.8	17.3
Medium Sand	17.3	---
Fine Sand	7.7	7.7
Silt	6.3	7.3
Clay	3.6	2.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit: NP
Plastic Limit: NP
Plasticity Index: NP
Activity Index: N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A
Maximum Dry Density (kg/m^3): N/A
Optimum Moisture Content (%): N/A
Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A
Compacted Dry Density (lb/ft^3): N/A
Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10
Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: GW-GM
Group Name: Well-graded gravel with silt and sand

AASHTO Classification: A-1-a (0)

Comments:

Reviewed By: RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B23-SS35G, 65.0'-66.5'

Project Number: 175568209
Lab ID: 925

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-20-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	93.0
3/8"	66.1
No. 4	48.7
No. 10	34.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

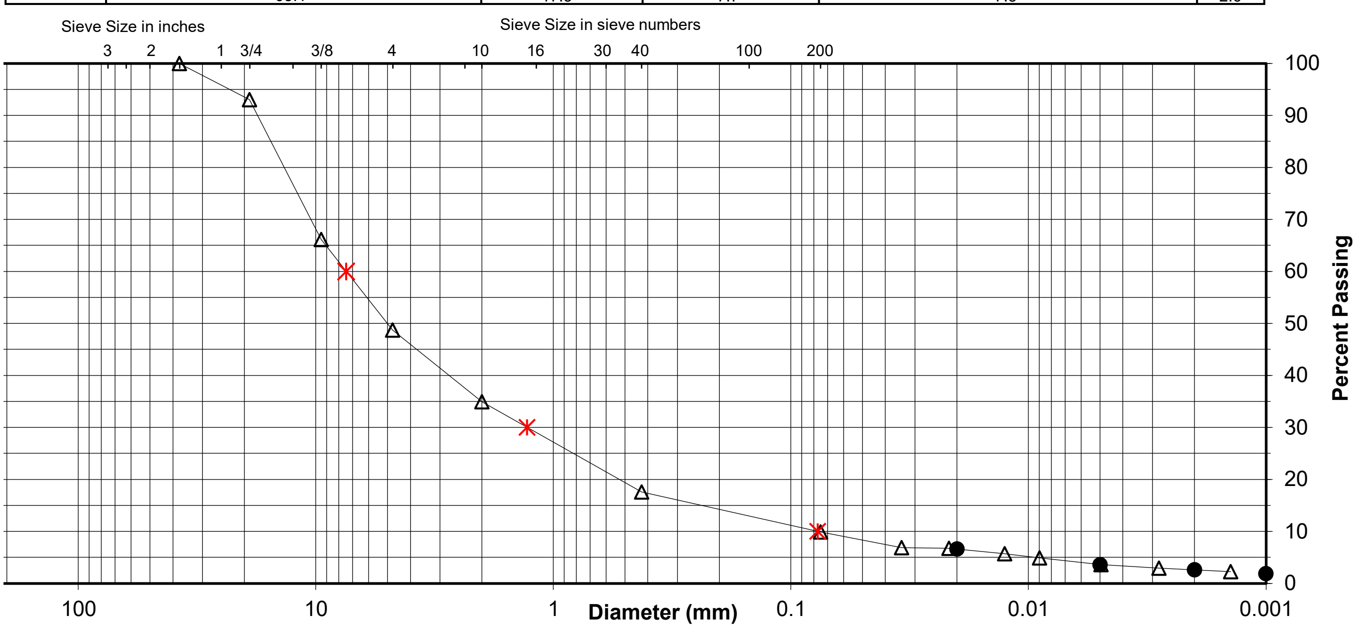
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	17.6
No. 200	9.9
0.02 mm	6.6
0.005 mm	3.6
0.002 mm	2.6
0.001 mm	1.9

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	7.0	44.3	13.8	17.3	7.7	6.3	3.6

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	65.1	17.3	7.7	7.3	2.6



Comments:

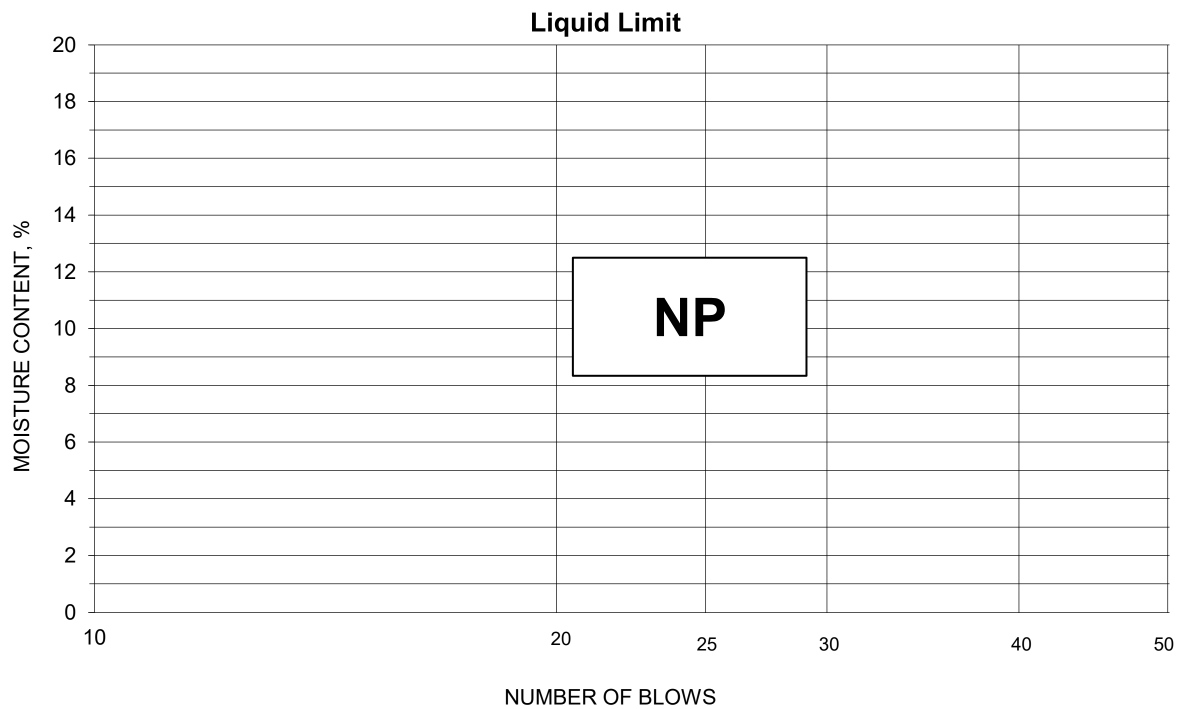
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS35G, 65.0'-66.5'	Lab ID	925
		% + No. 40	82
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-25-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks:

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	CUF TDEC Order	Project Number	175568209
Source	CUF-GT-B23-SS39G, 85.0'-86.5'	Lab ID	929
Sample Type	SS	Date Received	11-13-20
		Date Reported	11-30-20

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.2

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	96.8
3/8"	9.5	86.4
No. 4	4.75	71.3
No. 10	2	55.0
No. 40	0.425	35.2
No. 200	0.075	26.6
	0.02	22.0
	0.005	15.2
	0.002	9.9
estimated	0.001	8.2

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	28.7	45.0
Coarse Sand	16.3	19.8
Medium Sand	19.8	---
Fine Sand	8.6	8.6
Silt	11.4	16.7
Clay	15.2	9.9

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: 34

Plastic Limit: 17

Plasticity Index: 17

Activity Index: 1.7

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3): N/A

Maximum Dry Density (kg/m^3): N/A

Optimum Moisture Content (%): N/A

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Estimated

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.70

Classification

Unified Group Symbol: SC

Group Name: Clayey sand with gravel

AASHTO Classification: A-2-6 (1)

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: CUF TDEC Order
Source: CUF-GT-B23-SS39G, 85.0'-86.5'
Project Number: 175568209
Lab ID: 929

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JMB
Test Date: 11-20-2020
Date Received: 11-13-2020

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	96.8
3/8"	86.4
No. 4	71.3
No. 10	55.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity: 2.7

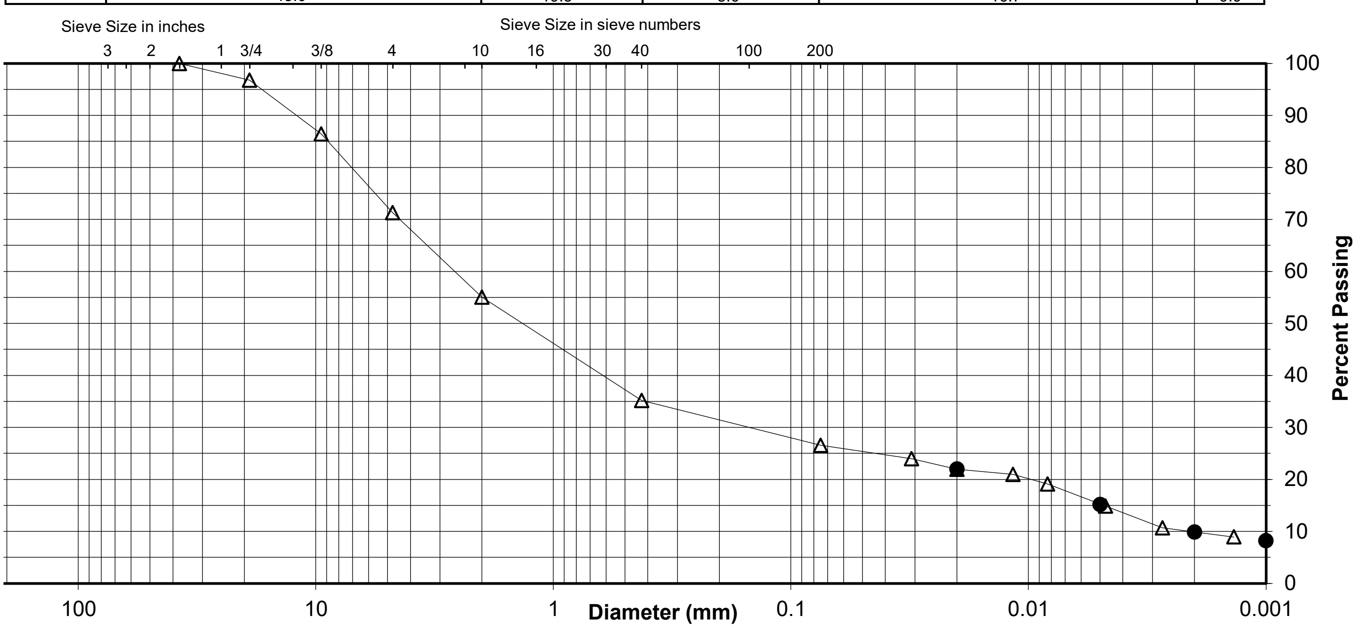
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	35.2
No. 200	26.6
0.02 mm	22.0
0.005 mm	15.2
0.002 mm	9.9
0.001 mm	8.2

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	3.2	25.5	16.3	19.8	8.6	11.4	15.2

AASHTO	Gravel	Coarse Sand	Fine Sand	Silt	Clay
	45.0	19.8	8.6	16.7	9.9



Comments ______

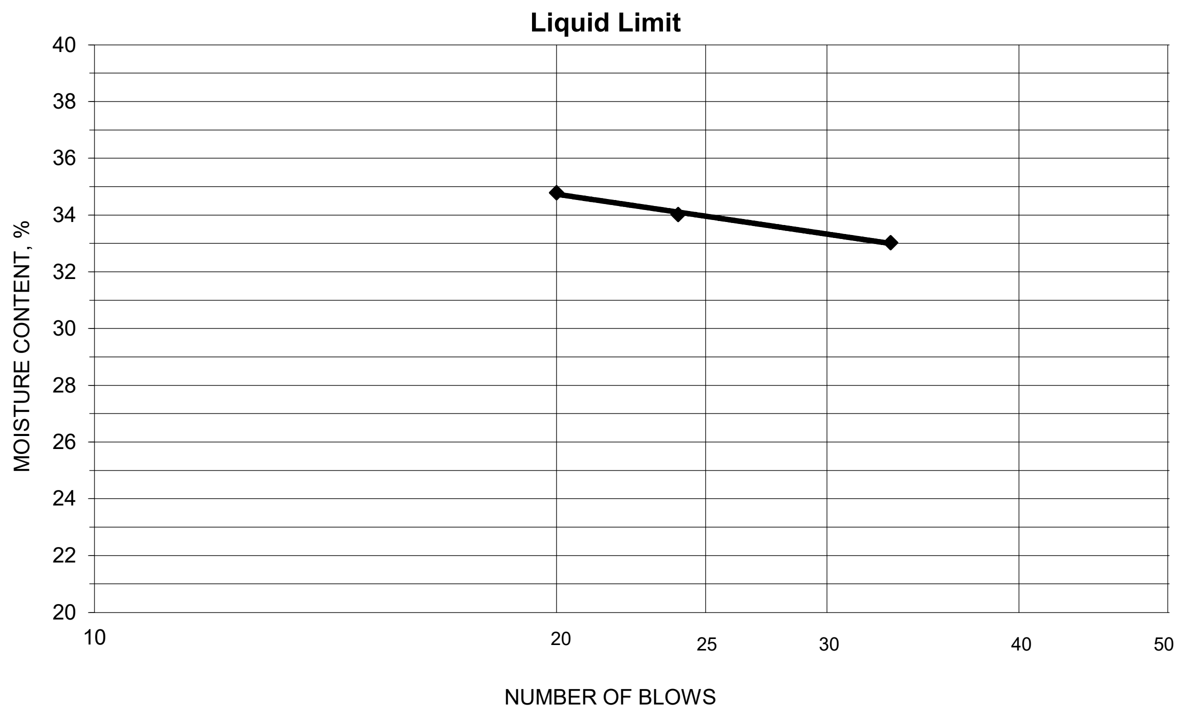
Reviewed By: RJ

Stantec

ATTERBERG LIMITS

Project	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B23-SS39G, 85.0'-86.5'	Lab ID	929
		% + No. 40	65
Tested By	KWS	Test Method	ASTM D 4318 Method A
Date Received	11-13-2020		
Test Date	11-24-2020	Prepared	Dry

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
17.95	16.12	10.86	20	34.8	34
17.50	15.84	10.96	24	34.0	
16.79	15.34	10.95	33	33.0	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.49	16.50	10.89	17.6	17	17
17.92	17.00	11.43	16.5		

Remarks: ______

Reviewed By RJ

ATTACHMENT F.4

Hydraulic Conductivity Testing Results

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-B16-ST01, 60.7'-61.0'			Test ID	25
Description	Silt (ML), brown, wet, very soft			Prepared By	KG
		Specific Gravity	2.62 ASTM D854, Dry	Date	1-30-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring.	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

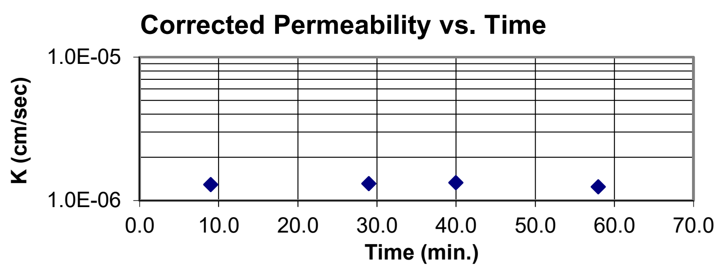
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".

The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4693	1.2883	1.2840	Chamber	60
Diameter (in.)	2.7910		2.8514	Influent	20.5
Moisture Content (%)	33.6		26.6	Effluent	20
Dry Unit Weight (pcf)	86.2		94.5		
Void Ratio	0.898		0.731		
Degree of Saturation (%)	98.0		95.1		

Applied Head Difference (psi)	0.5
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	40
Minimum Effective Consolidation Stress (psi)	39.5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
2-1-19	9:55	71.0	22.19	3.44	0	---	---	---	---
2-1-19	10:04	71.0	21.95	3.65	5.40E+02	1.3E-08	1.3E-06	1.3E-08	1.3E-06
2-1-19	10:24	71.0	21.45	4.14	1.20E+03	1.4E-08	1.4E-06	1.3E-08	1.3E-06
2-1-19	10:35	71.0	21.20	4.43	6.60E+02	1.4E-08	1.4E-06	1.3E-08	1.3E-06
2-1-19	10:53	71.0	20.80	4.84	1.08E+03	1.3E-08	1.3E-06	1.2E-08	1.2E-06



A gradient of approximately 9.4 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.29E-08	cm/s	1.29E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.29E-08	cm/s	1.29E-06

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name: CUF TDEC Order
Project No.: 175568209
Source: CUF-GT-B16-ST02, 100.2'-100.5'
Test ID: 41
Description: Fat Clay (CH), gray brown, moist, soft
Prepared By: KG
Specific Gravity: 2.66 ASTM D854, Dry
Date: 1-30-19
Specimen: Undisturbed
LL: 52
Preparation: Trimmed in a trimming ring.
PL: 22
Maximum Dry Density (pcf):
Permeant: De-aired Tap Water
PI: 30
Percent of Maximum:

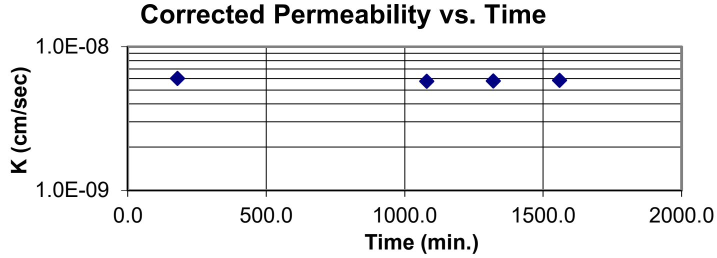
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".
The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.4496	2.3380	2.3385	Chamber	80
Diameter (in.)	2.7273		2.6774	Influent	32
Moisture Content (%)	32.9		27.3	Effluent	30
Dry Unit Weight (pcf)	86.7		94.3		
Void Ratio	0.915		0.762		
Degree of Saturation (%)	95.7		95.1		

Applied Head Difference (psi): 2
Back Pressure Saturated to (psi): 30
Maximum Effective Consolidation Stress (psi): 50
Minimum Effective Consolidation Stress (psi): 48

Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	Hydraulic Conductivity k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
2-7-19	14:15	72.0	21.94	3.55	0	---	---	---	---
2-7-19	17:15	72.0	21.84	3.64	1.08E+04	6.3E-11	6.3E-09	6.0E-11	6.0E-09
2-8-19	8:15	72.0	21.39	4.09	5.40E+04	6.0E-11	6.0E-09	5.7E-11	5.7E-09
2-8-19	12:16	72.0	21.27	4.21	1.45E+04	6.1E-11	6.1E-09	5.8E-11	5.8E-09
2-8-19	16:15	72.0	21.15	4.33	1.43E+04	6.1E-11	6.1E-09	5.8E-11	5.8E-09

Corrected Permeability vs. Time



A gradient of approximately 22.6 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 5.83E-11 cm/s 5.83E-09
Average Hydraulic Conductivity @ 20° C (last run) m/s 5.83E-11 cm/s 5.83E-09

Comments:

Reviewed By: KG

Template: tmp_fhp_input.xlsm
Version: 20170216
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: KG
Report Date: 02/11/2019

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name: CUF TDEC Order
Source: CUF-GT-B17-ST02, 60.0'-60.4'
Description: Silty Gravel with Sand (GM), dark brown, moist, very soft
Specimen: Undisturbed
Preparation: Trimmed in a trimming ring.
Permeant: De-aired Tap Water

Specific Gravity: 2.63 ASTM D854, Dry
LL: NP
PL: NP
PI: NP

Project No. 175568209
Test ID: 80
Prepared By: KG
Date: 1-29-19
Maximum Dry Density (pcf):
Percent of Maximum:

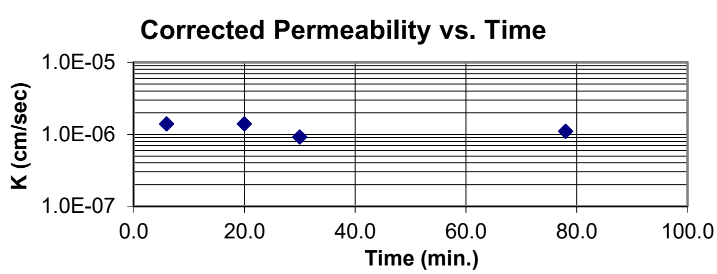
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data
Height (in.)	1.4448	1.4202	1.4164
Diameter (in.)	2.7933		2.7604
Moisture Content (%)	30.2		33.5
Dry Unit Weight (pcf)	82.7		86.4
Void Ratio	0.986		0.901
Degree of Saturation (%)	80.7		97.8

Final Pressures (psi)	
Chamber	62
Influent	20.1
Effluent	20

Applied Head Difference (psi)	0.1
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	42
Minimum Effective Consolidation Stress (psi)	41.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
2-1-19	9:00	71.0	21.03	4.35	0	---	---	---	---
2-1-19	9:06	71.0	20.94	4.43	3.60E+02	1.5E-08	1.5E-06	1.4E-08	1.4E-06
2-1-19	9:20	71.0	20.77	4.65	8.40E+02	1.4E-08	1.4E-06	1.4E-08	1.4E-06
2-1-19	9:30	71.0	20.68	4.74	6.00E+02	9.5E-09	9.5E-07	9.1E-09	9.1E-07
2-1-19	10:18	71.0	20.15	5.22	2.88E+03	1.1E-08	1.1E-06	1.1E-08	1.1E-06



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.20E-08	cm/s	1.20E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.20E-08	cm/s	1.20E-06

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW07-ST02, 60.0'-60.4'			Test ID	128
Description	Silt (ML), gray, wet, very soft			Prepared By	KG
		Specific Gravity	2.52 ASTM D854, Dry	Date	2-22-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring.	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

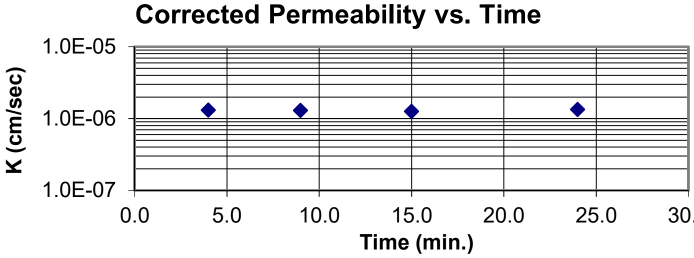
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.1906	2.1639	2.1527	Chamber	60
Diameter (in.)	2.9427		2.8905	Influent	20.5
Moisture Content (%)	27.6		23.3	Effluent	20
Dry Unit Weight (pcf)	93.6		98.7		
Void Ratio	0.681		0.593		
Degree of Saturation (%)	102.2		98.9		

Applied Head Difference (psi)	0.5
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	40
Minimum Effective Consolidation Stress (psi)	39.5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
3-1-19	13:43	72.0	22.05	3.16	0	---	---	---	---
3-1-19	13:47	72.0	21.80	3.44	2.40E+02	1.4E-08	1.4E-06	1.3E-08	1.3E-06
3-1-19	13:52	72.0	21.46	3.74	3.00E+02	1.4E-08	1.4E-06	1.3E-08	1.3E-06
3-1-19	13:58	72.0	21.10	4.11	3.60E+02	1.3E-08	1.3E-06	1.3E-08	1.3E-06
3-1-19	14:07	72.0	20.54	4.68	5.40E+02	1.4E-08	1.4E-06	1.3E-08	1.3E-06

Corrected Permeability vs. Time



A gradient of approximately 6.3 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.30E-08	cm/s	1.30E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.30E-08	cm/s	1.30E-06

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW08-ST03, 89.1'-89.5'	Test ID	199
Description	Lean Clay with Sand (CL), brown and gray, moist, firm, Mn concretions	Prepared By	KG
	Specific Gravity 2.59 ASTM D854, Dry	Date	2-22-19
Specimen	Undisturbed	LL	38
Preparation	Trimmed in a trimming ring.	PL	19
Permeant	De-aired Tap Water	PI	19

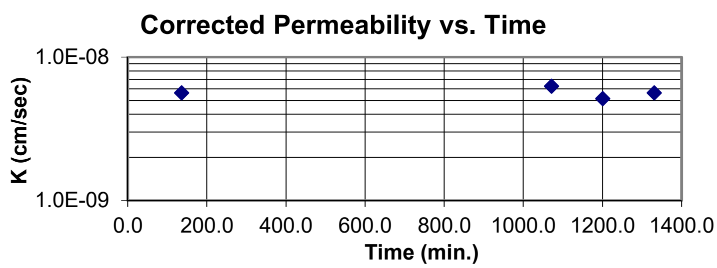
Maximum Dry Density (pcf):
Percent of Maximum:

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".
The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4653	1.4199	1.4204	Chamber	75
Diameter (in.)	2.8043		2.7595	Influent	22
Moisture Content (%)	24.8		22.4	Effluent	20
Dry Unit Weight (pcf)	100.5		107.1		
Void Ratio	0.609		0.510		
Degree of Saturation (%)	105.4		114.0		

Applied Head Difference (psi)	2
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	55
Minimum Effective Consolidation Stress (psi)	53

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
3-5-19	14:30	72.0	22.04	3.24	0	---	---	---	---
3-5-19	16:47	72.0	21.91	3.35	8.22E+03	5.9E-11	5.9E-09	5.6E-11	5.6E-09
3-6-19	8:22	72.0	21.00	4.24	5.61E+04	6.6E-11	6.6E-09	6.3E-11	6.3E-09
3-6-19	10:31	72.0	20.90	4.34	7.74E+03	5.4E-11	5.4E-09	5.1E-11	5.1E-09
3-6-19	12:41	72.0	20.79	4.45	7.80E+03	5.9E-11	5.9E-09	5.6E-11	5.6E-09



A gradient of approximately 37.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	5.66E-11	cm/s	5.66E-09
Average Hydraulic Conductivity @ 20° C (last run)	m/s	5.66E-11	cm/s	5.66E-09

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

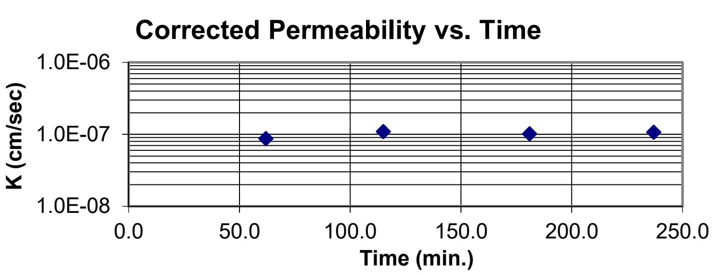
Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW09-ST01, 63.8'-64.0'			Test ID	254
Description	Silt with Sand (ML), brown, wet, soft			Prepared By	KG
		Specific Gravity	2.55 ASTM D854, Dry	Date	3-26-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring.	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".
The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.4121	2.1971	2.1945	Chamber	70
Diameter (in.)	2.8007		2.8634	Influent	30.2
Moisture Content (%)	27.5		23.6	Effluent	30
Dry Unit Weight (pcf)	92.9		97.7		
Void Ratio	0.713		0.629		
Degree of Saturation (%)	98.5		95.7		

Applied Head Difference (psi)	0.2
Back Pressure Saturated to (psi)	30
Maximum Effective Consolidation Stress (psi)	40
Minimum Effective Consolidation Stress (psi)	39.8

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-11-19	8:10	70.0	16.52	8.45	0	---	---	---	---
4-11-19	9:12	70.0	16.42	8.55	3.72E+03	8.9E-10	8.9E-08	8.7E-10	8.7E-08
4-11-19	10:05	70.0	16.32	8.66	3.18E+03	1.1E-09	1.1E-07	1.1E-09	1.1E-07
4-11-19	11:11	70.0	16.20	8.78	3.96E+03	1.0E-09	1.0E-07	1.0E-09	1.0E-07
4-11-19	12:07	70.0	16.09	8.88	3.36E+03	1.1E-09	1.1E-07	1.1E-09	1.1E-07



A gradient of approximately 2.3 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.01E-09	cm/s	1.01E-07
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.01E-09	cm/s	1.01E-07

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

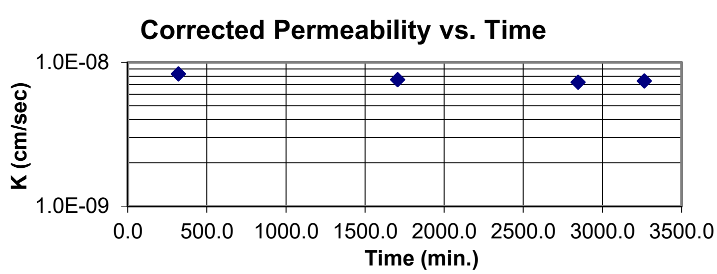
Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW09-ST03, 95.6'-95.9'	Test ID	268
Description	Lean Clay (CL), brown, moist, firm	Prepared By	KG
Specific Gravity	2.68 ASTM D854, Dry	Date	3-27-19

Specimen	Undisturbed	LL	38		
Preparation	Trimmed in a trimming ring.	PL	20	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	18	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)			
Height (in.)	2.4493	2.3757	2.3754	Chamber	70		
Diameter (in.)	2.7900		2.7498	Influent	22		
Moisture Content (%)	24.4		21.3	Effluent	20	Applied Head Difference (psi)	2
Dry Unit Weight (pcf)	100.4		106.6			Back Pressure Saturated to (psi)	20
Void Ratio	0.666		0.570			Maximum Effective Consolidation Stress (psi)	50
Degree of Saturation (%)	98.3		100.3			Minimum Effective Consolidation Stress (psi)	48

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
4-3-19	8:42	70.0	22.13	3.21	0	---	---	---	---
4-3-19	14:04	70.0	21.84	3.41	1.93E+04	8.5E-11	8.5E-09	8.3E-11	8.3E-09
4-4-19	13:08	70.0	20.88	4.34	8.30E+04	7.8E-11	7.8E-09	7.6E-11	7.6E-09
4-5-19	8:08	70.0	20.15	5.07	6.84E+04	7.5E-11	7.5E-09	7.3E-11	7.3E-09
4-5-19	15:08	70.0	19.88	5.34	2.52E+04	7.6E-11	7.6E-09	7.4E-11	7.4E-09



A gradient of approximately 22.6 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	7.64E-11	cm/s	7.64E-09
Average Hydraulic Conductivity @ 20° C (last run)	m/s	7.64E-11	cm/s	7.64E-09

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

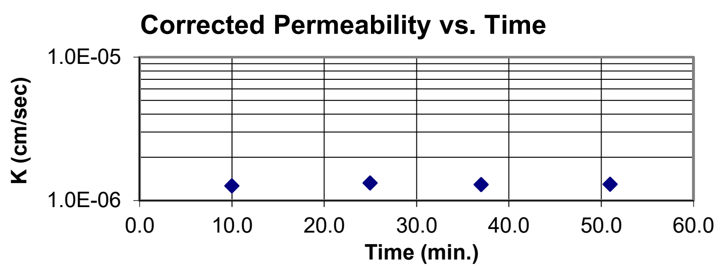
Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW01-ST02, 41.7'-42.0'			Test ID	309
Description	Silt (ML), gray, wet, soft			Prepared By	KG
		Specific Gravity	2.59 ASTM D854, Dry	Date	5-17-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".
The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4579	1.4143	1.4153	Chamber	55
Diameter (in.)	2.7975		2.7453	Influent	20.1
Moisture Content (%)	46.2		42.5	Effluent	20
Dry Unit Weight (pcf)	71.7		76.7		
Void Ratio	1.254		1.108		
Degree of Saturation (%)	95.3		99.4		

Applied Head Difference (psi)	0.1
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	35
Minimum Effective Consolidation Stress (psi)	34.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-27-19	10:31	70.0	20.10	5.71	0	---	---	---	---
5-27-19	10:41	70.0	19.98	5.81	6.00E+02	1.3E-08	1.3E-06	1.3E-08	1.3E-06
5-27-19	10:56	70.0	19.82	5.99	9.00E+02	1.4E-08	1.4E-06	1.3E-08	1.3E-06
5-27-19	11:08	70.0	19.68	6.11	7.20E+02	1.3E-08	1.3E-06	1.3E-08	1.3E-06
5-27-19	11:22	70.0	19.53	6.26	8.40E+02	1.3E-08	1.3E-06	1.3E-08	1.3E-06



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.29E-08	cm/s	1.29E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.29E-08	cm/s	1.29E-06

Comments

Reviewed By KG

Template: tmp_fhp_input.xlsm
Version: 20170216
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: KG
Report Date: 06/13/2019

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW02-ST02, 20.4'-20.7'	Test ID	336
Description	Silty Clay (CL-ML), light brown, moist, firm (fly ash and gypsum)	Prepared By	KG
	Specific Gravity 2.44 ASTM D854, Dry	Date	5-21-19
Specimen	Undisturbed	LL	24
Preparation	Trimmed in a trimming ring	PL	19
Permeant	De-aired Tap Water	PI	5
		Maximum Dry Density (pcf)	
		Percent of Maximum	

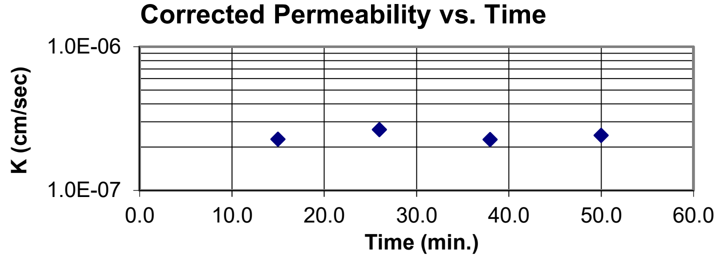
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4740	1.4287	1.4263	Chamber	45
Diameter (in.)	2.8040		2.7668	Influent	20.5
Moisture Content (%)	26.8		25.0	Effluent	20
Dry Unit Weight (pcf)	89.2		94.7		
Void Ratio	0.708		0.609		
Degree of Saturation (%)	92.5		100.0		

Applied Head Difference (psi)	0.5
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	25
Minimum Effective Consolidation Stress (psi)	24.5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-30-19	14:02	71.0	21.94	3.73	0	---	---	---	---
5-30-19	14:17	71.0	21.73	3.97	9.00E+02	2.4E-09	2.4E-07	2.3E-09	2.3E-07
5-30-19	14:28	71.0	21.54	4.16	6.60E+02	2.8E-09	2.8E-07	2.6E-09	2.6E-07
5-30-19	14:40	71.0	21.38	4.35	7.20E+02	2.4E-09	2.4E-07	2.3E-09	2.3E-07
5-30-19	14:52	71.0	21.19	4.53	7.20E+02	2.5E-09	2.5E-07	2.4E-09	2.4E-07

Corrected Permeability vs. Time



A gradient of approximately 9.4 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	2.40E-09	cm/s	2.40E-07
Average Hydraulic Conductivity @ 20° C (last run)	m/s	2.40E-09	cm/s	2.40E-07

Comments All moisture contents oven dried at 60° C

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW03-ST01, 29.4'-29.7'			Test ID	356
Description	Silt (ML), gray, wet, very soft			Prepared By	KG
		Specific Gravity	2.56 ASTM D854, Dry	Date	5-21-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

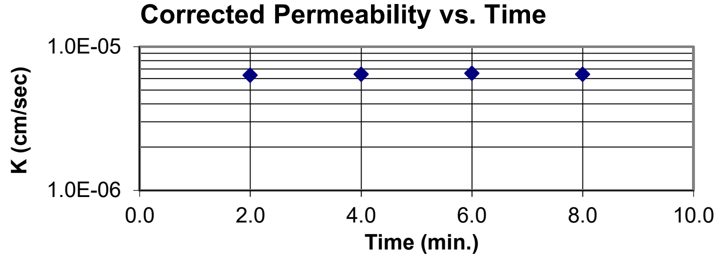
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".
The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.2758	1.2529	1.2540	Chamber	48
Diameter (in.)	2.8087		2.7732	Influent	20.2
Moisture Content (%)	40.5		33.5	Effluent	20
Dry Unit Weight (pcf)	82.5		86.1		
Void Ratio	0.936		0.855		
Degree of Saturation (%)	110.7		100.3		

Applied Head Difference (psi)	0.2
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	28
Minimum Effective Consolidation Stress (psi)	27.8

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-27-19	14:52	70.0	21.59	4.25	0	---	---	---	---
5-27-19	14:54	70.0	21.42	4.42	1.20E+02	6.5E-08	6.5E-06	6.3E-08	6.3E-06
5-27-19	14:56	70.0	21.25	4.59	1.20E+02	6.6E-08	6.6E-06	6.4E-08	6.4E-06
5-27-19	14:58	70.0	21.08	4.76	1.20E+02	6.7E-08	6.7E-06	6.5E-08	6.5E-06
5-27-19	15:00	70.0	20.92	4.93	1.20E+02	6.6E-08	6.6E-06	6.4E-08	6.4E-06

Corrected Permeability vs. Time



A gradient of approximately 4.3 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	6.42E-08	cm/s	6.42E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	6.42E-08	cm/s	6.42E-06

Comments

Reviewed By KG

Template: tmp_fhp_input.xlsm
Version: 20170216
Approved By: RJ

Stantec Consulting Services Inc.
Lexington, Kentucky

Reported By: KG
Report Date: 06/13/2019

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

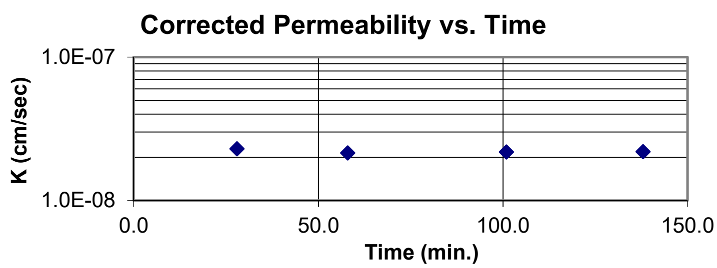
Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW03-ST02, 69.3'-69.6'			Test ID	372
Description	Lean Clay (CL), gray and brown, moist, firm (contains gypsum)			Prepared By	KG
		Specific Gravity	2.66 ASTM D854, Dry	Date	5-21-19
Specimen	Undisturbed	LL	28		
Preparation	Trimmed in a trimming ring	PL	16	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	12	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4675	1.4415	1.4402	Chamber	50
Diameter (in.)	2.8090		2.7867	Influent	22
Moisture Content (%)	19.3		19.3	Effluent	20
Dry Unit Weight (pcf)	106.8		110.6		
Void Ratio	0.554		0.501		
Degree of Saturation (%)	92.7		102.3		

Applied Head Difference (psi)	2
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	30
Minimum Effective Consolidation Stress (psi)	28

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-4-19	13:31	70.0	22.65	3.43	0	---	---	---	---
6-4-19	13:59	71.0	22.55	3.53	1.68E+03	2.4E-10	2.4E-08	2.3E-10	2.3E-08
6-4-19	14:29	71.0	22.45	3.63	1.80E+03	2.2E-10	2.2E-08	2.1E-10	2.1E-08
6-4-19	15:12	71.0	22.32	3.79	2.58E+03	2.3E-10	2.3E-08	2.2E-10	2.2E-08
6-4-19	15:49	71.0	22.19	3.91	2.22E+03	2.3E-10	2.3E-08	2.2E-10	2.2E-08



A gradient of approximately 37.7 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	2.19E-10	cm/s	2.19E-08
Average Hydraulic Conductivity @ 20° C (last run)	m/s	2.19E-10	cm/s	2.19E-08

Comments Oven dried at 60° C.

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

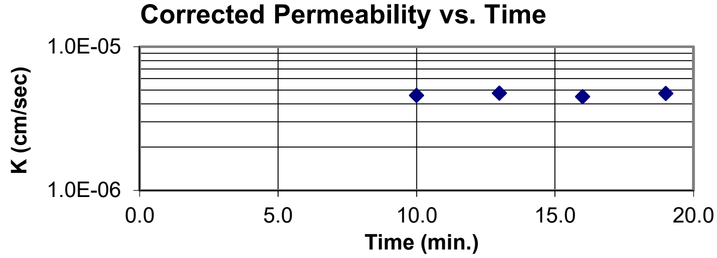
Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-TW04-ST01, 19.5'-20.1'	Test ID	384
Description	Silt (ML), brown and white, moist, soft (fly ash and gypsum)	Prepared By	KG
	Specific Gravity 2.34 ASTM D854, Dry	Date	5-21-19
Specimen	Undisturbed	LL	
Preparation	Trimmed in a trimming ring	PL	Maximum Dry Density (pcf)
Permeant	De-aired Tap Water	PI	Percent of Maximum

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".
The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4685	1.3977	1.3963	Chamber	35
Diameter (in.)	2.7760		2.8074	Influent	20.1
Moisture Content (%)	20.5		20.3	Effluent	20
Dry Unit Weight (pcf)	94.8		97.5		
Void Ratio	0.541		0.499		
Degree of Saturation (%)	88.5		95.2		

Applied Head Difference (psi)	0.1
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	15
Minimum Effective Consolidation Stress (psi)	14.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
5-30-19	13:43	70.0	21.78	3.79	0	---	---	---	---
5-30-19	13:53	70.0	21.30	4.31	6.00E+02	4.7E-08	4.7E-06	4.6E-08	4.6E-06
5-30-19	13:56	70.0	21.15	4.46	1.80E+02	4.9E-08	4.9E-06	4.7E-08	4.7E-06
5-30-19	13:59	70.0	21.00	4.59	1.80E+02	4.6E-08	4.6E-06	4.5E-08	4.5E-06
5-30-19	14:02	70.0	20.86	4.74	1.80E+02	4.8E-08	4.8E-06	4.7E-08	4.7E-06



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	4.64E-08	cm/s	4.64E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	4.64E-08	cm/s	4.64E-06

Comments Oven dried at 60°.

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

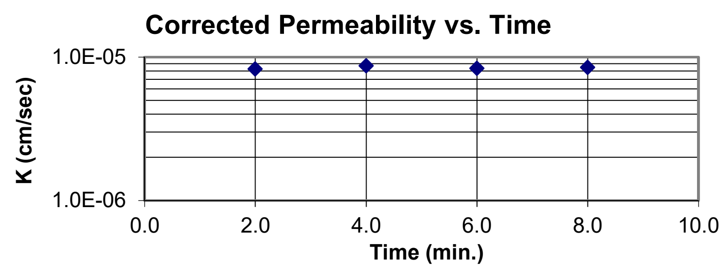
Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW05-ST01, 4.96'-5.25'			Test ID	390
Description	Silt (ML), gray and brown, moist, soft, fragile (fly ash and gypsum)			Prepared By	KG
	Specific Gravity	2.36	ASTM D854, Dry	Date	5-31-19
Specimen	Undisturbed	LL	NP		
Preparation	Trimmed in a trimming ring	PL	NP	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	NP	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4358	1.4289	1.4387	Chamber	25
Diameter (in.)	2.7957		2.7833	Influent	20.1
Moisture Content (%)	16.5		25.1	Effluent	20
Dry Unit Weight (pcf)	92.0		92.6		
Void Ratio	0.602		0.591		
Degree of Saturation (%)	64.6		100.0		

Applied Head Difference (psi)	0.1
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	5
Minimum Effective Consolidation Stress (psi)	4.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-4-19	14:38	72.0	20.10	4.31	0	---	---	---	---
6-4-19	14:40	72.0	19.93	4.47	1.20E+02	8.7E-08	8.7E-06	8.3E-08	8.3E-06
6-4-19	14:42	72.0	19.76	4.64	1.20E+02	9.2E-08	9.2E-06	8.7E-08	8.7E-06
6-4-19	14:44	72.0	19.60	4.80	1.20E+02	8.8E-08	8.8E-06	8.3E-08	8.3E-06
6-4-19	14:46	72.0	19.43	4.95	1.20E+02	8.9E-08	8.9E-06	8.5E-08	8.5E-06



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	8.45E-08	cm/s	8.45E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	8.45E-08	cm/s	8.45E-06

Comments Oven dried at 60° C.

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW05-ST02, 29.1'-29.4'			Test ID	405
Description	Silt (ML), gray, moist, firm, fragile (fly ash)			Prepared By	KG
		Specific Gravity	2.51 ASTM D854, Dry	Date	6-5-19
Specimen	Undisturbed	LL			
Preparation	Trimmed in a trimming ring	PL		Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI		Percent of Maximum	

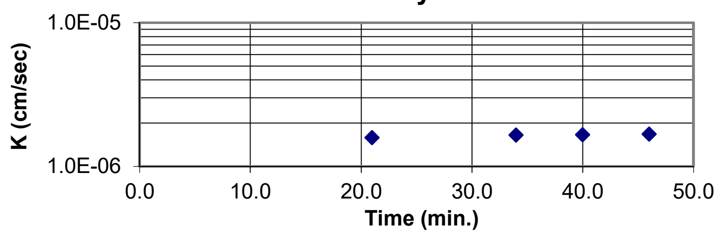
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".
The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4531	1.4389	1.4373	Chamber	40
Diameter (in.)	2.7833		2.7679	Influent	20.1
Moisture Content (%)	41.0		39.9	Effluent	20
Dry Unit Weight (pcf)	76.0		77.7		
Void Ratio	1.061		1.016		
Degree of Saturation (%)	97.0		98.6		

Applied Head Difference (psi)	0.1
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	20
Minimum Effective Consolidation Stress (psi)	19.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-11-19	9:53	70.0	21.85	3.79	0	---	---	---	---
6-11-19	10:14	70.0	21.51	4.15	1.26E+03	1.6E-08	1.6E-06	1.6E-08	1.6E-06
6-11-19	10:27	70.0	21.29	4.37	7.80E+02	1.7E-08	1.7E-06	1.7E-08	1.7E-06
6-11-19	10:33	70.0	21.19	4.47	3.60E+02	1.7E-08	1.7E-06	1.7E-08	1.7E-06
6-11-19	10:39	70.0	21.09	4.57	3.60E+02	1.7E-08	1.7E-06	1.7E-08	1.7E-06

Corrected Permeability vs. Time



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.64E-08	cm/s	1.64E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.64E-08	cm/s	1.64E-06

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-TW05-ST04, 66.9'-67.2'			Test ID	419
Description	Fat Clay (CH), red brown, moist, firm			Prepared By	KG
		Specific Gravity	2.72 ASTM D854, Dry	Date	6-5-19
Specimen	Undisturbed	LL	56		
Preparation	Trimmed in a trimming ring	PL	20	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	36	Percent of Maximum	

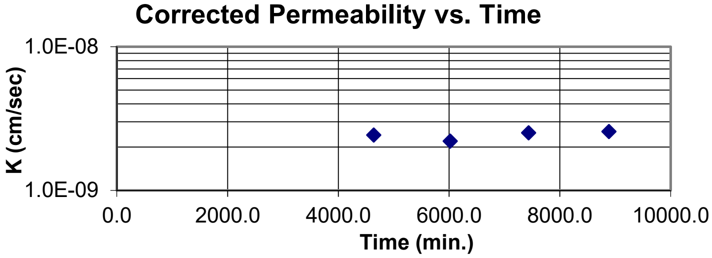
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.4543	2.3974	2.3972	Chamber	70
Diameter (in.)	2.7783		2.7749	Influent	32
Moisture Content (%)	28.9		28.8	Effluent	30
Dry Unit Weight (pcf)	92.3		94.8		
Void Ratio	0.839		0.792		
Degree of Saturation (%)	93.7		98.8		

Applied Head Difference (psi)	2
Back Pressure Saturated to (psi)	30
Maximum Effective Consolidation Stress (psi)	40
Minimum Effective Consolidation Stress (psi)	38

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-14-19	7:36	71.0	21.44	4.11	0	---	---	---	---
6-17-19	12:57	71.0	20.49	5.16	2.78E+05	2.5E-11	2.5E-09	2.4E-11	2.4E-09
6-18-19	11:56	71.0	20.19	5.39	8.27E+04	2.3E-11	2.3E-09	2.2E-11	2.2E-09
6-19-19	11:35	71.0	19.89	5.71	8.51E+04	2.6E-11	2.6E-09	2.5E-11	2.5E-09
6-20-19	11:44	71.0	19.59	6.05	8.69E+04	2.7E-11	2.7E-09	2.6E-11	2.6E-09

Corrected Permeability vs. Time



A gradient of approximately 22.6 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	2.42E-11	cm/s	2.42E-09
Average Hydraulic Conductivity @ 20° C (last run)	m/s	2.42E-11	cm/s	2.42E-09

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name CUF TDEC Order
Source CUF-GT-TW06-ST01, 10.5'-10.9'
Description Silt (ML), gray, moist, soft, fragile (fly ash and gypsum)
Project No. 175568209
Test ID 429
Prepared By KG
Date 5-31-19

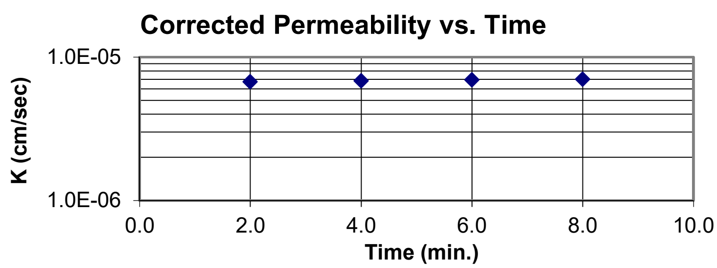
Specimen Undisturbed
Preparation Trimmed in a trimming ring
Permeant De-aired Tap Water
Specific Gravity 2.37 ASTM D854, Dry
LL NP
PL NP
PI NP
Maximum Dry Density (pcf)
Percent of Maximum

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4224	1.3881	1.3767	Chamber	30
Diameter (in.)	2.7777		2.7269	Influent	20.1
Moisture Content (%)	20.1		21.4	Effluent	20
Dry Unit Weight (pcf)	89.8		96.3		
Void Ratio	0.647		0.536		
Degree of Saturation (%)	73.5		94.7		

Applied Head Difference (psi) 0.1
Back Pressure Saturated to (psi) 20
Maximum Effective Consolidation Stress (psi) 10
Minimum Effective Consolidation Stress (psi) 9.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-6-19	15:04	71.0	21.50	4.23	0	---	---	---	---
6-6-19	15:06	71.0	21.35	4.36	1.20E+02	7.0E-08	7.0E-06	6.7E-08	6.7E-06
6-6-19	15:08	71.0	21.21	4.50	1.20E+02	7.1E-08	7.1E-06	6.8E-08	6.8E-06
6-6-19	15:10	71.0	21.07	4.64	1.20E+02	7.2E-08	7.2E-06	6.9E-08	6.9E-06
6-6-19	15:12	71.0	20.93	4.78	1.20E+02	7.3E-08	7.3E-06	7.0E-08	7.0E-06



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 6.87E-08 cm/s 6.87E-06
Average Hydraulic Conductivity @ 20° C (last run) m/s 6.87E-08 cm/s 6.87E-06

Comments Oven dried at 60° C.

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

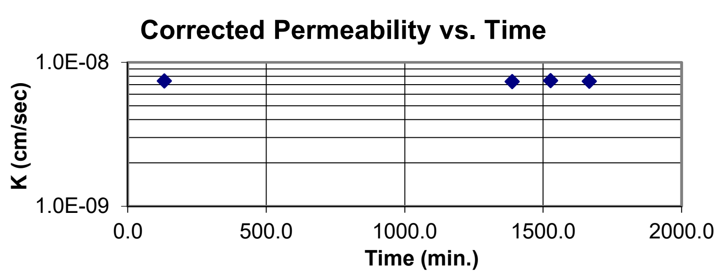
Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B11-ST01, 43.9'-44.3'	Test ID	456
Description	Lean Clay (CL), brown and gray, moist, firm	Prepared By	KG
Specific Gravity	2.68 (ASTM D854, Dry)	Date	6-6-19
Specimen	Undisturbed	LL	43
Preparation		PL	21
Permeant	De-aired Tap Water	PI	22
Maximum Dry Density (pcf)		Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4780	1.4415	1.4347	Chamber	60
Diameter (in.)	2.7983		2.7812	Influent	32
Moisture Content (%)	24.4		23.2	Effluent	30
Dry Unit Weight (pcf)	99.6		103.9		
Void Ratio	0.679		0.610		
Degree of Saturation (%)	96.2		102.1		

Applied Head Difference (psi)	2
Back Pressure Saturated to (psi)	30
Maximum Effective Consolidation Stress (psi)	30
Minimum Effective Consolidation Stress (psi)	28

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-10-19	10:48	70.0	22.10	3.71	0	---	---	---	---
6-10-19	13:01	70.0	21.93	3.84	7.98E+03	7.6E-11	7.6E-09	7.4E-11	7.4E-09
6-11-19	9:57	70.0	20.60	5.26	7.54E+04	7.6E-11	7.6E-09	7.4E-11	7.4E-09
6-11-19	12:15	70.0	20.45	5.41	8.28E+03	7.7E-11	7.7E-09	7.5E-11	7.5E-09
6-11-19	14:35	70.0	20.30	5.56	8.40E+03	7.6E-11	7.6E-09	7.4E-11	7.4E-09



A gradient of approximately 37.5 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	7.40E-11	cm/s	7.40E-09
Average Hydraulic Conductivity @ 20° C (last run)	m/s	7.40E-11	cm/s	7.40E-09

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

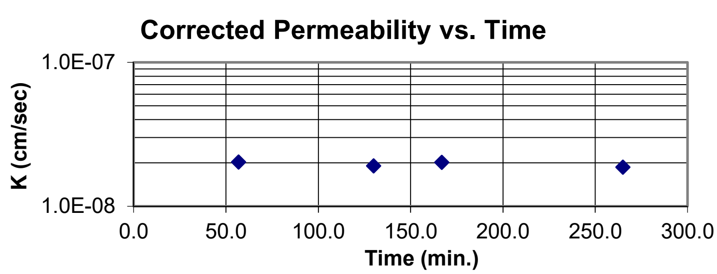
Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-B13-ST02, 18.7'-19.0'			Test ID	505
Description	Fat Clay (CH), red brown, moist, soft			Prepared By	KG
		Specific Gravity	2.75 ASTM D854, Dry	Date	6-10-19
Specimen	Undisturbed	LL	71		
Preparation	Trimmed in a trimming ring	PL	24	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	47	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4699	1.4395	1.4415	Chamber	55
Diameter (in.)	2.8090		2.7953	Influent	42
Moisture Content (%)	37.1		36.8	Effluent	40
Dry Unit Weight (pcf)	83.2		85.6		
Void Ratio	1.064		1.005		
Degree of Saturation (%)	95.8		100.8		

Applied Head Difference (psi)	2
Back Pressure Saturated to (psi)	40
Maximum Effective Consolidation Stress (psi)	15
Minimum Effective Consolidation Stress (psi)	13

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-13-19	9:57	71.0	21.91	3.35	0	---	---	---	---
6-13-19	10:54	71.0	21.74	3.54	3.42E+03	2.1E-10	2.1E-08	2.0E-10	2.0E-08
6-13-19	12:07	71.0	21.52	3.75	4.38E+03	2.0E-10	2.0E-08	1.9E-10	1.9E-08
6-13-19	12:44	71.0	21.40	3.86	2.22E+03	2.1E-10	2.1E-08	2.0E-10	2.0E-08
6-13-19	14:22	71.0	21.12	4.14	5.88E+03	1.9E-10	1.9E-08	1.9E-10	1.9E-08



A gradient of approximately 37.7 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.95E-10	cm/s	1.95E-08
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.95E-10	cm/s	1.95E-08

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

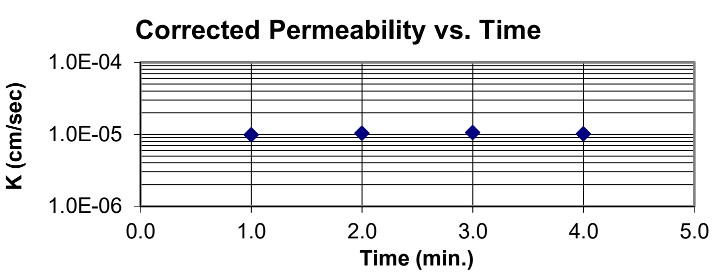
Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B14-ST03G, 61.6'-61.9'	Test ID	569
Description	Silt (ML), gray, moist, firm, fragile	Prepared By	KG
Specific Gravity	2.41 ASTM D854, Dry	Date	6-18-19
Specimen	Undisturbed	LL	NP
Preparation	Trimmed in a trimming ring	PL	NP
Permeant	De-aired Tap Water	PI	NP
Maximum Dry Density (pcf)		Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 19 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.4824	1.4353	1.4434	Chamber	90
Diameter (in.)	2.7993		2.7885	Influent	40.1
Moisture Content (%)	57.5		56.4	Effluent	40
Dry Unit Weight (pcf)	61.8		64.0		
Void Ratio	1.434		1.352		
Degree of Saturation (%)	96.6		100.5		

Applied Head Difference (psi)	0.1
Back Pressure Saturated to (psi)	40
Maximum Effective Consolidation Stress (psi)	50
Minimum Effective Consolidation Stress (psi)	49.9

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-26-19	10:26	72.0	20.74	4.04	0	---	---	---	---
6-26-19	10:27	72.0	20.64	4.14	6.00E+01	1.0E-07	1.0E-05	9.8E-08	9.8E-06
6-26-19	10:28	72.0	20.54	4.25	6.00E+01	1.1E-07	1.1E-05	1.0E-07	1.0E-05
6-26-19	10:29	72.0	20.44	4.36	6.00E+01	1.1E-07	1.1E-05	1.0E-07	1.0E-05
6-26-19	10:30	72.0	20.34	4.46	6.00E+01	1.1E-07	1.1E-05	1.0E-07	1.0E-05



A gradient of approximately 1.9 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.02E-07	cm/s	1.02E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.02E-07	cm/s	1.02E-05

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-B14-ST04G, 81.2'-81.5'			Test ID	578
Description	Sandy Lean Clay with Gravel (CL), red brown, moist, firm			Prepared By	KG
		Specific Gravity	2.71 ASTM D854, Dry	Date	6-18-19
Specimen	Undisturbed	LL	49		
Preparation		PL	16	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	33	Percent of Maximum	

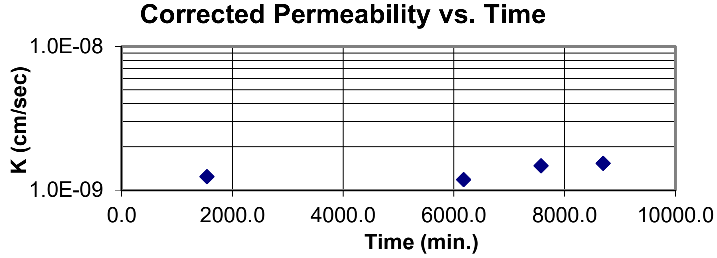
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.4465	2.3759	2.3671	Chamber	95
Diameter (in.)	2.8057		2.7829	Influent	37
Moisture Content (%)	21.2		20.0	Effluent	35
Dry Unit Weight (pcf)	104.2		109.5		
Void Ratio	0.623		0.545		
Degree of Saturation (%)	92.1		99.6		

Applied Head Difference (psi)	2
Back Pressure Saturated to (psi)	35
Maximum Effective Consolidation Stress (psi)	60
Minimum Effective Consolidation Stress (psi)	58

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
6-27-19	9:10	70.0	21.94	4.44	0	---	---	---	---
6-28-19	10:54	70.0	21.78	4.62	9.26E+04	1.3E-11	1.3E-09	1.2E-11	1.2E-09
7-1-19	16:10	70.0	21.31	5.12	2.78E+05	1.2E-11	1.2E-09	1.2E-11	1.2E-09
7-2-19	15:25	70.0	21.14	5.31	8.37E+04	1.5E-11	1.5E-09	1.5E-11	1.5E-09
7-3-19	10:09	70.0	20.99	5.46	6.74E+04	1.6E-11	1.6E-09	1.5E-11	1.5E-09

Corrected Permeability vs. Time



A gradient of approximately 22.6 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.36E-11	cm/s	1.36E-09
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.36E-11	cm/s	1.36E-09

Comments

Reviewed By KG

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B15-ST01, 15.3'-15.6'	Test ID	604
Description	Sandy Silt (ML), brown, moist, firm	Prepared By	JMB
	Specific Gravity 2.68 ASTM D854, Dry	Date	7-30-19
Specimen	Undisturbed	LL	N/A
Preparation		PL	N/A
Permeant	De-aired Tap Water	PI	N/A

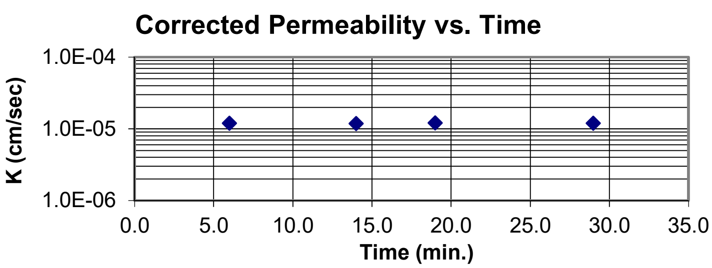
Maximum Dry Density (pcf) ____
Percent of Maximum ____

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted".
The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	1.3744	1.3816	1.3614	Chamber	32
Diameter (in.)	2.7798		2.7310	Influent	20.25
Moisture Content (%)	23.9		27.3	Effluent	20
Dry Unit Weight (pcf)	90.4		94.5		
Void Ratio	0.852		0.770		
Degree of Saturation (%)	75.3		95.0		

Applied Head Difference (psi)	0.25
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	12
Minimum Effective Consolidation Stress (psi)	11.75

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
8-1-19	10:37	71.2	15.10	8.90	0	---	---	---	---
8-1-19	10:43	71.2	14.60	9.40	3.60E+02	1.2E-07	1.2E-05	1.2E-07	1.2E-05
8-1-19	10:51	71.2	14.00	10.00	4.80E+02	1.2E-07	1.2E-05	1.2E-07	1.2E-05
8-1-19	10:56	71.2	13.66	10.36	3.00E+02	1.3E-07	1.3E-05	1.2E-07	1.2E-05
8-1-19	11:06	71.3	13.02	10.98	6.00E+02	1.2E-07	1.2E-05	1.2E-07	1.2E-05



A gradient of approximately 5 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.19E-07	cm/s	1.19E-05
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.19E-07	cm/s	1.19E-05

Comments ____

Reviewed By RHB

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B15-ST02, 78.5'-78.8'	Test ID	630
Description	Silt with Sand (ML), brown, wet, firm	Prepared By	JMB
	Specific Gravity 2.53 ASTM D854, Dry	Date	7-31-19
Specimen	Undisturbed	LL	NP
Preparation		PL	NP
Permeant	De-aired Tap Water	PI	NP

Maximum Dry Density (pcf)

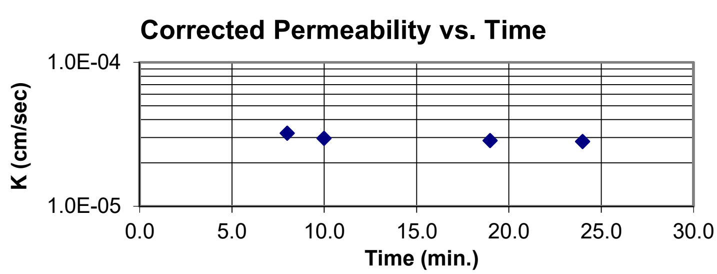
Percent of Maximum

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.5003	2.4481	2.4431	Chamber	75
Diameter (in.)	2.7937		2.7581	Influent	20.25
Moisture Content (%)	47.4		47.0	Effluent	20
Dry Unit Weight (pcf)	68.0		71.3		
Void Ratio	1.324		1.214		
Degree of Saturation (%)	90.6		98.0		

Applied Head Difference (psi)	0.25
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	55
Minimum Effective Consolidation Stress (psi)	54.75

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
8-2-19	11:30	72.4	15.41	8.23	0	---	---	---	---
8-2-19	11:38	72.4	14.38	9.26	4.80E+02	3.4E-07	3.4E-05	3.2E-07	3.2E-05
8-2-19	11:40	72.4	14.15	9.46	1.20E+02	3.1E-07	3.1E-05	3.0E-07	3.0E-05
8-2-19	11:49	72.4	13.30	10.30	5.40E+02	3.0E-07	3.0E-05	2.9E-07	2.9E-05
8-2-19	11:54	72.4	12.90	10.72	3.00E+02	3.0E-07	3.0E-05	2.8E-07	2.8E-05



A gradient of approximately 2.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 2.96E-07 cm/s 2.96E-05

Average Hydraulic Conductivity @ 20° C (last run) m/s 2.96E-07 cm/s 2.96E-05

Comments

Reviewed By RHB

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name	CUF TDEC Order	Project No.	175568209
Source	CUF-GT-B18-ST02, 26.3'-26.6'	Test ID	666
Description	Silt (ML), brown, wet, firm	Prepared By	JMB
Specific Gravity	2.28 ASTM D854, Dry	Date	8-2-19
Specimen	Undisturbed	LL	NP
Preparation		PL	NP
Permeant	De-aired Tap Water	PI	NP
Maximum Dry Density (pcf)		Percent of Maximum	

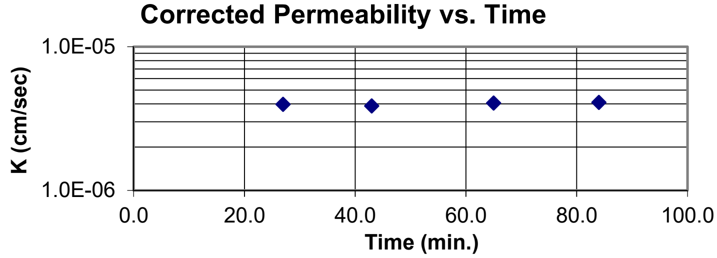
Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.5169	2.4903	2.4806	Chamber	33
Diameter (in.)	2.8313		2.7974	Influent	20.5
Moisture Content (%)	47.9		46.7	Effluent	20
Dry Unit Weight (pcf)	66.7		69.4		
Void Ratio	1.133		1.052		
Degree of Saturation (%)	96.5		101.3		

Applied Head Difference (psi)	0.5
Back Pressure Saturated to (psi)	20
Maximum Effective Consolidation Stress (psi)	13
Minimum Effective Consolidation Stress (psi)	12.5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
8-2-19	15:27	72.6	19.50	4.84	0	---	---	---	---
8-2-19	15:54	72.6	18.60	5.80	1.62E+03	4.2E-08	4.2E-06	4.0E-08	4.0E-06
8-2-19	16:10	72.6	18.08	6.30	9.60E+02	4.1E-08	4.1E-06	3.9E-08	3.9E-06
8-2-19	16:32	72.6	17.38	7.00	1.32E+03	4.3E-08	4.3E-06	4.0E-08	4.0E-06
8-2-19	16:51	72.6	16.80	7.58	1.14E+03	4.3E-08	4.3E-06	4.1E-08	4.1E-06

Corrected Permeability vs. Time



A gradient of approximately 5.5 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	3.99E-08	cm/s	3.99E-06
Average Hydraulic Conductivity @ 20° C (last run)	m/s	3.99E-08	cm/s	3.99E-06

Comments

Reviewed By RHB

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

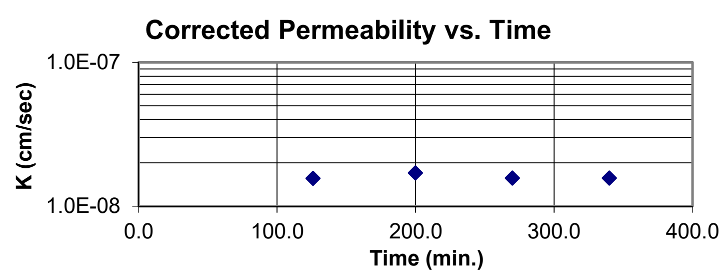
Project Name	CUF TDEC Order			Project No.	175568209
Source	CUF-GT-B18-ST03, 37.0'-38.9'			Test ID	672
Description	Lean Clay with Sand (CL), brown, moist, firm			Prepared By	JMB
		Specific Gravity	2.64 ASTM D854, Dry	Date	8-3-19
Specimen	Undisturbed	LL	43		
Preparation		PL	18	Maximum Dry Density (pcf)	
Permeant	De-aired Tap Water	PI	25	Percent of Maximum	

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.4275	2.4305	2.3974	Chamber	60
Diameter (in.)	2.8090		2.7282	Influent	42
Moisture Content (%)	33.7		34.0	Effluent	40
Dry Unit Weight (pcf)	80.1		86.0		
Void Ratio	1.058		0.917		
Degree of Saturation (%)	84.1		98.0		

Applied Head Difference (psi)	2
Back Pressure Saturated to (psi)	40
Maximum Effective Consolidation Stress (psi)	20
Minimum Effective Consolidation Stress (psi)	18

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
8-8-19	9:55	72.1	20.88	3.80	0	---	---	---	---
8-8-19	12:01	72.1	20.70	3.98	7.56E+03	1.6E-10	1.6E-08	1.6E-10	1.6E-08
8-8-19	13:15	72.1	20.65	4.16	4.44E+03	1.8E-10	1.8E-08	1.7E-10	1.7E-08
8-8-19	14:25	72.1	20.55	4.26	4.20E+03	1.7E-10	1.7E-08	1.6E-10	1.6E-08
8-8-19	15:35	72.1	20.45	4.36	4.20E+03	1.7E-10	1.7E-08	1.6E-10	1.6E-08



A gradient of approximately 22.8 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations)	m/s	1.60E-10	cm/s	1.60E-08
Average Hydraulic Conductivity @ 20° C (last run)	m/s	1.60E-10	cm/s	1.60E-08

Comments

Reviewed By RHB

Stantec

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084, Method C

Project Name CUF TDEC Order
Source CUF-GT-B19-ST02, 29.0'-29.3'
Description Silt (ML), gray, wet, soft

Project No. 175568209
Test ID 686
Prepared By JMB
Date 8-3-19

Specific Gravity 2.42 ASTM D854, Dry
LL NP
PL NP
PI NP

Specimen Undisturbed
Preparation
Permeant De-aired Tap Water

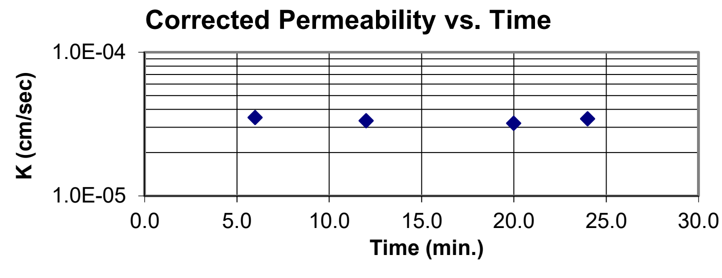
Maximum Dry Density (pcf)
Percent of Maximum

Specimens (if compacted) were compacted in a Proctor Mold as follows: The Maximum Dry Density was converted to Wet Density, this mass was divided by 4 (layers) and 3 of the 4 layers were compacted into the mold using a Proctor Hammer using 25 blows per layer. The density was varied by reducing the height of the drop by the amount listed beside "Compacted". The specimen was trimmed from the bottom two layers.

	Initial Specimen Data	After Consolidation Data	After Test Data	Final Pressures (psi)	
Height (in.)	2.5355	2.4868	2.4696	Chamber	45
Diameter (in.)	2.7540		2.6644	Influent	20.5
Moisture Content (%)	61.6		55.0	Effluent	20
Dry Unit Weight (pcf)	58.8		64.5		
Void Ratio	1.571		1.343		
Degree of Saturation (%)	94.9		99.1		

Applied Head Difference (psi) 0.5
Back Pressure Saturated to (psi) 20
Maximum Effective Consolidation Stress (psi) 25
Minimum Effective Consolidation Stress (psi) 24.5

						Hydraulic Conductivity			
Date	Clock (24H:M)	Temp. (°F)	Bottom Head (in)	Top Head (in)	Test Time (sec)	k (m/s)	k (cm/s)	k @ 20° C (m/s)	k @ 20° C (cm/s)
8-6-19	10:00	72.3	17.72	6.28	0	---	---	---	---
8-6-19	10:06	72.3	16.30	7.70	3.60E+02	3.7E-07	3.7E-05	3.5E-07	3.5E-05
8-6-19	10:12	72.3	15.10	8.90	3.60E+02	3.5E-07	3.5E-05	3.3E-07	3.3E-05
8-6-19	10:20	72.3	13.75	10.25	4.80E+02	3.4E-07	3.4E-05	3.2E-07	3.2E-05
8-6-19	10:24	72.3	13.10	10.90	2.40E+02	3.6E-07	3.6E-05	3.4E-07	3.4E-05



A gradient of approximately 5.5 was used for this test.

Average Hydraulic Conductivity @ 20° C (last 4 determinations) m/s 3.37E-07 cm/s 3.37E-05

Average Hydraulic Conductivity @ 20° C (last run) m/s 3.37E-07 cm/s 3.37E-05

Comments

Reviewed By RHB

APPENDIX G.3

CCR MATERIAL CHARACTERISTICS INVESTIGATION SAMPLING AND ANALYSIS REPORT

Cumberland Fossil Plant
CCR Material Characteristics Investigation
Sampling and Analysis Report

TDEC Commissioner's Order
Environmental Investigation Plan
Cumberland Fossil Plant
Cumberland City, Tennessee

April 16, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	April 16, 2021

Sign-off Sheet

This document entitled Cumberland Fossil Plant CCR Material Characteristics Investigation Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Rachel Harris

Rachel Harris, Engineer In Training

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Rebekah Brooks, Principal Hydrogeologist

Approved by J. M. Kerr, Jr.

James M. Kerr, Jr., Senior Principal Geologist

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LIST OF TABLES

LIST OF APPENDICES

Abbreviations

ASTM	American Society for Testing and Materials
CCR	Coal Combustion Residuals
CCR Parameters	Constituents listed in Appendices III and IV of 40 CFR 257 and five inorganic constituents included in Appendix I of Tennessee Rule 0400-11-01-.04
CEC	Civil & Environmental Consultants, Inc.
CFR	Code of Federal Regulations
COC	Chain of Custody
CUF Plant	Cumberland Fossil Plant
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EIP	Environmental Investigation Plan
ENV	Environmental
EnvStds	Environmental Standards, Inc.
FedEx	Federal Express
FSP	Field Sampling Personnel
ID	Identification
IDW	Investigation Derived Waste
mg/L	Milligrams per Liter
NIST	National Institute of Standards and Technology
NTU	Nephelometric Turbidity Units
ORP	Oxidation Reduction Potential
PG	Professional Geologist
PPE	Personal protective equipment
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SPLP	Synthetic Precipitation Leaching Procedure
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TestAmerica	Eurofins TestAmerica Laboratories, Inc.
TI	Technical Instruction
TVA	Tennessee Valley Authority

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this Sampling and Analysis Report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document the activities related to a coal combustion residuals (CCR) material characteristics investigation at TVA's Cumberland Fossil (CUF) Plant located in Cumberland City, Tennessee.

The purpose of the CCR material characteristics investigation was to characterize leachability of CCR constituents within three CCR units at the CUF Plant, in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at the TVA's coal ash disposal sites in Tennessee.

The purpose of the SAR is to document the work completed during the CCR material characteristics investigation and to present the information and data collected during the execution of the CCR Material Characteristics Sampling and Analysis Plan (SAP) (Stantec 2018a). This SAR is not intended to provide conclusions or evaluations of results. The scope of the CCR material characteristics investigation represented herein was conducted pursuant to the SAP and is part of a larger environmental investigation at the CUF Plant. The evaluation of the results will consider other aspects of the environmental investigation, as well as data collected under other State and/or CCR programs at the CUF Plant and will be presented in the Environmental Assessment Report (EAR).

The CCR material characteristics investigation activities were performed in conjunction with the exploratory drilling investigation at the CUF Plant and in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order:

- *CCR Material Characteristics SAP* (Stantec 2018a)
- *Environmental Investigation Plan (EIP)* (Stantec 2018b)
- *Exploratory Drilling SAP (Stantec 2018c)*
- *Quality Assurance Project Plan (QAPP)* (Environmental Standards, Inc. 2018).

The CCR Material Characteristics SAP was implemented in accordance with TVA- and TDEC- approved Programmatic- and Project-specific changes. Minor variations in scope and procedures from those outlined in the CCR Material Characteristics SAP occurred during field activities due to field conditions and programmatic updates and are referenced in Section 3.6.

Laboratory analysis of constituents was performed by Eurofins TestAmerica Laboratories, Inc. (TestAmerica) in St. Louis, Missouri (radium samples only), and in Pittsburgh, Pennsylvania (all other analytes). Additional quality assurance oversight on data acquisition protocols, sampling practices, and data validation and/or verification was performed by Environmental Standards, Inc. (EnvStds) under direct contract to TVA.

2.0 OBJECTIVE AND SCOPE

The primary objective of the CCR material characteristics investigation conducted pursuant to the CCR Material Characteristics SAP at the CUF Plant was to collect CCR material and pore water samples for characterization related to the leachability of CCR-related constituents from material within three CCR Units: the Gypsum Storage Area, Dry Ash Stack Area, and Retention Pond. The approach for the investigation was to:

- Collect CCR material samples for chemical analyses from the temporary well borings and from retained geotechnical samples obtained as part of non-TDEC Order investigations at the CUF Plant
- Following installation and development of the temporary wells, measure pore water levels and collect pore water samples for chemical analyses.

The scope of work of the CCR material characteristics investigation consisted of the following tasks:

- Collecting CCR material samples and associated quality control (QC) samples at the temporary well borings for laboratory analysis of CCR-related constituents and identifying the interface between CCR material and underlying foundation soils
- Collecting pore water level measurements
- Collecting pore water samples and associated QC samples from the temporary wells for analysis of CCR-related constituents and water quality parameters
- Collecting supplemental CCR material samples and associated QC samples from retained geotechnical samples.

These activities were carried out concurrently with advancement of borings and after the installation of temporary wells conducted as part of the CUF Plant exploratory drilling investigation. Drilling, geotechnical sampling, and temporary well installation and development activities were performed in general accordance with the Exploratory Drilling SAP and reported in the CUF Plant Exploratory Drilling SAR.

3.0 FIELD ACTIVITIES

CCR material characteristics investigation field activities were conducted between December 13, 2018 and March 7, 2019, between June 3 and 6, 2019, and on June 11, 2020. Stantec performed field activities for the CCR material characteristics investigation based on guidance and specifications listed in TVA's Environmental (ENV) Technical Instructions (TIs), the SAP, and the QAPP, except as noted in the Variations section of this report. As part of TVA's commitment to generate representative and reliable data, data validation and/or verification of laboratory analytical data was performed by EnvStds under direct contract with TVA. EnvStds also conducted audits of field activities and provided quality reviews of field documentation. In addition, on behalf of TDEC, Civil & Environmental Consultants, Inc. (CEC) collected split CCR material and pore water samples during this investigation. Additional information regarding CEC split sample collection is provided in Sections 3.3.2 and 3.3.3.2.

During the CCR material characteristics investigation, Stantec conducted the following field activities:

- Collected CCR material samples at the nine temporary well borings during drilling
- Collected supplemental CCR material samples from 16 retained geotechnical samples obtained for other non-TDEC Order investigations at the CUF Plant
- Recorded field measurements of CCR material pH at the nine sampled boring locations (see Section 3.3.2 for more detail)
- Following temporary well installation and development activities, collected pore water level measurements from the six installed temporary wells prior to sampling
- Recorded field measurements of pore water quality parameters during purging and stabilization at the six sampled temporary wells
- Collected filtered and unfiltered pore water samples from the six temporary wells
- Collected CCR material and pore water QC samples including 11 matrix spike/matrix spike duplicates, nine field duplicates, 24 field blanks, 11 equipment blanks, two tubing blanks, and three filter blanks
- Conveyed collected samples via a laboratory-provided courier service to TestAmerica for analysis.

Details on each activity are presented in the sections below. The CCR material characteristics investigation temporary wells and additional boring locations are shown on Exhibit A.1 in Appendix A. Appendix B provides tabulated information collected during the investigation, including summaries of samples collected, pore water measurements, field measurements, and analytical results in Tables B.1 through B.9. Subsurface boring logs and photographic logs of the CCR material cores are provided in Appendices C and D, respectively.

3.1 WORK LOCATIONS

The CCR material characteristics investigation field activities were completed at nine temporary well boring locations (CUF-TW01 through CUF-TW09) at the CUF Plant under the CCR material characteristics investigation scope of work. Borings were completed for locations CUF-TW02, CUF-TW04, and CUF-TW06; however, based on available information, these locations were drilled above the drainage layer in the Gypsum Storage Area, and no pore water was encountered. Thus, no temporary wells were installed at these three locations. Temporary wells (CUF-TW01, CUF-TW03, and CUF-TW05, respectively) were installed adjacent to these three borings.

A summary of the boring and temporary well locations is provided in Table 1 below.

Table 1 - Summary of Boring and Temporary Well Locations

Boring ID	Temporary Well ID	Location	Rationale
CUF-TW01	CUF-TW01	Northeastern portion of Gypsum Storage Area	To assess CCR material characteristics and pore water quality.
CUF-TW02	NC	Northeastern portion of Gypsum Storage Area	To assess CCR material characteristics and attempted to assess pore water quality. Well not installed because sufficient pore water was not present in the CCR at this location.
CUF-TW03	CUF-TW03	Southern portion of Gypsum Storage Area	To assess CCR material characteristics and pore water quality.
CUF-TW04	NC	Southern portion of Gypsum Storage Area	To assess CCR material characteristics and attempted to assess pore water quality. Well not installed because sufficient pore water was not present in the CCR at this location.
CUF-TW05	CUF-TW05	Northwestern portion of Gypsum Storage Area	To assess CCR material characteristics and pore water quality
CUF-TW06	NC	Northwestern portion of Gypsum Storage Area	To assess CCR material characteristics and attempted to assess pore water quality. Well not installed because sufficient pore water was not present in the CCR at this location.
CUF-TW07	CUF-TW07	Northeastern portion of Dry Ash Stack Area	To assess CCR material characteristics and pore water quality

Table 1 - Summary of Boring and Temporary Well Locations (continued)

Boring ID	Temporary Well ID	Location	Rationale
CUF-TW08	CUF-TW08	Northwestern portion of Dry Ash Stack Area	To assess CCR material characteristics and pore water quality
CUF-TW09	CUF-TW09	Southwestern portion of Dry Ash Stack Area	To assess CCR material characteristics and pore water quality
CUF-TW10	NC	Central portion of the Retention Pond within the Main Ash Pond.	Boring not installed because of inaccessibility due to construction activities. Intended to assess CCR material characteristics and pore water quality.

Notes:

CCR Coal Combustion Residuals
ID Identification
NC Not completed as a temporary well

Additionally, a TDEC-approved change to the CCR Material Characteristics SAP under the EIP allowed for supplemental environmental analyses to be conducted on select retained samples collected in August 2019 during a geotechnical exploration associated with the Temporary Lined Basin and Main Ash Pond Implementation Monitoring Plan Projects. CCR material samples were collected using retained samples from 10 geotechnical borings drilled for other projects at the CUF Plant that remained in Stantec custody, as detailed in Section 3.3.2.1. The objective of collecting supplemental samples from the retained geotechnical samples was to assess CCR material characteristics from the Retention Pond within the Main Ash Pond because proposed temporary well CUF-TW10 was eliminated from the investigation scope due to inaccessibility resulting from construction activities. Also, there were no other accessible locations in this area that would meet the technical objectives of the investigation. Temporary well and boring locations are shown on Exhibit A.1 in Appendix A.

3.2 DOCUMENTATION

Stantec planned the CCR material characteristics investigation activities per ENV-TI-05.08.01, *Planning Sampling Events* and maintained field documentation in general accordance with ENV-TI-05.80.03, *Field Record Keeping* and the QAPP. Field activities and data were primarily recorded on program-specific field forms. Health and safety forms were completed in accordance with TVA and Stantec health and safety requirements. Additional information regarding field documentation is provided below.

3.2.1 Field Forms

Stantec used program-specific field forms to record field observations and data for specific activities. Field forms used during the CCR material characteristics investigation included:

- *Daily Field Activity Log*
- *Subsurface Log*
- *Soil pH Calibration and Inspection Log*
- *Soil pH Data Form*
- *Monitoring Well Inspection Checklist*
- *Equipment Calibration Form*
- *Water Level Measurement Form*
- *Water Sampling Form*
- *Chain-of-Custody (COC).*

Documentation for the temporary well installation and well development is described in the CUF Plant Exploratory Drilling SAR.

3.2.1.1 Daily Field Activity Log

Stantec field sampling personnel (FSP) recorded daily field activities, observations and data on a *Daily Field Activity Log* to chronologically document the field program. Deviations from the SAP, TIs, or QAPP were documented on the *Daily Field Activity Log*.

3.2.1.2 Subsurface Log

A Professional Geologist (PG) licensed in the State of Tennessee, prepared a *Subsurface Log* for each boring. The log documented date, boring location, drilling personnel, tooling/equipment used, depth to water, sample number, sample recovery, Standard Penetration Test blow counts, subsurface lithology and other relevant observations. CCR material color was logged per the appropriate Munsell Soil Color Chart (Munsell Color 2009). The *Subsurface Logs* are provided in Appendix C.

3.2.1.3 Soil pH Calibration and Inspection Log

Stantec FSP recorded daily soil pH meter calibrations and inspections on a *Soil pH Calibration and Inspection Log* for each day that pH measurements were taken of the CCR material samples. The log documented temperature, temperature verification, temperature-adjusted calibration values, post calibration pH values, and calibration solution details. Additional information on equipment calibration is provided in Section 3.2.2.

3.2.1.4 Soil pH Data Form

Stantec FSP prepared a *Soil pH Data Form* for each day that pH measurements were taken of the CCR material samples. The form documented the sample identification (ID), boring ID, the depth range, pH measurement date and time, and the field pH value.

3.2.1.5 Monitoring Well Inspection Checklist

Prior to measuring water levels, Stantec FSP inspected each temporary well for damage or indications that the well integrity had been compromised in accordance with ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance*. Inspection results were documented on a *Monitoring Well Inspection Checklist*. No signs of damage or repairs were noted.

3.2.1.6 Equipment Calibration Form

Stantec FSP performed daily equipment calibrations of the water quality meter and documented the results on an *Equipment Calibration Form*. The form documented the calibration test results for temperature, turbidity, specific conductance, pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP), and verified that the field instruments' sensors were operating within acceptable criteria. Refer to Section 3.2.2 for additional details on equipment calibration procedures.

3.2.1.7 Water Level Measurement Form

Stantec FSP recorded pore water level measurement data on a *Water Level Measurement Form* in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*. The form includes the temporary well ID, time, and depth to water measured from a standardized reference point on the top of each well casing, recorded in feet below top of casing.

3.2.1.8 Water Sampling Form

Stantec FPS recorded the depth to water, purge flow rate, volume of water purged, temperature, pH, specific conductance, DO, ORP, turbidity, color of water, and other observations during temporary well purging and pore water sampling activities in accordance with ENV-TI-05.80.42, *Groundwater Sampling*. Field measurements were recorded on a *Water Sampling Form*. The form also documents the time intervals between measurement of field parameters, low-flow extraction rates, water level drawdown, and water quality parameter measurements during purging and after stabilization criteria were met.

3.2.1.9 Chain-of-Custody

Stantec FSP completed *COC* documentation for each CCR material and pore water sample collected during the CCR material characteristics investigation. The sample ID, sample location, sample depth (if applicable), type of sample, sampling date and time, analyses requested, and sample custody record were recorded on the *COCs*. The Field Team Leader reviewed the *COCs* for completeness and accuracy, and the FSP conducted a QC check of samples in each cooler compared to sample IDs on the corresponding *COC* prior to submittal to the laboratory. *COCs* were completed in accordance with ENV-TI-05.80.02*: Sample Labeling and Custody*.

3.2.2 Equipment Calibration

3.2.2.1 CCR Material Equipment Calibration

The pH meter used to collect, generate, or measure environmental data for the CCR material were calibrated each day prior to sampling as specified by the SAP, QAPP, and *Stantec Standard Operating Procedure - Rev 1 for the ExTech ExStik 110 meter* (Stantec 2018d). Temperature was recorded using a calibrated National Institute of Standards and Technology (NIST) traceable thermometer. Additional details regarding equipment calibration were recorded on the *Soil pH Calibration and Inspection Log*, as described in Section 3.2.1.3.

3.2.2.2 Pore Water Equipment Calibration

Field instruments used to collect, generate, or measure water quality parameters data were calibrated each day prior to sampling as specified by the SAP, QAPP, and ENV-TI-05.80-.46, *Field Measurement Using a Multi-Parameter Sonde*. Afternoon calibration verifications were performed to evaluate if instruments remained within acceptable criteria during sampling. Temperature and barometric pressure were recorded using a calibrated NIST traceable thermometer and the National Weather Service (via mesowest.utah.edu) barometric pressure readings for Clarksville Outlaw Field, Clarksville, Tennessee, respectively. Additional details regarding equipment calibration were recorded on the *Equipment Calibration Form*, as described in Section 3.2.1.6.

3.2.3 Photographs

Photographs of the CCR material cores from drilling activities were taken during the CCR material characteristics investigation. Photographic logs of CCR material cores from temporary well borings and additional borings are provided in Appendix D.

3.3 SAMPLING METHODS

The following sections present drilling, CCR material sampling, and pore water gauging and sampling procedures used in the CCR material characteristics investigation. Additional information regarding drilling and sampling procedures at the temporary well locations is provided in the Exploratory Drilling SAR. Drilling and sampling activities were performed under the direction of a Stantec PG licensed in the State of Tennessee.

As indicated in Table 1 and approved by TDEC, temporary well borings CUF-TW02, CUF-TW04, and CUF-TW06 were drilled and sampled, but the wells were not installed because pore water was not observed at the boring locations. CUF-TW10 was not installed because of inaccessibility due to construction activities. As described in Section 3.1, TDEC approved supplemental environmental analyses to be conducted on CCR material samples from retained geotechnical samples near the proposed CUF-TW10 location. Further details on CCR material sample collection from retained geotechnical samples are provided in Section 3.3.2.1.

3.3.1 Drilling

The temporary well borings were advanced by Stantec drillers licensed in Tennessee using hollow stem auger drilling techniques in general accordance with American Society for Testing and Materials (ASTM) D6151: *Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling*. Drilling details are reported in the CUF Plant Exploratory Drilling SAR.

The CCR material characteristics investigation temporary well and boring locations are shown on Exhibit A.1 in Appendix A.

3.3.2 CCR Material Sampling

During advancement of each boring, a Stantec Tennessee-licensed PG prepared field subsurface logs using a mobile data collection platform for borings CUF-TW01 through CUF-TW06 and using written *Subsurface Log* forms for borings CUF-TW07 through CUF-TW09. Inputs included a description of surface lithology, sample recovery, color using the Munsell Soil Color Charts and other relevant parameters as required by the SAPs and TIs. As part of the logging process, CCR material cores were photographed by FSP with interval data presented on a white board. Analytical and duplicate samples were collected from the CCR material characteristics investigation borings and documented in the *Daily Field Activity Logs* and *COCs*. A list of the CCR material samples are provided on Table B.1 in Appendix B. Split samples collected by CEC during drilling of temporary well boring CUF-TW08, are also identified in Table B.1.

The FSP typically collected approximately a two-foot grab sample from the midpoint of each five-foot boring interval where sampling was planned based on recovery. The collected CCR material sample was placed in clean, resealable bags and homogenized using gloved hands and when necessary, clean, disposable, or decontaminated sampling tools. Decontamination of sampling equipment was conducted in accordance with TVA, ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*. Once the sample was sufficiently homogenized, an aliquot of the homogenized sample and deionized water was used to create a paste for measurement of the CCR material pH with the ExTech ExStik 110 pH meter according to Stantec Standard Operating Procedure – Rev 1. The measurements were recorded on the *Soil pH Data Form* within 15 minutes after creating the CCR material paste.

Afterwards, the CCR material sample was placed in an appropriate laboratory-supplied sample jar. CCR material samples were collected in accordance with ENV-TI-05.80.50, *Soil and Sediment Sampling.* Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*. FSP secured caps on each bottle and attached a custody seal across the cap before placing the sample container in a cooler with ice (within 15 minutes of sample collection) for transport to the laboratory. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

The samples were analyzed for CCR-related constituents listed in Appendices III and IV of Title 40 of the Code of Federal Regulations (CFR) Part 257 (40 CFR 257). In addition, five inorganic constituents listed in Appendix I of Tennessee Rule 0400-11-01-.04 and not included in the 40 CFR 257 Appendices III and IV were analyzed to maintain continuity with the TDEC environmental programs. These additional TDEC Appendix I constituents included copper, nickel, silver, vanadium, and zinc. The combined federal CCR Appendices III and IV constituents and TDEC Appendix I inorganic constituents are hereafter referred to as "CCR Parameters." In addition, total organic carbon, iron, and manganese were added as specific parameters of interest to be analyzed per the CCR Material Characteristics Investigation SAP. Also Synthetic Precipitation Leaching Procedure (SPLP) analyses were performed for metals and radiological parameters.

The CCR material analytical data for CCR Parameters and additional parameters of interest are presented in Tables B.2a and B.3a in Appendix B. The field pH data are summarized in Table B.4.

3.3.2.1 Supplemental CCR Material Samples Collected from Retained Geotechnical Samples

Geotechnical samples were originally collected in August 2019, during non-TDEC Order investigations at the Retention Pond within the Main Ash Pond. These samples were stored in a secure location in the Louisville, Kentucky geotechnical laboratory and warehouse and then kept in the possession of a Stantec employee. Stantec personnel identified representative boring locations and depth intervals from the retained geotechnical samples to meet the objectives of this investigation. In June 2020, Stantec collected supplemental CCR material samples from the retained geotechnical samples, as detailed in Table 2 below.

Geotechnical boring locations in relation to the location of proposed location CUF-TW10 shown on Exhibit A.1 in Appendix A.

Table 2 - Summary of Supplemental CCR Material Samples Collected from Retained Geotechnical Boring Samples

<table>
<tr><th>Geotechnical Boring ID</th><th>Geotechnical Sample ID</th><th>Depth Interval (feet bgs)</th><th>Supplemental CCR Material Sample ID</th></tr>
<tr><td>ALT-2</td><td>SPT-1</td><td>11.5 - 13.0</td><td>CUF-CCR-ALT2-11.5/13.0-20200611</td></tr>
<tr><td rowspan="2">ALT-7B</td><td>SPT-1</td><td>6.0 – 7.5</td><td rowspan="2">CUF-CCR-ALT7B-6.0/13.0-20200611</td></tr>
<tr><td>SPT-2</td><td>11.0 - 13.0</td></tr>
<tr><td rowspan="3">B-1</td><td>SPT-2</td><td>7.5 - 9.5</td><td>CUF-CCR-B1-7.5/9.5-20200611</td></tr>
<tr><td>SPT-4</td><td>11.0 - 12.5</td><td rowspan="2">CUF-CCR-B1-11.0/14.7-20200611</td></tr>
<tr><td>ST-2</td><td>12.5 - 14.7</td></tr>
</table>

Table 2 - Summary of Supplemental CCR Material Samples Collected from Retained Geotechnical Boring Samples (continued)

Geotechnical Boring ID	Geotechnical Sample ID	Depth Interval (feet bgs)	Supplemental CCR Material Sample ID
B-2	SPT-2	5.0 - 6.5	CUF-CCR-B2-5.0/6.5-20200611
B-2	SPT-3	10.0 - 11.5	CUF-CCR-B2/B2A-10.0/14.0-20200611
B-2A	SPT-1	12.5 - 14.0	
B-3	SPT-3	9.0 -10.5	CUF-CCR-B3/3A/3B/A5-4.5/10.5-20200611
B-3A	SPT-1	4.5 - 6.0	
B-3B	SPT-1	6.5 - 8.0	
ALT-5	SPT-1	4.5 - 6.0	
	SPT-2A	9.5 – 10.2	
B-4	SPT-1	3.0 – 4.5	CUF-CCR-B4-3.0/6.5-20200611
	SPT-2	5.0 - 6.5	

Notes:

ID Identification
SPT Standard penetration test
ST Shelby tube
bgs below ground surface
1. Location IDs and sample IDs from retained geotechnical samples do not include the “MAP (Main Ash Pond)” nomenclature.

The retained sample material from the supplemental sample intervals was placed in clean, decontaminated sample mixing bowls and homogenized using gloved hands and when necessary, clean, disposable, or decontaminated sampling tools. For the supplemental CCR material samples, pH was only measured by the analytical laboratory, as approved by TDEC. Decontamination of sampling equipment was conducted in accordance with TVA, ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*.

Afterwards, the CCR material sample was placed in an appropriate laboratory-supplied sample jar. CCR material samples were collected in accordance with ENV-TI-05.80.50, *Soil and Sediment Sampling.*

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*. FSP secured caps on each bottle and attached a custody seal across the cap before placing the sample container in a cooler with ice (within 15 minutes of sample collection) for transport to the laboratory. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

CCR material samples were collected using a constituent priority list (metals, anions, pH, and then radiological parameters), based on the available volumes of sample material and the analytical volume requirements, as approved by TDEC. Based on available sample volume, the samples were analyzed for CCR Parameters, total organic carbon, iron, and manganese. Also, SPLP analyses were performed for metals and radiological parameters when collected. Because of insufficient sample volume, only two samples were analyzed for radiological parameters as shown on Table B.1.

The CCR material analytical data for CCR Parameters and additional parameters of interest from the retained geotechnical samples from the Retention Pond within the Main Ash Pond are presented in Tables B.2b and B.3b, respectively, in Appendix B.

3.3.3 Pore Water Gauging and Sampling

The following sections present temporary well data collection and sampling procedures used during the CCR material characteristics investigation. The pore water gauging and sampling activities were conducted at the CUF Plant on June 3 through 6, 2019 following temporary well installation and development activities. Temporary well installation and well development information are reported in the CUF Plant Exploratory Drilling SAR.

3.3.3.1 Pore Water Level Measurements

Static pore water levels were measured at the six temporary wells in accordance with ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement* prior to sampling. On June 3, 2019, static pore water level readings were measured and recorded to the nearest 0.01 feet from a reference point on the top of each temporary well casing using an electronic water level indicator. Water level indicator probes were decontaminated prior to the first use and between measurements, and the decontamination was documented as specified in ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*. Depth to pore water measurements were recorded on a *Water Level Measurement Form*. Pore water level data are shown in Table B.5 in Appendix B.

3.3.3.2 Pore Water Purging and Sampling

Analytical and field duplicate pore water samples were collected from the six temporary wells during a single sampling event. The temporary wells were purged using non-dedicated bladder pumps with dedicated tubing and low-flow purging and sampling techniques as specified in ENV-TI-05.80.42, *Groundwater Sampling*. Analytical and duplicate samples were collected from the temporary wells and documented in the *Daily Field Activity Logs* and *COCs* as shown on Table B.6 in Appendix B. A split sample collected by CEC during pore water sampling at temporary well CUF-TW08 is also identified in Table B.6.

During the purging process, water quality field parameters including pH, specific conductance, temperature, ORP, and DO were measured using water quality meters (YSI ProPlus with flow-through cell) and recorded on field forms. Depth to water and turbidity were measured and recorded using decontaminated electronic water-level indicators (Heron Dipper-T) and calibrated turbidimeters (Hach 2100Q), respectively. Water quality parameters were measured and recorded on a *Water Sampling Form* during purging until readings were stabilized as specified in the SAP and/or applicable TI. Well purging was considered complete when three consecutive readings met the following stabilization criteria:

- pH – ± 0.1 Standard Units
- Specific Conductance – ± 5% microSiemens per centimeter
- Turbidity – Less than 10 Nephelometric Turbidity Units (NTUs) or ± 10% for values above 10 NTUs
- DO – Less than 0.5 milligrams per Liter (mg/L) or ± 10% for values above 0.5 mg/L.

After water quality stabilization criteria were achieved, the final water quality parameter results were recorded, purging was discontinued, and a sample was collected as specified in the SAP. Final water quality parameter results are shown in Table B.7 in Appendix B.

Laboratory-provided, pre-preserved sample containers were filled directly from the pump discharge line with the exception of the dissolved metals samples, which were collected via a new 0.45-micron disposable inline filter attached to the end of the discharge line to field filter the samples. FSP wore new, clean nitrile gloves when handling sample containers and did not touch the interior of containers or container caps. New gloves were used when handling each sample. When filling sample bottles, care was taken to minimize sample aeration (i.e., water was directed down the inner walls of the sample bottle) and to avoid overfilling and diluting preservatives. Each sample bottle was capped before filling the next bottle. Following completion of sampling, final turbidity measurements were made.

Sample containers were labeled and handled in accordance with ENV-TI-05.80.02, *Sample Labeling and Custody*. FSP secured caps on each bottle, attached a custody seal across the cap, and placed in a cooler on ice within 15 minutes of collection. QC samples were collected in accordance with ENV-TI-05.80.04, *Field Sampling Quality Control.*

Pore water samples were analyzed for CCR Parameters and additional parameters of interest as defined in Section 3.3.2; the pore water analytical data are presented in Tables B.8 and B.9, in Appendix B.

3.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) generated during the CCR material characteristics investigation included:

- CCR material cuttings
- Temporary well purge water
- Used calibration solutions
- Decontamination fluids
- Personal protective equipment (PPE)
- General trash.

IDW was handled in general accordance with ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination* and ENV-TI-05.80.42, *Groundwater Sampling* (purge water); the CCR Material Characteristics SAP, the CUF Plant-specific waste management plan; and local, state, and federal regulations. Transportation and disposal of IDW was coordinated with TVA Plant facility management. CCR material cuttings, temporary well purge water, used calibration solutions, and decontamination fluids were managed as authorized by CUF Plant facility management and in general accordance with the CCR Material Characteristics SAP. Used disposable PPE (e.g., nitrile gloves) and general trash were placed in garbage bags and disposed in a municipal waste dumpster onsite.

3.5 SAMPLE SHIPMENT

Samples were packed and transported under *COC* procedures as specified in ENV-TI-05.80.06, *Handling and Shipping of Samples*. The CCR material samples were delivered via courier to TestAmerica in Nashville, Tennessee and then subsequently shipped to St. Louis, Missouri (radium samples only), and to Pittsburgh, Pennsylvania (all other analytes). The pore water samples were shipped via Federal Express (FedEx) to TestAmerica in Pittsburgh, Pennsylvania and then the pore water samples for radium analysis were subsequently shipped to St. Louis, Missouri. The supplemental CCR material samples collected from retained geotechnical samples were shipped via FedEx to TestAmerica in Pittsburgh, Pennsylvania and then the CCR material samples for radium analysis were shipped to St. Louis, Missouri. TestAmerica submitted sample receipt forms to EnvStds for review and confirmation.

3.6 VARIATIONS

The proposed scope and procedures for the CCR material characteristics investigation were outlined in the SAP, QAPP, and applicable TVA TIs and ASTM standards, as detailed in the sections above. Variations in scope or procedures discussed with TDEC and/or TVA, changes based on field conditions, or additional field sampling performed to complete the scope of work in the SAPs are described in the following sections. As discussed below, these variations do not impact the overall usability and representativeness of the dataset provided in this SAR for the CCR materials characteristics investigation at the CUF Plant.

3.6.1 Variations in Scope

Variations in scope are provided below.

- Temporary wells CUF-TW02, CUF-TW04, and CUF-TW06 were not installed because no pore water was encountered in the borings, as approved by TDEC.
- Temporary well CUF-TW10 was not installed because of inaccessibility issues due to construction activities and there were no other accessible locations that would meet the technical objectives of the investigation. As a substitute, supplemental CCR material samples were collected from retained geotechnical samples from a previous investigation, as approved by TDEC.

3.6.2 Variations in Procedures

No variations in procedures were documented during field activities.

4.0 SUMMARY

The data presented in this report are from the CCR material characteristics investigation at the CUF Plant. The CCR material characteristics investigation included collecting CCR material from temporary well locations and retained geotechnical samples, with TDEC approval, and collecting pore water from the installed temporary wells for analysis of CCR Parameters and additional parameters of interest. Also, pore water levels were measured in the installed temporary wells.

A summary of boring and temporary well locations drilled during this investigation is presented in Table 1. Table 2 provides the locations and depth intervals for the supplemental CCR material samples collected from the retained geotechnical samples. A total of 118 CCR material samples, including eight duplicates, were collected from the nine temporary well borings and 16 retained geotechnical samples for analysis of CCR Parameters and additional parameters of interest. A summary of the CCR material samples collected during this investigation are presented in Table B.1, and sample analytical data are presented in Tables B.2a, B.2b, B.3a, and B.3b. The field pH data are summarized in Table B.4.

Following temporary well installation and development, pore water levels were measured prior to sampling, and six pore water samples and one field duplicate sample were collected from the six temporary wells. Water quality parameters were recorded during well purging. Stabilization criteria for pH, specific conductance, turbidity, and DO were achieved at each sampling location. Pore water level measurements and a summary of the pore water samples collected are presented in Tables B.5 and B.6, respectively. The final pore water quality parameter measurements prior to initiating sample collection are presented in Table B.7. Pore water analytical data for CCR Parameters and additional parameters of interest are presented in Tables B.8 and B.9.

CCR material and pore water analytical data were reported by TestAmerica and validated by EnvStds.

Stantec has completed a CCR material characteristics investigation at the CUF Plant in Cumberland City, Tennessee, in accordance with the CCR Material Characteristics SAP as documented herein. The data collected during the investigation are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The CCR materials characterization data will be evaluated along with data collected under other TDEC Order SAPs, including but not limited to, the exploratory drilling investigation, as well as data collected under other State and CCR programs. This evaluation will be provided in the EAR.

5.0 REFERENCES

American Society for Testing and Materials. D6151: *Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling*.

Environmental Standards, Inc. 2018. *Quality Assurance Project Plan for the Tennessee Valley Authority Cumberland Fossil Plant Environment Investigation*. Prepared for Tennessee Valley Authority. Revision 2. January 2018.

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Stantec Consulting Services Inc. (Stantec). 2018a. *CCR Material Characteristics Sampling and Analysis Plan , Cumberland Fossil Plant.* Revision 3. Prepared for Tennessee Valley Authority. June 25, 2018.

Stantec. 2018b. *Environmental Investigation Plan, Cumberland Fossil Plant.* Revision 3. Prepared for Tennessee Valley Authority. June 25, 2018.

Stantec. 2018c. *Exploratory Drilling Sampling and Analysis Plan Cumberland Fossil Plant.* Revision 3. Prepared for Tennessee Valley Authority. June 25, 2018.

Stantec. 2018d. *Standard Operating Procedures - Rev 1 for the ExTech ExStik 110 meter*. September 5, 2018.

Tennessee Department of Environment and Conservation. 2015. *Commissioner's Order No. OGC15-0177*. August 6, 2015.

Tennessee Valley Authority (TVA). ENV-TI-05.08.01 *Planning Sampling Events*.

TVA. ENV-TI-05.80.02, *Sample Labeling and Custody*.

TVA. ENV-TI-05.80.03, *Field Record Keeping*.

TVA. ENV-TI-05.80.04, *Field Sampling Quality Control*.

TVA. ENV-TI-05.80.05, *Field Sampling Equipment Cleaning and Decontamination*.

TVA. ENV-TI-05.80.06, *Handling and Shipping of Samples*.

TVA. ENV-TI-05.80.21, *Monitoring Well Inspection and Maintenance.*

TVA. ENV-TI-05.80.42, *Groundwater Sampling*.

TVA. ENV-TI-05.80.44, *Groundwater Level and Well Depth Measurement*.

TVA. ENV-TI-05.80.46, *Field Measurement Using a Multi-Parameter Sonde.*

TVA. ENV-TI-05.80.50, *Soil and Sediment Sampling*.

APPENDIX A - EXHIBITS

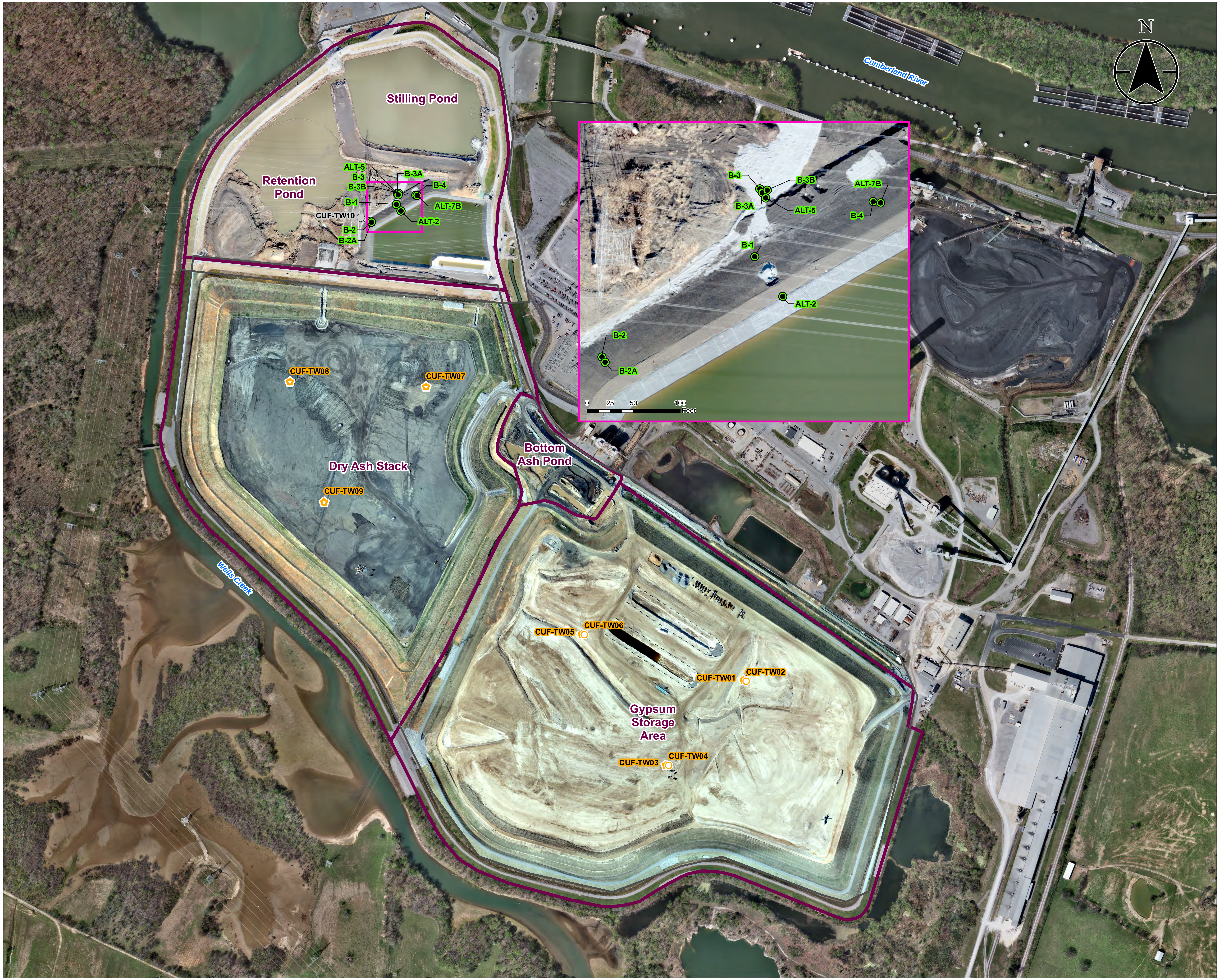


Exhibit No.

A.1

Title

Boring and Temporary Well Location Map

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209

Prepared by DMB on 2021-03-03
Technical Review by RH on 2021-03-03

0 300 600 900 1,200 Feet

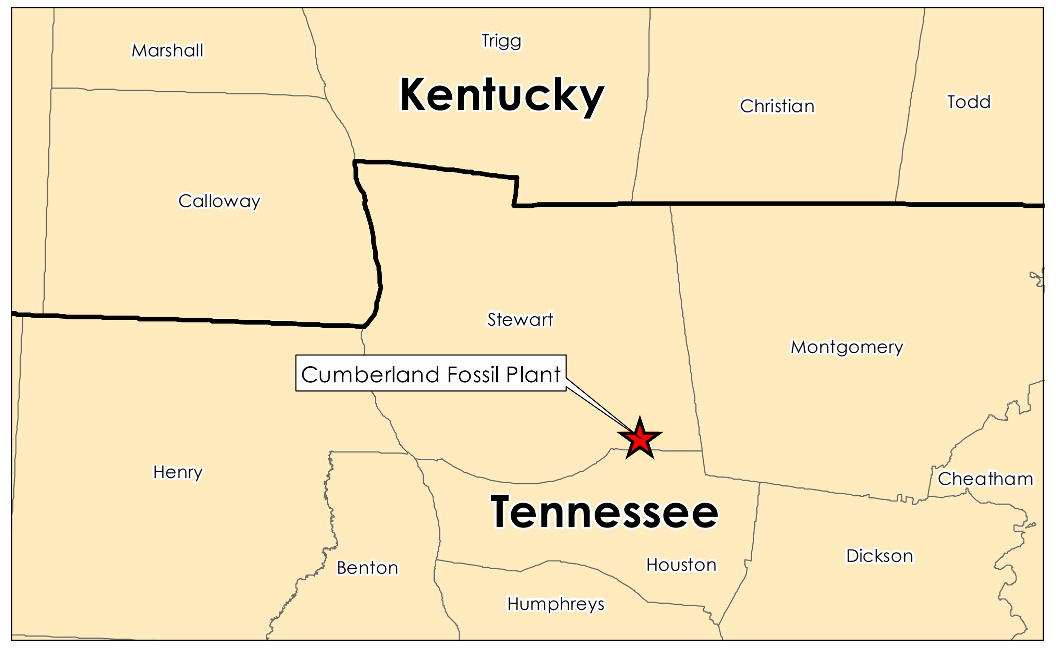
1:3,600 (At original document size of 22x34)

Legend

- Boring
- Non-TDEC Order Geotechnical Boring (used for supplemental CCR material sampling)
- Temporary Well
- Proposed Boring (Not Completed)
- 2019 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (2019-03-06 and 2019-12-11)
3. Geotechnical data includes CCR thickness, clay foundation soil thickness, top of rock elevation, and rock coring (RQD).
4. The geotechnical boring IDs do not include the "MAP (Main Ash Pond)" nomenclature.



Stantec TVA

APPENDIX B - TABLES

TABLE B.1 – Summary of CCR Material Samples
Cumberland Fossil Plant
December 2018 - June 2020

			Analysis Type											
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	SPLP Metals	Total Mercury	SPLP Mercury	Anions	pH (laboratory)	Total Organic Carbon	Radium-226, Radium-228, Radium-226+228	SPLP Radium-226	SPLP Radium-228	SPLP Radium-226+228
ALT-2	CUF-CCR-ALT2-11.5/13.0-20200611	Normal Environmental Sample		x	x	x	x	x	x	x				
ALT-7B	CUF-CCR-ALT7B-6.0/13.0-20200611	Normal Environmental Sample		x	x	x	x	x	x	x				
B-1	CUF-CCR-B1-7.5/9.5-20200611	Normal Environmental Sample		x	x	x	x	x	x	x				
	CUF-CCR-B1-11.0/14.7-20200611	Normal Environmental Sample		x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-DUP01-20200611	Field Duplicate Sample		x	x	x	x	x	x	x				
B-2	CUF-CCR-B2-5.0/6.5-20200611	Normal Environmental Sample		x	x	x	x	x	x	x				
B-2, B-2A	CUF-CCR-B2/B2A-10.0/14.0-20200611	Normal Environmental Sample		x	x	x	x	x	x	x				
B-3,B-3A,B-3B,ALT-5	CUF-CCR-B3/3A/3B/A5-4.5/10.5-20200611	Normal Environmental Sample		x	x	x	x	x	x	x	x	x	x	x
B-4	CUF-CCR-B4-3.0/6.5-20200611	Normal Environmental Sample		x	x	x	x	x	x	x				
CUF-TW01	CUF-CCR-TW01-1.5/3.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-6.0/8.0-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-12.0/14.0-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-16.5/18.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-22.5/24.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-27.0/29.0-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-31.5/33.5-20190205	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-36.0/40.0-20190206	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-DUP04-20190206	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-42.5/45.0-20190206	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-47.0/49.5-20190206	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW01-51.5/53.8-20190206	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
CUF-TW02	CUF-CCR-TW02-1.5/3.5-20190305	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW02-6.5/8.5-20190305	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW02-10.5/12.9-20190306	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW02-16.5/18.5-20190306	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW02-21.5/23.3-20190306	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
CUF-TW03	CUF-CCR-TW03-1.5/3.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-6.5/8.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-11.5/13.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-16.5/18.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-21.0/23.0-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-26.5/28.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-31.5/33.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-36.5/39.5-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-41.0/44.0-20190213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-DUP05-20190213	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-46.5/48.5-20190214	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-51.5/53.5-20190214	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-56.5/58.5-20190214	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW03-61.5/63.5-20190214	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
CUF-TW04	CUF-CCR-TW04-1.5/3.5-20190306	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW04-6.0/7.9-20190306	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW04-10.5/12.8-20190306	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW04-16.5/18.5-20190307	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW04-21.5/23.0-20190307	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
CUF-TW05	CUF-CCR-TW05-1.5/3.5-20190219	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-6.5/8.5-20190220	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-11.5/13.5-20190220	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-16.5/18.5-20190220	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-21.5/23.5-20190220	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-26.5/28.5-20190220	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-31.5/33.5-20190220	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-36.5/38.5-20190221	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-41.5/44.0-20190221	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-46.0/49.0-20190221	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-DUP06-20190221	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-51.5/53.5-20190221	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW05-56.5/58.5-20190221	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
CUF-TW06	CUF-CCR-TW06-1.0/4.0-20190307	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-DUP07-20190307	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW06-6.5/8.5-20190307	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW06-12.5/14.2-20190307	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW06-16.5/19.0-20190307	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x

See notes on last page.

TABLE B.1 – Summary of CCR Material Samples
Cumberland Fossil Plant
December 2018 - June 2020

			Analysis Type											
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	SPLP Metals	Total Mercury	SPLP Mercury	Anions	pH (laboratory)	Total Organic Carbon	Radium-226, Radium-228, Radium-226+228	SPLP Radium-226	SPLP Radium-228	SPLP Radium-226+228
	CUF-CCR-TW07-1.5/3.5-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-6.0/8.0-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-10.5/12.5-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-16.5/18.5-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-21.0/23.4-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-27.0/29.0-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-31.5/33.5-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-36.5/38.5-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-41.5/43.5-20181213	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
CUF-TW07	CUF-CCR-TW07-46.5/48.5-20181217	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-51.5/53.5-20181217	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-56.5/58.5-20181217	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-62.0/64.0-20181218	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-66.0/68.5-20181218	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-71.5/73.5-20181218	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-76.5/78.5-20181218	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-85.0/87.0-20181218	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW07-91.0/94.0-20181218	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-DUP01-20181218	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-1.0/4.0-20190109	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-6.5/7.8-20190109	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-11.5/15.0-20190109	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-16.5/18.5-20190109	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-21.0/23.0-20190109	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-25.5/28.8-20190110	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-30.0/34.5-20190110	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-DUP02-20190110	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
CUF-TW08	CUF-CCR-TW08-36.5/39.0-20190110	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-41.5/43.5-20190110	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-46.5/48.5-20190110	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-51.0/54.0-20190110	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-56.5/58.5-20190110	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-61.5/63.5-20190110	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-66.0/69.0-20190111	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-71.0/74.0-20190111	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW08-76.5/78.5-20190114	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-1.5/3.5-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-6.5/8.5-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-12.0/15.0-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-16.5/18.5-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-21.5/23.7-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-26.0/29.8-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-DUP03-20190122	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-32.0/34.0-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-36.5/38.5-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
CUF-TW09	CUF-CCR-TW09-41.0/43.0-20190122	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-45.5/47.5-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-51.5/53.5-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-56.0/59.0-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-60.5/63.0-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-67.0/69.5-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-72.0/74.5-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-76.5/79.0-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-81.0/83.5-20190124	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x
	CUF-CCR-TW09-85.5/88.0-20190125	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x	x

Notes	Method
Total Metals	SW-846 6020A
SPLP Metals	SW-846 6020A
Total Mercury	SW-846 7471B
SPLP Mercury	SW-846 7470A
Anions	SW-846 9056A
pH (laboratory)	SW-846 9045D
Total Organic Carbon	Lloyd Kahn/SW-846 9060A
Radium-226, Radium-228, Radium-226+228	EPA 901.1
SPLP Radium-226	EPA 903.0
SPLP Radium-228	EPA 904.0
SPLP Radium-226+228	CALC
ID	identification
SPLP	Synthetic Precipitation Leaching Procedure

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.
2. CEC collected split samples from CUF-TW08 at depth intervals of 1.0-4.0 and 51.0-54.0 feet below ground surface.
3. Location IDs and sample IDs from retained geotechnical samples do not include the "MAP (Main Ash Pond)" nomenclature.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW01							
Sample Date		5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	6-Feb-19
Sample ID		CUF-CCR-TW01-1.5/3.5-20190205	CUF-CCR-TW01-6.0/8.0-20190205	CUF-CCR-TW01-12.0/14.0-20190205	CUF-CCR-TW01-16.5/18.5-20190205	CUF-CCR-TW01-22.5/24.5-20190205	CUF-CCR-TW01-27.0/29.0-20190205	CUF-CCR-TW01-31.5/33.5-20190205	CUF-CCR-DUP04-20190206
Sample Depth		1.5 - 3.5 ft	6 - 8 ft	12 - 14 ft	16.5 - 18.5 ft	22.5 - 24.5 ft	27 - 29 ft	31.5 - 33.5 ft	36 - 40 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units								
Total Metals									
Antimony	MG/KG	0.502	0.0914 J	<0.0907	0.458	0.105 J	5.73	5.60	4.29
Arsenic	MG/KG	3.64	0.655	0.453	3.31	0.345	53.1	48.2	55.9
Barium	MG/KG	105	10.5	16.7	138	13.0	331	353	499
Beryllium	MG/KG	0.263	0.0834 J	0.0481 J	0.218	0.0370 J	3.66	3.81	4.26
Boron	MG/KG	5.17 J	1.84 UJ	1.97 UJ	4.11 J	1.99 UJ	308 J	371 J	683 J
Cadmium	MG/KG	1.54	0.221	0.198	1.13	0.270	3.31	3.07	2.18
Calcium	MG/KG	245,000 J	262,000 J	275,000 J	249,000 J	271,000 J	22,200 J	17,100 J	22,500 J
Chromium	MG/KG	20.5 J	2.71 J	1.93 J	24.0 J	2.20 J	84.0 J	87.0 J	65.9 J
Cobalt	MG/KG	1.17	0.282	0.0917	0.940	0.0442 J	10.2	9.95	8.64
Copper	MG/KG	13.3	1.72	0.828	9.48	0.853	31.5	31.2	30.3
Iron	MG/KG	4,060	1,170	377	4,070	486	39,200	38,500	23,400 J
Lead	MG/KG	10.5	1.07	0.643	6.32	0.502	30.6	29.4	33.2
Lithium	MG/KG	7.82 J	0.987 J	0.923 J	10.1 J	0.613 J	10.9 J	11.3 J	14.8 J
Manganese	MG/KG	63.7 J	15.7 J	10.9 J	107 J	5.14 J	195 J	173 J	143 J
Mercury	MG/KG	0.582	0.227	0.336	2.92	0.155	0.0307 J	<0.0209	<0.0164
Molybdenum	MG/KG	2.58	0.485 J	0.421 J	2.94	0.332 J	9.31	10.3	11.1
Nickel	MG/KG	6.25	1.24	0.842	10.2	1.66	37.6	36.5	30.4
Selenium	MG/KG	14.0	1.97	1.89	27.7	3.23	6.91	6.91	6.37
Silver	MG/KG	0.0673 J	<0.0368	<0.0395	0.0647 J	<0.0398	0.132 J	0.125 J	0.116 J
Thallium	MG/KG	0.187	<0.0341	<0.0366	0.156	<0.0369	6.14	7.29	6.72
Vanadium	MG/KG	14.8 J	3.07 J	1.85 J	14.1 J	1.73 J	303 J	290 J	208 J
Zinc	MG/KG	116	16.0	11.4	120	13.8	141	132	118
SPLP - Metals									
Antimony	UG/L	<0.378	<0.378	<0.378	<0.378	<0.378	4.64	5.73	9.13
Arsenic	UG/L	0.657 J	<0.323	0.710 J	0.345 J	<0.323	15.1	18.7	36.3 J
Barium	UG/L	15.2	10.7	16.7	14.0	11.4	41.3	87.4	62.0 J
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	889	849	892	913	893	1,360	2,030	4,440
Cadmium	UG/L	0.304 J	<0.125	0.787 J	0.961 J	0.866 J	<0.125	<0.125	<0.125
Calcium	UG/L	651,000	614,000	623,000	625,000	617,000	306,000	220,000	77,600 J
Chromium	UG/L	5.89	<1.53	<1.53	<1.53	<1.53	<1.53	<1.53	4.36 J
Cobalt	UG/L	0.236 J	0.211 J	0.195 J	0.204 J	0.221 J	0.0930 J	<0.0750	0.0970 J
Copper	UG/L	1.05 J	1.50 J	0.788 J	1.39 J	1.52 J	1.14 J	0.993 J	3.20 J
Iron	UG/L	24.8 J	<14.1	<14.1	<14.1	<14.1	<14.1	<14.1	138
Lead	UG/L	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	0.381 J
Lithium	UG/L	7.33	3.19 J	7.37	7.18	7.03	19.8	20.5	8.25 J
Manganese	UG/L	2.14 J	<1.35	3.06 J	<1.35	3.12 J	12.8	6.90	<1.35
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	0.908 J	5.17	<0.610	1.79 J	0.677 J	4.20 J	6.10	14.2
Nickel	UG/L	2.88	0.406 J	0.585 J	1.52	0.915 J	<0.312	<0.312	0.440 J
Selenium	UG/L	3.16 J	<2.62	4.03 J	5.00	6.63	9.52	16.5	9.08 J
Silver	UG/L	<0.121	<0.121	<0.121	0.160 J	<0.121	<0.121	0.317 J	<0.121
Thallium	UG/L	<0.128	<0.128	<0.128	<0.128	<0.128	1.30	1.35	<0.128
Vanadium	UG/L	2.01	1.11	1.68	1.56	1.46	153	184	134
Zinc	UG/L	<3.22	<3.22	5.71	<3.22	<3.22	<3.22	8.86	4.14 J
Anions									
Chloride	MG/KG	<5.32	<5.15	<5.55	<5.70	<5.77	6.41 J	49.9	40.0
Fluoride	MG/KG	29.8	13.1	15.6	39.3	18.3	8.36	2.31	1.25 J
Sulfate	MG/KG	18,800	18,600	21,000	21,100	20,500	20,200	5,940	2,760
General Chemistry									
pH (lab)	SU	7.6	7.6	7.2	7.4	7.6	8.2	8.3	9.5
Total Organic Carbon	MG/KG	3,550 J	<1,010	3,380 J	4,950	<1,120	10,600	6,110 J	6,060 J

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW01				CUF-TW02			
Sample Date		6-Feb-19	6-Feb-19	6-Feb-19	6-Feb-19	5-Mar-19	5-Mar-19	6-Mar-19	6-Mar-19
Sample ID		CUF-CCR-TW01-36.0/40.0-20190206	CUF-CCR-TW01-42.5/45.0-20190206	CUF-CCR-TW01-47.0/49.5-20190206	CUF-CCR-TW01-51.5/53.8-20190206	CUF-CCR-TW02-1.5/3.5-20190305	CUF-CCR-TW02-6.5/8.5-20190305	CUF-CCR-TW02-10.5/12.9-20190306	CUF-CCR-TW02-16.5/18.5-20190306
Sample Depth		36 - 40 ft	42.5 - 45 ft	47 - 49.5 ft	51.5 - 53.8 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	10.5 - 12.9 ft	16.5 - 18.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units								
Total Metals									
Antimony	MG/KG	4.66	4.59	4.45	0.831	0.208 J	<0.0829	<0.0899	0.107 J
Arsenic	MG/KG	49.2	67.2	53.7	12.1	4.76	3.02	2.86	3.43
Barium	MG/KG	561	341	762	246	83.0	13.8	20.4	23.4
Beryllium	MG/KG	4.34	5.11	2.15	1.22	0.139	0.0446 J	0.0455 J	0.0671 J
Boron	MG/KG	876 J	477 J	624 J	134 J	3.08 J	<1.80	<1.96	<2.01
Cadmium	MG/KG	1.73	2.65	3.90	0.661	0.448	0.502	0.168	0.737
Calcium	MG/KG	27,500 J	13,100 J	21,700 J	12,900 J	251,000	251,000	258,000	262,000
Chromium	MG/KG	83.1 J	74.6 J	72.0 J	18.2 J	15.2	3.33	3.91	6.86
Cobalt	MG/KG	10.2	10.9	5.09	7.79	0.515	0.169	0.131	0.203
Copper	MG/KG	30.7	35.8	22.0	10.2	3.63	3.20	2.69	4.55
Iron	MG/KG	38,000 J	28,000	21,000	11,300	2,220	719	436	797
Lead	MG/KG	31.0	42.7	34.5	15.6	5.55	2.39	1.23	2.83
Lithium	MG/KG	13.2 J	16.5 J	9.30 J	6.43 J	3.19	0.966	1.44	2.02
Manganese	MG/KG	182 J	120 J	194 J	803 J	55.8	15.6	14.2	23.1
Mercury	MG/KG	<0.0175	<0.0184	<0.0169	0.0223 J	0.779	0.299	0.218	4.19
Molybdenum	MG/KG	13.5	14.7	11.4	38.2	2.80	0.528 J	0.751	1.12
Nickel	MG/KG	36.2	36.3	20.7	10.7	2.63	0.914	0.942	1.95
Selenium	MG/KG	5.54	7.45	3.46	2.53	2.19	1.82	2.54	3.70
Silver	MG/KG	0.124 J	0.153	0.109 J	0.0545 J	<0.0372	<0.0361	<0.0391	<0.0403
Thallium	MG/KG	6.20	6.37	5.39	1.23	0.162	0.0449 J	0.0425 J	0.0498 J
Vanadium	MG/KG	238 J	240 J	182 J	61.7 J	7.38	2.57	2.28	3.42
Zinc	MG/KG	116	142	131	35.9	45.3	20.6	16.4	38.7
SPLP - Metals									
Antimony	UG/L	7.85	8.12	11.7	22.5	<0.378	<0.378	<0.378	<0.378
Arsenic	UG/L	9.26 J	7.48	7.66	9.45	1.56	0.729 J	2.39	3.26
Barium	UG/L	90.0 J	125	143	20.2	14.5	14.0	15.9	18.3
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	4,030	3,630	3,760	5,110	<30.3	<30.3	<30.3	<30.3
Cadmium	UG/L	<0.125	<0.125	<0.125	0.392 J	0.185 J	0.286 J	0.473 J	1.20
Calcium	UG/L	105,000 J	49,100	54,200	57,900	553,000	554,000	545,000	550,000
Chromium	UG/L	2.15 J	1.68 J	2.15	6.86	<1.53	1.88 J	<1.53	1.55 J
Cobalt	UG/L	<0.0750	<0.0750	<0.0750	0.420 J	0.212 J	0.210 J	0.187 J	0.239 J
Copper	UG/L	0.691 J	1.56 J	1.30 J	4.97	0.876 J	1.09 J	0.812 J	1.41 J
Iron	UG/L	<14.1	<14.1	<14.1	461	<14.1	<14.1	<14.1	<14.1
Lead	UG/L	<0.128	<0.128	<0.128	1.60	<0.128	<0.128	<0.128	<0.128
Lithium	UG/L	11.6 J	10.5	10.6	<3.14	<3.14	<3.14	<3.14	<3.14
Manganese	UG/L	<1.35	<1.35	<1.35	10.3	1.58 J	<1.35	2.70 J	28.1
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	13.0	16.2	17.4	1,380	0.940 J	3.62 J	0.711 J	2.22 J
Nickel	UG/L	<0.312	<0.312	<0.312	1.14	0.481 J	0.328 J	0.463 J	1.59
Selenium	UG/L	12.0 J	14.2	5.62	7.91	4.39 J	3.40 J	4.80 J	7.25
Silver	UG/L	0.129 J	<0.121	<0.121	0.234 J	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	0.278 J	0.346 J	0.210 J	<0.128	<0.128	<0.128	<0.128	<0.128
Vanadium	UG/L	132	160	116	104	1.80	1.43	1.70	1.72
Zinc	UG/L	<3.22	<3.22	<3.22	14.4	<3.22	<3.22	<3.22	<3.22
Anions									
Chloride	MG/KG	30.0	16.8	20.3	82.6	<5.20	12.3 J	<5.17	<5.54
Fluoride	MG/KG	1.54	1.27 J	<0.993	4.64	35.8	8.06	10.9	37.5
Sulfate	MG/KG	2,260	983	1,130	1,140	19,100	17,800	18,800	20,400
General Chemistry									
pH (lab)	SU	9.3	9.6	10.1	8.7	7.8	7.7	7.7	7.7
Total Organic Carbon	MG/KG	1,150 UJ	4,750 J	<1,120	10,800	1,890	3,390 J	1,340 J	1,760

See notes on last page.

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TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW02	CUF-TW03						
Sample Date		6-Mar-19	13-Feb-19	13-Feb-19	13-Feb-19	13-Feb-19	13-Feb-19	13-Feb-19	13-Feb-19
Sample ID		CUF-CCR-TW02-21.5/23.3-20190306	CUF-CCR-TW03-1.5/3.5-20190213	CUF-CCR-TW03-6.5/8.5-20190213	CUF-CCR-TW03-11.5/13.5-20190213	CUF-CCR-TW03-16.5/18.5-20190213	CUF-CCR-TW03-21.0/23.0-20190213	CUF-CCR-TW03-26.5/28.5-20190213	CUF-CCR-TW03-31.5/33.5-20190213
Sample Depth		21.5 - 23.3 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft	16.5 - 18.5 ft	21 - 23 ft	26.5 - 28.5 ft	31.5 - 33.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units								
Total Metals									
Antimony	MG/KG	0.118 J	0.309 J	0.777 J	0.122 J	0.108 J	0.104 J	5.21 J	4.74 J
Arsenic	MG/KG	3.08	1.63	4.85	0.327	0.380	0.287	54.0	46.9
Barium	MG/KG	26.5	78.9	27.8	8.54	15.2	8.33	348	400
Beryllium	MG/KG	0.0615 J	0.0994 J	0.336	0.0275 J	0.0319 J	0.0344 J	3.06	2.84
Boron	MG/KG	<2.03	9.19 J	20.1 J	1.90 UJ	1.93 UJ	4.72 J	488 J	453 J
Cadmium	MG/KG	0.621	0.432	0.588	0.220	0.169	0.142 J	3.86	3.44
Calcium	MG/KG	248,000	206,000	195,000	216,000	220,000	220,000	20,800	19,400
Chromium	MG/KG	7.12	10.5	15.7	1.93	3.08	2.28	102	96.2
Cobalt	MG/KG	0.208	0.393	1.07	0.122	0.137	0.118	9.63	8.75
Copper	MG/KG	5.78	3.62	4.75	0.700	0.830	1.07	34.7	31.1
Iron	MG/KG	915	1,910	4,680	304	365	360	36,400	35,400
Lead	MG/KG	4.63	3.09	10.8	0.422 U*	0.646 U*	0.463 U*	32.1	27.5
Lithium	MG/KG	2.26	1.75	4.02	0.937	0.491 J	<0.413	9.46	8.04
Manganese	MG/KG	32.2	25.8	38.5	7.39	10.8	5.94	184	181
Mercury	MG/KG	1.55	1.02	0.823	0.133	0.150	0.235	<0.0205	<0.0177
Molybdenum	MG/KG	1.15	1.68	2.04	0.390 J	0.538 J	0.414 J	16.6	15.9
Nickel	MG/KG	1.60	2.16	4.12	0.481	0.673	0.549	37.2	33.2
Selenium	MG/KG	4.72	7.39	2.99	1.27	1.76	2.60	6.93	7.38
Silver	MG/KG	<0.0407	1.79	2.19	2.13	0.276 U*	0.181 U*	0.593	0.481
Thallium	MG/KG	0.0567 J	0.0792 J	0.645	<0.0353	<0.0358	<0.0374	7.52	6.63
Vanadium	MG/KG	3.98	6.12	30.5	1.38	1.78	1.63	349	348
Zinc	MG/KG	34.1	37.2	36.7	11.2	11.8	8.98	141	127
SPLP - Metals									
Antimony	UG/L	<0.378	<0.378	1.43 U*	<0.378	<0.378	1.06 U*	8.10	9.18
Arsenic	UG/L	0.778 J	0.395 U*	2.75	0.420 U*	0.551 U*	1.07 U*	5.06	6.70
Barium	UG/L	20.6	23.6	23.1	15.1	15.7	17.4	74.9	87.7
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	<30.3	236 U*	315 U*	109 U*	175 U*	212 U*	1,770 J	1,340 J
Cadmium	UG/L	2.38	0.312 J	<0.125	0.213 J	0.234 J	0.546 J	<0.125	<0.125
Calcium	UG/L	571,000	592,000	600,000	606,000	601,000	616,000	62,600	57,800
Chromium	UG/L	1.59 J	<1.53	<1.53	<1.53	1.84 J	1.90 J	2.54	2.74
Cobalt	UG/L	0.724	0.294 U*	0.380 U*	0.280 U*	0.455 U*	1.10 U*	0.112 U*	0.112 U*
Copper	UG/L	1.60 J	4.40 U*	42.5 J	25.0 J	44.2 J	48.6 J	5.54 U*	12.0 J
Iron	UG/L	<14.1	19.5 J	31.8 J	<14.1	16.6 J	26.1 J	<14.1	24.1 J
Lead	UG/L	<0.128	<0.128	0.192 U*	0.135 U*	0.267 U*	0.831 U*	0.145 U*	0.153 U*
Lithium	UG/L	<3.14	<3.14	<3.14	<3.14	<3.14	4.33 J	7.95 J	11.0 J
Manganese	UG/L	1,160	21.5	2.62 J	2.31 J	3.39 J	35.1	<1.35	<1.35
Mercury	UG/L	<0.101	0.127 J	0.106 J	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	4.76 J	3.54 U*	5.40	1.33 U*	3.10 U*	5.93	36.8	48.1
Nickel	UG/L	2.77	1.35	3.48	2.28	3.83	5.22	0.624 J	1.15
Selenium	UG/L	22.0	5.53 J	4.35 J	3.66 J	4.44 J	7.51 J	11.1 J	15.5 J
Silver	UG/L	<0.121	1.46	0.172 J	0.131 J	0.181 J	<0.121	<0.121	<0.121
Thallium	UG/L	0.156 J	<0.128	0.312 U*	<0.128	0.224 U*	0.856 U*	0.300 U*	0.394 U*
Vanadium	UG/L	3.32	1.67 U*	15.6	1.87 U*	2.18 U*	2.92 U*	133	197
Zinc	UG/L	<3.22	5.13 U*	11.4 U*	6.25 U*	9.90 U*	8.78 U*	5.35 U*	6.58 U*
Anions									
Chloride	MG/KG	<5.63	119	22.4	7.43 J	<5.79	<5.56	217	495
Fluoride	MG/KG	24.7 J	40.4	15.2	7.52	21.4	16.3	1.64	1.80
Sulfate	MG/KG	20,300	19,200	19,900	18,100	21,200	20,300	2,340	1,530
General Chemistry									
pH (lab)	SU	7.7	7.7	7.9	7.6	7.8	7.9	9.8	10
Total Organic Carbon	MG/KG	1,450 J	43,500	5,270	<1,000	<1,120	<1,110	10,400	4,170

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW03						
Sample Date		13-Feb-19	13-Feb-19	13-Feb-19	14-Feb-19	14-Feb-19	14-Feb-19	14-Feb-19
Sample ID		CUF-CCR-TW03-36.5/39.5-20190213	CUF-CCR-TW03-41.0/44.0-20190213	CUF-CCR-DUP05-20190213	CUF-CCR-TW03-46.5/48.5-20190214	CUF-CCR-TW03-51.5/53.5-20190214	CUF-CCR-TW03-56.5/58.5-20190214	CUF-CCR-TW03-61.5/63.5-20190214
Sample Depth		36.5 - 39.5 ft	41 - 44 ft	41 - 44 ft	46.5 - 48.5 ft	51.5 - 53.5 ft	56.5 - 58.5 ft	61.5 - 63.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Total Metals								
Antimony	MG/KG	3.60 J	4.18 J	4.04 J	4.12	4.99	4.32	4.25
Arsenic	MG/KG	59.8	48.4	50.0	47.8	44.1	38.0	43.0
Barium	MG/KG	468	473	502	714	941	880	739
Beryllium	MG/KG	3.18	2.95	3.19	1.81	1.69	1.54	1.22
Boron	MG/KG	492 J	442 J	483 J	394	369	349	291
Cadmium	MG/KG	1.75	1.74	1.82	2.99	2.57	2.68	2.87
Calcium	MG/KG	21,200	19,400	20,700	24,600	27,900	27,500	23,500
Chromium	MG/KG	95.6	92.9	96.7	66.3	61.2	53.5	48.3
Cobalt	MG/KG	10.4	10.1	10.4	4.39	4.62	4.27	3.62
Copper	MG/KG	32.8	31.3	32.2	20.2	19.6	17.9	15.8
Iron	MG/KG	39,500	40,400	42,900	23,100	29,900	29,000	25,700
Lead	MG/KG	27.3	25.5	26.3	27.8	26.0	23.8	19.4
Lithium	MG/KG	10.5	9.14	9.74	7.80	8.04	7.88	5.49
Manganese	MG/KG	163	165	175	208	232	233	228
Mercury	MG/KG	0.0238 J	<0.0173	<0.0200	<0.0184	<0.0203	<0.0212	<0.0219
Molybdenum	MG/KG	18.6	15.7	17.1	14.9	16.5	18.2	19.0
Nickel	MG/KG	36.4	36.1	36.9	18.6	18.8	17.9	16.6
Selenium	MG/KG	6.22	7.97	8.27	3.72	3.68	4.42	4.57
Silver	MG/KG	0.850	0.426 J	1.02 J	0.0796 J	0.0746 J	0.0677 J	0.0527 J
Thallium	MG/KG	7.98	7.29	7.53	5.35	4.98	4.62	4.45
Vanadium	MG/KG	275	279	297	200	183	154	137
Zinc	MG/KG	105	101	102	110	107	110	97.4
SPLP - Metals								
Antimony	UG/L	7.57	16.3 J	10.2 J	6.31	8.63	7.36	12.5
Arsenic	UG/L	4.96	11.8 J	6.75 J	5.59	6.84	7.25	8.74
Barium	UG/L	92.0	105	82.2	69.1	63.1	43.6	65.0
Beryllium	UG/L	<0.155	0.699 J	<0.155	<0.155	<0.155	0.168 J	<0.155
Boron	UG/L	1,580 J	2,680 J	1,800 J	847	776	686	761
Cadmium	UG/L	<0.125	0.630 J	0.139 J	<0.125	<0.125	0.133 J	0.150 J
Calcium	UG/L	45,800	49,900	63,400	57,400	45,100	39,700	38,100
Chromium	UG/L	3.32	7.11	3.95	2.42	2.04	2.63	2.48
Cobalt	UG/L	0.162 U*	5.52 J	1.03 U*	<0.0750	<0.0750	<0.0750	<0.0750
Copper	UG/L	24.4 J	287 J	69.5 J	<0.627	<0.627	0.862 J	1.13 J
Iron	UG/L	151	236 J	36.4 J	<14.1	<14.1	38.2 J	14.4 J
Lead	UG/L	0.404 U*	5.90 J	1.04 U*	<0.128	<0.128	0.218 J	<0.128
Lithium	UG/L	11.5 J	24.6 J	14.9 J	8.88	9.31	11.7	7.90
Manganese	UG/L	1.62 J	12.9 J	2.76 J	<1.35	<1.35	<1.35	<1.35
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	54.2	88.9	74.4	108	158	263	337
Nickel	UG/L	2.20	26.4 J	6.32 J	<0.312	<0.312	1.65	2.05
Selenium	UG/L	7.60 J	41.8 J	32.4 J	5.84	10.9	18.6	22.0
Silver	UG/L	<0.121	0.587 J	0.162 J	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	0.138 U*	5.43 J	1.39 U*	0.254 J	0.410 J	0.301 J	0.369 J
Vanadium	UG/L	139	281	271	78.8	95.9	108	84.8
Zinc	UG/L	7.22 U*	68.2 J	9.00 U*	<3.22	<3.22	<3.22	<3.22
Anions								
Chloride	MG/KG	430	229	276	129	75.8	23.8	11.3 J
Fluoride	MG/KG	1.53	1.21 J	1.69	1.48	<0.944	1.13 J	1.40 J
Sulfate	MG/KG	737	863 J	1,510 J	4,530 J	617	942	1,080
General Chemistry								
pH (lab)	SU	10.3	9.9	10.3	10.7	11.5	11.3	11.0
Total Organic Carbon	MG/KG	4,350 J	7,260	8,310	4,510 J	5,410 J	8,230 J	10,600 J

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW04					CUF-TW05		
Sample Date		6-Mar-19	6-Mar-19	6-Mar-19	7-Mar-19	7-Mar-19	19-Feb-19	20-Feb-19	20-Feb-19
Sample ID		CUF-CCR-TW04-1.5/3.5-20190306	CUF-CCR-TW04-6.0/7.9-20190306	CUF-CCR-TW04-10.5/12.8-20190306	CUF-CCR-TW04-16.5/18.5-20190307	CUF-CCR-TW04-21.5/23.0-20190307	CUF-CCR-TW05-1.5/3.5-20190219	CUF-CCR-TW05-6.5/8.5-20190220	CUF-CCR-TW05-11.5/13.5-20190220
Sample Depth		1.5 - 3.5 ft	6 - 7.9 ft	10.5 - 12.8 ft	16.5 - 18.5 ft	21.5 - 23 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Validated	Validated	Final-Verified	Final-Verified	Final-Verified
Total Metals									
Antimony	MG/KG	<0.0865	0.172 J	<0.0864	0.132 J	0.130 J	0.159 J	0.170 J	0.421
Arsenic	MG/KG	2.83	4.32	2.31	0.568	0.368	2.27	1.06	2.70
Barium	MG/KG	16.7	21.3	8.59	16.1	11.6	34.9	34.4	128
Beryllium	MG/KG	0.0543 J	0.106 J	0.0282 J	0.0678 U*	0.0702 U*	0.0753 J	0.0931 J	0.169
Boron	MG/KG	<1.88	4.68 J	<1.88	<1.99	2.17 J	<2.11	<1.91	4.70 J
Cadmium	MG/KG	0.182	0.356	0.135 J	0.193	0.182	0.349	0.407	1.08
Calcium	MG/KG	254,000	243,000	269,000	274,000 J	249,000	276,000	190,000	175,000
Chromium	MG/KG	3.52	9.61	1.29	3.41	3.07	6.64	5.63	18.2
Cobalt	MG/KG	0.156	0.390	0.0513 J	0.0952	0.0761	0.214	0.246	0.660
Copper	MG/KG	1.32	3.45	0.583	1.48	0.875	1.74	2.32	7.00
Iron	MG/KG	633	1,570	181	535	564	1,090	1,090	3,610
Lead	MG/KG	1.43	3.32	0.478	1.07	0.641	2.30	2.06	4.44
Lithium	MG/KG	1.18	4.54	0.555 J	1.44	0.965	1.92	2.43	8.31
Manganese	MG/KG	22.3	28.8	4.50	13.4	7.31	47.4	26.0	51.8
Mercury	MG/KG	0.162	0.837	0.237	0.373	0.694	0.813	0.649	2.75
Molybdenum	MG/KG	0.701	1.49	0.310 J	0.741	0.481 U*	1.21	1.07	2.83
Nickel	MG/KG	0.791	1.90	0.377	0.793	0.790	1.27	2.03	6.65
Selenium	MG/KG	2.19	2.60	1.30	2.11 J	3.71 J	1.62	2.73	9.53
Silver	MG/KG	<0.0377	<0.0382	<0.0376	<0.0397	<0.0384	<0.0423	<0.0382	<0.0420
Thallium	MG/KG	0.0459 J	0.111 J	<0.0348	<0.0368	<0.0355	0.0748 J	0.0672 J	0.171
Vanadium	MG/KG	2.56	7.56	1.12	2.46	2.12	3.49	4.36	12.1
Zinc	MG/KG	15.9	30.3	7.69	16.5 J	13.8 J	25.1	29.7	80.3
SPLP - Metals									
Antimony	UG/L	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378
Arsenic	UG/L	0.359 J	0.819 J	1.14	1.28	0.435 J	0.347	<0.323	<0.323
Barium	UG/L	16.4	20.9	18.3	17.2	14.6	16.2	19.5	13.6
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	<30.3	107	<30.3	<30.3	52.9 J	<30.3	<30.3	30.4
Cadmium	UG/L	0.194 J	0.366 J	0.151 J	0.274 J	0.953 J	0.177	0.347	1.26
Calcium	UG/L	545,000	564,000	551,000	563,000 J	574,000 J	592,000	612,000	585,000
Chromium	UG/L	<1.53	1.59 J	1.88 J	1.55 J	1.69 J	<1.53	<1.53	<1.53
Cobalt	UG/L	0.203 J	0.206 J	0.200 J	0.211 J	0.389 J	0.329	0.233	0.267
Copper	UG/L	0.930 J	0.894 J	0.834 J	0.849 J	0.922 J	0.940	0.866	1.72
Iron	UG/L	<14.1	<14.1	<14.1	<14.1	<14.1	34.3	<14.1	14.4
Lead	UG/L	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	UG/L	<3.14	<3.14	<3.14	<3.14	<3.14	<3.14	<3.14	<3.14
Manganese	UG/L	3.33 J	9.44	1.36 J	5.45	114	1.61	1.94	8.94
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	1.03 J	2.11 J	0.724 J	1.40 J	1.99 J	0.749	1.21	8.70
Nickel	UG/L	0.378 J	0.564 J	0.446 J	0.471 J	1.78	0.479	0.536	2.69
Selenium	UG/L	4.86 J	5.44	4.61 J	7.53	13.2	4.25	3.30	9.29
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	0.162	<0.121	<0.121
Thallium	UG/L	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Vanadium	UG/L	1.56	2.53	1.80	1.80	1.96	1.38	1.57	1.25
Zinc	UG/L	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22
Anions									
Chloride	MG/KG	<5.25	68.4	37.5	<5.87	<5.54	<6.03	<5.61	<5.69
Fluoride	MG/KG	30.5 J	28.1 J	8.61 J	27.6	18.0	18.2	19.2	45.0
Sulfate	MG/KG	19,900	21,300	18,900	22,000	20,800	22,300	21,100	21,100
General Chemistry									
pH (lab)	SU	7.7	7.6	7.6	7.6	7.7	7.6	7.6	7.5
Total Organic Carbon	MG/KG	1,100 J	1,540	1,150 J	1,400 J	1,330 J	<1,170	<1,090	1,110 J

See notes on last page.

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TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW05							
Sample Date		20-Feb-19	20-Feb-19	20-Feb-19	20-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID		CUF-CCR-TW05-16.5/18.5-20190220	CUF-CCR-TW05-21.5/23.5-20190220	CUF-CCR-TW05-26.5/28.5-20190220	CUF-CCR-TW05-31.5/33.5-20190220	CUF-CCR-TW05-36.5/38.5-20190221	CUF-CCR-TW05-41.5/44.0-20190221	CUF-CCR-TW05-46.0/49.0-20190221	CUF-CCR-DUP06-20190221
Sample Depth		16.5 - 18.5 ft	21.5 - 23.5 ft	26.5 - 28.5 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	41.5 - 44 ft	46 - 49 ft	46 - 49 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review	**Units**	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Total Metals									
Antimony	MG/KG	<0.0908	4.99	5.61	5.22	3.75	3.48	4.33	4.55
Arsenic	MG/KG	0.316	38.3	41.5	63.5	54.0	60.5	44.3	41.5
Barium	MG/KG	10.3	299	316	397	361	336	1,190	1,290
Beryllium	MG/KG	0.0379 J	3.32	3.39	3.40	4.30	3.60	2.19	1.89
Boron	MG/KG	<1.98	345	351	587	654	412	563	599
Cadmium	MG/KG	0.350	3.18	3.23	2.42	1.79	1.66	2.98	2.98
Calcium	MG/KG	193,000	14,400	12,400	17,000	16,100	12,700	25,000	28,200
Chromium	MG/KG	1.85	76.2	76.1	64.5	78.8 J	71.9 J	63.5 J	61.5 J
Cobalt	MG/KG	0.0531 J	8.70	8.28	8.56	10.4	10.1	5.75	4.87
Copper	MG/KG	1.60	29.0	29.5	30.0	35.0	32.0	22.4	21.1
Iron	MG/KG	333	39,100	30,000	27,000	31,500	33,200	30,500	28,700
Lead	MG/KG	0.324	26.9	28.5	30.9	37.3	33.1	28.6	26.8
Lithium	MG/KG	0.804	10.8	10.9	10.5	14.9 J	14.6 J	8.95 J	7.51 J
Manganese	MG/KG	4.72	180	176	184	131	118	219	235
Mercury	MG/KG	0.208	0.0553	<0.0235	<0.0210	<0.0196	<0.0182	<0.0183	<0.0184
Molybdenum	MG/KG	0.277 J	8.27	8.66	12.4	15.2	13.0	11.6	11.8
Nickel	MG/KG	0.880	33.1	31.5	30.9	36.9	33.8	22.0	19.2
Selenium	MG/KG	3.50	7.50	6.02	7.99	6.59	7.38	3.64	3.61
Silver	MG/KG	<0.0395	0.0925 J	0.103 J	0.0875 J	0.0950 J	0.0957 J	0.0599 J	0.0587 J
Thallium	MG/KG	<0.0366	5.65	6.06	8.11	5.68	4.58	4.62	4.66
Vanadium	MG/KG	1.76	254	269	222	215 J	212 J	181 J	176 J
Zinc	MG/KG	11.2	127	122	117	119	106	114	108
SPLP - Metals									
Antimony	UG/L	<0.378	6.61	7.38	8.62	5.82	3.35	5.50	7.87
Arsenic	UG/L	<0.323	15.8	16.0	14.4	3.36	7.86	10.3	9.96
Barium	UG/L	11.7	43.7	73.2	69.1	97.7	117	103	120
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	<30.3	1,160	1,280	2,900	2,760 J	2,140 J	2,360 J	2,490 J
Cadmium	UG/L	1.26	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Calcium	UG/L	579,000	431,000	207,000	111,000	55,300 J	34,000 J	47,900 J	56,600 J
Chromium	UG/L	<1.53	<1.53	<1.53	2.64	2.35	1.96 J	3.61	2.94
Cobalt	UG/L	0.382	0.144	0.0940	<0.0750	<0.0750	<0.0750	0.121 J	<0.0750
Copper	UG/L	1.04	0.746	0.653	<0.627	<0.627	<0.627	0.890 J	<0.627
Iron	UG/L	<14.1	<14.1	<14.1	15.9	16.0 J	<14.1	90.0	21.2 J
Lead	UG/L	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	0.175 J	<0.128
Lithium	UG/L	<3.14	14.2	13.0	5.05	3.15 J	3.95 J	4.29 J	4.13 J
Manganese	UG/L	5.80	12.1	5.68	<1.35	<1.35	<1.35	<1.35	<1.35
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	2.17	5.14	5.09	12.4	29.7	17.8	22.8	25.0
Nickel	UG/L	2.78	<0.312	<0.312	<0.312	<0.312	<0.312	<0.312	<0.312
Selenium	UG/L	26.5	14.6	14.3	12.7	6.83 J	10.8 J	8.74 J	8.59 J
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	<0.128	1.38	1.30	<0.128	0.439 J	0.284 J	<0.128	<0.128
Vanadium	UG/L	1.22	123	173	185	82.6	206	196	158
Zinc	UG/L	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22
Anions									
Chloride	MG/KG	<5.84	19.5	29.8	55.6	107	133	164	166
Fluoride	MG/KG	19.2	8.37	5.15	2.63	<0.918	1.27 J	<0.971	<0.979
Sulfate	MG/KG	21,900	15,000	7,660	2,640	1,070	1,020	1,200	1,120
General Chemistry									
pH (lab)	SU	7.6	8.0	8.4	9.5	9.5	9.7	9.6	10
Total Organic Carbon	MG/KG	<1,140	<1,060	14,700	19,800 J	6,650	4,530	4,090	1,090 UJ

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW05		CUF-TW06				
Sample Date		21-Feb-19	21-Feb-19	7-Mar-19	7-Mar-19	7-Mar-19	7-Mar-19	7-Mar-19
Sample ID		CUF-CCR-TW05-51.5/53.5-20190221	CUF-CCR-TW05-56.5/58.5-20190221	CUF-CCR-TW06-1.0/4.0-20190307	CUF-CCR-DUP07-20190307	CUF-CCR-TW06-6.5/8.5-20190307	CUF-CCR-TW06-12.5/14.2-20190307	CUF-CCR-TW06-16.5/19.0-20190307
Sample Depth		51.5 - 53.5 ft	56.5 - 58.5 ft	1 - 4 ft	1 - 4 ft	6.5 - 8.5 ft	12.5 - 14.2 ft	16.5 - 19 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Validated	Validated	Validated	Validated	Validated
	Units							
Total Metals								
Antimony	MG/KG	3.24	3.66	0.126 J	0.125 J	0.221 J	0.649	0.370
Arsenic	MG/KG	32.3	40.3	0.884	1.05	1.14	3.36	2.27
Barium	MG/KG	724	557	31.2	39.2	40.7	245	124
Beryllium	MG/KG	1.51	1.71	0.109 U*	0.114 U*	0.128 U*	0.328	0.192
Boron	MG/KG	260	466	<1.82	2.14 J	<1.95	7.46 J	4.12 J
Cadmium	MG/KG	1.87	2.11	0.282	0.350	0.412	1.53	0.960
Calcium	MG/KG	21,300	22,400	248,000	270,000	264,000	235,000 J	264,000
Chromium	MG/KG	66.7 J	62.7 J	7.28	7.59	7.83	33.0	18.2
Cobalt	MG/KG	4.34	4.82	0.211	0.290	0.397	0.935	0.463
Copper	MG/KG	26.0	19.1	2.04	2.29	3.20	8.71	5.27
Iron	MG/KG	31,900	40,000	1,170	1,340	1,310	5,520	3,190
Lead	MG/KG	20.0	23.3	1.80	2.12	2.23	7.16	3.62
Lithium	MG/KG	11.2 J	6.42 J	2.26	2.36	2.96	10.1	4.28
Manganese	MG/KG	222	231	32.8	40.7	30.8	76.5	27.8
Mercury	MG/KG	0.0712	<0.0193	0.975	0.881	0.991	1.40	0.209
Molybdenum	MG/KG	11.0	8.57	0.872	1.11	1.06	4.23	2.74
Nickel	MG/KG	20.6	21.6	1.59	1.92	2.23	11.3	4.31
Selenium	MG/KG	18.4	3.43	2.09 J	1.86 J	2.63 J	14.0 J	21.9 J
Silver	MG/KG	0.0526 J	0.0478 J	<0.0365	<0.0395	<0.0389	<0.0416	<0.0399
Thallium	MG/KG	3.66	4.63	<0.0338	<0.0366	0.0457 J	0.258	0.0874 J
Vanadium	MG/KG	136 J	133 J	3.71	4.18	5.23	20.0	11.2
Zinc	MG/KG	83.6	129	28.0 J	33.1 J	35.7 J	117 J	70.6 J
SPLP - Metals								
Antimony	UG/L	1.61 J	4.59	<0.378	<0.378	<0.378	<0.378	<0.378
Arsenic	UG/L	4.48	7.26	0.674 J	0.419 J	0.452 J	0.420 J	1.39
Barium	UG/L	46.4	44.4	15.2	17.8	15.6	14.0	13.5
Beryllium	UG/L	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Boron	UG/L	1,680 J	929 J	<30.3	<30.3	<30.3	70.0 J	<30.3
Cadmium	UG/L	<0.125	<0.125	0.134 J	0.157 J	0.333 J	0.640 J	1.30
Calcium	UG/L	135,000 J	52,400 J	541,000 J	526,000 J	521,000 J	533,000 J	527,000 J
Chromium	UG/L	2.11	2.59	1.96 J	<1.53	1.82 J	1.59 J	<1.53
Cobalt	UG/L	<0.0750	<0.0750	0.198 J	0.214 J	0.229 J	0.253 J	0.338 J
Copper	UG/L	0.897 J	<0.627	0.857 J	0.963 J	1.61 J	1.48 J	1.01 J
Iron	UG/L	17.2 J	<14.1	<14.1	<14.1	<14.1	<14.1	<14.1
Lead	UG/L	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128	<0.128
Lithium	UG/L	6.79	<3.14	<3.14	<3.14	4.45 J	<3.14	<3.14
Manganese	UG/L	<1.35	<1.35	<1.35	<1.35	<1.35	8.88	21.1
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	30.7	27.5	0.650 J	0.840 J	1.33 J	6.31	2.90 J
Nickel	UG/L	<0.312	<0.312	0.390 J	<0.312	0.783 J	1.11	2.19
Selenium	UG/L	132 J	13.7 J	4.75 J	4.66 J	3.51 J	7.36	26.4
Silver	UG/L	<0.121	<0.121	0.121 UJ	3.80 J	3.15	1.43	0.731 J
Thallium	UG/L	<0.128	0.595 J	<0.128	<0.128	<0.128	<0.128	<0.128
Vanadium	UG/L	157	112	1.90	2.11	1.71	1.70	1.76
Zinc	UG/L	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22	<3.22
Anions								
Chloride	MG/KG	169	333	<5.41	<5.43	<5.63	<5.76	<5.94
Fluoride	MG/KG	1.42 J	1.26 J	18.2 J	16.2 J	20.7 J	42.8 J	19.4 J
Sulfate	MG/KG	11,800	1,590	19,600	19,700	19,200	21,200	21,700
General Chemistry								
pH (lab)	SU	9.9	10.3	7.7	7.7	7.8	7.7	7.6
Total Organic Carbon	MG/KG	34,100	2,720 J	1,490	1,510	1,280 J	4,490	1,340 J

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW07							
Sample Date		13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18
Sample ID		CUF-CCR-TW07-1.5/3.5-20181213	CUF-CCR-TW07-6.0/8.0-20181213	CUF-CCR-TW07-10.5/12.5-20181213	CUF-CCR-TW07-16.5/18.5-20181213	CUF-CCR-TW07-21.0/23.4-20181213	CUF-CCR-TW07-27.0/29.0-20181213	CUF-CCR-TW07-31.5/33.5-20181213	CUF-CCR-TW07-36.5/38.5-20181213
Sample Depth		1.5 - 3.5 ft	6 - 8 ft	10.5 - 12.5 ft	16.5 - 18.5 ft	21 - 23.4 ft	27 - 29 ft	31.5 - 33.5 ft	36.5 - 38.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Total Metals									
Antimony	MG/KG	3.30	3.69	1.11	4.18	2.64	5.13	4.11	0.884
Arsenic	MG/KG	27.4	39.2	12.8	46.9	18.6	56.6	27.5	7.57
Barium	MG/KG	230	315	91.3	308	90.0	174	210	93.7
Beryllium	MG/KG	2.98	3.69	1.25	3.69	1.94	2.79	1.89	0.970
Boron	MG/KG	425	537	115	575	157	532	379	86.2
Cadmium	MG/KG	2.93	2.48	0.653	3.23	2.35	4.45	3.20	0.511
Calcium	MG/KG	25,400	31,400	9,990	30,800	18,300	16,100	15,700	9,060
Chromium	MG/KG	66.0	72.8	23.4	72.7	37.2	61.7	46.5	18.5
Cobalt	MG/KG	6.99	9.61	3.20	8.54	5.07	7.13	4.94	2.52
Copper	MG/KG	25.9	33.3	10.9	32.4	14.1	25.9	16.7	8.00
Iron	MG/KG	26,100	38,400	14,500	35,400	21,700	33,400	25,300	15,900
Lead	MG/KG	62.4	100	26.0	120	41.5	60.4	22.1	6.33
Lithium	MG/KG	9.88	12.0	6.70	14.2	7.73	13.4	8.63	5.76
Manganese	MG/KG	92.4	110	49.6	114	83.5	114	110	53.0
Mercury	MG/KG	<0.0168	0.0644	0.0274 J	0.0411	0.151	0.0242 J	<0.0158	<0.0148
Molybdenum	MG/KG	58.5	45.9	11.1	47.6	14.5	28.9	46.4	23.6
Nickel	MG/KG	25.7	31.0	11.8	29.0	19.0	29.8	22.3	11.5
Selenium	MG/KG	7.06	7.96	1.51	11.3	4.21	9.62	5.14	0.494 J
Silver	MG/KG	0.135	0.150	0.0419 J	0.150	0.0599 J	0.107 J	0.0775 J	0.0228 J
Thallium	MG/KG	4.37	4.06	0.687	5.36	2.40	5.78	3.55	0.951
Vanadium	MG/KG	141	174	45.6	178	131	211	213	56.5
Zinc	MG/KG	139	145	38.1	152	88.7	199	122	34.5
SPLP - Metals									
Antimony	UG/L	6.86	6.55	8.52	9.31	8.05	9.35	14.7	12.1
Arsenic	UG/L	6.33	7.64	11.8	7.9	9.78	12.4	13	2.41
Barium	UG/L	65.6	46.3	20.6	86	45.5	50.8	37.3	24.6
Beryllium	UG/L	<0.057	<0.057	<0.057	<0.057	<0.057	<0.057	<0.057	<0.057
Boron	UG/L	1,750	1,250	844	1,760	1,250	1,800	2,200	489
Cadmium	UG/L	<0.125	0.623 J	<0.125	0.142 J	<0.125	54	<0.125	4.7
Calcium	UG/L	99,700	60,600	53,600	90,600	170,000	194,000	74,100	39,800
Chromium	UG/L	43.6	16	11.2	8.99	6.23	7.18	7.49	5.89
Cobalt	UG/L	0.184 J	0.415 J	0.374 J	0.348 J	0.095 J	3.8	<0.075	3.41
Copper	UG/L	1.43 J	3.06	2.75	3.57	2.03	7.98	<1.3	12.5
Iron	UG/L	122	183	115	327	85.8	313	69.2	419
Lead	UG/L	0.719 J	1.08	1.59	2.21	0.565 J	2.54	0.211 J	2.46
Lithium	UG/L	86	38.6	36.4	72.7	50.8	56.6	43.2	23.3
Manganese	UG/L	<1.35	11.9	2.63 J	3.84 J	<1.35	15.1	2.65 J	50.5
Mercury	UG/L	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	UG/L	334	247	137	271	167	77	85.8	139
Nickel	UG/L	0.69 J	0.968 J	0.844 J	2.41	0.443 J	6.03	0.413 J	3.59
Selenium	UG/L	6.42	7.15	9.37	14.7	19.9	21.7	15.2	1.24 J
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	0.127 J	<0.063	<0.063	0.246 J	<0.063	0.232 J	<0.063	0.107 J
Vanadium	UG/L	196	173	104	240	227	205	344	13.5
Zinc	UG/L	4.83 U*	25.1	6.08 U*	13 U*	4.43 U*	38.7	3.69 U*	73.2
Anions									
Chloride	MG/KG	506	157	185	590	218	334	271	76.9
Fluoride	MG/KG	2.74 J	3.69 J	2.03 J	4.19 J	3.60 J	0.973 U*	0.749 UJ	0.727 UJ
Sulfate	MG/KG	3,530	1,460	1,460	2,890	11,900	6,580	5,070	2,410
General Chemistry									
pH (lab)	SU	9.8	10.8	10.4	10.4	9.2	10	9.9	7.6
Total Organic Carbon	MG/KG	7,280 J	8,840 J	7,100 J	6,930	10,700 J	8,260 J	8,290 J	12,000

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW07							
Sample Date		13-Dec-18	17-Dec-18	17-Dec-18	17-Dec-18	18-Dec-18	18-Dec-18	18-Dec-18	18-Dec-18
Sample ID		CUF-CCR-TW07-41.5/43.5-20181213	CUF-CCR-TW07-46.5/48.5-20181217	CUF-CCR-TW07-51.5/53.5-20181217	CUF-CCR-TW07-56.5/58.5-20181217	CUF-CCR-TW07-62.0/64.0-20181218	CUF-CCR-TW07-66.0/68.5-20181218	CUF-CCR-TW07-71.5/73.5-20181218	CUF-CCR-TW07-76.5/78.5-20181218
Sample Depth		41.5 - 43.5 ft	46.5 - 48.5 ft	51.5 - 53.5 ft	56.5 - 58.5 ft	62 - 64 ft	66 - 68.5 ft	71.5 - 73.5 ft	76.5 - 78.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Validated	Validated	Validated	Validated	Validated	Validated	Validated
Total Metals									
Antimony	MG/KG	0.900	0.666	0.385	6.95	6.50	4.84	3.18	3.62 J
Arsenic	MG/KG	5.99	4.04	3.95	50.0	47.4	55.4	30.3 J	39.3 J
Barium	MG/KG	78.9	97.7	26.8	272	314	255	452	310
Beryllium	MG/KG	1.02	0.832	0.626	3.94	4.08	4.94 J	2.18 J	3.23 J
Boron	MG/KG	93.7	77.5	101	573	661	500 J	276 J	289 J
Cadmium	MG/KG	0.546	0.560	0.316	4.37	4.28	4.39	1.50	1.95 J
Calcium	MG/KG	9,460	8,960 J	16,700 J	19,100 J	21,000 J	16,700 J	21,500 J	17,000 J
Chromium	MG/KG	18.5	14.6 J	8.54 J	78.6 J	86.7 J	106 J	56.0 J	68.7 J
Cobalt	MG/KG	2.36	1.80 J	1.39 J	7.53 J	8.48 J	13.0 J	5.62 J	6.45 J
Copper	MG/KG	6.88	6.14 J	7.05 J	28.9 J	32.8 J	38.9 J	19.1 J	23.4 J
Iron	MG/KG	13,300	8,540 J	7,710 J	29,700 J	29,100 J	40,300 J	34,100 J	31,200 J
Lead	MG/KG	4.62	4.18	5.50	41.8	35.6	38.1	16.7	30.0
Lithium	MG/KG	5.25	4.77	2.16	20.0	13.8	14.5 J	9.19 J	9.76 J
Manganese	MG/KG	52.6	66.8	42.9	254	215	162	194 J	194 J
Mercury	MG/KG	<0.0169	<0.0154	<0.0150	<0.0201	<0.0190	<0.0174	<0.0181	<0.0173
Molybdenum	MG/KG	11.7	8.45	32.9	20.1	20.9	33.3	12.6 J	12.4 J
Nickel	MG/KG	10.6	7.79 J	4.97 J	31.3 J	32.5 J	46.1 J	19.9 J	22.3 J
Selenium	MG/KG	0.445 J	0.221 J	1.67	5.58	6.88	7.16	2.30 J	2.52 J
Silver	MG/KG	0.0263 J	0.0180 J	0.0339 J	0.154	0.159	0.181	0.0668 J	0.0916 J
Thallium	MG/KG	0.317	0.344	0.489	5.84	9.06	8.49	3.35	4.92
Vanadium	MG/KG	64.3	44.5 J	27.1 J	294 J	334 J	321 J	133 J	169 J
Zinc	MG/KG	34.0	27.7 J	19.1 J	150 J	147 J	149 J	87.3 J	109 J
SPLP - Metals									
Antimony	UG/L	<1.12	<1.12	<1.12	7.64	9.58	8.98	6.83	7.92
Arsenic	UG/L	3.71	4.16	2.43	12.8	10.2	12.5	8.23	13.5
Barium	UG/L	19.1	360	219	86.9	87.8	389	96.3	98.6
Beryllium	UG/L	<0.057	<0.057	<0.057	<0.057	<0.057	0.119 J	<0.057	<0.057
Boron	UG/L	346	246	234	2,350	2,000	1,810	1,210	1,120
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	0.127 J	<0.125	<0.125
Calcium	UG/L	55,400	28,800	19,500	107,000	43,100	35,900	41,300	39,300
Chromium	UG/L	5.93	2.06	1.91 J	2.8	4.44	5.99	3.67	3.59
Cobalt	UG/L	0.087 J	0.188 J	<0.075	0.08 J	<0.075	0.336 J	<0.075	<0.075
Copper	UG/L	<1.3	2.79	<1.3	6.52	<1.3	21.2	<1.3	<1.3
Iron	UG/L	217	160 J	59.4 J	92.3 J	17.9 J	1,160 J	14.1 UR	22.6 J
Lead	UG/L	0.276 J	0.281 J	0.124 J	0.316 J	<0.094	2.49	<0.094	<0.094
Lithium	UG/L	14.6	12	7.14	69.2	22.1	23.7	9.87	6.02
Manganese	UG/L	<1.35	11.4	1.67 J	<1.35	<1.35	10.3	<1.35	<1.35
Mercury	UG/L	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	UG/L	73.7	33.4	50.2	96.8	79	76.2	37.3	58.4
Nickel	UG/L	0.53 J	0.565 J	<0.312	<0.312	<0.312	1.7	<0.312	0.495 J
Selenium	UG/L	1.64 J	2.07 J	5.25 J	9.51 J	12 J	29.1 J	17.4 J	10.3 J
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	<0.063	<0.063	<0.063	1.17	1.03	0.821 J	0.164 J	0.258 J
Vanadium	UG/L	21.4	30.1	27.4	210	226	365	353	219
Zinc	UG/L	3.17 U*	37.2 J	35.5 J	25.5 J	10.2 J	210 J	11.4 J	19.7 J
Anions									
Chloride	MG/KG	155	175	53.8	137	71.3	37.3	144	219
Fluoride	MG/KG	1.04 U*	<0.744	3.39	2.42 U*	1.94 U*	1.86 U*	1.04 U*	1.44 U*
Sulfate	MG/KG	2,940	997	6,560	1,840	812	824	689	678
General Chemistry									
pH (lab)	SU	7.6	8.0	7.6	9.9	10.3	10.3	10.1	10.4
Total Organic Carbon	MG/KG	15,800	19,500	464,000	4,590 J	5,410	6,960	7,910	6,400

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW07			CUF-TW08				
Sample Date		18-Dec-18	18-Dec-18	18-Dec-18	9-Jan-19	9-Jan-19	9-Jan-19	9-Jan-19	9-Jan-19
Sample ID		CUF-CCR-TW07-85.0/87.0-20181218	CUF-CCR-TW07-91.0/94.0-20181218	CUF-CCR-DUP01-20181218	CUF-CCR-TW08-1.0/4.0-20190109	CUF-CCR-TW08-6.5/7.8-20190109	CUF-CCR-TW08-11.5/15.0-20190109	CUF-CCR-TW08-16.5/18.5-20190109	CUF-CCR-TW08-21.0/23.0-20190109
Sample Depth		85 - 87 ft	91 - 94 ft	91 - 94 ft	1 - 4 ft	6.5 - 7.8 ft	11.5 - 15 ft	16.5 - 18.5 ft	21 - 23 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Validated	Validated	Validated	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units								
Total Metals									
Antimony	MG/KG	4.34 J	4.11 J	3.91	3.28	0.983	6.36	5.01	5.82
Arsenic	MG/KG	59.9 J	72.9 J	76.7 J	31.2	7.81	58.5	39.7	50.6
Barium	MG/KG	425	496	514	352	53.9	125	106	130
Beryllium	MG/KG	2.41 J	2.79 J	3.07 J	2.85	0.787	3.29	3.10	3.40
Boron	MG/KG	368 J	300 J	329 J	384	65.8	507	390	448
Cadmium	MG/KG	3.20 J	3.59 J	4.36	3.30	0.655	4.59	3.22	3.79
Calcium	MG/KG	19,200 J	17,500 J	17,800 J	41,400 J	6,460 J	49,400 J	36,500 J	35,900 J
Chromium	MG/KG	74.4 J	70.1 J	72.4 J	70.0	14.0	71.3	59.5	71.9
Cobalt	MG/KG	5.41 J	6.67 J	6.90 J	6.55	1.76	6.74	5.73	6.84
Copper	MG/KG	23.0 J	23.7 J	25.9 J	27.0	6.40	27.9	21.9	25.6
Iron	MG/KG	26,500 J	28,600 J	24,100 J	19,400	7,320	29,500	24,000	26,400
Lead	MG/KG	28.0	33.3	39.4	61.3	19.0	186	109	116
Lithium	MG/KG	9.96 J	10.9 J	13.8 J	10.4 J	3.43 J	12.8 J	11.6 J	13.6 J
Manganese	MG/KG	197 J	185 J	189 J	90.2	27.4	142	112	112
Mercury	MG/KG	<0.0205	<0.0195	<0.0211	0.260	0.0275 J	0.0888	0.0747	0.0480
Molybdenum	MG/KG	12.9 J	13.0 J	14.7 J	61.3	13.1	52.3	50.0	57.8
Nickel	MG/KG	20.3 J	22.8 J	24.0 J	25.4	6.12	26.4	21.2	24.9
Selenium	MG/KG	3.15 J	2.92 J	2.89 J	7.03 J	1.39 J	13.7 J	8.44 J	10.2 J
Silver	MG/KG	0.112 J	0.0987 J	0.119 J	0.151	0.0191 J	0.168	0.102 J	0.136
Thallium	MG/KG	5.74	4.93	5.95	5.07	0.789	7.05	5.77	6.92
Vanadium	MG/KG	176 J	154 J	164 J	135	31.8	207	157	186
Zinc	MG/KG	128 J	145 J	148 J	134	24.8	156	107	118
SPLP - Metals									
Antimony	UG/L	10	13.6	13.3	6.17	9.38	10.1	7.79	11.9
Arsenic	UG/L	10.6	10.6 J	16.9 J	4.67	5.09	8.09	11.0	9.86
Barium	UG/L	118	117	134	63.2	23.8	9.81 J	32.2	18.1
Beryllium	UG/L	<0.057	<0.057	<0.057	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570
Boron	UG/L	1,400	1,180	1,140	1,160	882	1,050	1,090	1,140
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Calcium	UG/L	38,900	34,600	35,300	92,600	94,500	74,500	127,000	71,900
Chromium	UG/L	3.33	3.43	3.32	19.3	5.92	7.17	5.47	6.43
Cobalt	UG/L	<0.075	<0.075	<0.075	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750
Copper	UG/L	1.41 J	<1.3	<1.3	<1.30	<1.30	<1.30	<1.30	<1.30
Iron	UG/L	16.5 J	14.1 UR	15.8 J	52.9	<14.1	<14.1	<14.1	14.6 J
Lead	UG/L	<0.094	<0.094	<0.094	0.141 U*	<0.0940	0.0980 U*	<0.0940	<0.0940
Lithium	UG/L	5.19	5.02	5.46	22.0	12.3	55.6	36.3	70.3
Manganese	UG/L	<1.35	<1.35	<1.35	<1.35	<1.35	<1.35	<1.35	<1.35
Mercury	UG/L	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	UG/L	106	109 J	139 J	156	147	151	94.1	213
Nickel	UG/L	0.374 J	0.445 J	0.589 J	0.364 J	<0.312	<0.312	<0.312	<0.312
Selenium	UG/L	12.7 J	12.7 J	14 J	2.93 J	13.6	13.6	9.79	13.3
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	0.466 J	0.524 J	0.343 J	0.0910 J	0.318 J	0.242 J	0.547 J	0.913 J
Vanadium	UG/L	172	131	117	161	66.7	268	329	427
Zinc	UG/L	9.97 J	11.7 J	18.5 J	2.75 J	<2.42	<2.42	<2.42	<2.42
Anions									
Chloride	MG/KG	34.9	8.68 J	<5.75	640	624	144	107	123
Fluoride	MG/KG	1.30 U*	3.22	1.26 U*	5.07	3.68 J	3.82	2.35	4.94
Sulfate	MG/KG	621	584	655	3,210	2,940	1,090	6,590	1,360
General Chemistry									
pH (lab)	SU	10.5	10.5	10.5	9.9	9.0	11.3	10.4	10.8
Total Organic Carbon	MG/KG	6,370	5,460 J	9,660 J	13,300	8,370	4,980	9,130	3,390 J

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW08							
Sample Date		10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19
Sample ID		CUF-CCR-TW08-25.5/28.8-20190110	CUF-CCR-TW08-30.0/34.5-20190110	CUF-CCR-DUP02-20190110	CUF-CCR-TW08-36.5/39.0-20190110	CUF-CCR-TW08-41.5/43.5-20190110	CUF-CCR-TW08-46.5/48.5-20190110	CUF-CCR-TW08-51.0/54.0-20190110	CUF-CCR-TW08-56.5/58.5-20190110
Sample Depth		25.5 - 28.8 ft	30 - 34.5 ft	30 - 34.5 ft	36.5 - 39 ft	41.5 - 43.5 ft	46.5 - 48.5 ft	51 - 54 ft	56.5 - 58.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Total Metals									
Antimony	MG/KG	4.14	2.33 J	1.40 J	0.565 U*	0.530 U*	0.434 U*	5.15	5.13
Arsenic	MG/KG	42.1	21.6 J	13.6 J	6.15	3.27	4.54	38.2	49.3
Barium	MG/KG	113	59.7	46.5	31.7	42.7	36.7	224	273
Beryllium	MG/KG	2.70	1.51 J	0.943 J	0.568	0.685	0.685	2.72	3.53
Boron	MG/KG	335	147 J	82.4 J	31.5	35.1	38.1	349	472
Cadmium	MG/KG	2.99	1.53 J	0.932 J	0.178	0.150	0.962	5.61	4.63
Calcium	MG/KG	37,500 J	16,300 J	10,600 J	6,430 J	6,780 J	7,380 J	19,700 J	14,800 J
Chromium	MG/KG	58.7	31.2 J	17.1 J	9.68	7.86	7.81	60.6	77.5
Cobalt	MG/KG	5.86	3.43 J	2.11 J	1.55	1.53	2.39	5.07	7.21
Copper	MG/KG	29.4	12.3 J	7.69 J	4.44	4.69	5.57	21.9	29.9
Iron	MG/KG	21,800	16,400	11,500	9,890	8,440	16,900	18,600	21,300
Lead	MG/KG	89.0	51.8 J	31.3 J	11.3	6.82	82.9	42.7	44.2
Lithium	MG/KG	13.1 J	8.96 J	7.46 J	4.72 J	5.10 J	6.39 J	12.9 J	14.6 J
Manganese	MG/KG	103	51.0 J	33.1 J	20.8	28.7	31.9	165	148
Mercury	MG/KG	0.0924	0.0304 J	0.0373 J	<0.0158	<0.0158	<0.0167	0.0591	<0.0197
Molybdenum	MG/KG	54.5	75.6	77.1	4.70	4.27	7.48	18.2	21.3
Nickel	MG/KG	21.5	12.6 J	7.77 J	5.73	5.51	7.04	23.8	29.9
Selenium	MG/KG	8.87 J	4.56 J	2.71 J	0.462 J	0.255 J	1.56 J	7.77 J	5.18 J
Silver	MG/KG	0.105 J	0.0586 J	0.0339 J	<0.0155	0.0167 J	0.0225 J	0.140	0.139
Thallium	MG/KG	4.95	2.50 J	1.36 J	0.298	0.128	1.82	6.15	6.92
Vanadium	MG/KG	149	82.3 J	49.8 J	25.9	23.3	24.0	220	227
Zinc	MG/KG	98.2	50.3	42.1	12.4 U*	14.4 U*	14.8 U*	161	144
SPLP - Metals									
Antimony	UG/L	6.16	12.0	11.7	<1.12	<1.12	1.18 J	9.92	11.2
Arsenic	UG/L	12.9	2.62 J	3.95 J	0.423 J	<0.323	0.965 J	7.44	9.80
Barium	UG/L	36.9	18.6	24.1	38.8	40.8	37.5	48.9	89.8
Beryllium	UG/L	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570
Boron	UG/L	1,010	1,290	1,330	161	138	247	2,670	2,400
Cadmium	UG/L	<0.125	0.163 J	0.194 J	0.855 J	0.492 J	0.714 J	<0.125	<0.125
Calcium	UG/L	158,000	184,000 J	124,000 J	124,000	86,000	79,700	394,000	62,100
Chromium	UG/L	4.67	4.63	5.16	1.93 J	1.85 J	1.41 J	2.26	3.27
Cobalt	UG/L	<0.0750	0.0970 J	0.0860 J	2.30	1.75	7.39	0.166 J	<0.0750
Copper	UG/L	<1.30	<1.30	1.35 J	<1.30	<1.30	<1.30	<1.30	<1.30
Iron	UG/L	<14.1	45.7 J	25.7 J	111	93.4	40.9 J	<14.1	<14.1
Lead	UG/L	<0.0940	0.436 U*	0.106 U*	0.137 U*	0.101 U*	<0.0940	<0.0940	<0.0940
Lithium	UG/L	68.7	86.2	94.3	58.3	62.4	91.9	41.3	16.8
Manganese	UG/L	<1.35	<1.35	<1.35	20.0	24.1	36.8	6.39	<1.35
Mercury	UG/L	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653	<0.0653
Molybdenum	UG/L	132	894	798	5.60	<0.474	7.75	86.5	165
Nickel	UG/L	<0.312	<0.312	<0.312	5.62	4.03	14.1	0.331 J	<0.312
Selenium	UG/L	12.1	20.6	23.5	<0.813	<0.813	1.19 J	31.2	14.7
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	1.11	0.307 J	0.232 J	1.26	0.289 J	1.52	2.75	1.46
Vanadium	UG/L	338	49.7 J	152 J	2.01	1.79	4.48	197	336
Zinc	UG/L	<2.42	<2.42	<2.42	3.37 J	<2.42	<2.42	<2.42	<2.42
Anions									
Chloride	MG/KG	200	290	287	213	298	546	240	141
Fluoride	MG/KG	2.91 J	4.23	4.25	0.734 UJ	<0.731	<0.800	7.31	2.50
Sulfate	MG/KG	8,740	6,240	6,910	7,010	4,610	6,490	18,600	2,480
General Chemistry									
pH (lab)	SU	9.7	8.6	9.2	5.4	5.1	5.6	8.6	9.2
Total Organic Carbon	MG/KG	6,240	13,800 J	17,300 J	11,800 J	7,080 J	30,800 J	6,740 J	2,350 J

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW08				CUF-TW09			
Sample Date		10-Jan-19	11-Jan-19	11-Jan-19	14-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19
Sample ID		CUF-CCR-TW08-61.5/63.5-20190110	CUF-CCR-TW08-66.0/69.0-20190111	CUF-CCR-TW08-71.0/74.0-20190111	CUF-CCR-TW08-76.5/78.5-20190114	CUF-CCR-TW09-1.5/3.5-20190122	CUF-CCR-TW09-6.5/8.5-20190122	CUF-CCR-TW09-12.0/15.0-20190122	CUF-CCR-TW09-16.5/18.5-20190122
Sample Depth		61.5 - 63.5 ft	66 - 69 ft	71 - 74 ft	76.5 - 78.5 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	12 - 15 ft	16.5 - 18.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units								
Total Metals									
Antimony	MG/KG	4.67	4.90	6.44	3.88	2.91	2.49	3.99	2.85
Arsenic	MG/KG	35.3	34.8	45.2	46.6	25.6	26.9	36.7	28.0
Barium	MG/KG	405	457	410	464	301	110	396	121
Beryllium	MG/KG	2.98	3.43	3.63	2.29	3.42	2.98	3.58	1.92
Boron	MG/KG	538	530	508	434	317	258	518	125
Cadmium	MG/KG	3.26	3.12	3.72	2.59	2.99	2.94	4.31	1.95
Calcium	MG/KG	26,900 J	13,600 J	16,700 J	27,400	21,900	21,900	34,200	17,400
Chromium	MG/KG	68.1	73.7	83.1	78.9	70.6 J	54.6 J	65.6 J	44.4 J
Cobalt	MG/KG	6.83	7.40	7.61	5.71	8.15	7.30	7.16	5.32
Copper	MG/KG	24.5	27.1	29.9	25.1	27.5	23.7	30.8	16.3
Iron	MG/KG	25,900	22,600	24,000	27,500	31,600	22,300	30,400	29,500
Lead	MG/KG	25.6	31.9	39.0	25.6	51.2	78.2	110	56.0
Lithium	MG/KG	9.48 J	11.2 J	13.1 J	9.45	9.22 J	10.4 J	14.9 J	11.7 J
Manganese	MG/KG	205	137	157	211	91.2 J	70.6 J	115 J	107 J
Mercury	MG/KG	<0.0202	<0.0169	<0.0202	<0.0210	0.0277 J	0.0384 J	0.0567	0.194
Molybdenum	MG/KG	30.0	29.4	32.0	35.1	37.5	31.6	33.0	79.5
Nickel	MG/KG	25.9	28.2	30.1	22.6	32.3	24.8	25.8	20.1
Selenium	MG/KG	5.91 J	6.39 J	6.57 J	3.19	6.03	7.41	9.06	3.40
Silver	MG/KG	0.0975 J	0.119 J	0.144	0.0758 J	0.142	0.127	0.159	0.0868 J
Thallium	MG/KG	5.38	7.14	8.30	5.52	4.08	3.17	4.95	2.65
Vanadium	MG/KG	195	210	244	193	140 J	106 J	197 J	140 J
Zinc	MG/KG	94.1	103	122	117	116 J	112 J	132 J	78.4 J
SPLP - Metals									
Antimony	UG/L	7.90	12.2	14.6	12.7	10.4	7.84	11.6	5.00
Arsenic	UG/L	6.30	8.43	8.21	7.99	6.43	10.1	9.98	2.54
Barium	UG/L	83.9	108	75.8	65.5	70.9	27.6	60.5	31.0
Beryllium	UG/L	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570
Boron	UG/L	1,430	2,990	1,910	1,180	2,390	1,220	2,670	1,390
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	0.229 J
Calcium	UG/L	65,800	46,300	46,700	45,100	169,000	79,700	70,900	381,000
Chromium	UG/L	3.77	4.32	5.43	3.43	7.12	9.40	7.59	0.975 U*
Cobalt	UG/L	<0.0750	0.173 J	<0.0750	0.125 J	0.116 J	<0.0750	<0.0750	0.177 J
Copper	UG/L	<1.30	<1.30	1.34 J	<1.30	<1.30	<1.30	<1.30	<1.30
Iron	UG/L	<14.1	<14.1	<14.1	18.1 J	25.9 J	<14.1	17.0 J	<14.1
Lead	UG/L	<0.0940	0.103 U*	<0.0940	<0.0940	<0.0940	<0.0940	0.148 J	0.120 J
Lithium	UG/L	19.6	8.51	10.1	15.0	16.8	10.1	40.7	73.3
Manganese	UG/L	<1.35	<1.35	<1.35	<1.35	<1.35	<1.35	<1.35	15.6
Mercury	UG/L	<0.0653	<0.0653	<0.0653	<0.0653	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	353	354	497	690	211	154	159	851
Nickel	UG/L	<0.312	0.408 J	0.354 J	0.317 J	<0.312	<0.312	<0.312	0.484 J
Selenium	UG/L	13.8	21.7	24.8	11.7	17.4	14.7	27.4	7.91
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	1.66	0.311 J	0.179 J	0.633 J	0.414 J	<0.0630	0.115 J	2.10
Vanadium	UG/L	196	337	423	156	91.0	182	411	24.6
Zinc	UG/L	<2.42	3.02 J	2.99 J	<2.42	2.54 J	5.13	<2.42	<2.42
Anions									
Chloride	MG/KG	198	136	58.6	18.3	45.1	48.8	32.9	102
Fluoride	MG/KG	1.64	0.881 J	1.16 J	1.26 J	4.74	4.75	4.04	8.35
Sulfate	MG/KG	2,200	590	797	1,130	6,010 J	1,380 J	1,220 J	16,200 J
General Chemistry									
pH (lab)	SU	10	9.9	10.3	10.8	8.8	10.3	10.6	8.0
Total Organic Carbon	MG/KG	2,280 J	1,900 J	3,170 J	6,630	10,400	10,000	6,920	15,200

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW09							
Sample Date		22-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19	24-Jan-19	24-Jan-19
Sample ID		CUF-CCR-TW09-21.5/23.7-20190122	CUF-CCR-TW09-26.0/29.8-20190122	CUF-CCR-TW09-DUP03-20190122	CUF-CCR-TW09-32.0/34.0-20190122	CUF-CCR-TW09-36.5/38.5-20190122	CUF-CCR-TW09-41.0/43.0-20190122	CUF-CCR-TW09-45.5/47.5-20190124	CUF-CCR-TW09-51.5/53.5-20190124
Sample Depth		21.5 - 23.7 ft	26 - 29.8 ft	26 - 29.8 ft	32 - 34 ft	36.5 - 38.5 ft	41 - 43 ft	45.5 - 47.5 ft	51.5 - 53.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Validated	Validated
Total Metals									
Antimony	MG/KG	6.55	6.00	6.63	7.06	0.887	1.55	6.89 J	8.06 J
Arsenic	MG/KG	45.4	43.0	45.8	60.8	7.17	11.3	48.6 J	45.8 J
Barium	MG/KG	182	171	178	139	121	177	494	314 J
Beryllium	MG/KG	3.73	3.88	4.15	4.50	1.12	1.57	2.68	2.44
Boron	MG/KG	605	548	575	582	66.8	97.6	650	798
Cadmium	MG/KG	4.68	5.36	5.45	7.32	0.441	1.46	5.67 J	7.15 J
Calcium	MG/KG	22,600	20,600	23,200	28,200	7,210	13,600	32,800 J	27,100 J
Chromium	MG/KG	72.9 J	69.9 J	81.5 J	93.1 J	18.0 J	21.9 J	77.4 J	75.8 J
Cobalt	MG/KG	7.71	7.58	8.89	8.49	2.78	3.39	7.30 J	5.97 J
Copper	MG/KG	27.9	27.0	29.8	34.7	8.81	9.12	27.4 J	28.5 J
Iron	MG/KG	29,900	28,600	35,100	38,500	15,300	17,800	36,100 J	27,800 J
Lead	MG/KG	89.3	94.6	102	148	9.66	13.1	41.1 J	32.3 J
Lithium	MG/KG	12.3 J	12.9 J	14.3 J	15.7 J	7.69 J	9.54 J	11.3	13.6
Manganese	MG/KG	157 J	148 J	173 J	174 J	48.2 J	104 J	240 J	206 J
Mercury	MG/KG	<0.0165	<0.0158	<0.0193	0.0239 J	<0.0175	<0.0162	0.0503	0.0842
Molybdenum	MG/KG	55.6	56.6	62.1	108	124	13.0	56.4 J	75.0 J
Nickel	MG/KG	30.0	28.8	33.9	34.1	13.0	15.6	32.3 J	31.4 J
Selenium	MG/KG	8.78	7.81	8.70	9.14	0.626	1.98	8.54 J	12.9 J
Silver	MG/KG	0.112 J	0.135	0.133	0.190	0.0231 J	0.0350 J	0.143 U*	0.141 U*
Thallium	MG/KG	7.16	6.89	7.22	8.12	0.365	1.24	8.15 J	8.99 J
Vanadium	MG/KG	289 J	268 J	301 J	316 J	51.5 J	92.4 J	359 J	386 J
Zinc	MG/KG	160 J	159 J	179 J	215 J	28.6 J	56.6 J	202 J	180 J
SPLP - Metals									
Antimony	UG/L	7.37	7.80 J	10.0 J	8.27	<1.12	4.25	9.48	5.03
Arsenic	UG/L	8.03	7.90	9.46	10.4	0.724 J	8.88	7.88	6.73
Barium	UG/L	75.9	75.6	80.4	69.1	44.2	43.8	84.2	46.6
Beryllium	UG/L	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570
Boron	UG/L	2,590	2,330	2,070	2,140	1,200	1,260	2,700	2,820
Cadmium	UG/L	<0.125	<0.125	<0.125	<0.125	0.338 J	<0.125	<0.125	<0.125
Calcium	UG/L	127,000	107,000	109,000	109,000	74,000	132,000	60,300	161,000
Chromium	UG/L	1.73 U*	2.65 U*	2.78 U*	2.39 U*	1.59 U*	1.58 U*	2.75	2.12
Cobalt	UG/L	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750
Copper	UG/L	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30
Iron	UG/L	15.1 J	<14.1	<14.1	<14.1	<14.1	<14.1	<14.1	<14.1
Lead	UG/L	0.113 J	<0.0940	<0.0940	<0.0940	0.0960 J	<0.0940	<0.0940	<0.0940
Lithium	UG/L	44.8	59.7	60.0	52.7	36.3	48.4	29.5	33.3
Manganese	UG/L	<1.35	<1.35	<1.35	<1.35	1.75 J	19.8	<1.35	<1.35
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	190	110	127	95.9	1,490	54.9	67.0	101
Nickel	UG/L	<0.312	<0.312	<0.312	0.318 J	0.561 J	0.325 J	<0.312	<0.312
Selenium	UG/L	6.98	6.91	7.87	9.49	<0.813	15.8	10.4	8.26
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	0.247 J	0.569 J	0.319 J	0.515 J	0.335 J	1.16	0.271 U*	0.109 U*
Vanadium	UG/L	186	211	247	172	3.37	74.9	146 J	118 J
Zinc	UG/L	2.86 J	<2.42	3.10 J	<2.42	<2.42	<2.42	<2.42	<2.42
Anions									
Chloride	MG/KG	122	189	238	611	104	21.0	48.6	151
Fluoride	MG/KG	<0.803	<0.827	<0.828	<0.987	<0.769	<0.756	<0.950	<0.996
Sulfate	MG/KG	5,610 J	4,750 J	5,290 J	5,650 J	3,560 J	5,230 J	2,930	9,280
General Chemistry									
pH (lab)	SU	9.5	6.7	9.6	10.1	6.9	7.9	10.5	10.2
Total Organic Carbon	MG/KG	6,610	7,550 J	11,700 J	9,110	47,800	29,200	10,500 J	31,900 J

See notes on last page.

TABLE B.2a - CCR Material Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location					CUF-TW09			
Sample Date		24-Jan-19	24-Jan-19	24-Jan-19	24-Jan-19	24-Jan-19	24-Jan-19	25-Jan-19
Sample ID		CUF-CCR-TW09-56.0/59.0-20190124	CUF-CCR-TW09-60.5/63.0-20190124	CUF-CCR-TW09-67.0/69.5-20190124	CUF-CCR-TW09-72.0/74.5-20190124	CUF-CCR-TW09-76.5/79.0-20190124	CUF-CCR-TW09-81.0/83.5-20190124	CUF-CCR-TW09-85.5/88.0-20190125
Sample Depth		56 - 59 ft	60.5 - 63 ft	67 - 69.5 ft	72 - 74.5 ft	76.5 - 79 ft	81 - 83.5 ft	85.5 - 88 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Validated	Validated	Validated	Validated	Validated	Validated	Validated
	Units							
Total Metals								
Antimony	MG/KG	4.74 J	5.05 J	4.19 J	4.86 J	4.20 J	3.78 J	4.44 J
Arsenic	MG/KG	44.7 J	33.2 J	28.1 J	40.6 J	52.9 J	49.2 J	46.6 J
Barium	MG/KG	264 J	225 J	218	254	536 J	784	847
Beryllium	MG/KG	2.91	2.76	2.51	3.41	1.88	2.05	1.97
Boron	MG/KG	387	388	327	350	336	315	367
Cadmium	MG/KG	5.01 J	3.42 J	2.78 J	3.42 J	3.00 J	3.60 J	3.64 J
Calcium	MG/KG	41,100	17,700 J	14,400	14,400	21,100	21,700	26,000
Chromium	MG/KG	86.2	81.9 J	72.0	77.0	75.5	77.0	69.5
Cobalt	MG/KG	7.01	7.28 J	7.04	8.62	5.55	6.55	5.11
Copper	MG/KG	29.7	26.8 J	23.8	30.7	20.6	21.9	22.6
Iron	MG/KG	26,400	27,400 J	25,600	23,300	21,900	29,100	21,300
Lead	MG/KG	39.3 J	33.2 J	33.4 J	32.8 J	30.4 J	36.0 J	32.1 J
Lithium	MG/KG	15.5	11.8	9.95	12.4	9.06	10.4	9.59
Manganese	MG/KG	177	173 J	130	135	199	221	241
Mercury	MG/KG	0.0468	<0.0180	<0.0196	<0.0179	<0.0200	<0.0182	<0.0212
Molybdenum	MG/KG	20.1 J	17.9 J	28.2 J	36.8 J	29.2 J	30.9 J	28.4 J
Nickel	MG/KG	30.8	30.0 J	28.5	33.4	21.0	23.5	20.7
Selenium	MG/KG	6.47 J	5.41 J	3.68 J	5.92 J	2.65 J	2.81 J	3.23 J
Silver	MG/KG	0.145 U*	0.123 U*	0.118 U*	0.142 U*	0.0972 U*	0.104 U*	0.108 U*
Thallium	MG/KG	6.41 J	6.39 J	5.39 J	7.78 J	6.31 J	5.39 J	5.63 J
Vanadium	MG/KG	324	302 J	267	293	200	193	199
Zinc	MG/KG	162	126 J	100	128	117	128	129
SPLP - Metals								
Antimony	UG/L	1.78 J	9.58	12.2	9.89	12.3	9.85	9.97
Arsenic	UG/L	11.6	7.05	3.85	7.78	4.72	6.07	8.02
Barium	UG/L	34.5	62.2	76.1	60.2	92.8	73.0	81.3
Beryllium	UG/L	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570	<0.0570
Boron	UG/L	2,330	2,910	2,330	2,660	2,340	1,920	2,100
Cadmium	UG/L	<0.125	<0.125	<0.125	0.155 J	0.268 J	0.198 J	0.201 J
Calcium	UG/L	561,000	37,200	36,500	27,600	40,300	32,000	43,000
Chromium	UG/L	1.02 J	2.38	2.50	2.59	2.07	2.42	2.43
Cobalt	UG/L	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750	<0.0750
Copper	UG/L	<1.30	<1.30	1.43 J	<1.30	<1.30	<1.30	<1.30
Iron	UG/L	<14.1	24.7 J	<14.1	<14.1	<14.1	<14.1	<14.1
Lead	UG/L	<0.0940	0.119 J	0.167 J	<0.0940	<0.0940	<0.0940	<0.0940
Lithium	UG/L	46.0	80.5	34.9	18.6	26.4	19.6	19.0
Manganese	UG/L	<1.35	<1.35	<1.35	<1.35	<1.35	<1.35	<1.35
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	41.1	123	209	557	895	662	626
Nickel	UG/L	<0.312	<0.312	<0.312	<0.312	<0.312	<0.312	<0.312
Selenium	UG/L	8.10	14.7	12.2	30.9	17.6	21.7	11.5
Silver	UG/L	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	2.00	1.28	0.417 J	0.121 U*	0.443 J	0.667 J	0.881 J
Vanadium	UG/L	224 J	161 J	115 J	307 J	54.3 J	90.9 J	85.5 J
Zinc	UG/L	<2.42	<2.42	<2.42	<2.42	<2.42	<2.42	<2.42
Anions								
Chloride	MG/KG	26.1	8.23 J	34.0	106	110	117	109
Fluoride	MG/KG	<0.988	<0.938	<0.930	<0.963	<0.974	<0.945	<1.02
Sulfate	MG/KG	20,100	1,210	1,290	759	883	1,090	2,620
General Chemistry								
pH (lab)	SU	9.9	10.3	10.5	10.0	10.7	10.7	10.4
Total Organic Carbon	MG/KG	7,200 J	5,760 J	7,830	13,600 J	7,550 J	6,390 J	5,620 J

Notes:
Please note that units have been converted automatically in this table, and significant figures may not have been maintained.

<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
ft	feet below ground surface
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/kg	milligrams per kilogram
SPLP	Synthetic Precipitation Leaching Procedure
SU	Standard Unit
ug/L	micrograms per Liter
U*	this result should be considered "not detected" because it was detected in an associated field or laboratory blank at a similar level
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation
UR	Unreliable reporting or detection limit; compound may or may not be present in sample.

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.2b. Supplemental CCR Material Analytical Results for Metals, Anions, and General Chemistry for Retention Pond within the Main Ash Pond
Cumberland Fossil Plant
June 2020

Sample Location		ALT-2	ALT-7B	B-1			B-2	B-2, B-2A	B-3,B-3A,B-3B,ALT-5	B-4
Sample Date		11-Jun-20	11-Jun-20	11-Jun-20	11-Jun-20	11-Jun-20	11-Jun-20	11-Jun-20	11-Jun-20	11-Jun-20
Sample ID		CUF-CCR-ALT2-11.5/13.0-20200611	CUF-CCR-ALT7B-6.0/13.0-20200611	CUF-CCR-B1-7.5/9.5-20200611	CUF-CCR-B1-11.0/14.7-20200611	CUF-CCR-DUP01-20200611	CUF-CCR-B2-5.0/6.5-20200611	CUF-CCR-B2/B2A-10.0/14.0-20200611	CUF-CCR-B3/3A/3B/A5-4.5/10.5-20200611	CUF-CCR-B4-3.0/6.5-20200611
Sample Depth		11.5 - 13 ft	6 - 13 ft	7.5 - 9.5 ft	11 - 14.7 ft	11 - 14.7 ft	5 - 6.5 ft	10 - 14 ft	4.5 - 10.5 ft	3 - 6.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units									
Total Metals										
Antimony	MG/KG	2.12 J	2.44 J	1.79 J	2.45 J	2.17 J	1.30 J	2.55 J	1.81 J	2.95 J
Arsenic	MG/KG	62.5	63.0	92.7	43.7	49.0	49.2	40.7	87.7	56.4
Barium	MG/KG	374	324	399	392	424	363	404	363	295
Beryllium	MG/KG	3.48	3.14	5.27	2.17	2.45	2.63	2.43	3.99	3.92
Boron	MG/KG	150	190	183	139	145	199	160	121	227
Cadmium	MG/KG	1.49	1.53	1.34	1.67	1.68	0.553	1.76	1.10	2.41
Calcium	MG/KG	37,500	24,300	6,780	25,200	25,300	14,100	15,700	12,400	7,850
Chromium	MG/KG	72.9 J	59.8 J	59.1 J	63.4 J	63.8 J	33.0 J	66.4 J	49.2 J	65.6 J
Cobalt	MG/KG	12.6	10.6	18.2	7.65	8.56	10.1	8.55	13.7	12.4
Copper	MG/KG	47.8	34.6	54.1	24.4	27.3	32.0	27.7	44.3	38.6
Iron	MG/KG	26,700	25,000	20,700	27,900	28,700	30,800	35,000	22,100	32,700
Lead	MG/KG	27.1	24.2	37.0	21.5	23.3	13.1	23.3	27.2	30.8
Lithium	MG/KG	27.0	16.5	32.2	10.0	11.3	14.4	10.0	21.7	17.4
Manganese	MG/KG	286	155	99.7	197	209	130	201	131	140
Mercury	MG/KG	0.0506	<0.0304	<0.0268	<0.0314	<0.0337	0.0433 J	<0.0337	0.0535	<0.0325
Molybdenum	MG/KG	23.4	18.3	6.61	7.42	7.62	9.05	9.14	11.2	7.33
Nickel	MG/KG	43.8	38.1	45.5	27.1	29.5	28.0	32.3	45.2	41.5
Selenium	MG/KG	8.99 J	16.2 J	4.99 J	4.12 J	4.20 J	4.01 J	2.80 J	7.00 J	5.24 J
Silver	MG/KG	0.121	0.0952	0.141	0.0784 J	0.0721 J	0.0542 J	0.0765 J	0.101	0.115
Thallium	MG/KG	5.18	5.15	4.07	4.55	4.92	3.04	4.31	3.79	4.79
Vanadium	MG/KG	177	213	150	159	161	102	170	158	235
Zinc	MG/KG	109	102	108	784	902	47.8	123	89.7	132
SPLP - Metals										
Antimony	UG/L	13.6	14.8	6.09	12.7	12.3	7.76	9.85	11.0	19.0
Arsenic	UG/L	11.1	22.4	85.0	14.1	15.3	21.9	28.7	84.3	54.3
Barium	UG/L	76.2	100	109	81.2	70.9	44.5	50.4	97.8	64.1
Beryllium	UG/L	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182	<0.182
Boron	UG/L	1,660	2,710	1,900	1,800	1,780	1,510	1,340	1,270	1,630
Cadmium	UG/L	0.242 U*	<0.217	<0.217	<0.217	<0.217	<0.217	<0.217	<0.217	0.282 U*
Calcium	UG/L	31,500	39,100	32,000	35,300	32,900	48,800	18,600	24,000	21,100
Chromium	UG/L	2.21	1.84 J	6.04	<1.53	1.57 J	7.17	3.31	<1.53	4.30
Cobalt	UG/L	0.232 U*	<0.134	<0.134	<0.134	<0.134	<0.134	0.277 U*	<0.134	0.267 U*
Copper	UG/L	1.88 J	1.56 J	0.831 J	1.15 J	0.955 J	<0.627	2.89	0.774 J	1.51 J
Iron	UG/L	226	88.9 U*	88.7 U*	37.5 U*	91.1 U*	36.5 U*	579	30.3 U*	177 U*
Lead	UG/L	0.633 U*	0.429 U*	0.374 U*	0.148 U*	0.245 U*	0.154 U*	1.32	<0.128	0.744 U*
Lithium	UG/L	12.5	5.46	5.13	4.13 J	4.43 J	4.91 J	<3.39	<3.39	4.20 J
Manganese	UG/L	6.89	2.71 J	0.988 J	0.933 J	2.41 J	<0.866	12.7	<0.866	1.59 J
Mercury	UG/L	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130	<0.130
Molybdenum	UG/L	635	312	42.7	111	105	59.8	73.4	182	34.6
Nickel	UG/L	1.69	1.11	0.473 J	0.788 J	0.789 J	0.356 J	2.32	0.482 J	0.813 J
Selenium	UG/L	3.72 J	20.6	56.1	10.9	10.9	30.7	8.98	57.8	59.9
Silver	UG/L	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177	<0.177
Thallium	UG/L	0.343 U*	0.200 U*	0.617 U*	0.351 U*	0.332 U*	0.191 U*	0.387 U*	<0.148	0.655 U*
Vanadium	UG/L	43.6	144	239	182	179	144	216	248	360
Zinc	UG/L	7.59	7.35	9.59	9.13	10.2	6.53	13.3	<3.22	9.02
Anions										
Chloride	MG/KG	137	206	157	287	315	<5.51	43.2	71.6	152
Fluoride	MG/KG	1.15 J	0.987 J	2.28	2.42	2.34	1.34 J	1.56	2.31	4.53
Sulfate	MG/KG	1,100	874	588	1,080	1,090	1,150	460	743	840
General Chemistry										
pH (lab)	SU	8.1	8.2	8.3	8.8	8.7	9.8	8.1	8.0	8.1
Total Organic Carbon	MG/KG	14,600 J	14,000 J	7,190 J	4,770 J	9,080 J	57,000 J	18,700 J	13,600 J	4,000 J

Notes:
Please note that units have been converted automatically in this table, and significant figures may not have been maintained.

<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
ft	feet below ground surface
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/kg	milligrams per kilogram
SPLP	Synthetic Precipitation Leaching Procedure
SU	Standard Unit
ug/L	micrograms per Liter
U*	this result should be considered “not detected” because it was detected in an associated field or laboratory blank at a similar level
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation

1. Level of review is defined in the Quality Assurance Project Plan.
2. Location IDs and sample IDs from retained geotechnical samples do not include the "MAP (Main Ash Pond)" nomenclature.
3. The CCR material utilized for this investigation was originally collected in August 2019. As approved by TDEC, supplemental CCR material samples prepared in June 2020 were analyzed within the analytical holding time based on the dates of supplemental sample preparation.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW01							
Sample Date		5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	5-Feb-19	6-Feb-19
Sample ID		CUF-CCR-TW01-1.5/3.5-20190205	CUF-CCR-TW01-6.0/8.0-20190205	CUF-CCR-TW01-12.0/14.0-20190205	CUF-CCR-TW01-16.5/18.5-20190205	CUF-CCR-TW01-22.5/24.5-20190205	CUF-CCR-TW01-27.0/29.0-20190205	CUF-CCR-TW01-31.5/33.5-20190205	CUF-CCR-TW01-36.0/40.0-20190206
Sample Depth		1.5 - 3.5 ft	6 - 8 ft	12 - 14 ft	16.5 - 18.5 ft	22.5 - 24.5 ft	27 - 29 ft	31.5 - 33.5 ft	36 - 40 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	0.766 +/-(0.221)	0.512 +/-(0.189)	0.496 +/-(0.239)	1.71 +/-(0.368)	-0.185 +/-(0.182)U	7.23 +/-(1.03)	7.53 +/-(1.03)	6.75 +/-(0.849)
Radium-228	PCI/G	0.200 +/-(0.336)U	0.119 +/-(0.281)U	0.0314 +/-(0.442)U	0.106 +/-(0.203)U	-0.0226 +/-(0.0950)U	1.91 +/-(0.536)	1.96 +/-(0.659)	2.03 +/-(0.396)
Radium-226+228	PCI/G	0.966 +/-(0.402)J	0.631 +/-(0.339)J	0.527 +/-(0.502)J	1.82 +/-(0.420)J	0.000 +/-(0.205)U	9.14 +/-(1.16)	9.49 +/-(1.22)	8.78 +/-(0.937)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.118 +/-(0.0787)	0.118 +/-(0.0689)J	0.186 +/-(0.0876)	0.177 +/-(0.0981)	0.176 +/-(0.0861)	0.105 +/-(0.0870)U	0.221 +/-(0.100)	0.0843 +/-(0.0639)UJ
Radium-228	PCI/L	0.236 +/-(0.207)U	0.230 +/-(0.317)U	0.0964 +/-(0.217)U	-0.0204 +/-(0.208)U	0.134 +/-(0.199)U	0.236 +/-(0.225)U	0.0414 +/-(0.204)U	0.0324 +/-(0.263)U
Radium-226+228	PCI/L	0.354 +/-(0.221)J	0.347 +/-(0.324)J	0.283 +/-(0.234)J	0.177 +/-(0.230)J	0.310 +/-(0.217)J	0.341 +/-(0.241)U	0.262 +/-(0.227)J	0.117 +/-(0.271)UJ

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW01				CUF-TW02			
Sample Date		6-Feb-19	6-Feb-19	6-Feb-19	6-Feb-19	5-Mar-19	5-Mar-19	6-Mar-19	6-Mar-19
Sample ID		CUF-CCR-DUP04-20190206	CUF-CCR-TW01-42.5/45.0-20190206	CUF-CCR-TW01-47.0/49.5-20190206	CUF-CCR-TW01-51.5/53.8-20190206	CUF-CCR-TW02-1.5/3.5-20190305	CUF-CCR-TW02-6.5/8.5-20190305	CUF-CCR-TW02-10.5/12.9-20190306	CUF-CCR-TW02-16.5/18.5-20190306
Sample Depth		36 - 40 ft	42.5 - 45 ft	47 - 49.5 ft	51.5 - 53.8 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	10.5 - 12.9 ft	16.5 - 18.5 ft
Sample Type		Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	6.51 +/-(0.973)	6.34 +/-(0.794)	4.94 +/-(0.679)	1.70 +/-(0.312)	0.814 +/-(0.207)	0.289 +/-(0.163)U	0.0377 +/-(0.312)U	0.266 +/-(0.196)U
Radium-228	PCI/G	1.34 +/-(0.677)	2.16 +/-(0.378)	1.98 +/-(0.566)	1.20 +/-(0.332)	0.00254 +/-(0.00678)U	0.000 +/-(0.0509)U	0.233 +/-(0.165)	-0.0332 +/-(0.0756)U
Radium-226+228	PCI/G	7.85 +/-(1.19)	8.50 +/-(0.879)	6.92 +/-(0.884)	2.90 +/-(0.456)	0.817 +/-(0.207)J	0.289 +/-(0.171)U	0.271 +/-(0.353)J	0.266 +/-(0.210)U
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.215 +/-(0.0958)J	0.104 +/-(0.0756)U	0.125 +/-(0.0720)	-0.000803 +/-(0.0584)U	0.161 +/-(0.0824)	0.169 +/-(0.0890)	0.377 +/-(0.127)	0.187 +/-(0.0977)
Radium-228	PCI/L	-0.00445 +/-(0.174)U	0.257 +/-(0.200)U	0.108 +/-(0.196)U	0.212 +/-(0.245)U	0.0998 +/-(0.215)U	0.515 +/-(0.254)	0.0949 +/-(0.236)U	0.0762 +/-(0.226)U
Radium-226+228	PCI/L	0.215 +/-(0.199)J	0.362 +/-(0.214)U	0.232 +/-(0.209)J	0.212 +/-(0.252)U	0.261 +/-(0.230)J	0.684 +/-(0.269)	0.472 +/-(0.268)J	0.263 +/-(0.246)J

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW02	CUF-TW03						
Sample Date		6-Mar-19	13-Feb-19	13-Feb-19	13-Feb-19	13-Feb-19	13-Feb-19	13-Feb-19	13-Feb-19
Sample ID		CUF-CCR-TW02-21.5/23.3-20190306	CUF-CCR-TW03-1.5/3.5-20190213	CUF-CCR-TW03-6.5/8.5-20190213	CUF-CCR-TW03-11.5/13.5-20190213	CUF-CCR-TW03-16.5/18.5-20190213	CUF-CCR-TW03-21.0/23.0-20190213	CUF-CCR-TW03-26.5/28.5-20190213	CUF-CCR-TW03-31.5/33.5-20190213
Sample Depth		21.5 - 23.3 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft	16.5 - 18.5 ft	21 - 23 ft	26.5 - 28.5 ft	31.5 - 33.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Validated	Validated	Validated	Validated	Validated	Validated	Validated
Radiological Parameters									
Radium-226	PCI/G	1.06 +/-(0.297)	0.744 +/-(0.248)	1.40 +/-(0.326)	0.0565 +/-(0.0682)U	0.0744 +/-(0.0956)U	0.292 +/-(0.252)U	7.70 +/-(0.988)	7.31 +/-(0.950)
Radium-228	PCI/G	0.0959 +/-(0.419)U	0.0881 +/-(0.212)U	0.712 +/-(0.258)	-0.0144 +/-(0.0129)U	-0.0195 +/-(0.0307)U	0.0136 +/-(0.0289)U	1.81 +/-(0.508)	2.32 +/-(0.624)
Radium-226+228	PCI/G	1.16 +/-(0.514)J	0.832 +/-(0.326)J	2.11 +/-(0.416)	0.0565 +/-(0.06941)U	0.0744 +/-(0.1004)U	0.306 +/-(0.254)U	9.51 +/-(1.11)	9.63 +/-(1.14)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.216 +/-(0.0912)	0.191 +/-(0.0871)	0.336 +/-(0.117)	0.216 +/-(0.0920)	0.209 +/-(0.0926)	0.245 +/-(0.101)	0.134 +/-(0.0730)	0.175 +/-(0.0848)
Radium-228	PCI/L	0.0516 +/-(0.176)U	0.105 +/-(0.251)U	0.322 +/-(0.292)U	0.256 +/-(0.263)U	0.270 +/-(0.246)U	0.249 +/-(0.269)U	0.447 +/-(0.259)	0.293 +/-(0.232)U
Radium-226+228	PCI/L	0.267 +/-(0.198)J	0.295 +/-(0.266)J	0.659 +/-(0.315)J	0.472 +/-(0.279)J	0.479 +/-(0.263)J	0.494 +/-(0.287)J	0.581 +/-(0.269)	0.468 +/-(0.247)J

See notes on last page.

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TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW03						
Sample Date		13-Feb-19	13-Feb-19	13-Feb-19	14-Feb-19	14-Feb-19	14-Feb-19	14-Feb-19
Sample ID		CUF-CCR-TW03-36.5/39.5-20190213	CUF-CCR-TW03-41.0/44.0-20190213	CUF-CCR-DUP05-20190213	CUF-CCR-TW03-46.5/48.5-20190214	CUF-CCR-TW03-51.5/53.5-20190214	CUF-CCR-TW03-56.5/58.5-20190214	CUF-CCR-TW03-61.5/63.5-20190214
Sample Depth		36.5 - 39.5 ft	41 - 44 ft	41 - 44 ft	46.5 - 48.5 ft	51.5 - 53.5 ft	56.5 - 58.5 ft	61.5 - 63.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Validated	Validated	Validated	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters								
Radium-226	PCI/G	6.46 +/-(0.890)	6.56 +/-(0.851)	6.75 +/-(0.849)	5.04 +/-(0.680)	4.56 +/-(0.682)	5.04 +/-(0.715)	4.37 +/-(0.659)
Radium-228	PCI/G	2.41 +/-(0.544)	1.86 +/-(0.441)	2.05 +/-(0.417)	1.58 +/-(0.411)	1.72 +/-(0.432)	1.94 +/-(0.425)	1.91 +/-(0.470)
Radium-226+228	PCI/G	8.87 +/-(1.04)	8.42 +/-(0.958)	8.80 +/-(0.946)	6.62 +/-(0.795)	6.28 +/-(0.807)	6.98 +/-(0.832)	6.28 +/-(0.809)
Radiological Parameters - SPLP								
Radium-226	PCI/L	0.212 +/-(0.0924)	0.0688 +/-(0.0648)U	0.130 +/-(0.0727)	0.0554 +/-(0.0583)U	0.0679 +/-(0.0724)U	0.0224 +/-(0.0488)U	0.00227 +/-(0.0419)U
Radium-228	PCI/L	-0.0361 +/-(0.195)U	0.118 +/-(0.275)U	0.320 +/-(0.273)U	0.429 +/-(0.231)	0.413 +/-(0.241)	-0.0292 +/-(0.198)U	0.0750 +/-(0.235)U
Radium-226+228	PCI/L	0.212 +/-(0.216)J	0.187 +/-(0.283)U	0.450 +/-(0.283)J	0.484 +/-(0.238)J	0.480 +/-(0.252)J	0.0224 +/-(0.204)U	0.0772 +/-(0.239)U

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW04					CUF-TW05		
Sample Date		6-Mar-19	6-Mar-19	6-Mar-19	7-Mar-19	7-Mar-19	19-Feb-19	20-Feb-19	20-Feb-19
Sample ID		CUF-CCR-TW04-1.5/3.5-20190306	CUF-CCR-TW04-6.0/7.9-20190306	CUF-CCR-TW04-10.5/12.8-20190306	CUF-CCR-TW04-16.5/18.5-20190307	CUF-CCR-TW04-21.5/23.0-20190307	CUF-CCR-TW05-1.5/3.5-20190219	CUF-CCR-TW05-6.5/8.5-20190220	CUF-CCR-TW05-11.5/13.5-20190220
Sample Depth		1.5 - 3.5 ft	6 - 7.9 ft	10.5 - 12.8 ft	16.5 - 18.5 ft	21.5 - 23 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	11.5 - 13.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Validated	Validated	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	0.497 +/-(0.190)	0.850 +/-(0.229)	0.258 +/-(0.115)	0.391 +/-(0.173)	0.139 +/-(0.169)U	0.735 +/-(0.267)	0.489 +/-(0.167)	2.94 +/-(0.471)
Radium-228	PCI/G	0.226 +/-(0.152)	0.0898 +/-(0.355)U	0.0487 +/-(0.222)U	-0.221 +/-(0.528)U	-0.0422 +/-(0.0998)U	0.0320 +/-(0.266)U	0.0422 +/-(0.0928)U	0.390 +/-(0.392)U
Radium-226+228	PCI/G	0.723 +/-(0.243)	0.940 +/-(0.422)J	0.307 +/-(0.250)J	0.391 +/-(0.556)J	0.139 +/-(0.169)U	0.767 +/-(0.377)J	0.531 +/-(0.191)J	3.33 +/-(0.613)J
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.192 +/-(0.0829)	0.229 +/-(0.0936)	0.260 +/-(0.102)	-0.0569 +/-(0.0140)U	0.306 +/-(0.109)	0.242 +/-(0.101)	0.225 +/-(0.101)	0.256 +/-(0.108)
Radium-228	PCI/L	0.113 +/-(0.188)U	0.276 +/-(0.235)U	0.0721 +/-(0.238)U	0.166 +/-(0.226)U	-0.0369 +/-(0.233)U	0.0976 +/-(0.221)U	-0.145 +/-(0.252)U	0.177 +/-(0.262)U
Radium-226+228	PCI/L	0.305 +/-(0.205)J	0.504 +/-(0.253)J	0.333 +/-(0.259)J	0.166 +/-(0.226)U	0.306 +/-(0.257)J	0.339 +/-(0.243)J	0.225 +/-(0.271)J	0.433 +/-(0.283)J

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW05							
Sample Date		20-Feb-19	20-Feb-19	20-Feb-19	20-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID		CUF-CCR-TW05-16.5/18.5-20190220	CUF-CCR-TW05-21.5/23.5-20190220	CUF-CCR-TW05-26.5/28.5-20190220	CUF-CCR-TW05-31.5/33.5-20190220	CUF-CCR-TW05-36.5/38.5-20190221	CUF-CCR-TW05-41.5/44.0-20190221	CUF-CCR-TW05-46.0/49.0-20190221	CUF-CCR-DUP06-20190221
Sample Depth		16.5 - 18.5 ft	21.5 - 23.5 ft	26.5 - 28.5 ft	31.5 - 33.5 ft	36.5 - 38.5 ft	41.5 - 44 ft	46 - 49 ft	46 - 49 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	0.0881 +/-(0.164)U	6.58 +/-(0.839)	6.42 +/-(0.842)	6.54 +/-(0.882)	7.31 +/-(0.924)	5.84 +/-(0.742)	4.81 +/-(0.694)	5.05 +/-(0.710)
Radium-228	PCI/G	-0.317 +/-(0.313)U	1.90 +/-(0.420)	2.03 +/-(0.501)	2.12 +/-(0.533)	2.99 +/-(0.672)	2.08 +/-(0.459)	1.73 +/-(0.421)	1.43 +/-(0.435)
Radium-226+228	PCI/G	0.0881 +/-(0.353)U	8.48 +/-(0.938)	8.45 +/-(0.980)	8.66 +/-(1.03)	10.3 +/-(1.14)	7.92 +/-(0.872)	6.54 +/-(0.812)	6.48 +/-(0.833)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.209 +/-(0.103)	0.160 +/-(0.0858)	0.0786 +/-(0.0865)U	0.242 +/-(0.105)	0.198 +/-(0.0951)	0.150 +/-(0.0827)	0.0932 +/-(0.0738)U	0.120 +/-(0.0836)
Radium-228	PCI/L	0.242 +/-(0.240)U	-0.228 +/-(0.229)U	0.168 +/-(0.274)U	0.299 +/-(0.245)U	0.213 +/-(0.239)U	-0.134 +/-(0.197)U	0.169 +/-(0.272)U	0.332 +/-(0.263)U
Radium-226+228	PCI/L	0.451 +/-(0.261)J	0.160 +/-(0.245)J	0.246 +/-(0.287)U	0.541 +/-(0.267)J	0.411 +/-(0.257)J	0.150 +/-(0.214)J	0.262 +/-(0.282)U	0.453 +/-(0.276)J

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW05		CUF-TW06				
Sample Date		21-Feb-19	21-Feb-19	7-Mar-19	7-Mar-19	7-Mar-19	7-Mar-19	7-Mar-19
Sample ID		CUF-CCR-TW05-51.5/53.5-20190221	CUF-CCR-TW05-56.5/58.5-20190221	CUF-CCR-TW06-1.0/4.0-20190307	CUF-CCR-DUP07-20190307	CUF-CCR-TW06-6.5/8.5-20190307	CUF-CCR-TW06-12.5/14.2-20190307	CUF-CCR-TW06-16.5/19.0-20190307
Sample Depth		51.5 - 53.5 ft	56.5 - 58.5 ft	1 - 4 ft	1 - 4 ft	6.5 - 8.5 ft	12.5 - 14.2 ft	16.5 - 19 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Validated	Validated	Validated	Validated	Validated
Radiological Parameters								
Radium-226	PCI/G	4.07 +/-(0.632)	4.55 +/-(0.640)	0.583 +/-(0.190)	0.706 +/-(0.232)	0.766 +/-(0.241)	2.49 +/-(0.472)	0.635 +/-(0.214)
Radium-228	PCI/G	1.63 +/-(0.494)	1.96 +/-(0.447)	0.148 +/-(0.143)U	-0.153 +/-(0.505)U	-0.0905 +/-(0.603)U	0.421 +/-(0.426)U	0.251 +/-(0.168)
Radium-226+228	PCI/G	5.70 +/-(0.802)	6.51 +/-(0.781)	0.731 +/-(0.238)J	0.706 +/-(0.556)J	0.766 +/-(0.649)J	2.91 +/-(0.636)J	0.886 +/-(0.272)
Radiological Parameters - SPLP								
Radium-226	PCI/L	0.111 +/-(0.0758)	0.0508 +/-(0.0636)U	0.203 +/-(0.139)	0.0528 +/-(0.0543)UJ	0.205 +/-(0.0913)J	0.194 +/-(0.0933)J	0.320 +/-(0.110)J
Radium-228	PCI/L	0.0446 +/-(0.259)U	0.126 +/-(0.240)U	0.345 +/-(0.291)U	0.376 +/-(0.254)U	0.228 +/-(0.255)U	-0.0989 +/-(0.216)U	0.153 +/-(0.234)U
Radium-226+228	PCI/L	0.155 +/-(0.270)J	0.177 +/-(0.248)U	0.549 +/-(0.322)J	0.429 +/-(0.260)UJ	0.433 +/-(0.271)J	0.194 +/-(0.235)J	0.473 +/-(0.259)J

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW07							
Sample Date		13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18	13-Dec-18
Sample ID		CUF-CCR-TW07-1.5/3.5-20181213	CUF-CCR-TW07-6.0/8.0-20181213	CUF-CCR-TW07-10.5/12.5-20181213	CUF-CCR-TW07-16.5/18.5-20181213	CUF-CCR-TW07-21.0/23.4-20181213	CUF-CCR-TW07-27.0/29.0-20181213	CUF-CCR-TW07-31.5/33.5-20181213	CUF-CCR-TW07-36.5/38.5-20181213
Sample Depth		1.5 - 3.5 ft	6 - 8 ft	10.5 - 12.5 ft	16.5 - 18.5 ft	21 - 23.4 ft	27 - 29 ft	31.5 - 33.5 ft	36.5 - 38.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	11.8 +/-(1.46)	8.44 +/-(1.12)	7.55 +/-(0.950)	6.76 +/-(0.925)	8.37 +/-(1.21)	6.63 +/-(0.895)	6.79 +/-(0.860)	8.04 +/-(1.05)
Radium-228	PCI/G	2.32 +/-(0.582)	2.15 +/-(0.558)	1.83 +/-(0.595)	1.94 +/-(0.491)	2.00 +/-(0.545)	1.82 +/-(0.565)	1.40 +/-(0.428)	1.69 +/-(0.472)
Radium-226+228	PCI/G	14.1 +/-(1.57)	10.6 +/-(1.25)	9.38 +/-(1.12)	8.70 +/-(1.05)	10.4 +/-(1.33)	8.45 +/-(1.06)	8.19 +/-(0.961)	9.73 +/-(1.15)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.107 +/-(0.0639)	0.0831 +/-(0.0606)U	0.106 +/-(0.0614)	0.232 +/-(0.0888)	0.104 +/-(0.0673)	0.101 +/-(0.0659)	0.0418 +/-(0.0523)U	0.122 +/-(0.0674)
Radium-228	PCI/L	-0.0887 +/-(0.235)U	0.0583 +/-(0.246)U	0.219 +/-(0.249)U	0.291 +/-(0.248)U	0.0290 +/-(0.198)U	0.266 +/-(0.252)U	0.0933 +/-(0.210)U	0.136 +/-(0.205)U
Radium-226+228	PCI/L	0.107 +/-(0.244)J	0.141 +/-(0.253)U	0.325 +/-(0.256)J	0.522 +/-(0.263)J	0.133 +/-(0.209)J	0.367 +/-(0.260)J	0.135 +/-(0.216)U	0.258 +/-(0.216)J

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW07							
Sample Date		13-Dec-18	17-Dec-18	17-Dec-18	17-Dec-18	18-Dec-18	18-Dec-18	18-Dec-18	18-Dec-18
Sample ID		CUF-CCR-TW07-41.5/43.5-20181213	CUF-CCR-TW07-46.5/48.5-20181217	CUF-CCR-TW07-51.5/53.5-20181217	CUF-CCR-TW07-56.5/58.5-20181217	CUF-CCR-TW07-62.0/64.0-20181218	CUF-CCR-TW07-66.0/68.5-20181218	CUF-CCR-TW07-71.5/73.5-20181218	CUF-CCR-TW07-76.5/78.5-20181218
Sample Depth		41.5 - 43.5 ft	46.5 - 48.5 ft	51.5 - 53.5 ft	56.5 - 58.5 ft	62 - 64 ft	66 - 68.5 ft	71.5 - 73.5 ft	76.5 - 78.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	9.14 +/-(1.13)	8.87 +/-(1.16)	0.603 +/-(0.172)	8.03 +/-(1.17)	8.97 +/-(1.13)	9.81 +/-(1.18)	5.59 +/-(0.696)	5.22 +/-(0.688)
Radium-228	PCI/G	2.10 +/-(0.537)	1.57 +/-(0.702)	0.208 +/-(0.224)U	2.00 +/-(0.526)	2.44 +/-(0.600)	2.59 +/-(0.569)	1.38 +/-(0.394)	1.78 +/-(0.425)
Radium-226+228	PCI/G	11.2 +/-(1.25)	10.4 +/-(1.36)	0.811 +/-(0.282)J	10.0 +/-(1.28)	11.4 +/-(1.28)	12.4 +/-(1.31)	6.97 +/-(0.800)	7.00 +/-(0.809)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.0758 +/-(0.0576)U	0.114 +/-(0.0676)	0.0120 +/-(0.0484)U	0.124 +/-(0.0674)	0.155 +/-(0.0739)	0.200 +/-(0.0810)	0.126 +/-(0.0651)	0.0531 +/-(0.0479)U
Radium-228	PCI/L	0.0875 +/-(0.211)U	0.342 +/-(0.219)	0.383 +/-(0.231)	0.567 +/-(0.230)	0.781 +/-(0.240)	0.378 +/-(0.241)	0.166 +/-(0.201)U	0.207 +/-(0.215)U
Radium-226+228	PCI/L	0.163 +/-(0.219)U	0.456 +/-(0.229)	0.395 +/-(0.236)J	0.691 +/-(0.240)	0.936 +/-(0.251)	0.577 +/-(0.254)	0.292 +/-(0.211)J	0.260 +/-(0.220)U

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW07			CUF-TW08				
Sample Date		18-Dec-18	18-Dec-18	18-Dec-18	9-Jan-19	9-Jan-19	9-Jan-19	9-Jan-19	9-Jan-19
Sample ID		CUF-CCR-TW07-85.0/87.0-20181218	CUF-CCR-TW07-91.0/94.0-20181218	CUF-CCR-DUP01-20181218	CUF-CCR-TW08-1.0/4.0-20190109	CUF-CCR-TW08-6.5/7.8-20190109	CUF-CCR-TW08-11.5/15.0-20190109	CUF-CCR-TW08-16.5/18.5-20190109	CUF-CCR-TW08-21.0/23.0-20190109
Sample Depth		85 - 87 ft	91 - 94 ft	91 - 94 ft	1 - 4 ft	6.5 - 7.8 ft	11.5 - 15 ft	16.5 - 18.5 ft	21 - 23 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	4.72 +/-(0.719)	4.85 +/-(0.667)	5.19 +/-(0.743)	9.93 +/-(1.18)	9.15 +/-(1.18)	6.37 +/-(0.921)	6.83 +/-(0.847)	9.27 +/-(1.18)
Radium-228	PCI/G	1.87 +/-(0.592)	1.93 +/-(0.538)	1.93 +/-(0.457)	1.69 +/-(0.576)	2.17 +/-(0.484)	1.95 +/-(0.546)	1.44 +/-(0.312)	2.54 +/-(0.614)
Radium-226+228	PCI/G	6.59 +/-(0.931)	6.78 +/-(0.857)	7.12 +/-(0.872)	11.6 +/-(1.31)	11.3 +/-(1.28)	8.32 +/-(1.07)	8.27 +/-(0.903)	11.8 +/-(1.33)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.0881 +/-(0.0523)	0.0234 +/-(0.0409)U	0.0376 +/-(0.0439)U	0.132 +/-(0.0723)	0.0348 +/-(0.0570)U	0.0317 +/-(0.0533)U	0.104 +/-(0.0689)	0.113 +/-(0.0796)
Radium-228	PCI/L	0.208 +/-(0.203)U	0.179 +/-(0.227)U	-0.0285 +/-(0.193)U	0.293 +/-(0.224)U	0.218 +/-(0.226)U	0.216 +/-(0.191)U	0.284 +/-(0.236)U	0.141 +/-(0.236)U
Radium-226+228	PCI/L	0.296 +/-(0.210)J	0.202 +/-(0.231)U	0.0376 +/-(0.198)U	0.426 +/-(0.235)J	0.253 +/-(0.233)U	0.248 +/-(0.198)U	0.388 +/-(0.246)J	0.254 +/-(0.249)J

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW08							
Sample Date		10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19	10-Jan-19
Sample ID		CUF-CCR-TW08-25.5/28.8-20190110	CUF-CCR-TW08-30.0/34.5-20190110	CUF-CCR-DUP02-20190110	CUF-CCR-TW08-36.5/39.0-20190110	CUF-CCR-TW08-41.5/43.5-20190110	CUF-CCR-TW08-46.5/48.5-20190110	CUF-CCR-TW08-51.0/54.0-20190110	CUF-CCR-TW08-56.5/58.5-20190110
Sample Depth		25.5 - 28.8 ft	30 - 34.5 ft	30 - 34.5 ft	36.5 - 39 ft	41.5 - 43.5 ft	46.5 - 48.5 ft	51 - 54 ft	56.5 - 58.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	7.35 +/-(0.932)	8.50 +/-(1.11)	7.86 +/-(1.16)	7.27 +/-(0.985)	6.89 +/-(0.905)	7.59 +/-(0.998)	7.28 +/-(0.967)	7.63 +/-(1.02)
Radium-228	PCI/G	2.19 +/-(0.487)	2.01 +/-(0.709)	2.27 +/-(0.538)	1.10 +/-(0.866)	2.04 +/-(0.461)	1.59 +/-(0.452)	2.11 +/-(0.553)	2.48 +/-(0.613)
Radium-226+228	PCI/G	9.54 +/-(1.05)	10.5 +/-(1.32)	10.1 +/-(1.28)	8.37 +/-(1.31)	8.93 +/-(1.02)	9.18 +/-(1.10)	9.39 +/-(1.11)	10.1 +/-(1.19)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.230 +/-(0.0919)	0.0787 +/-(0.0658)U	0.151 +/-(0.0826)	0.439 +/-(0.127)	0.268 +/-(0.0989)	0.280 +/-(0.102)	0.137 +/-(0.0818)	0.135 +/-(0.0698)
Radium-228	PCI/L	0.111 +/-(0.235)U	0.0554 +/-(0.235)UJ	0.417 +/-(0.244)J	0.120 +/-(0.195)U	-0.0106 +/-(0.181)U	0.276 +/-(0.252)U	0.551 +/-(0.269)	0.129 +/-(0.205)U
Radium-226+228	PCI/L	0.342 +/-(0.252)J	0.134 +/-(0.244)UJ	0.568 +/-(0.258)J	0.559 +/-(0.233)J	0.268 +/-(0.206)J	0.556 +/-(0.272)J	0.688 +/-(0.281)	0.264 +/-(0.217)J

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW08				CUF-TW09			
Sample Date		10-Jan-19	11-Jan-19	11-Jan-19	14-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19
Sample ID		CUF-CCR-TW08-61.5/63.5-20190110	CUF-CCR-TW08-66.0/69.0-20190111	CUF-CCR-TW08-71.0/74.0-20190111	CUF-CCR-TW08-76.5/78.5-20190114	CUF-CCR-TW09-1.5/3.5-20190122	CUF-CCR-TW09-6.5/8.5-20190122	CUF-CCR-TW09-12.0/15.0-20190122	CUF-CCR-TW09-16.5/18.5-20190122
Sample Depth		61.5 - 63.5 ft	66 - 69 ft	71 - 74 ft	76.5 - 78.5 ft	1.5 - 3.5 ft	6.5 - 8.5 ft	12 - 15 ft	16.5 - 18.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
Radiological Parameters									
Radium-226	PCI/G	9.25 +/-(1.24)	7.96 +/-(0.987)	7.34 +/-(0.936)	5.17 +/-(0.700)	10.8 +/-(1.27)	11.6 +/-(1.46)	8.15 +/-(1.02)	9.09 +/-(1.15)
Radium-228	PCI/G	2.68 +/-(0.583)	2.16 +/-(0.541)	1.91 +/-(0.481)	1.86 +/-(0.405)	2.15 +/-(0.552)	3.06 +/-(0.686)	2.07 +/-(0.486)	1.78 +/-(0.719)
Radium-226+228	PCI/G	11.9 +/-(1.37)	10.1 +/-(1.13)	9.25 +/-(1.05)	7.03 +/-(0.809)	13.0 +/-(1.38)	14.7 +/-(1.61)	10.2 +/-(1.13)	10.9 +/-(1.36)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.191 +/-(0.0832)	0.139 +/-(0.0773)	0.0961 +/-(0.0685)	0.0319 +/-(0.0517)U	0.136 +/-(0.0756)J	0.117 +/-(0.0652)J	0.0452 +/-(0.0458)UJ	0.0836 +/-(0.0604)J
Radium-228	PCI/L	0.307 +/-(0.231)U	0.350 +/-(0.239)U	0.269 +/-(0.239)U	0.118 +/-(0.220)U	0.191 +/-(0.281)UJ	0.0833 +/-(0.216)UJ	0.208 +/-(0.250)UJ	0.182 +/-(0.286)UJ
Radium-226+228	PCI/L	0.498 +/-(0.246)J	0.489 +/-(0.251)J	0.365 +/-(0.249)J	0.150 +/-(0.226)U	0.327 +/-(0.291)J	0.200 +/-(0.226)J	0.253 +/-(0.254)UJ	0.265 +/-(0.292)J

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW09							
Sample Date		22-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19	22-Jan-19	24-Jan-19	24-Jan-19
Sample ID		CUF-CCR-TW09-21.5/23.7-20190122	CUF-CCR-TW09-26.0/29.8-20190122	CUF-CCR-TW09-DUP03-20190122	CUF-CCR-TW09-32.0/34.0-20190122	CUF-CCR-TW09-36.5/38.5-20190122	CUF-CCR-TW09-41.0/43.0-20190122	CUF-CCR-TW09-45.5/47.5-20190124	CUF-CCR-TW09-51.5/53.5-20190124
Sample Depth		21.5 - 23.7 ft	26 - 29.8 ft	26 - 29.8 ft	32 - 34 ft	36.5 - 38.5 ft	41 - 43 ft	45.5 - 47.5 ft	51.5 - 53.5 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Validated	Validated
Radiological Parameters									
Radium-226	PCI/G	7.02 +/-(0.901)	8.73 +/-(1.10)	8.70 +/-(1.15)	11.4 +/-(1.50)	8.33 +/-(1.08)	8.68 +/-(1.10)	8.09 +/-(1.13)	9.25 +/-(1.16)
Radium-228	PCI/G	1.79 +/-(0.480)	1.97 +/-(0.514)J	2.84 +/-(0.654)J	3.21 +/-(0.681)	2.15 +/-(0.563)	1.91 +/-(0.484)	2.48 +/-(0.695)	1.86 +/-(0.536)
Radium-226+228	PCI/G	8.81 +/-(1.02)	10.7 +/-(1.21)J	11.5 +/-(1.32)J	14.6 +/-(1.65)	10.5 +/-(1.22)	10.6 +/-(1.20)	10.6 +/-(1.33)	11.1 +/-(1.28)
Radiological Parameters - SPLP									
Radium-226	PCI/L	0.0950 +/-(0.0576)J	0.102 +/-(0.0592)J	0.185 +/-(0.0758)J	0.186 +/-(0.0782)J	0.0954 +/-(0.0622)J	0.106 +/-(0.0646)J	0.0287 +/-(0.0416)U	0.0210 +/-(0.0458)U
Radium-228	PCI/L	0.353 +/-(0.280)UJ	0.120 +/-(0.229)UJ	0.128 +/-(0.259)UJ	-0.0129 +/-(0.231)UJ	0.298 +/-(0.260)UJ	-0.0824 +/-(0.291)UJ	0.245 +/-(0.261)U	-0.152 +/-(0.199)U
Radium-226+228	PCI/L	0.448 +/-(0.286)J	0.222 +/-(0.237)J	0.314 +/-(0.270)J	0.186 +/-(0.244)J	0.393 +/-(0.267)J	0.106 +/-(0.298)J	0.274 +/-(0.264)U	0.0210 +/-(0.204)U

See notes on last page.

TABLE B.3a. CCR Material Analytical Results for Radiological Parameters
Cumberland Fossil Plant
December 2018 - March 2019

Sample Location		CUF-TW09						
Sample Date		24-Jan-19	24-Jan-19	24-Jan-19	24-Jan-19	24-Jan-19	24-Jan-19	25-Jan-19
Sample ID		CUF-CCR-TW09-56.0/59.0-20190124	CUF-CCR-TW09-60.5/63.0-20190124	CUF-CCR-TW09-67.0/69.5-20190124	CUF-CCR-TW09-72.0/74.5-20190124	CUF-CCR-TW09-76.5/79.0-20190124	CUF-CCR-TW09-81.0/83.5-20190124	CUF-CCR-TW09-85.5/88.0-20190125
Sample Depth		56 - 59 ft	60.5 - 63 ft	67 - 69.5 ft	72 - 74.5 ft	76.5 - 79 ft	81 - 83.5 ft	85.5 - 88 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Validated	Validated	Validated	Validated	Validated	Validated	Validated
Radiological Parameters								
Radium-226	PCI/G	8.22 +/-(1.08)	10.7 +/-(1.33)	7.85 +/-(1.02)	7.66 +/-(0.967)	4.53 +/-(0.646)	4.00 +/-(0.559)	4.62 +/-(0.745)
Radium-228	PCI/G	2.49 +/-(0.679)	2.69 +/-(0.599)	2.03 +/-(0.480)	2.39 +/-(0.493)	1.82 +/-(0.666)	1.76 +/-(0.364)	1.48 +/-(0.473)J
Radium-226+228	PCI/G	10.7 +/-(1.28)	13.4 +/-(1.46)	9.88 +/-(1.13)	10.1 +/-(1.09)	6.35 +/-(0.928)	5.76 +/-(0.667)	6.10 +/-(0.882)J
Radiological Parameters - SPLP								
Radium-226	PCI/L	0.0859 +/-(0.0669)U	0.128 +/-(0.0745)	0.0922 +/-(0.0656)	0.0903 +/-(0.0695)U	0.0152 +/-(0.0477)U	0.00681 +/-(0.0533)U	0.0384 +/-(0.0549)U
Radium-228	PCI/L	-0.0908 +/-(0.226)U	-0.0902 +/-(0.182)U	0.241 +/-(0.206)U	0.00407 +/-(0.259)U	0.0345 +/-(0.215)U	-0.140 +/-(0.215)U	0.128 +/-(0.267)U
Radium-226+228	PCI/L	0.0859 +/-(0.236)U	0.128 +/-(0.197)J	0.333 +/-(0.216)J	0.0943 +/-(0.268)U	0.0497 +/-(0.220)U	0.00681 +/-(0.222)U	0.166 +/-(0.273)U

Notes:

ft	feet below ground surface
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/g	picoCurie per gram
pCi/L	picoCurie per Liter
SPLP	Synthetic Precipitation Leaching Procedure
U	not detected
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.3b. Supplemental CCR Material Analytical Results for Radiological Parameters for Retention Pond within the Main Ash Pond
Cumberland Fossil Plant
June 2020

Sample Location Sample Date Sample ID Sample Depth Sample Type	Units	B-1 11-Jun-20 CUF-CCR-B1-11.0/14.7-20200611 11 - 14.7 ft Normal Environmental Sample Final-Verified	B-3,B-3A,B-3B,ALT-5 11-Jun-20 CUF-CCR-B3/3A/3B/A5-4.5/10.5-20200611 4.5 - 10.5 ft Normal Environmental Sample Final-Verified
Radiological Parameters			
Radium-226	PCI/G	5.43 +/-(0.736)	4.13 +/-(0.559)
Radium-228	PCI/G	2.24 +/-(0.517)	2.46 +/-(0.448)
Radium-226+228	PCI/G	7.67 +/-(0.899)	6.59 +/-(0.716)
Radiological Parameters - SPLP			
Radium-226	PCI/L	-0.0205 +/-(0.0682)U	0.0473 +/-(0.0610)U
Radium-228	PCI/L	0.362 +/-(0.270)UJ	0.461 +/-(0.278)J
Radium-226+228	PCI/L	0.362 +/-(0.278)UJ	0.508 +/-(0.285)J

Notes:

ft	feet below ground surface
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/g	picoCurie per gram
pCi/L	picoCurie per Liter
SPLP	Synthetic Precipitation Leaching Procedure
U	not detected
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation

1. Level of review is defined in the Quality Assurance Project Plan.
2. Location IDs and sample IDs from retained geotechnical samples do not include the "MAP (Main Ash Pond)" nomenclature.
3. The CCR material utilized for this investigation was originally collected in August 2019. As approved by TDEC, supplemental CCR material samples prepared in June 2020 were analyzed within the analytical holding time based on the dates of supplemental sample preparation.

TABLE B.4. CCR Material pH Field Results
Cumberland Fossil Plant
Dec 2018 - March 2019

Sample Location	Sample ID	Sample Date	Sample Depth	pH (field)
				SU
CUF-TW01	CUF-CCR-TW01-1.5/3.5-20190205	5-Feb-19	1.5 - 3.5 ft	6.63
	CUF-CCR-TW01-6.0/8.0-20190205	5-Feb-19	6 - 8 ft	6.29
	CUF-CCR-TW01-12.0/14.0-20190205	5-Feb-19	12 - 14 ft	6.34
	CUF-CCR-TW01-16.5/18.5-20190205	5-Feb-19	16.5 - 18.5 ft	6.53
	CUF-CCR-TW01-22.5/24.5-20190205	5-Feb-19	22.5 - 24.5 ft	6.74
	CUF-CCR-TW01-27.0/29.0-20190205	5-Feb-19	27 - 29 ft	8.12
	CUF-CCR-TW01-31.5/33.5-20190205	5-Feb-19	31.5 - 33.5 ft	8.48
	CUF-CCR-TW01-36.0/40.0-20190206	6-Feb-19	36 - 40 ft	9.87
	CUF-CCR-TW01-42.5/45.0-20190206	6-Feb-19	42.5 - 45 ft	9.74
	CUF-CCR-TW01-47.0/49.5-20190206	6-Feb-19	47 - 49.5 ft	10.09
	CUF-CCR-TW01-51.5/53.8-20190206	6-Feb-19	51.5 - 53.8 ft	9.47
CUF-TW02	CUF-CCR-TW02-1.5/3.5-20190305	5-Mar-19	1.5 - 3.5 ft	6.39
	CUF-CCR-TW02-6.5/8.5-20190305	5-Mar-19	6.5 - 8.5 ft	6.63
	CUF-CCR-TW02-10.5/12.9-20190306	6-Mar-19	10.5 - 12.9 ft	6.81
	CUF-CCR-TW02-16.5/18.5-20190306	6-Mar-19	16.5 - 18.5 ft	8.37
	CUF-CCR-TW02-21.5/23.3-20190306	6-Mar-19	21.5 - 23.3 ft	7.38
CUF-TW03	CUF-CCR-TW03-1.5/3.5-20190213	13-Feb-19	1.5 - 3.5 ft	6.18
	CUF-CCR-TW03-6.5/8.5-20190213	13-Feb-19	6.5 - 8.5 ft	6.86
	CUF-CCR-TW03-11.5/13.5-20190213	13-Feb-19	11.5 - 13.5 ft	6.52
	CUF-CCR-TW03-16.5/18.5-20190213	13-Feb-19	16.5 - 18.5 ft	6.36
	CUF-CCR-TW03-21.0/23.0-20190213	13-Feb-19	21 - 23 ft	6.71
	CUF-CCR-TW03-26.5/28.5-20190213	13-Feb-19	26.5 - 28.5 ft	10.14
	CUF-CCR-TW03-31.5/33.5-20190213	13-Feb-19	31.5 - 33.5 ft	10.31
	CUF-CCR-TW03-36.5/39.5-20190213	13-Feb-19	36.5 - 39.5 ft	10.29
	CUF-CCR-TW03-41.0/44.0-20190213	13-Feb-19	41 - 44 ft	10.11
	CUF-CCR-TW03-46.5/48.5-20190214	14-Feb-19	46.5 - 48.5 ft	10.66
	CUF-CCR-TW03-51.5/53.5-20190214	14-Feb-19	51.5 - 53.5 ft	10.85
	CUF-CCR-TW03-56.5/58.5-20190214	14-Feb-19	56.5 - 58.5 ft	10.78
	CUF-CCR-TW03-61.5/63.5-20190214	14-Feb-19	61.5 - 63.5 ft	10.96
CUF-TW04	CUF-CCR-TW04-1.5/3.5-20190306	6-Mar-19	1.5 - 3.5 ft	7.30
	CUF-CCR-TW04-6.0/7.9-20190306	6-Mar-19	6 - 7.9 ft	7.24
	CUF-CCR-TW04-10.5/12.8-20190306	6-Mar-19	10.5 - 12.8 ft	7.36
	CUF-CCR-TW04-16.5/18.5-20190307	7-Mar-19	16.5 - 18.5 ft	7.34
	CUF-CCR-TW04-21.5/23.0-20190307	7-Mar-19	21.5 - 23 ft	7.32
CUF-TW05	CUF-CCR-TW05-1.5/3.5-20190219	19-Feb-19	1.5 - 3.5 ft	6.84
	CUF-CCR-TW05-6.5/8.5-20190220	20-Feb-19	6.5 - 8.5 ft	7.01
	CUF-CCR-TW05-11.5/13.5-20190220	20-Feb-19	11.5 - 13.5 ft	6.51
	CUF-CCR-TW05-16.5/18.5-20190220	20-Feb-19	16.5 - 18.5 ft	6.84
	CUF-CCR-TW05-21.5/23.5-20190220	20-Feb-19	21.5 - 23.5 ft	8.49
	CUF-CCR-TW05-26.5/28.5-20190220	20-Feb-19	26.5 - 28.5 ft	8.82
	CUF-CCR-TW05-31.5/33.5-20190220	20-Feb-19	31.5 - 33.5 ft	9.89
	CUF-CCR-TW05-36.5/38.5-20190221	21-Feb-19	36.5 - 38.5 ft	10.11
	CUF-CCR-TW05-41.5/44.0-20190221	21-Feb-19	41.5 - 44 ft	10.01
	CUF-CCR-TW05-46.0/49.0-20190221	21-Feb-19	46 - 49 ft	10.78
	CUF-CCR-TW05-51.5/53.5-20190221	21-Feb-19	51.5 - 53.5 ft	10.50
	CUF-CCR-TW05-56.5/58.5-20190221	21-Feb-19	56.5 - 58.5 ft	10.38

See notes on last page.

TABLE B.4. CCR Material pH Field Results
Cumberland Fossil Plant
Dec 2018 - March 2019

Sample Location	Sample ID	Sample Date	Sample Depth	pH (field)
				SU
CUF-TW06	CUF-CCR-TW06-1.0/4.0-20190307	7-Mar-19	1 - 4 ft	7.63
	CUF-CCR-TW06-6.5/8.5-20190307	7-Mar-19	6.5 - 8.5 ft	7.84
	CUF-CCR-TW06-12.5/14.2-20190307	7-Mar-19	12.5 - 14.2 ft	7.64
	CUF-CCR-TW06-16.5/19.0-20190307	7-Mar-19	16.5 - 19 ft	7.88
CUF-TW07	CUF-CCR-TW07-1.5/3.5-20181213	13-Dec-18	1.5 - 3.5 ft	10.40
	CUF-CCR-TW07-6.0/8.0-20181213	13-Dec-18	6 - 8 ft	11.16
	CUF-CCR-TW07-10.5/12.5-20181213	13-Dec-18	10.5 - 12.5 ft	11.01
	CUF-CCR-TW07-16.5/18.5-20181213	13-Dec-18	16.5 - 18.5 ft	11.00
	CUF-CCR-TW07-21.0/23.4-20181213	13-Dec-18	21 - 23.4 ft	9.06
	CUF-CCR-TW07-27.0/29.0-20181213	13-Dec-18	27 - 29 ft	10.12
	CUF-CCR-TW07-31.5/33.5-20181213	13-Dec-18	31.5 - 33.5 ft	10.17
	CUF-CCR-TW07-36.5/38.5-20181213	13-Dec-18	36.5 - 38.5 ft	8.03
	CUF-CCR-TW07-41.5/43.5-20181213	13-Dec-18	41.5 - 43.5 ft	6.56
	CUF-CCR-TW07-46.5/48.5-20181217	17-Dec-18	46.5 - 48.5 ft	8.56
	CUF-CCR-TW07-51.5/53.5-20181217	17-Dec-18	51.5 - 53.5 ft	8.23
	CUF-CCR-TW07-56.5/58.5-20181217	17-Dec-18	56.5 - 58.5 ft	9.98
	CUF-CCR-TW07-62.0/64.0-20181218	18-Dec-18	62 - 64 ft	10.64
	CUF-CCR-TW07-66.0/68.5-20181218	18-Dec-18	66 - 68.5 ft	10.25
	CUF-CCR-TW07-71.5/73.5-20181218	18-Dec-18	71.5 - 73.5 ft	10.49
	CUF-CCR-TW07-76.5/78.5-20181218	18-Dec-18	76.5 - 78.5 ft	10.76
	CUF-CCR-TW07-85.0/87.0-20181218	18-Dec-18	85 - 87 ft	10.92
	CUF-CCR-TW07-91.0/94.0-20181218	18-Dec-18	91 - 94 ft	10.79
CUF-TW08	CUF-CCR-TW08-1.0/4.0-20190109	9-Jan-19	1 - 4 ft	10.55
	CUF-CCR-TW08-6.5/7.8-20190109	9-Jan-19	6.5 - 7.8 ft	7.97
	CUF-CCR-TW08-11.5/15.0-20190109	9-Jan-19	11.5 - 15 ft	11.57
	CUF-CCR-TW08-16.5/18.5-20190109	9-Jan-19	16.5 - 18.5 ft	10.31
	CUF-CCR-TW08-21.0/23.0-20190109	9-Jan-19	21 - 23 ft	11.51
	CUF-CCR-TW08-25.5/28.8-20190110	10-Jan-19	25.5 - 28.8 ft	11.54
	CUF-CCR-TW08-30.0/34.5-20190110	10-Jan-19	30 - 34.5 ft	10.94
	CUF-CCR-TW08-36.5/39.0-20190110	10-Jan-19	36.5 - 39 ft	6.21
	CUF-CCR-TW08-41.5/43.5-20190110	10-Jan-19	41.5 - 43.5 ft	6.02
	CUF-CCR-TW08-46.5/48.5-20190110	10-Jan-19	46.5 - 48.5 ft	7.03
	CUF-CCR-TW08-51.0/54.0-20190110	10-Jan-19	51 - 54 ft	9.17
	CUF-CCR-TW08-56.5/58.5-20190110	10-Jan-19	56.5 - 58.5 ft	10.44
	CUF-CCR-TW08-61.5/63.5-20190110	10-Jan-19	61.5 - 63.5 ft	8.58
	CUF-CCR-TW08-66.0/69.0-20190111	11-Jan-19	66 - 69 ft	10.14
	CUF-CCR-TW08-71.0/74.0-20190111	11-Jan-19	71 - 74 ft	10.88
	CUF-CCR-TW08-76.5/78.5-20190114	14-Jan-19	76.5 - 78.5 ft	11.20

See notes on last page.

TABLE B.4. CCR Material pH Field Results
Cumberland Fossil Plant
Dec 2018 - March 2019

Sample Location	Sample ID	Sample Date	Sample Depth	pH (field)
				SU
CUF-TW09	CUF-CCR-TW09-1.5/3.5-20190122	22-Jan-19	1.5 - 3.5 ft	8.40
	CUF-CCR-TW09-6.5/8.5-20190122	22-Jan-19	6.5 - 8.5 ft	10.91
	CUF-CCR-TW09-12.0/15.0-20190122	22-Jan-19	12 - 15 ft	11.73
	CUF-CCR-TW09-16.5/18.5-20190122	22-Jan-19	16.5 - 18.5 ft	8.49
	CUF-CCR-TW09-21.5/23.7-20190122	22-Jan-19	21.5 - 23.7 ft	10.73
	CUF-CCR-TW09-26.0/29.8-20190122	22-Jan-19	26 - 29.8 ft	10.71
	CUF-CCR-TW09-32.0/34.0-20190122	22-Jan-19	32 - 34 ft	10.82
	CUF-CCR-TW09-36.5/38.5-20190122	22-Jan-19	36.5 - 38.5 ft	6.04
	CUF-CCR-TW09-41.0/43.0-20190122	22-Jan-19	41 - 43 ft	6.20
	CUF-CCR-TW09-45.5/47.5-20190124	24-Jan-19	45.5 - 47.5 ft	10.81
	CUF-CCR-TW09-51.5/53.5-20190124	24-Jan-19	51.5 - 53.5 ft	10.54
	CUF-CCR-TW09-56.0/59.0-20190124	24-Jan-19	56 - 59 ft	10.43
	CUF-CCR-TW09-60.5/63.0-20190124	24-Jan-19	60.5 - 63 ft	10.89
	CUF-CCR-TW09-67.0/69.5-20190124	24-Jan-19	67 - 69.5 ft	10.90
	CUF-CCR-TW09-72.0/74.5-20190124	24-Jan-19	72 - 74.5 ft	10.26
	CUF-CCR-TW09-76.5/79.0-20190124	24-Jan-19	76.5 - 79 ft	10.46
	CUF-CCR-TW09-81.0/83.5-20190124	24-Jan-19	81 - 83.5 ft	10.81
	CUF-CCR-TW09-85.5/88.0-20190125	25-Jan-19	85.5 - 88 ft	10.58

Notes:

ft feet below ground surface
ID identification
SU Standard Unit

Table B.5 - Pore Water Level Measurements
Cumberland Fossil Plant
June 2019

Well ID	Date Measured	Depth to Pore Water	Top of Casing Elevation	Pore Water Elevation	Screen Interval
		ft btoc	ft msl	ft msl	ft btoc
CUF-TW01	06/03/2019	40.04	430.99	390.95	45.3 - 55.9
CUF-TW03	06/03/2019	28.83	429.53	400.70	60.3 - 70.9
CUF-TW05	06/03/2019	30.81	426.80	395.99	50.2 - 60.8
CUF-TW07	06/03/2019	58.81	443.69	384.88	85.5 - 96.1
CUF-TW08	06/03/2019	52.30	443.36	391.06	76.9 - 87.5
CUF-TW09	06/03/2019	56.82	446.44	389.62	83.5 - 94.1

Notes:

btoc below top of casing
ft feet
ID Identification
msl mean sea level

1. Top of casing elevations and screen intervals were obtained from survey datum on the TVA TDEC Order Well Installation Detail Logs included in the Exploratory Drilling SAR.

TABLE B.6. Summary of Pore Water Samples
Cumberland Fossil Plant
June 2019

			Analysis Type										
Location ID	**Sample ID**	**Sample Type**	Field Parameters	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Anions	Total Dissolved Solids	Total Organic Carbon	Radium-226	Radium-228	Radium-226+228
CUF-TW01	CUF-PW-TW01-20190605	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
CUF-TW03	CUF-PW-TW03-20190604	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
CUF-TW05	CUF-PW-TW05-20190604	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
CUF-TW07	CUF-PW-TW07-20190606	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
CUF-TW08	CUF-PW-TW08-20190606	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
CUF-TW09	CUF-PW-TW09-20190605	Normal Environmental Sample	x	x	x	x	x	x	x	x	x	x	x
	CUF-PW-DUP01-20190605	Field Duplicate Sample		x	x	x	x	x	x	x	x	x	x

Notes:

Total and Dissolved Metals	SW-846 6020A
Total and Dissolved Mercury	SW-846 7470A
Anions	SW-846 9056A
Total Dissolved Solids	SM2540C
Total Organic Carbon	SW-846 9060A
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Radium-226+228	CALC
ID	identification

1. Field and laboratory quality control sample results except for field duplicates are not included in report tables but were used for data validation.
2. CEC collected split samples from CUF-TW08

Stantec

TABLE B.7. Summary of Pore Water Quality Parameters
Cumberland Fossil Plant
June 2019

Sample Location		CUF-TW01	CUF-TW03	CUF-TW05	CUF-TW07	CUF-TW08	CUF-TW09
Sample Date		5-Jun-19	4-Jun-19	4-Jun-19	6-Jun-19	6-Jun-19	5-Jun-19
Sample ID		CUF-PW-TW01-20190605	CUF-PW-TW03-20190604	CUF-PW-TW05-20190604	CUF-PW-TW07-20190606	CUF-PW-TW08-20190606	CUF-PW-TW09-20190605
Sample Depth		51.3 ft	66.3 ft	56.3 ft	93.3 ft	83.3 ft	90 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample
Level of Review	Units	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review	Final QC Review
Field Parameters							
Dissolved Oxygen	%	3.6	4.2	4.3	3.8	1.9	2.4
Dissolved Oxygen	mg/L	0.32	0.36	0.40	0.33	0.17	0.22
ORP	mV	-118.8	-44.1	52.4	-146.2	-178.8	-72.5
pH (field)	SU	8.52	9.56	10.90	10.12	9.79	10.48
Specific Cond. (Field)	uS/cm	2,551	2,881	4,148	2,142	2,341	3,229
Temperature, Water (C)	DEG C	21.1	22.0	18.9	20.6	21.3	25.0
Turbidity, field	NTU	2.24	2.45	4.23	9.56	9.47	9.33

Notes:

%	percent
Cond.	conductance
DEG C	degrees Celsius
ft	feet below top of casing
ID	identification
mg/L	milligrams per Liter
mV	milliVolts
NTU	Nephelometric Turbidity Unit
ORP	Oxidation Reduction Potential, measured using a silver reference electrode which has a standard potential of 200 mV
SU	Standard Units
uS/cm	microSiemens per centimeter

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.8. Pore Water Analytical Results for Metals, Anions, and General Chemistry
Cumberland Fossil Plant
June 2019

Sample Location		CUF-TW01	CUF-TW03	CUF-TW05	CUF-TW07	CUF-TW08	CUF-TW09	
Sample Date		5-Jun-19	4-Jun-19	4-Jun-19	6-Jun-19	6-Jun-19	5-Jun-19	5-Jun-19
Sample ID		CUF-PW-TW01-20190605	CUF-PW-TW03-20190604	CUF-PW-TW05-20190604	CUF-PW-TW07-20190606	CUF-PW-TW08-20190606	CUF-PW-TW09-20190605	CUF-PW-DUP01-20190605
Sample Depth		51.3 ft	66.3 ft	56.3 ft	93.3 ft	83.3 ft	90 ft	90 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review		Final-Verified	Validated	Validated	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units							
Total Metals								
Antimony	UG/L	11.2	3.92 J	1.46 U*	4.70 U*	6.19	3.07 U*	3.13 U*
Arsenic	UG/L	23.9	21.6 J	17.1 J	71.0	18.7	28.6	29.7
Barium	UG/L	45.5	88.4	141	73.2	167	99.6	101
Beryllium	UG/L	0.456 U*	0.155 UJ	<0.155	0.233 U*	0.509 U*	0.302 U*	0.256 U*
Boron	UG/L	13,200	3,530 J	12,700	14,400	10,300	18,700	19,100
Cadmium	UG/L	0.210 J	1.80 J	0.400 J	0.983 J	1.69	8.66	8.90
Calcium	UG/L	575,000	349,000 J	900,000	356,000	396,000	358,000	363,000
Chromium	UG/L	2.29 U*	1.53 UJ	<1.53	4.41 U*	4.09 U*	3.91 U*	4.06 U*
Cobalt	UG/L	0.527	0.152 J	<0.0750	0.492 J	0.530	0.387 J	0.393 J
Copper	UG/L	1.15 U*	0.895 U*	<0.627	2.06 U*	2.63 U*	1.57 U*	1.97 U*
Iron	UG/L	113	30.4 J	125	598	359	403	383
Lead	UG/L	0.182 U*	0.176 U*	0.355 U*	1.38 U*	1.08 U*	1.18 U*	1.14 U*
Lithium	UG/L	17.8 U*	80.8 J	129	69.7	21.2 U*	675	688
Manganese	UG/L	198	25.2 J	3.13 J	6.14	15.8	5.01	4.95 J
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	485	8,990 J	1,300 J	3,950	6,860	37,100	37,400
Nickel	UG/L	0.803 J	5.75 J	1.93	4.31	3.06	4.33	4.66
Selenium	UG/L	54.2	68.7 J	13.5 J	<2.62	7.21	546	551
Silver	UG/L	<0.121	0.121 UJ	0.121 UJ	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	2.21	0.834 U*	0.577 U*	0.203 U*	0.687 U*	0.370 U*	0.331 U*
Vanadium	UG/L	94.7	426 J	267	19.8	101	983	997
Zinc	UG/L	<3.22	3.22 UJ	3.22 J	6.81	6.02	5.29	5.09
Dissolved Metals								
Antimony	UG/L	10.7	3.46 J	1.22 U*	4.80	5.67	3.00 U*	2.81 U*
Arsenic	UG/L	22.9	24.2 J	16.0 J	68.9	17.6	28.3	27.9
Barium	UG/L	44.6	95.1	129	64.2	180	90.4	90.4
Beryllium	UG/L	0.299 U*	<0.155	0.212 U*	<0.155	0.219 U*	0.193 U*	0.176 U*
Boron	UG/L	13,100	3,900	12,100	14,400	10,700	19,500	18,800
Cadmium	UG/L	0.144 J	1.96 J	0.309 J	0.869 J	1.57	8.59	8.39
Calcium	UG/L	568,000	397,000 J	840,000 J	357,000	402,000	358,000	357,000
Chromium	UG/L	2.16 U*	1.53 UJ	1.53 UJ	3.18 U*	2.41 U*	2.41 U*	1.99 U*
Cobalt	UG/L	0.450 J	0.145 J	0.0750 UJ	0.253 J	0.322 J	0.222 J	0.218 J
Copper	UG/L	1.05 U*	0.627 UJ	0.627 UJ	1.23 U*	1.36 U*	1.12 U*	1.26 U*
Iron	UG/L	37.2 J	14.1 UJ	14.1 UJ	<14.1	28.7 J	29.2 J	26.8 J
Lead	UG/L	<0.128	<0.128	<0.128	<0.128	0.151 J	<0.128	<0.128
Lithium	UG/L	16.8 U*	92.7 J	122	69.9	19.6	679	670
Manganese	UG/L	194	20.2 J	1.35 UJ	1.40 J	12.4	<1.35	<1.35
Mercury	UG/L	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101	<0.101
Molybdenum	UG/L	470	10,400 J	1,230 J	3,890	6,860	37,400	37,000
Nickel	UG/L	0.724 U*	6.79 J	1.86 U*	3.60	2.48	3.88	3.75
Selenium	UG/L	42.0	75.3 J	12.5 J	<2.62	6.36	549	537
Silver	UG/L	<0.121	0.121 UJ	0.121 UJ	<0.121	<0.121	<0.121	<0.121
Thallium	UG/L	2.02	0.706 U*	1.73 U*	<0.128	0.251 J	0.158 J	0.132 J
Vanadium	UG/L	89.8	464 J	260 J	14.8	94.6	948	938
Zinc	UG/L	<3.22	3.22 UJ	3.22 UJ	<3.22	<3.22	<3.22	<3.22
Anions								
Chloride	MG/L	17.2	73.2	781	236	104	282	281
Fluoride	MG/L	3.81	0.506	0.198 J	0.0717 J	0.173 J	0.0712 J	<0.0658
Sulfate	MG/L	1,670	1,850	1,100	657	1,160	1,270	1,280
General Chemistry								
Total Dissolved Solids	MG/L	2,000	3,340	3,130	1,770	1,970	2,630	2,200
Total Organic Carbon	MG/L	10.5	85.9	3.53	13.2	61.8	8.18	8.17

Notes:

<0.03	analyte was not detected at a concentration greater than the Method Detection Limit
ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
mg/L	milligrams per Liter
U*	this result should be considered "not detected" because it was detected in an associated field or laboratory blank at a similar level
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data
ug/L	validation micrograms per Liter

1. Level of review is defined in the Quality Assurance Project Plan.

TABLE B.9. Pore Water Analytical Results for Radiological Parameters
Cumberland Fossil Plant
June 2019

Sample Location		CUF-TW01	CUF-TW03	CUF-TW05	CUF-TW07	CUF-TW08	CUF-TW09	
Sample Date		5-Jun-19	4-Jun-19	4-Jun-19	6-Jun-19	6-Jun-19	5-Jun-19	5-Jun-19
Sample ID		CUF-PW-TW01-20190605	CUF-PW-TW03-20190604	CUF-PW-TW05-20190604	CUF-PW-TW07-20190606	CUF-PW-TW08-20190606	CUF-PW-TW09-20190605	CUF-PW-DUP01-20190605
Sample Depth		51.3 ft	66.3 ft	56.3 ft	93.3 ft	83.3 ft	90 ft	90 ft
Sample Type		Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Normal Environmental Sample	Field Duplicate Sample
Level of Review		Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified	Final-Verified
	Units							
Radiological Parameters								
Radium-226	PCI/L	0.155 +/-(0.210)UJ	0.356 +/-(0.127)	0.157 +/-(0.0825)	0.0800 +/-(0.208)UJ	0.153 +/-(0.268)UJ	0.000 +/-(0.190)UJ	-0.0569 +/-(0.180)UJ
Radium-228	PCI/L	-0.152 +/-(0.333)U	-0.0110 +/-(0.248)U	-0.0655 +/-(0.232)U	-0.00782 +/-(0.356)U	0.203 +/-(0.349)U	0.345 +/-(0.400)U	0.147 +/-(0.373)U
Radium-226+228	PCI/L	0.155 +/-(0.394)UJ	0.356 +/-(0.279)J	0.157 +/-(0.246)J	0.0800 +/-(0.412)UJ	0.357 +/-(0.440)UJ	0.345 +/-(0.443)UJ	0.147 +/-(0.414)UJ

Notes:

ft	feet below top of casing
ID	identification
J	quantitation is approximate due to limitations identified during data validation
pCi/L	picoCurie per Liter
U	not detected
UJ	this compound was not detected, but the reporting or detection limit should be considered estimated due to a bias identified during data validation

1. Level of review is defined in the Quality Assurance Project Plan.

APPENDIX C - SUBSURFACE LOGS

REFER TO

APPENDIX B.3 - TEMPORARY WELLS

APPENDIX D - PHOTOGRAPHIC LOGS

ATTACHMENT D.1a

Photographic Logs of Soil Cores –
CUF-TW01 Through CUF-TW05

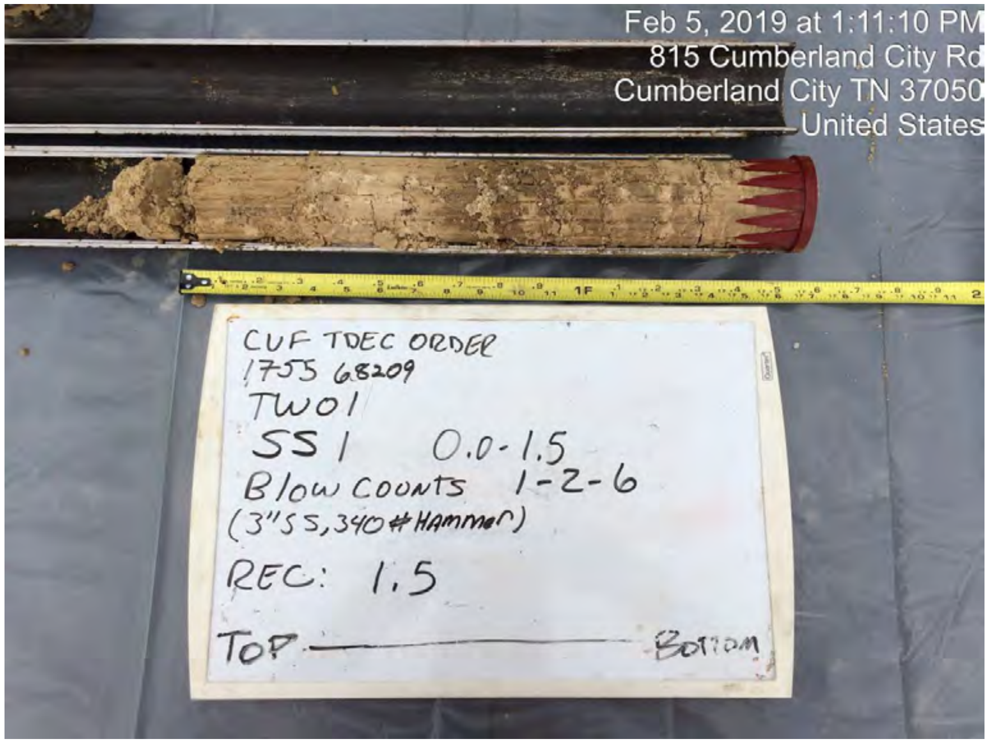
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 1

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (0.0-1.5 feet). Split spoon shown on white board should be SS01.

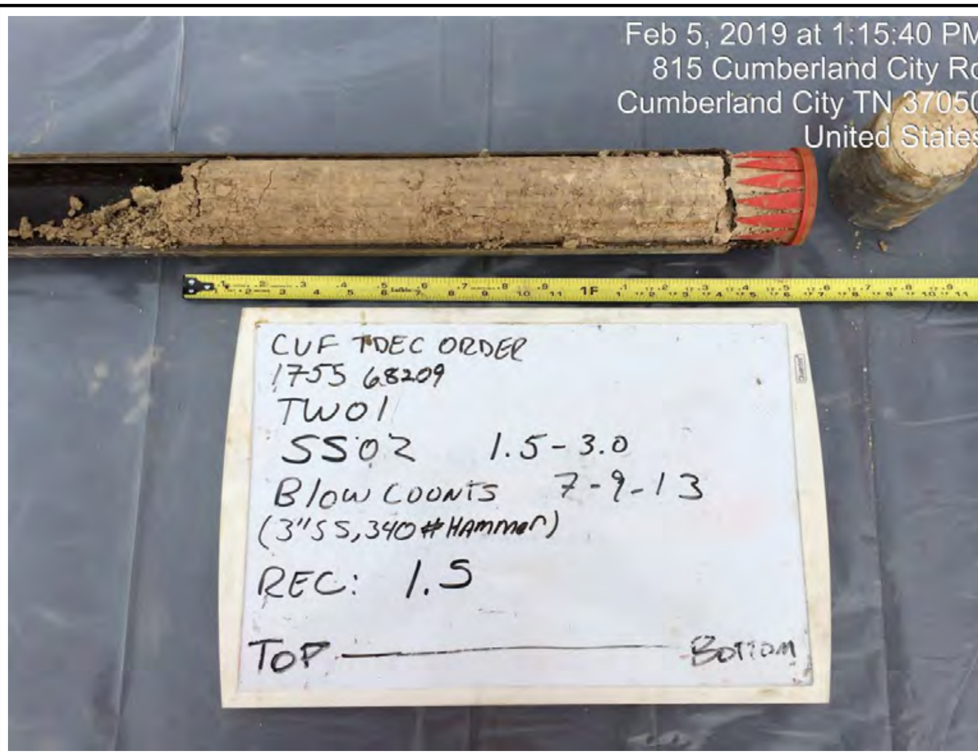


Photograph ID: 2

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (1.5-3.0 feet).



Stantec

Photographic Log

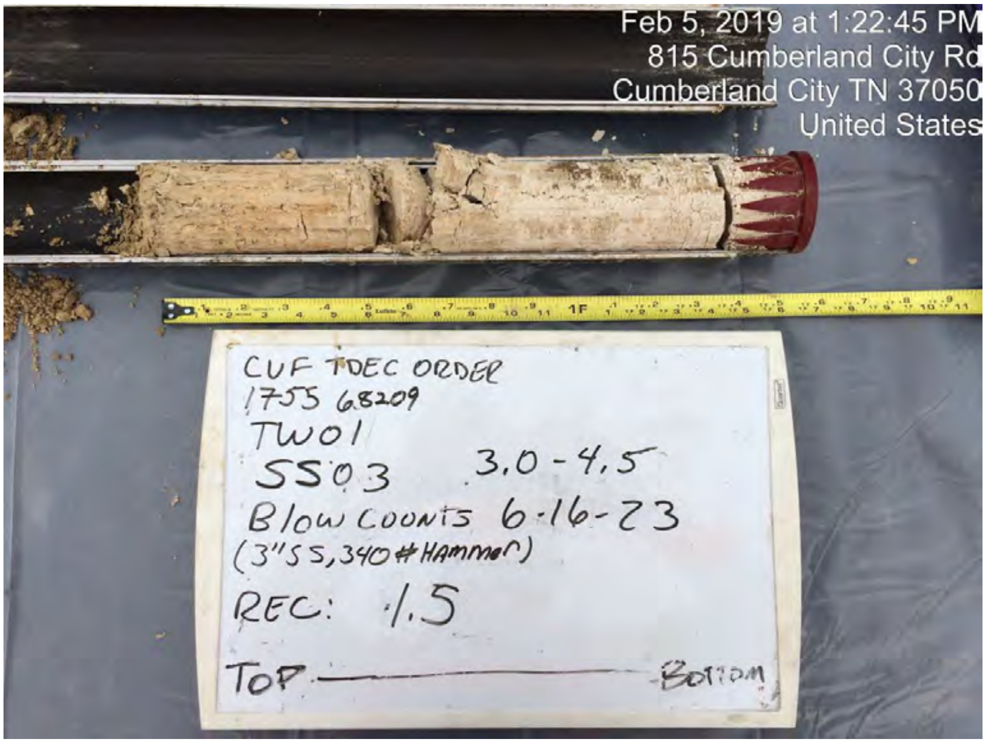
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 3

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (3.0-4.5 feet). Blow count shown on white board should be 6-23-16.

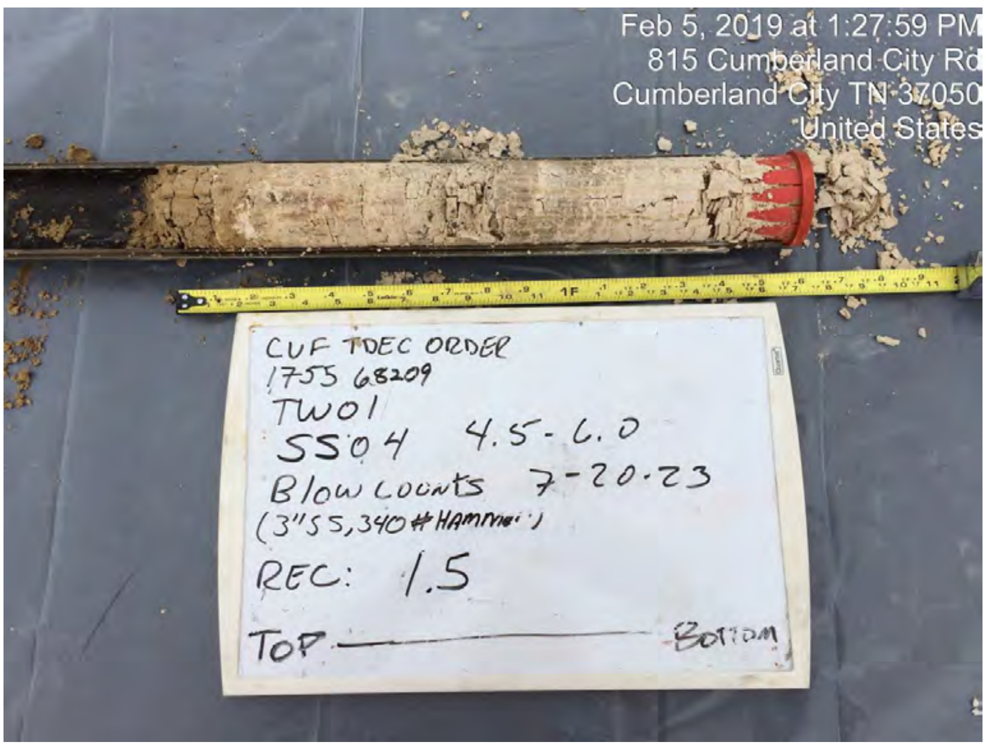


Photograph ID: 4

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (4.5-6.0 feet).



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 5

Photo Location: CUF-TW01

Photo Date: 2/5/2019

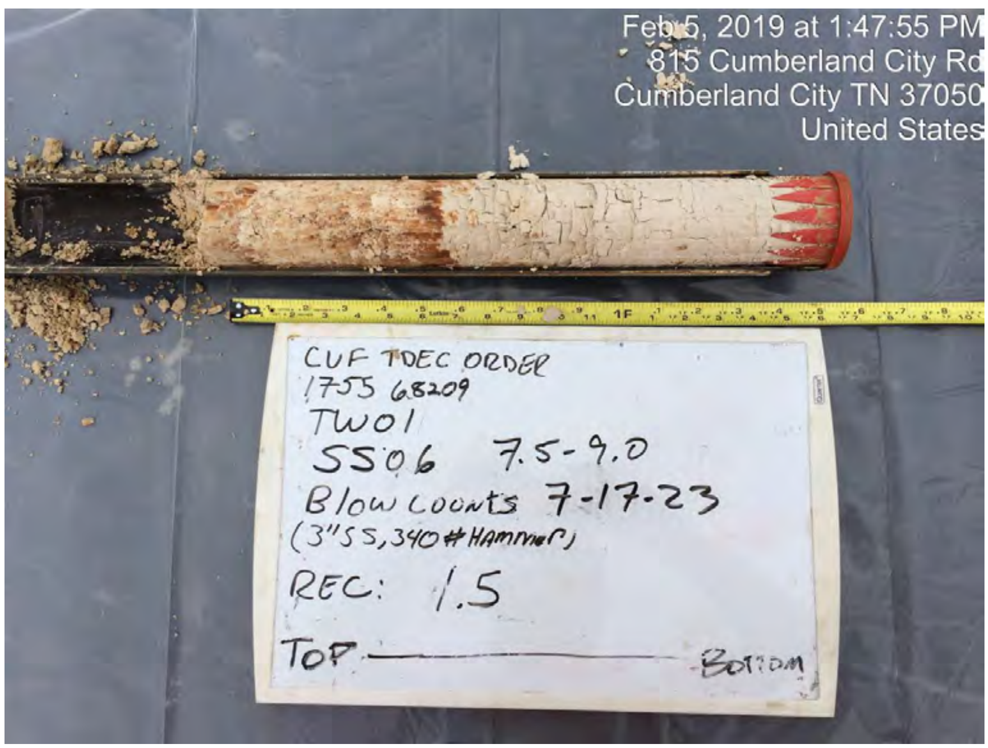
Comments: Interval (6.0-7.5 feet).

Photograph ID: 6

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (7.5-9.0 feet).



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 7

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

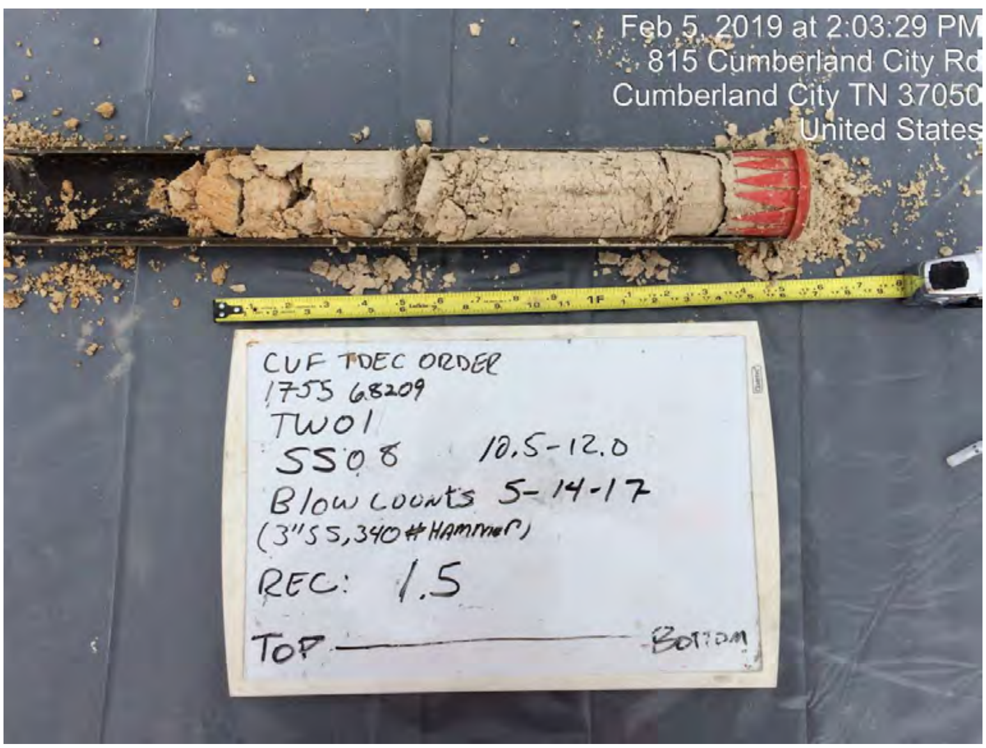
Comments:
Interval (9.0-10.5 feet).

Photograph ID: 8

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (10.5-12.0 feet).



Stantec

Photographic Log

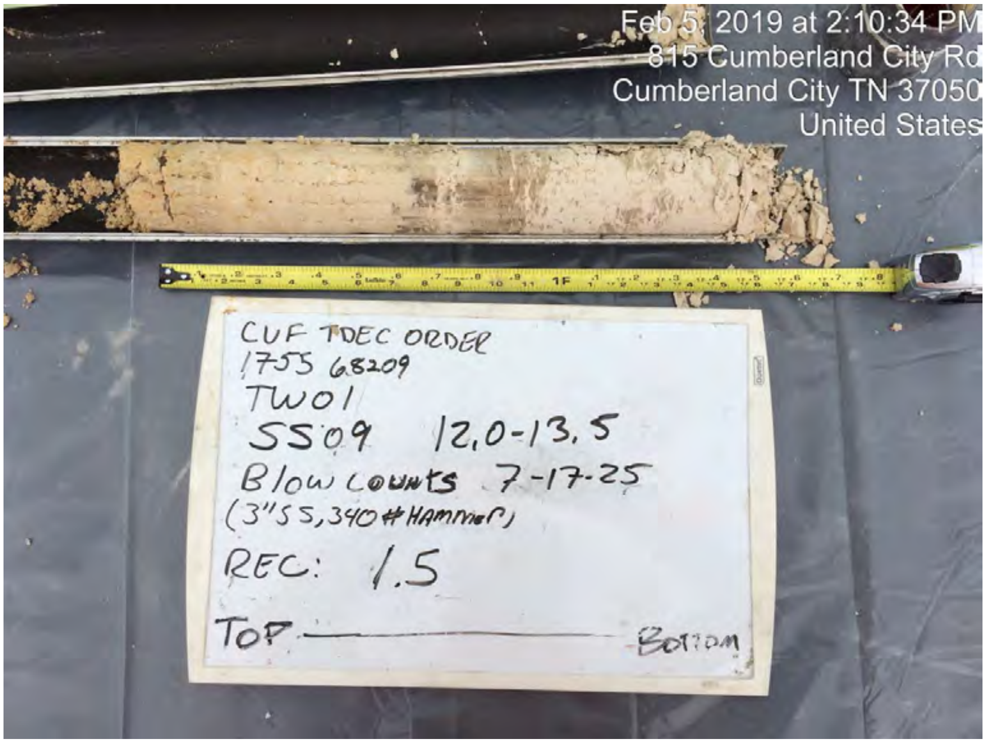
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 9

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (12.0-13.5 feet).



Photograph ID: 10

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (13.5-15.0 feet).

Stantec **Photographic Log**

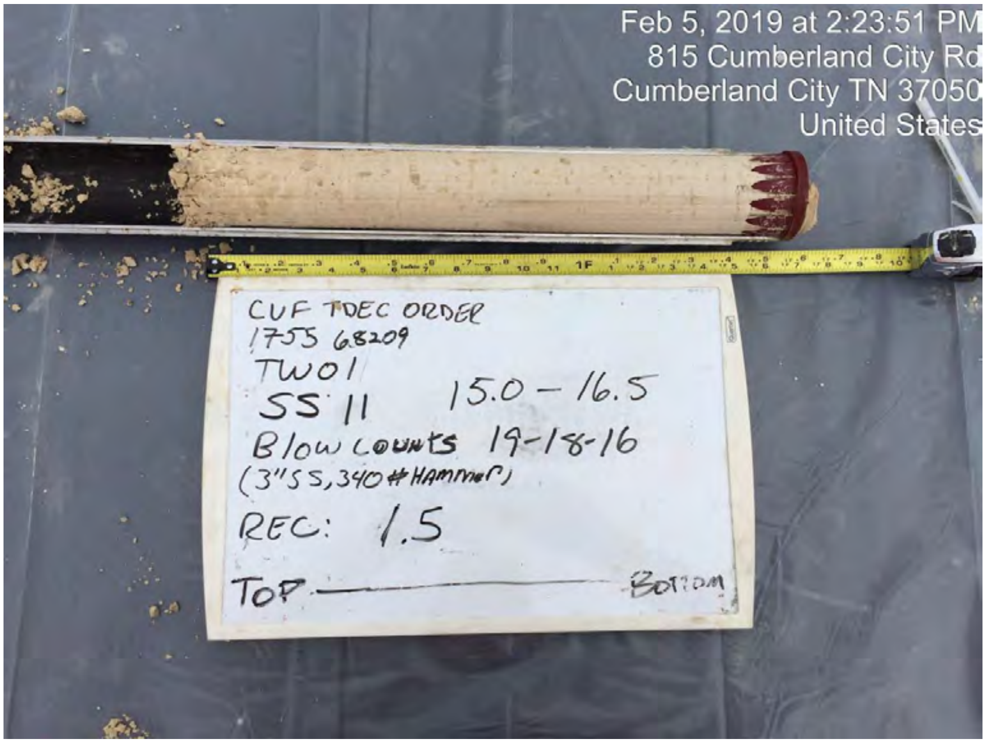
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 11

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (15.0-16.5 feet).

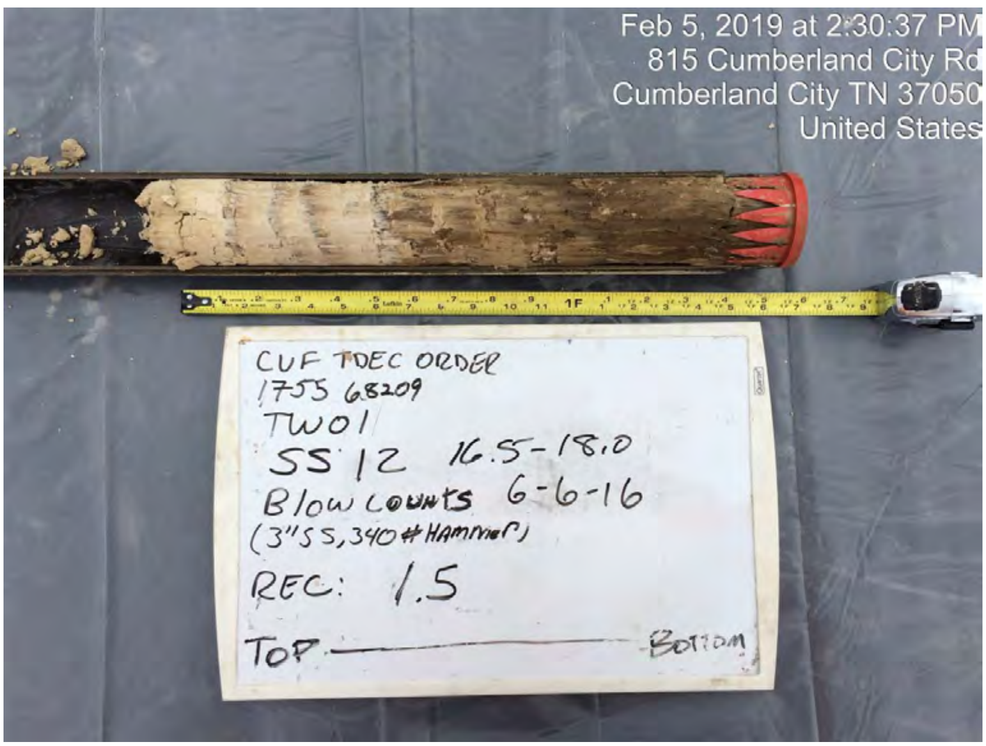


Photograph ID: 12

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (16.5-18.0 feet).



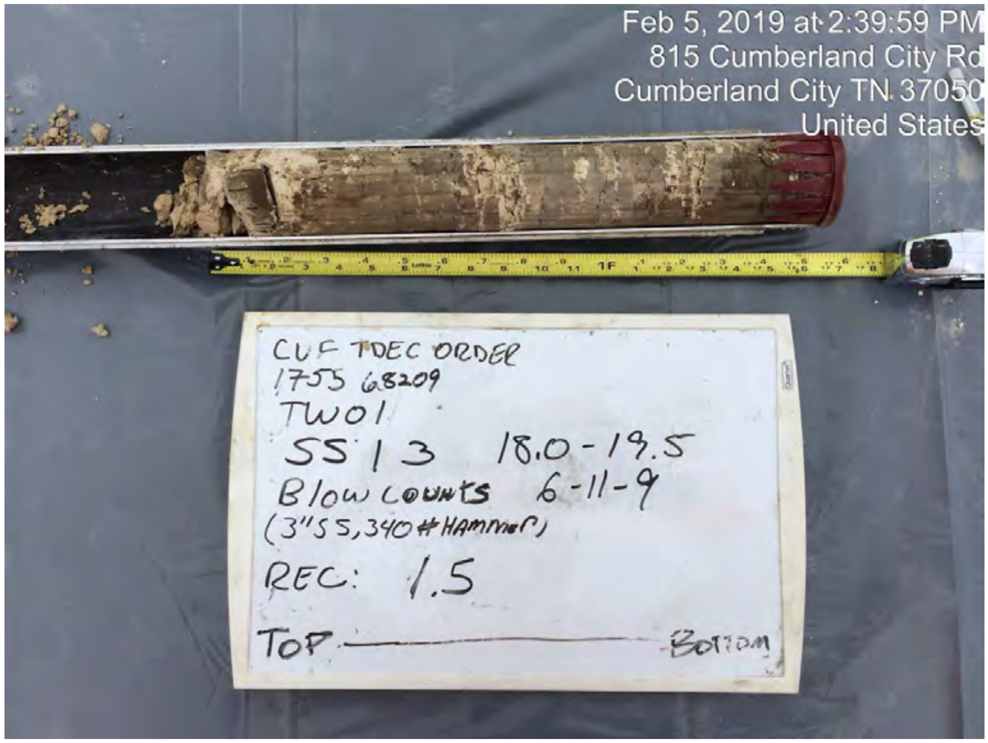
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 13

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (18.0-19.5 feet).

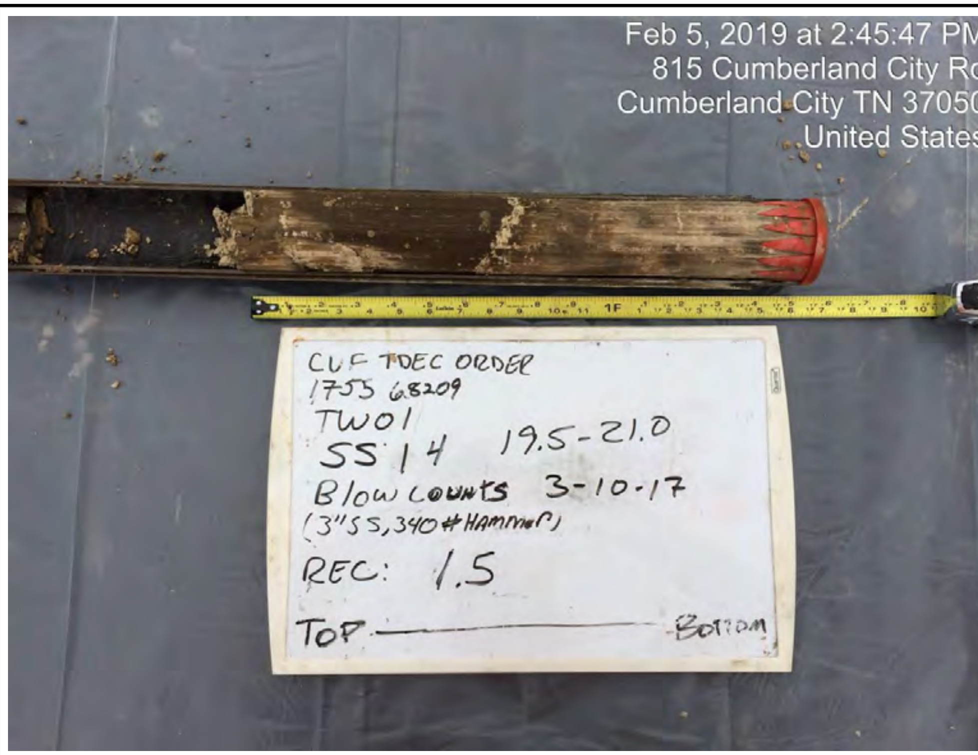


Photograph ID: 14

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (19.5-21.0 feet).



Stantec **Photographic Log**

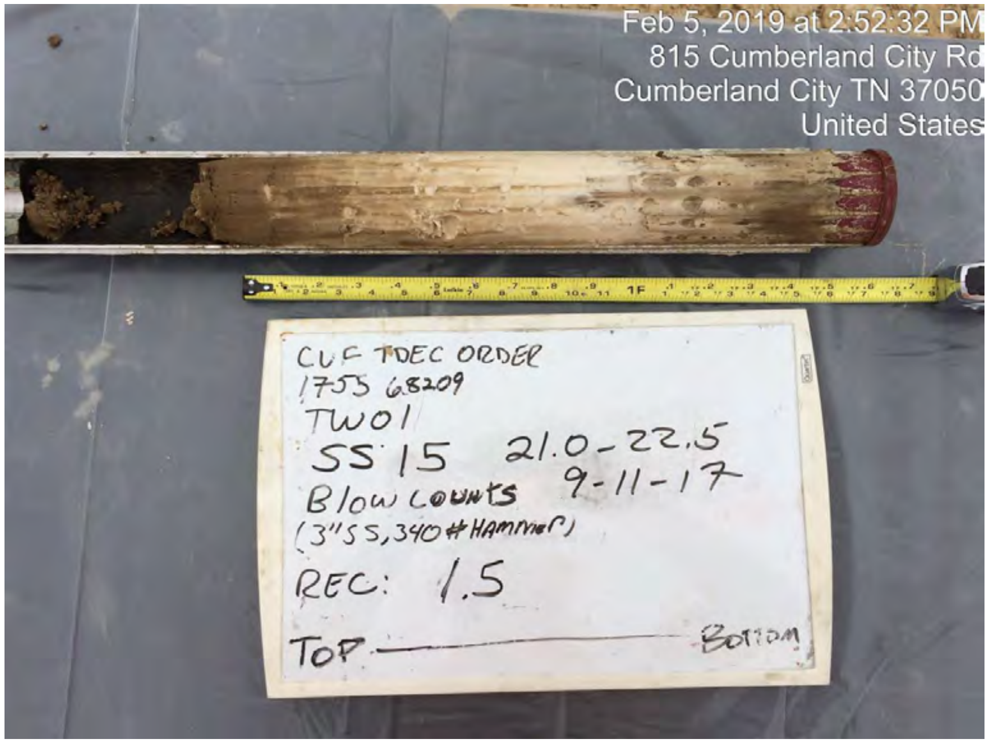
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 15

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (21.0-22.5 feet).



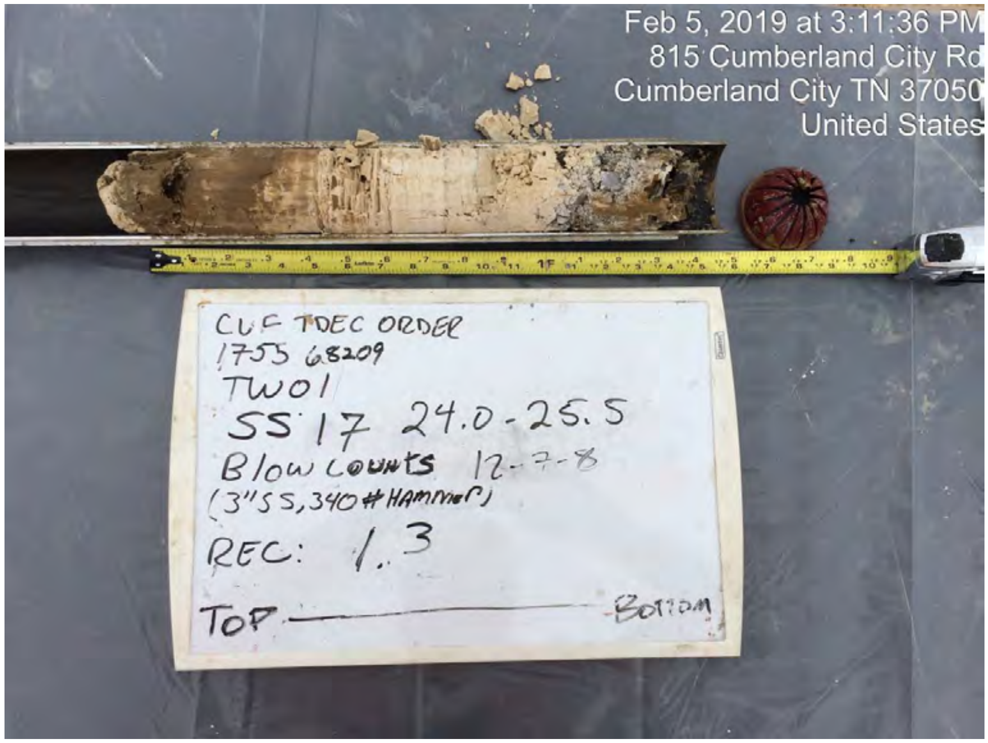
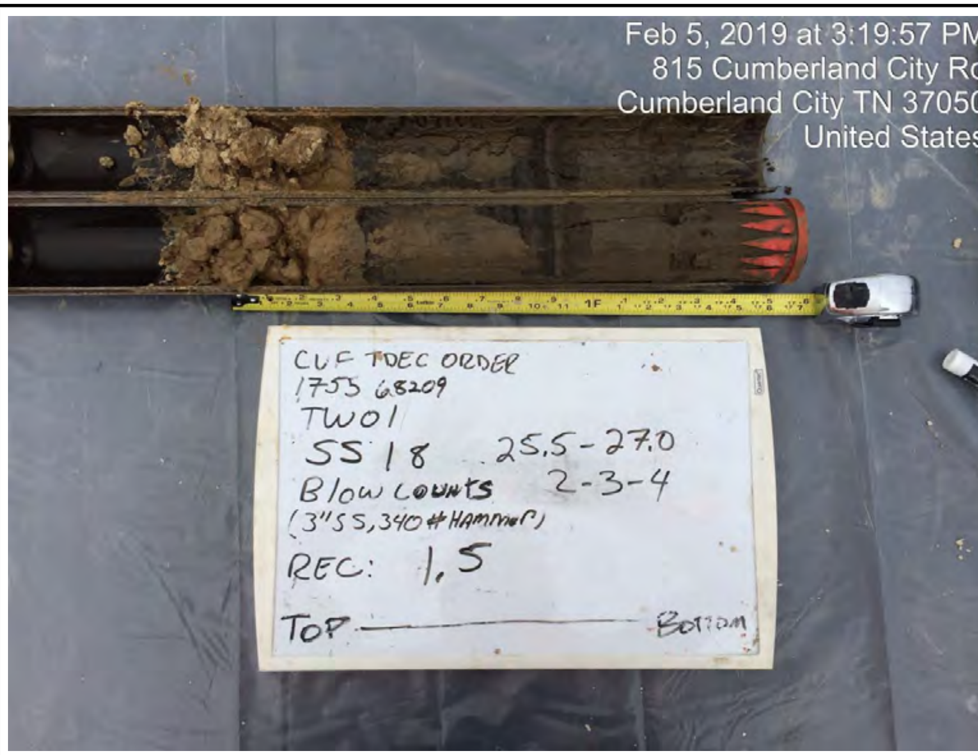
Photograph ID: 16

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (22.5-24.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 17 **Photo Location:** CUF-TW01 **Photo Date:** 2/5/2019 **Comments:** Interval (24.0-25.5 feet).	
Photograph ID: 18 **Photo Location:** CUF-TW01 **Photo Date:** 2/5/2019 **Comments:** Interval (25.5-27.0 feet). Blow count shown on white board should be 2-4-3.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 19

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (27.0-28.5 feet).

Photograph ID: 20

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (28.5-30.0 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 21

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

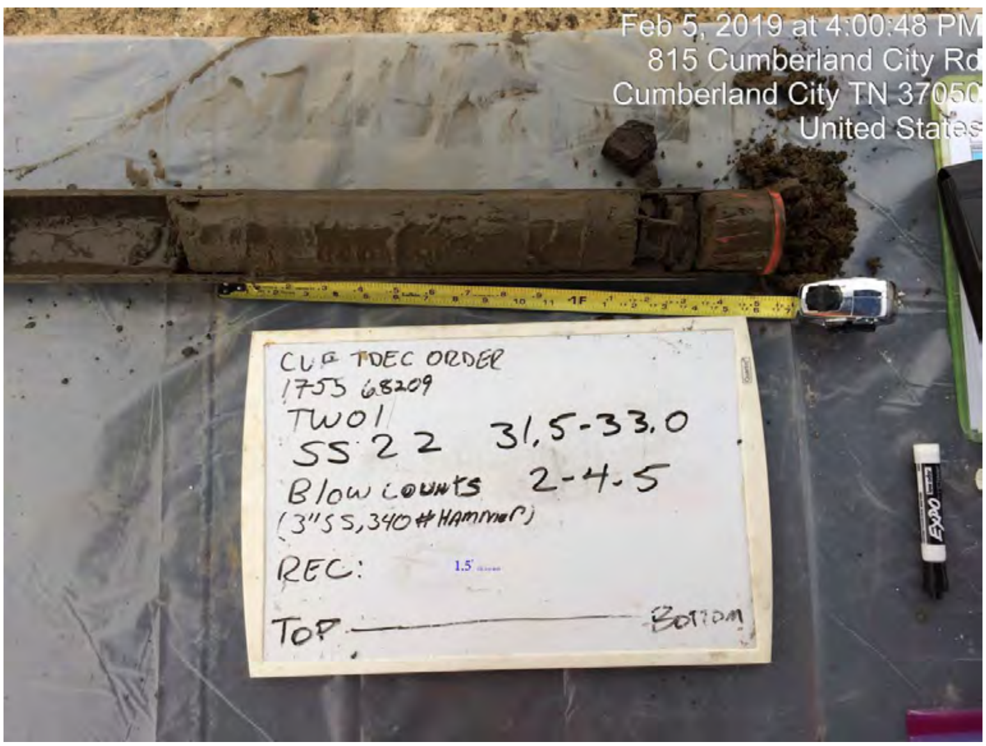
Comments:
Interval (30.0-31.5 feet). Depth interval shown on white board should be 30.0-31.5.

Photograph ID: 22

Photo Location:
CUF-TW01

Photo Date:
2/5/2019

Comments:
Interval (31.5-33.0 feet).



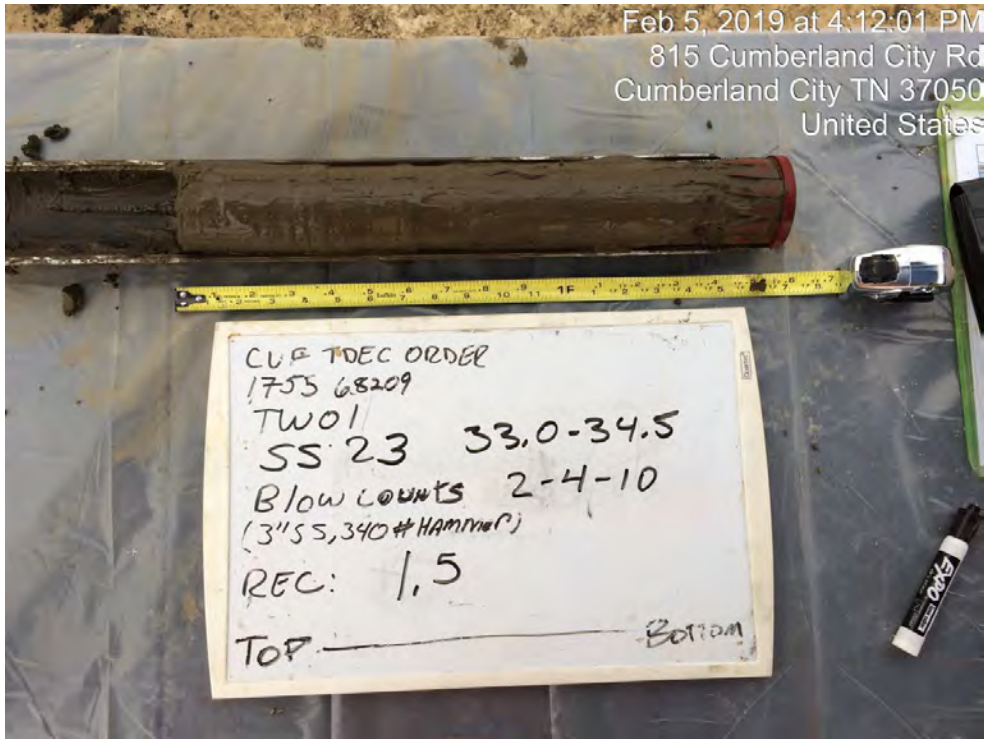
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 23

Photo Location: CUF-TW01

Photo Date: 2/5/2019

Comments: Interval (33.0-34.5 feet).



Photograph ID: 24

Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Photo of interval (34.5-34.6 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 25

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (34.6-36.0 feet). Recovery shown on white board should be 1.4.

Photograph ID: 26

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (36.0-37.5 feet).

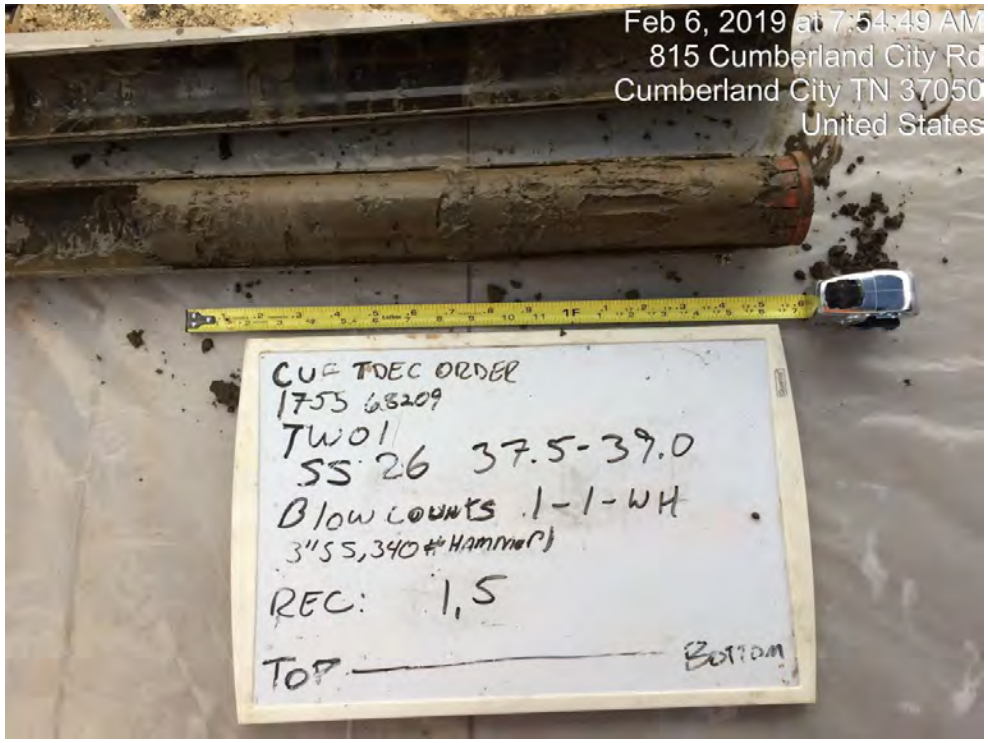
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 27

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (37.5-39.0 feet).

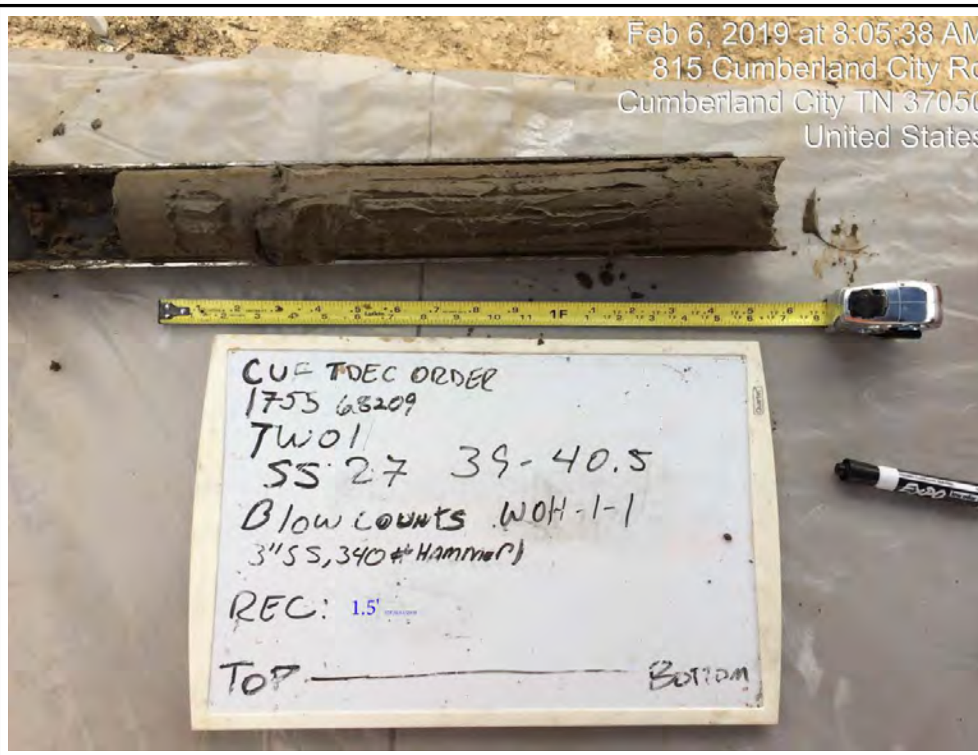


Photograph ID: 28

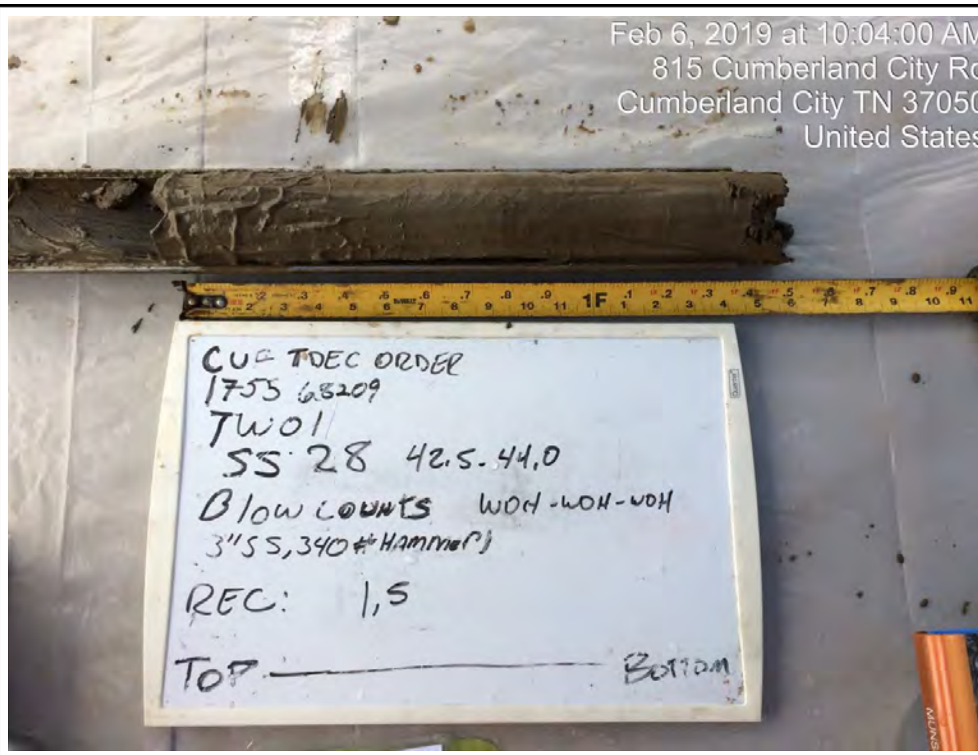
Photo Location:
CUF-TW01

Photo Date:
2/6/2019

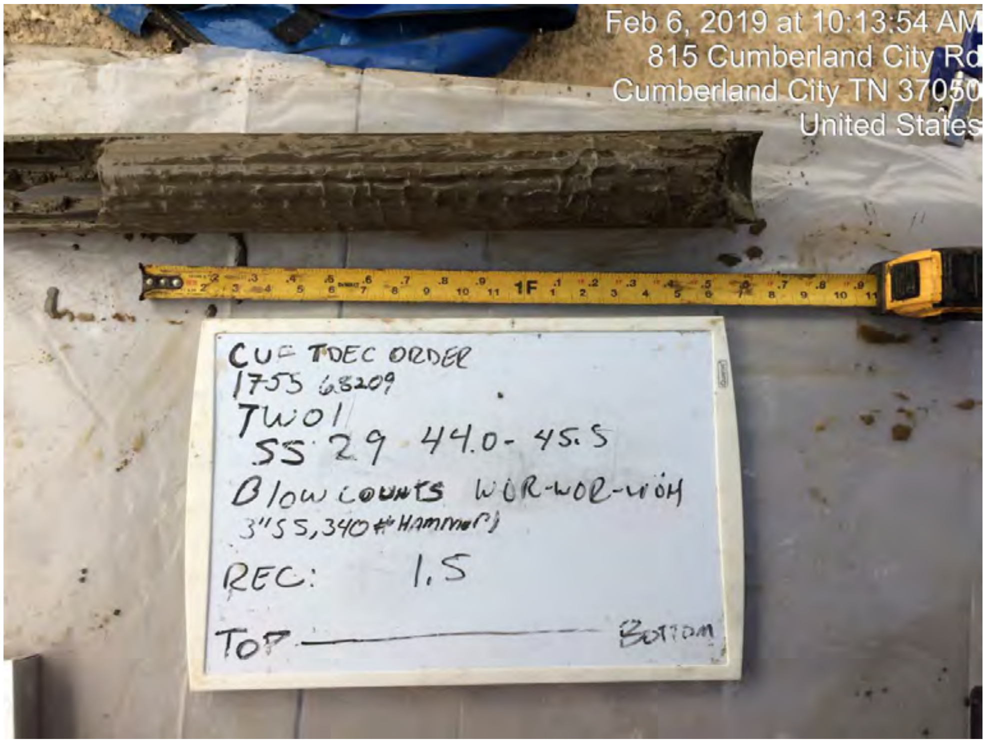
Comments:
Interval (39.0-40.5 feet). Depth interval shown on white board should be 39.0-40.5. WOH on white board is the same as WH on the boring log.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 29 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Photo of interval (40.5-42.5 feet) unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 30 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Interval (42.5-44.0 feet). WOH on white board is the same as WH on the boring log.	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 31 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Interval (44.0-45.5 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.	
Photograph ID: 32 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Interval (45.5-47.0 feet). Blow count shown on white board should be 1-WH-1.	

Photographic Log

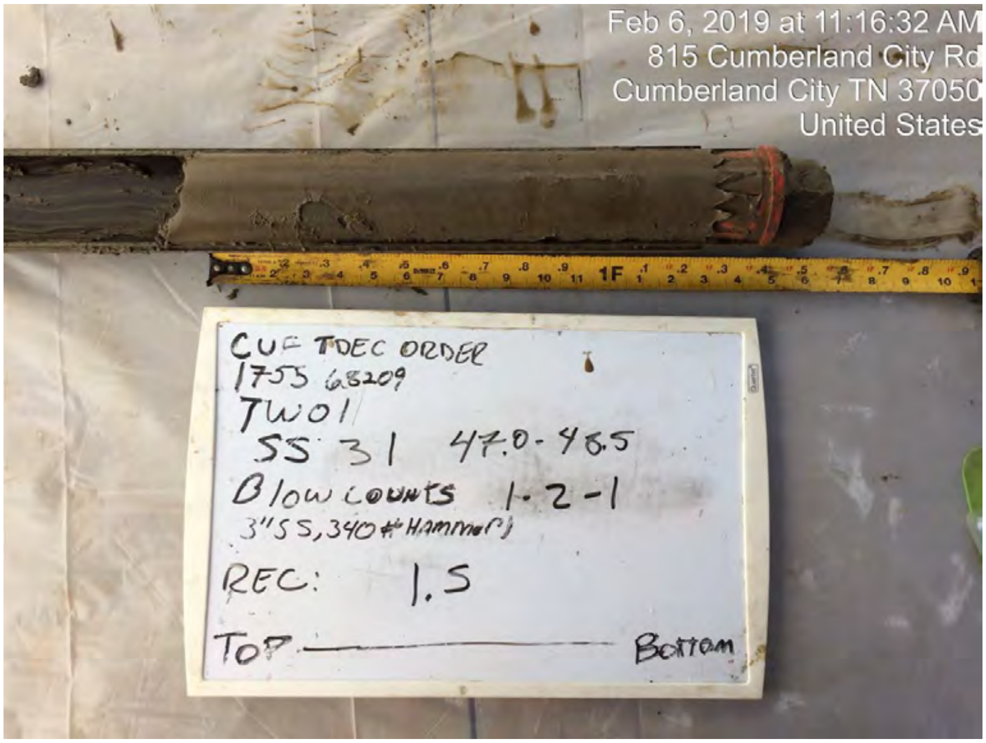
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 33

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (47.0-48.5 feet).

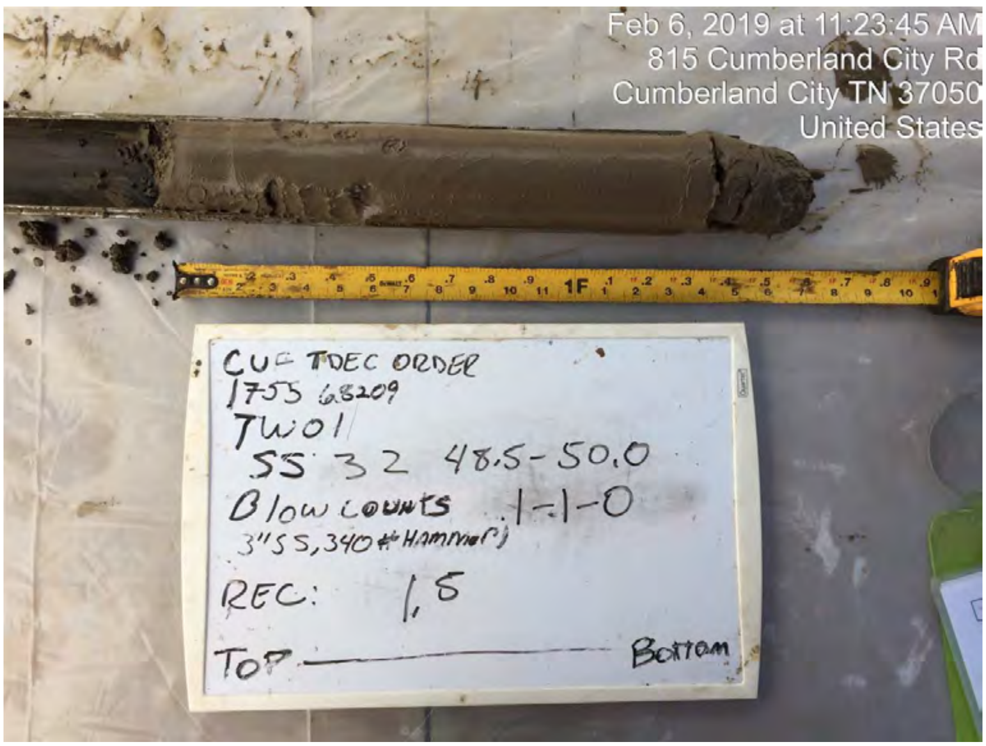


Photograph ID: 34

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (48.5-50.0 feet). Blow count shown on white board should be 1-1-WH.



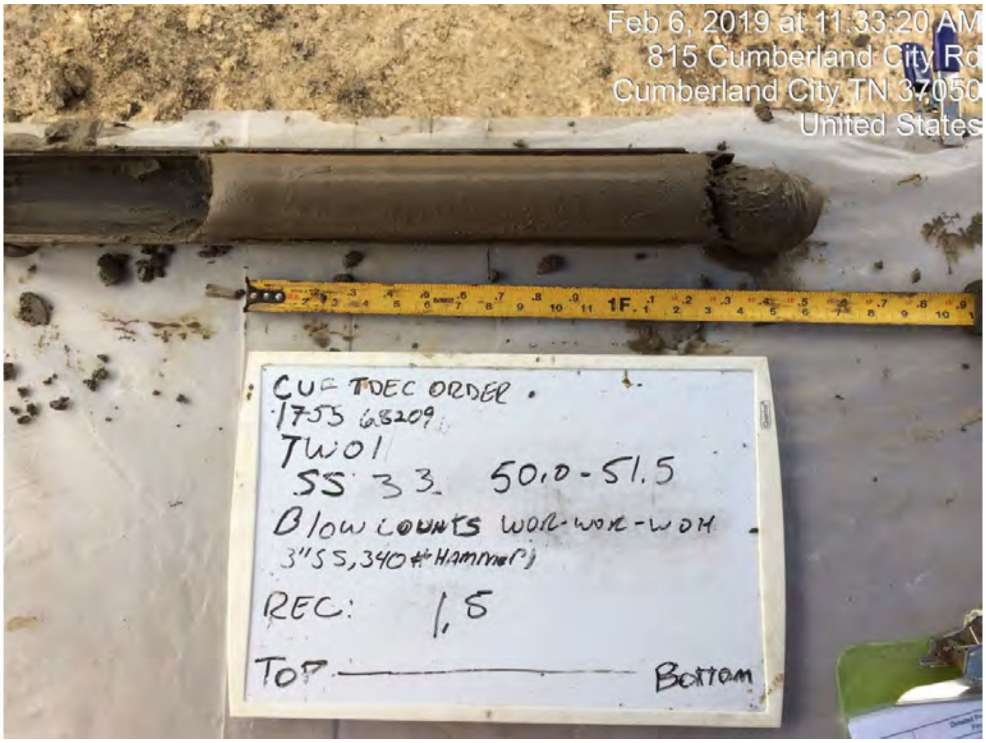
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 35

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (50.0-51.5 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

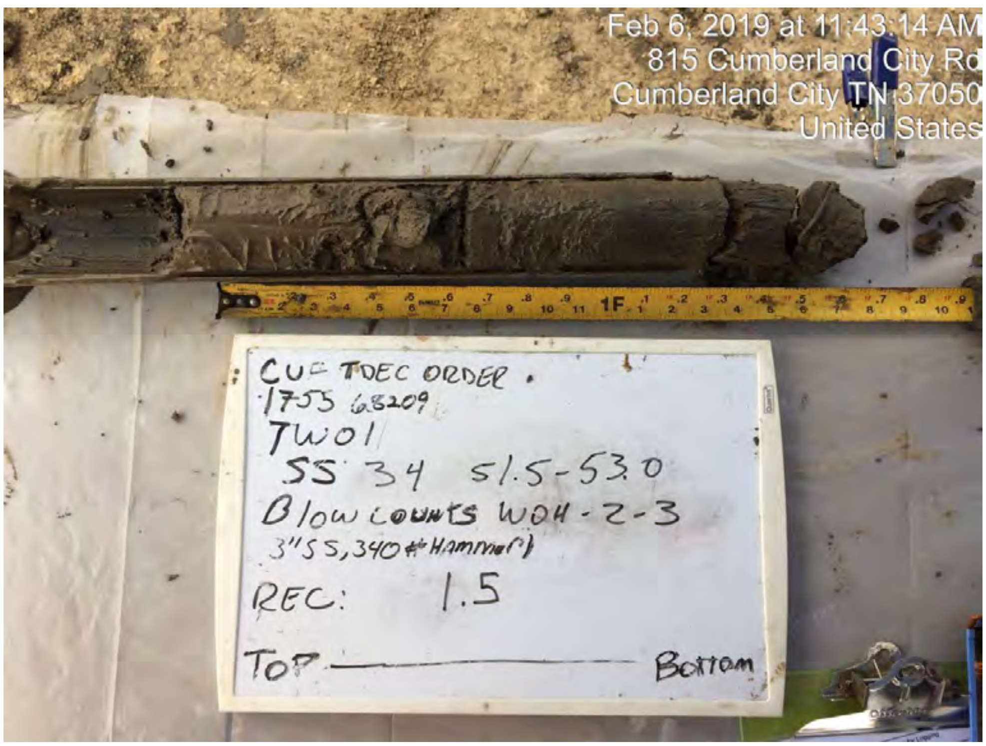


Photograph ID: 36

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (51.5-53.0 feet). WOH on white board is the same as WH on the boring log.



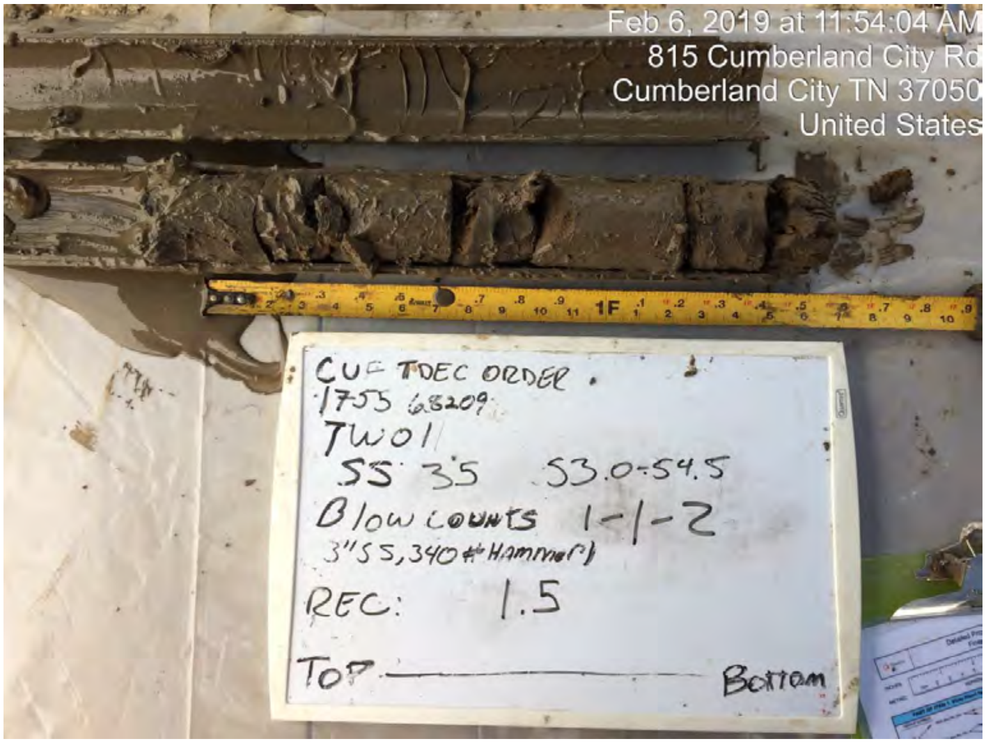
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 37

Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Interval (53.0-54.5 feet).



Photograph ID: 38

Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Interval (54.5-56.0 feet).

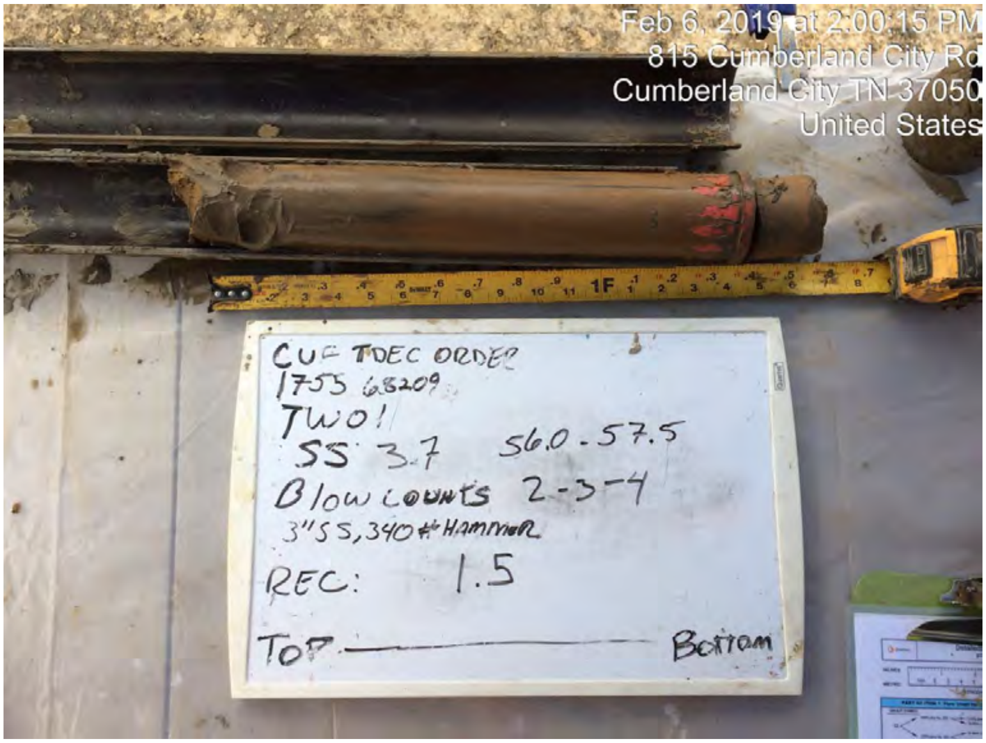
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 39

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Interval (56.0-57.5 feet).



Photograph ID: 40

Photo Location:
CUF-TW01

Photo Date:
2/6/2019

Comments:
Photo of interval (57.5-59.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

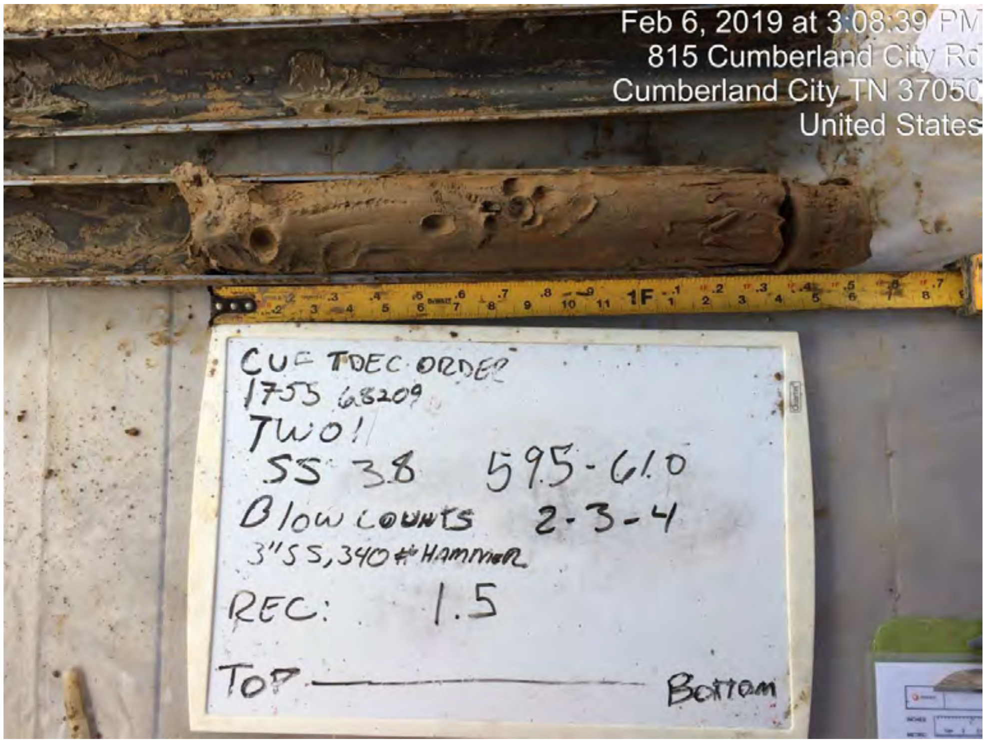
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 41

Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Interval (59.5-61.0 feet).



Photograph ID: 42

Photo Location: CUF-TW01

Photo Date: 2/6/2019

Comments: Interval (61.0-62.5 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 43 **Photo Location:** CUF-TW01 **Photo Date:** 2/6/2019 **Comments:** Photo of interval (62.5-62.7 feet) unavailable because sample collected with shelby tube.	No Photo Applicable
Photograph ID: 44 **Photo Location:** CUF-TW01 **Photo Date:** 2/7/2019 **Comments:** Interval (62.7-64.0 feet).	

Stantec

Photographic Log

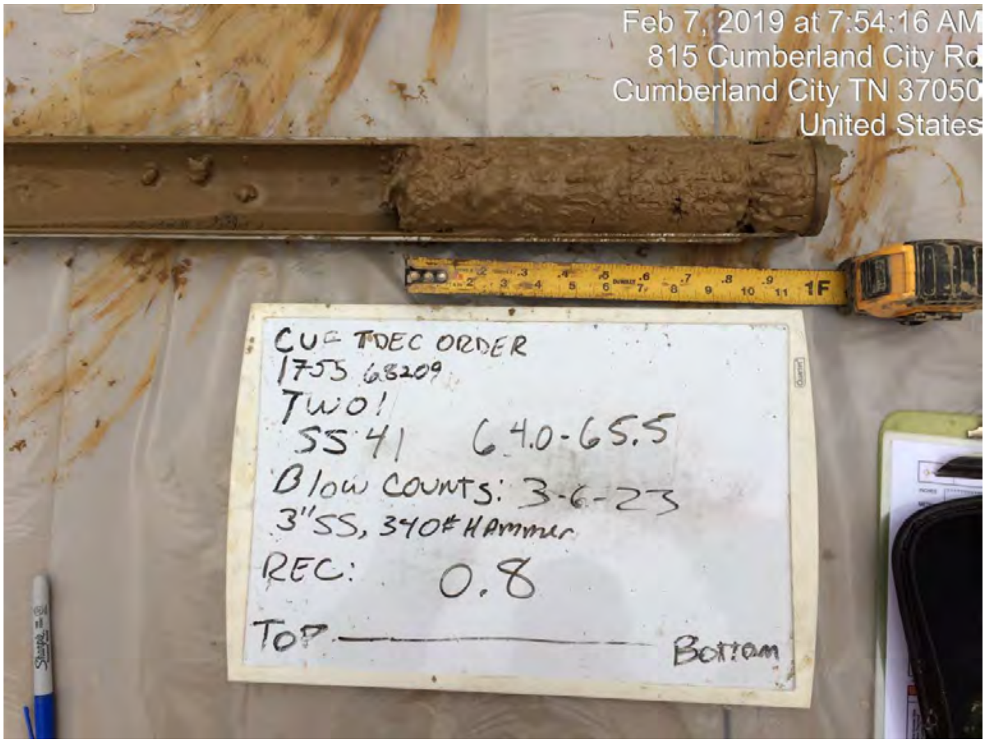
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 45

Photo Location: CUF-TW01

Photo Date: 2/7/2019

Comments: Interval (64.0-65.5 feet).

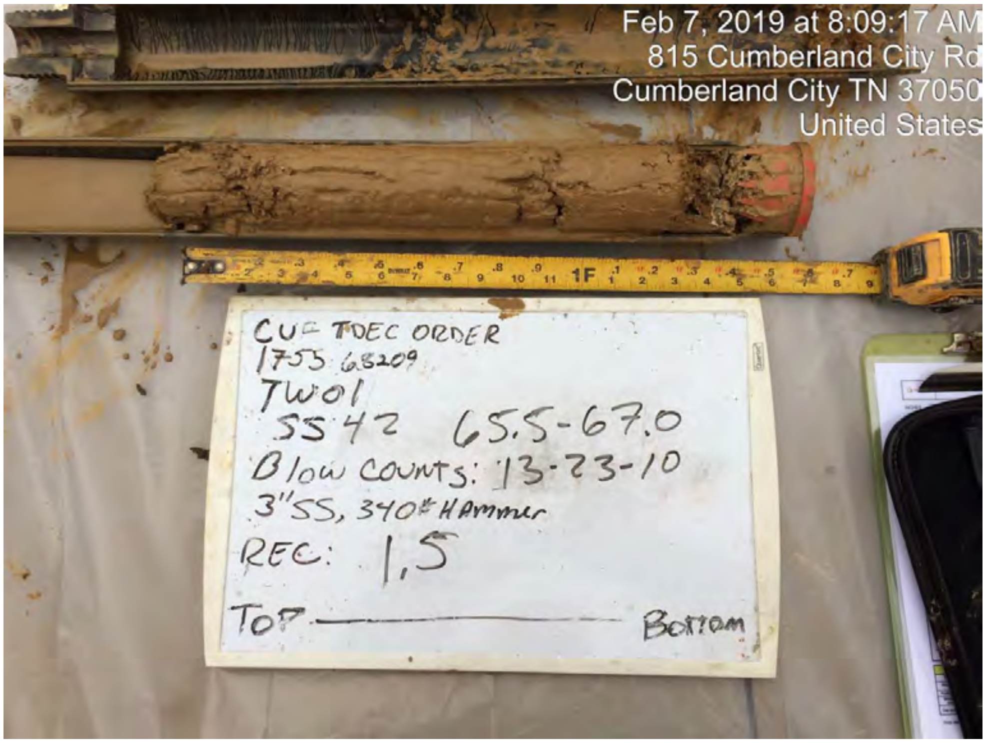


Photograph ID: 46

Photo Location: CUF-TW01

Photo Date: 2/7/2019

Comments: Interval (65.5-67.0 feet).



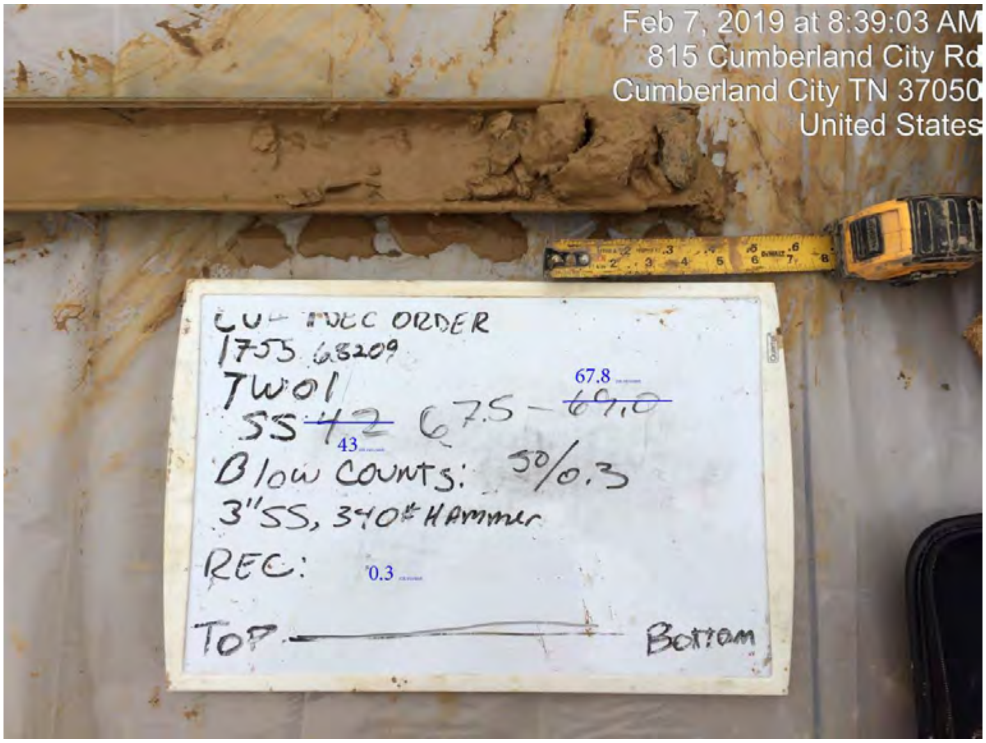
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 47

Photo Location: CUF-TW01

Photo Date: 2/7/2019

Comments: Interval (67.0-67.3 feet). Depth interval shown on white board should be 67.0-67.3. Auger refusal at 67.8 feet. No sample collected from 67.8 to 70.0 feet.



Photograph ID: 48

Photo Location: CUF-TW01

Photo Date: 2/12/2019

Comments: Interval (70.0-90.4 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 49

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Interval (0.0-1.5 feet). Depth interval shown on white board should be 0.0-1.5.

Photograph ID: 50

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Interval (1.5-3.0 feet).

Stantec

Photographic Log

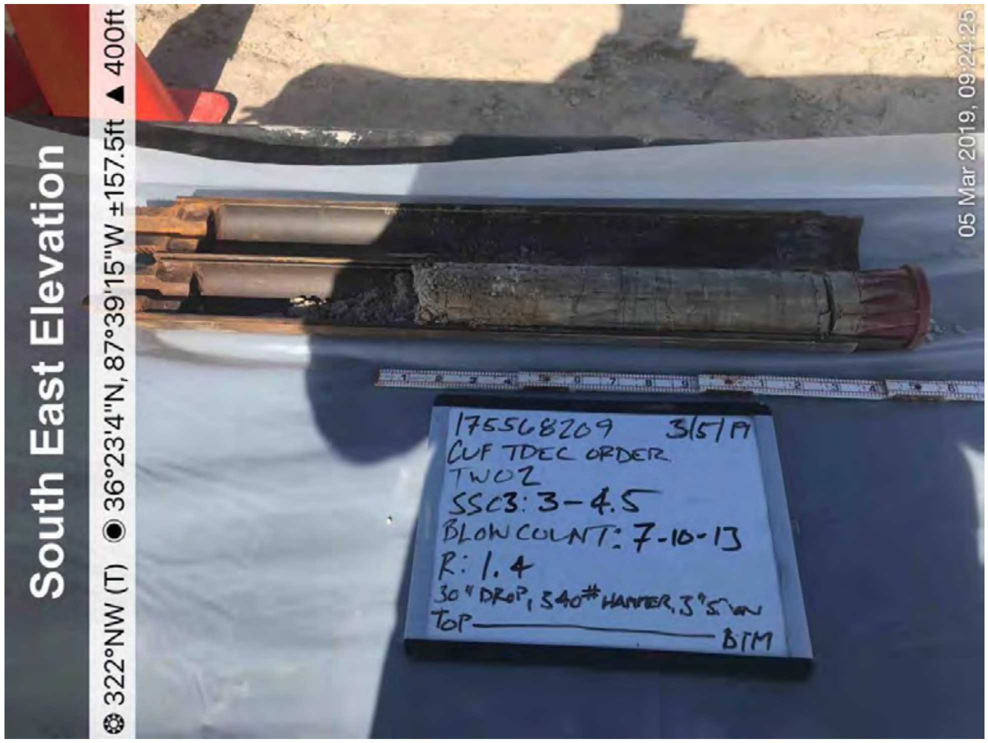
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 51

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Interval (3.0-4.5 feet). Depth interval shown on white board should be 3.0-4.5.



Photograph ID: 52

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Photo of interval (4.5-5.2 feet) unavailable because sample collected with shelby tube. Sampler refusal at 5.2 feet.

No Photo Applicable

Stantec

Photographic Log

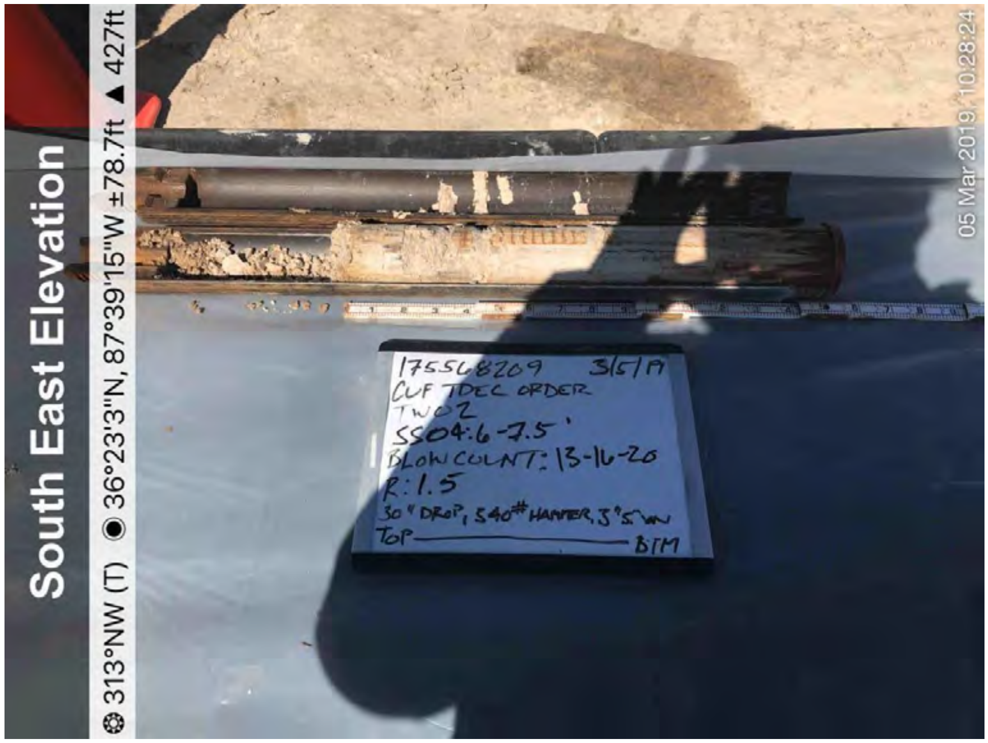
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 53

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Interval (6.0-7.5 feet). Depth interval shown on white board should be 6.0-7.5.

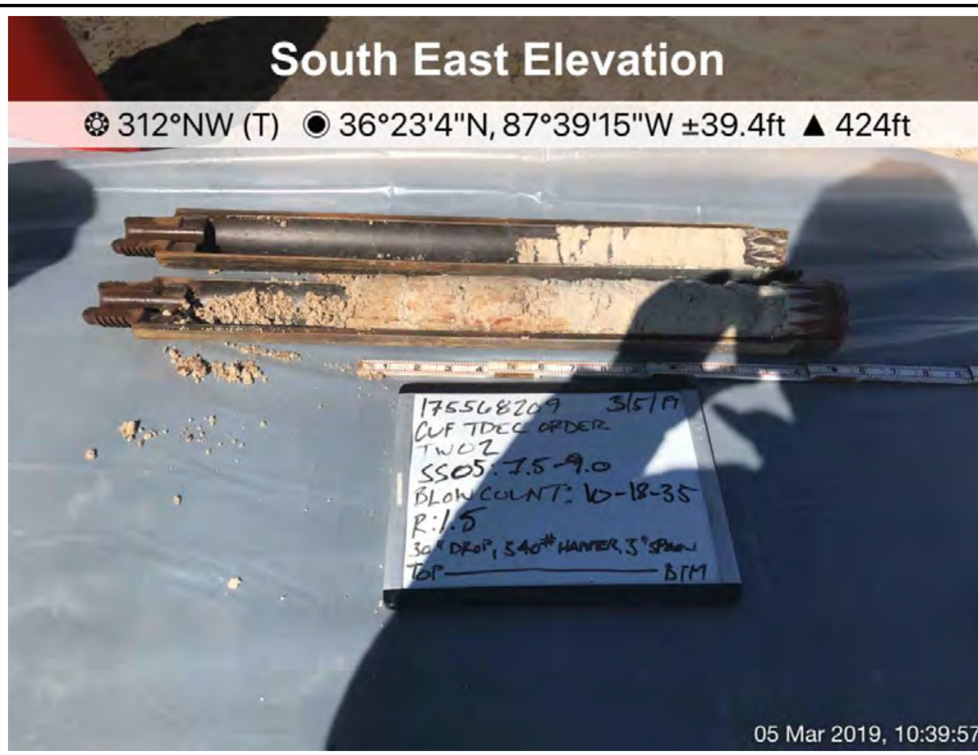


Photograph ID: 54

Photo Location:
CUF-TW02

Photo Date:
3/5/2019

Comments:
Interval (7.5-9.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 55

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (9.0-9.8 feet). Depth interval shown on white board should be 9.0-9.8.

Photograph ID: 56

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (10.5-11.4 feet). Depth interval shown on white board should be 10.5-11.4.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 57

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (12.0-12.9 feet). Depth interval shown on white board should be 12.0-12.9.

Photograph ID: 58

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (13.5-15.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 59

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (15.0-16.5 feet). Depth interval shown on white board should be 15.0-16.5. Blow count shown on white board is 22-33-40.

Photograph ID: 60

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (16.5-18.0 feet). Depth interval shown on white board should be 16.5-18.0.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 61

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (18.0-19.5 feet). Depth interval shown on white board should be 18.0-19.5.

Photograph ID: 62

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Photo of interval (19.5-20.7 feet) unavailable because sample collected with shelby tube. Sampler refusal at 20.7 feet.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 63

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (21.0-22.5 feet). Depth interval shown on white board should be 21.0-22.5.

Photograph ID: 64

Photo Location: CUF-TW02

Photo Date: 3/6/2019

Comments: Interval (22.5-23.3 feet). Depth interval shown on white board should be 22.5-23.3.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 65

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (24.0-25.5 feet). Depth interval shown on white board should be 24.0-25.5.

Photograph ID: 66

Photo Location:
CUF-TW02

Photo Date:
3/6/2019

Comments:
Interval (25.5-27.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 67

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (0.0-1.5 feet). Depth interval shown on white board should be 0.0-1.5.

Photograph ID: 68

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (1.5-3.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 69

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (3.0-4.5 feet).

Photograph ID: 70

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (4.5-6.0 feet). Depth interval shown on white board should be 4.5-6.0.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 71

Photo Location: CUF-TW03

Photo Date: 2/13/2019

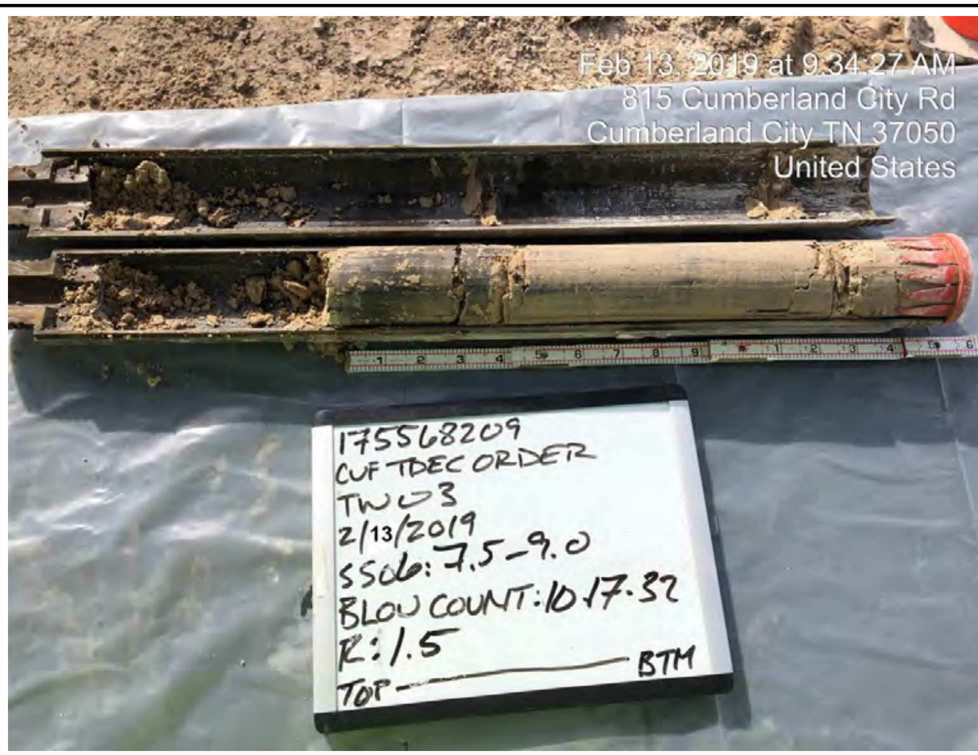
Comments: Interval (6.0-7.5 feet).

Photograph ID: 72

Photo Location: CUF-TW03

Photo Date: 2/13/2019

Comments: Interval (7.5-9.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 73

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (9.0-10.5 feet).

Photograph ID: 74

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (10.5-12.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 75 **Photo Location:** CUF-TW03 **Photo Date:** 2/13/2019 **Comments:** Interval (12.0-13.5 feet). Depth interval shown on white board should be 12.0-13.5. Blow count shown on white board is 13-28-29.	
Photograph ID: 76 **Photo Location:** CUF-TW03 **Photo Date:** 2/13/2019 **Comments:** Interval (13.5-15.0 feet). Depth interval shown on white board should be 13.5-15.0.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 77

Photo Location: CUF-TW03

Photo Date: 2/13/2019

Comments: Interval (15.0-16.5 feet). Depth interval shown on white board should be 15.0-16.5.

Photograph ID: 78

Photo Location: CUF-TW03

Photo Date: 2/13/2019

Comments: Interval (16.5-18.0 feet). Depth interval shown on white board should be 16.5-18.0. Blow count shown on white board is 13-19-21.

Stantec

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 79

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (18.0-19.5 feet). Depth interval shown on white board should be 18.0-19.5.

Photograph ID: 80

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (19.5-21.0 feet). Depth interval shown on white board should be 19.5-21.0.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 81

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (21.0-22.0 feet). Depth interval shown on white board should be 21.0-22.0. Blow count shown on white board should be 16-50.

Photograph ID: 82

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (22.5-24.0 feet). Depth interval shown on white board should be 22.5-24.0.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 83

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (24.0-25.5 feet). Depth interval shown on white board should be 24.0-25.5.

Photograph ID: 84

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (25.5-27.0 feet). Depth interval shown on white board should be 25.5-27.0.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 85

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (27.0-28.5 feet). Depth interval shown on white board should be 27.0-28.5. WOH on white board is the same as WH on the boring log.

Photograph ID: 86

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Photo of interval (28.5-30.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 87

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (30.5-32.0 feet). Depth interval shown on white board should be 30.5-32.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 88

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Photo of interval (32.0-33.5 feet) unavailable.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 89

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (33.5-35.0 feet). Depth interval shown on white board should be 33.5-35.0. Blow count shown on white board should be 2-1-WH.

Photograph ID: 90

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (35.0-36.5 feet). Depth interval shown on white board should be 35.0-36.5. WOH on white board is the same as WH on the boring log.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 91

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (36.5-38.0 feet). Depth interval shown on white board should be 36.5-38.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 92

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (38.0-39.5 feet). Depth interval shown on white board should be 38.0-39.5. Blow count shown on white board should be WH-1-WH.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 93

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Interval (39.5-41.0 feet). Depth interval shown on white board should be 39.5-41.0. Blow count shown on white board should be WR-1-WH.

Photograph ID: 94

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

Comments:
Photo of interval (41.0-42.5 feet) unavailable.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 95

Photo Location:
CUF-TW03

Photo Date:
2/13/2019

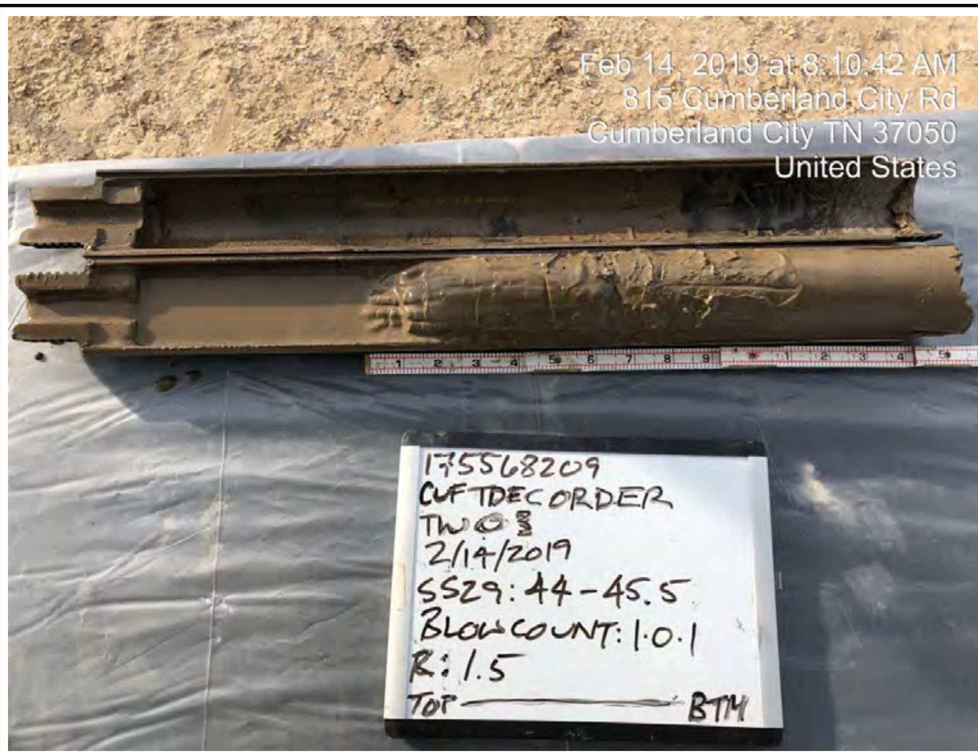
Comments:
Interval (42.5-44.0 feet). Depth interval shown on white board should be 42.5-44.0. Blow count shown on white board should be WR-1-WH.

Photograph ID: 96

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (44.0-45.5 feet). Depth interval shown on white board should be 44.0-45.5. Blow count shown on white board should be 1-WH-1.



Stantec

Photographic Log

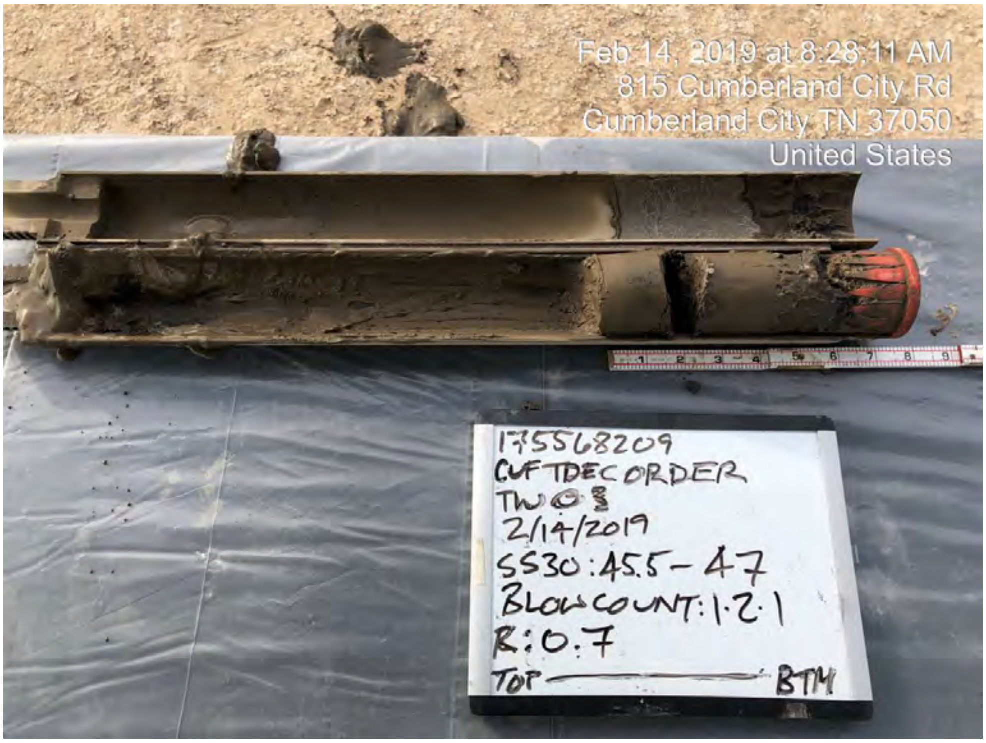
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 97

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (45.5-47.0 feet). Depth interval shown on white board should be 45.5-47.0.



Photograph ID: 98

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (47.0-48.5 feet). Depth interval shown on white board should be 47.0-48.5. Blow count shown on white board should be 1-WH-WH.

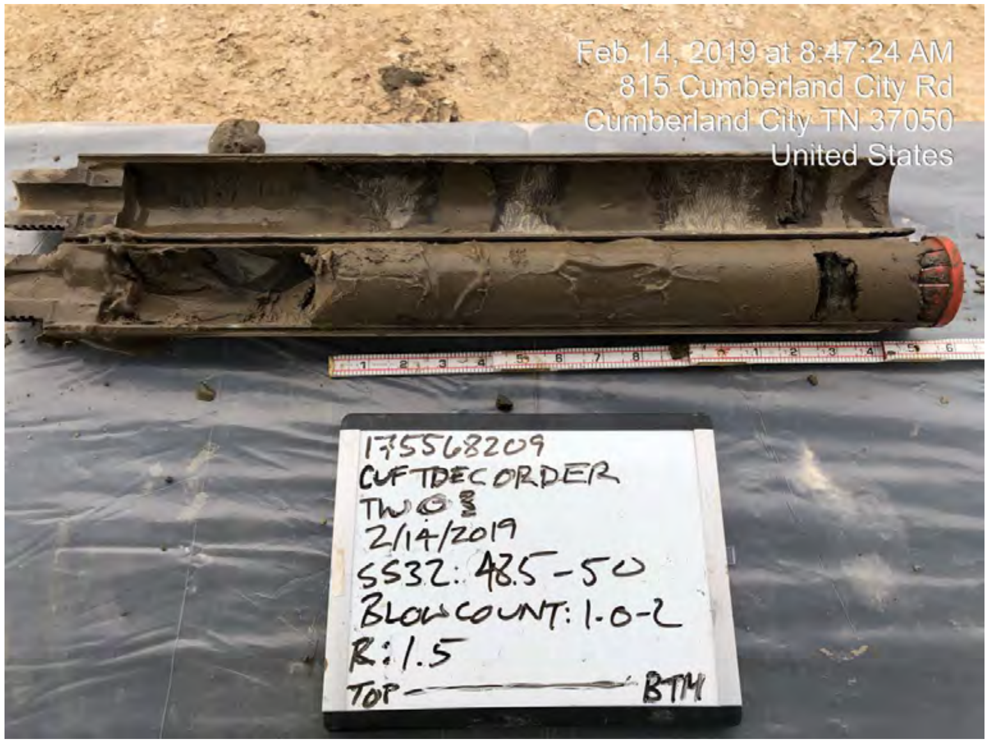
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 99

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (48.5-50.0 feet). Depth interval shown on white board should be 48.5-50.0. Blow count shown on white board should be 1-WH-2.

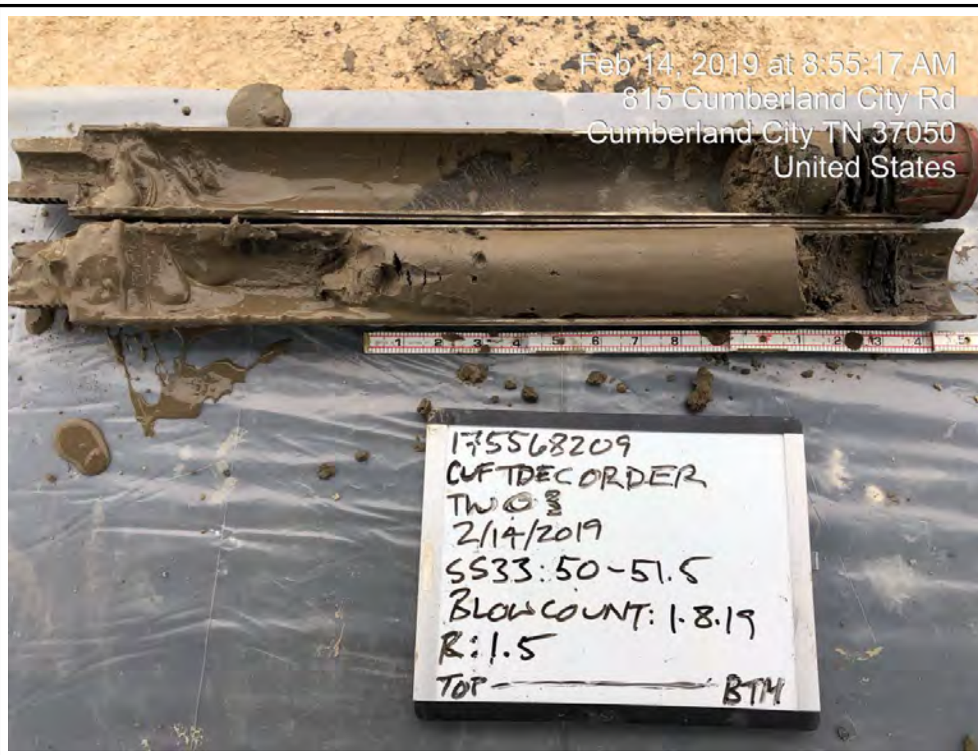


Photograph ID: 100

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (50.0-51.5 feet). Depth interval shown on white board should be 50.0-51.5.



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 101

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (51.5-53.0 feet). Depth interval shown on white board should be 51.5-53.0.

Photograph ID: 102

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (53.0-54.5 feet). Depth interval shown on white board should be 53.0-54.5. WOH on white board is the same as WH on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 103

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

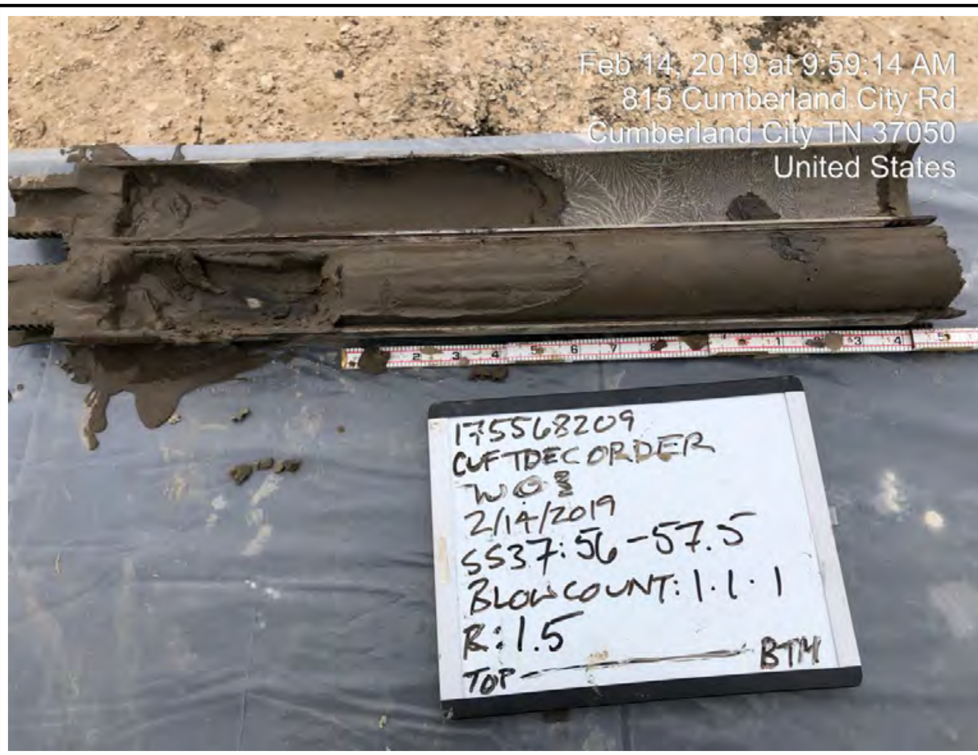
Comments:
Interval (54.5-56.0 feet). Depth interval shown on white board should be 54.5-56.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 104

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (56.0-57.5 feet). Depth interval shown on white board should be 56.0-57.5.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 105

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

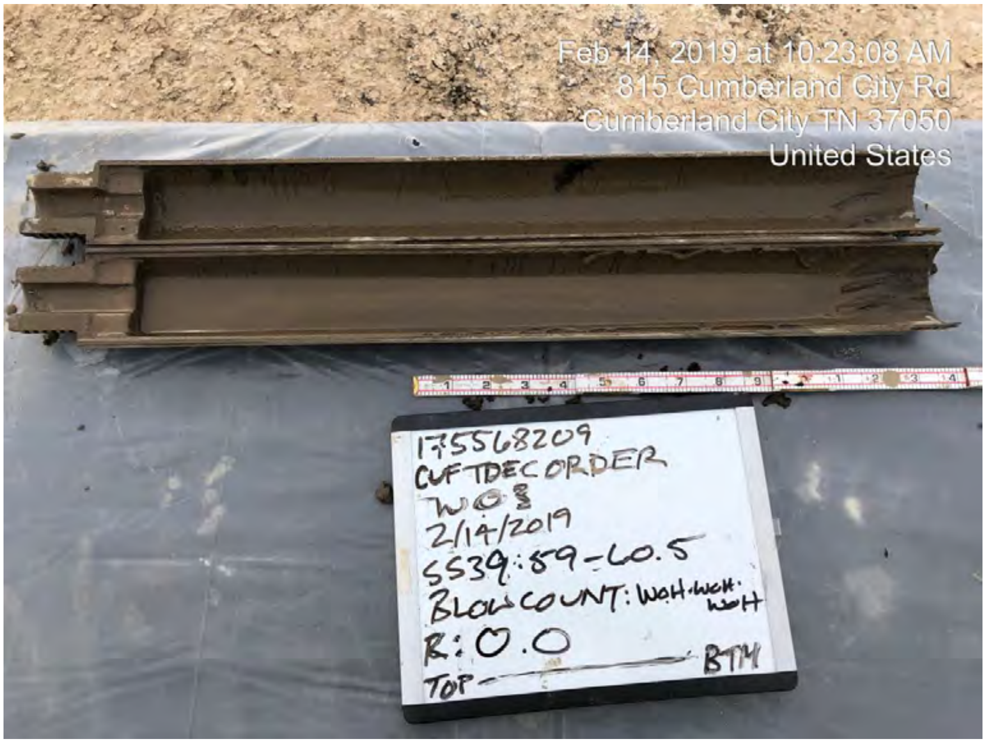
Comments:
Interval (57.5-59.0 feet). Depth interval shown on white board should be 57.5-59.0. Blow count shown on white board should be 1-WH-1.

Photograph ID: 106

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (59.0-60.5 feet). Depth interval shown on white board should be 59.0-60.5. WOH on white board is the same as WH on the boring log.



Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 107

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (60.5-62.0 feet). Depth interval shown on white board should be 60.5-62.0. WOR on white board is the same as WR on the boring log.

Photograph ID: 108

Photo Location: CUF-TW03

Photo Date: 2/14/2019

Comments: Interval (62.0-63.5 feet). Depth interval shown on white board should be 62.0-63.5. Blow count shown on white board should be 1-WH-1.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 109

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (63.5-65.0 feet)WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

Photograph ID: 110

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (65.0-66.5 feet). Depth interval shown on white board should be 65.0-66.5. WOR on white board is the same as WR on the boring log.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 111

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (66.5-68.0 feet). Depth interval shown on white board should be 66.5-68.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 112

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Photo of interval (68.0-70.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 113

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

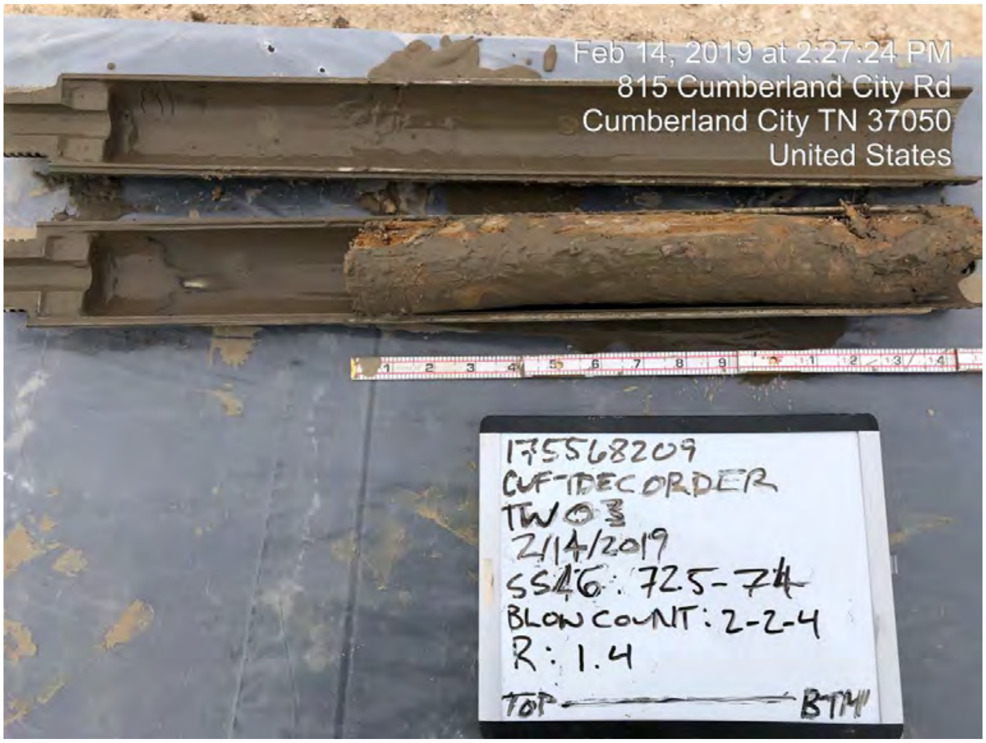
Comments:
Interval (70.0-71.5 feet).

Photograph ID: 114

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (72.5-74.0 feet). Depth interval shown on white board should be 72.5-74.0. Recovery shown on white board should be 1.5.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 115

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (75.0-76.5 feet). Depth interval shown on white board should be 75.0-76.5.

Photograph ID: 116

Photo Location:
CUF-TW03

Photo Date:
2/14/2019

Comments:
Interval (77.5-78.9 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 117 **Photo Location:** CUF-TW03 **Photo Date:** 2/18/2019 **Comments:** Interval (79.2-93.3 feet).	
Photograph ID: 118 **Photo Location:** CUF-TW03 **Photo Date:** 2/19/2019 **Comments:** Interval (93.3-99.4 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 119

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (0.0-1.5 feet). Depth interval shown on white board should be 0.0-1.5.

Photograph ID: 120

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (1.5-3.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 121

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

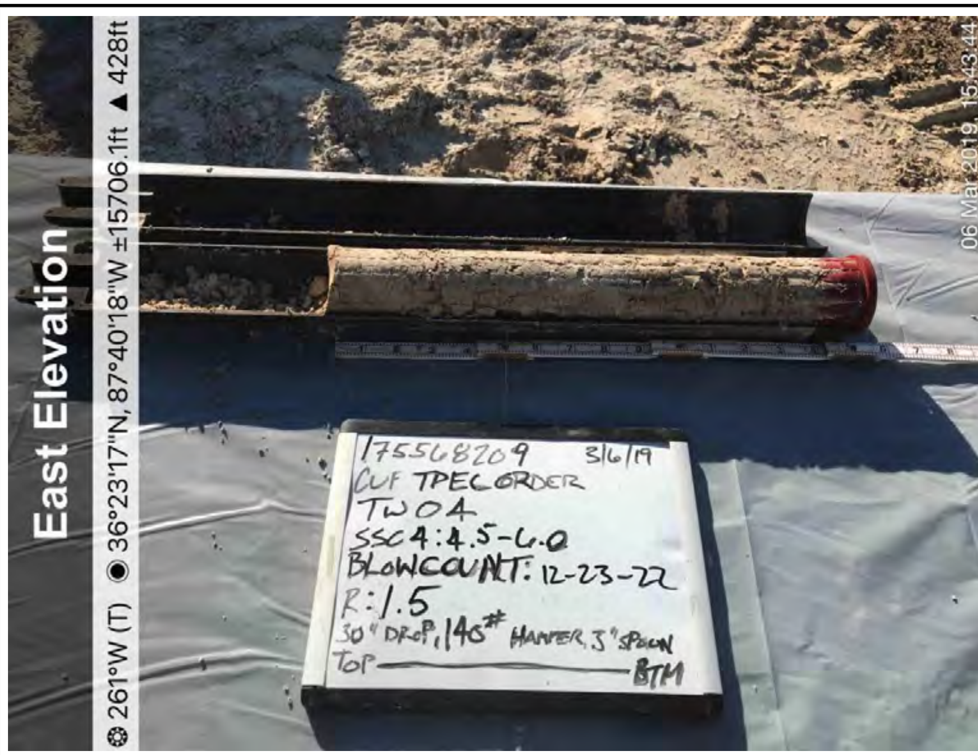
Comments:
Interval (3.0-4.5 feet). Blow count shown on white board is 25-42-45.

Photograph ID: 122

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (4.5-6.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 123

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (6.0-6.9 feet). Depth interval shown on white board should be 6.0-6.9.

Photograph ID: 124

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (7.0-7.9 feet). Depth interval shown on white board should be 7.0-7.9.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 125

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (9.0-10.2 feet). Depth interval shown on white board should be 9.0-10.2.

Photograph ID: 126

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

Comments:
Interval (10.5-11.4 feet). Depth interval shown on white board should be 10.5-11.4.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 127

Photo Location:
CUF-TW04

Photo Date:
3/6/2019

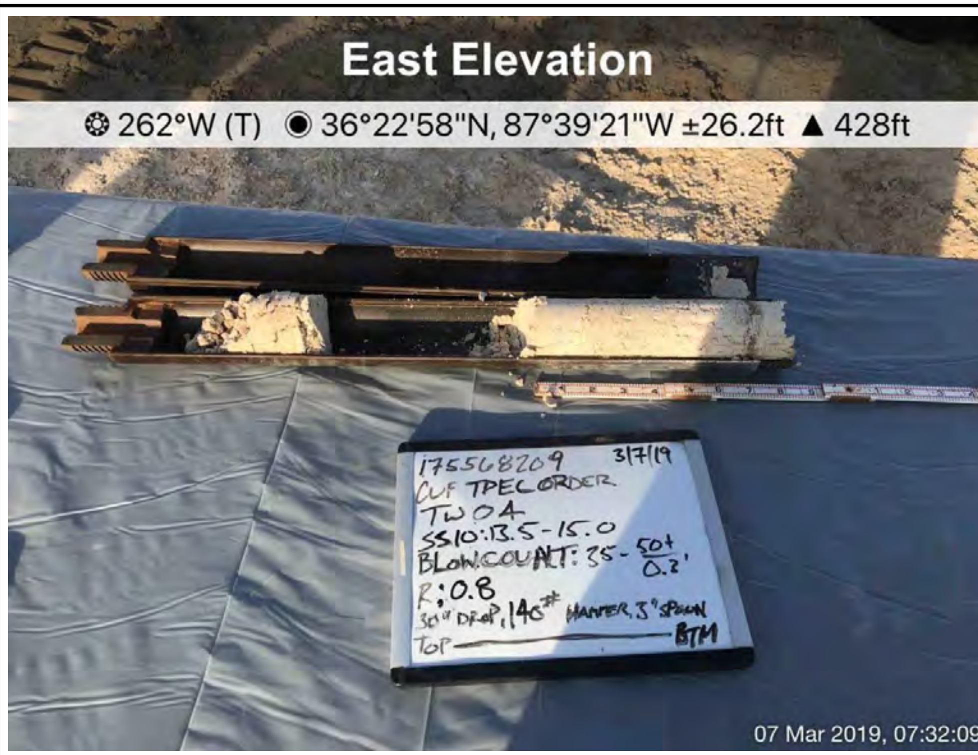
Comments:
Interval (12.0-12.8 feet). Depth interval shown on white board should be 12.0-12.8.

Photograph ID: 128

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (13.5-14.3 feet). Depth interval shown on white board should be 13.5-14.3.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 129

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (15.0-16.4 feet). Depth interval shown on white board should be 15.0-16.4.

Photograph ID: 130

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (16.5-17.9 feet). Depth interval shown on white board should be 16.5-17.9.

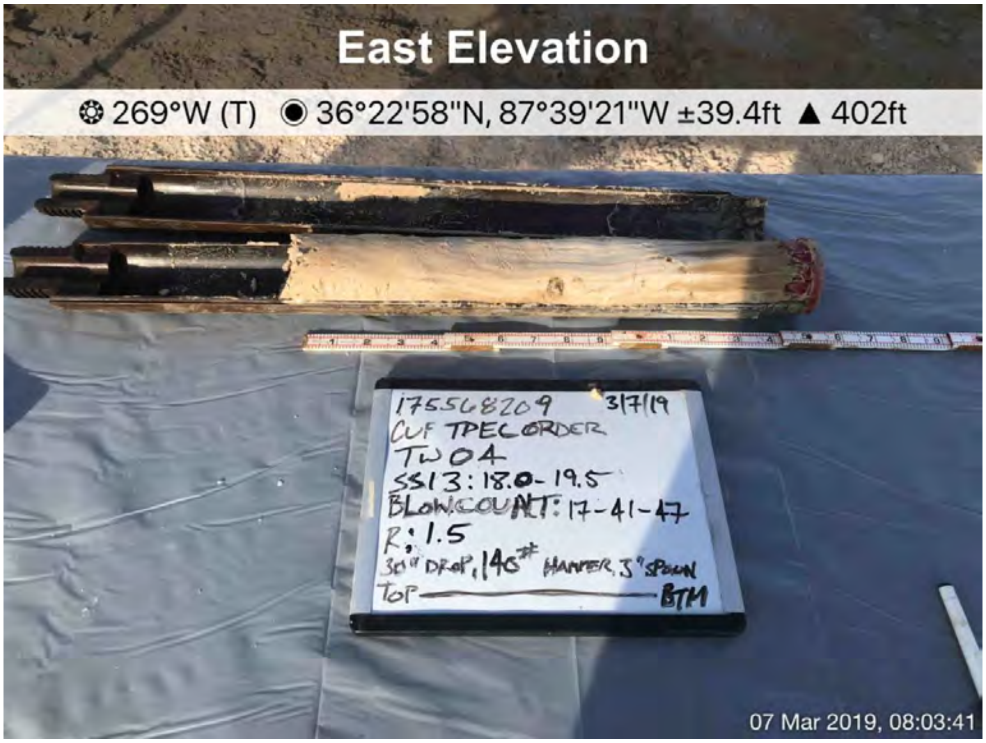
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 131

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (18.0-19.5 feet).



Photograph ID: 132

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Photo of interval (19.5-20.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 133

Photo Location: CUF-TW04

Photo Date: 3/7/2019

Comments: Interval (20.0-20.8 feet). Depth interval shown on white board should be 20.0-20.8.

Photograph ID: 134

Photo Location: CUF-TW04

Photo Date: 3/7/2019

Comments: Interval (21.5-23.0 feet). Depth interval shown on white board should be 21.5-23.0.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 135

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (23.0-24.5 feet). Depth interval shown on white board should be 23.0-24.5.

Photograph ID: 136

Photo Location:
CUF-TW04

Photo Date:
3/7/2019

Comments:
Interval (24.5-26.0 feet). Depth interval shown on white board should be 24.5-26.0.

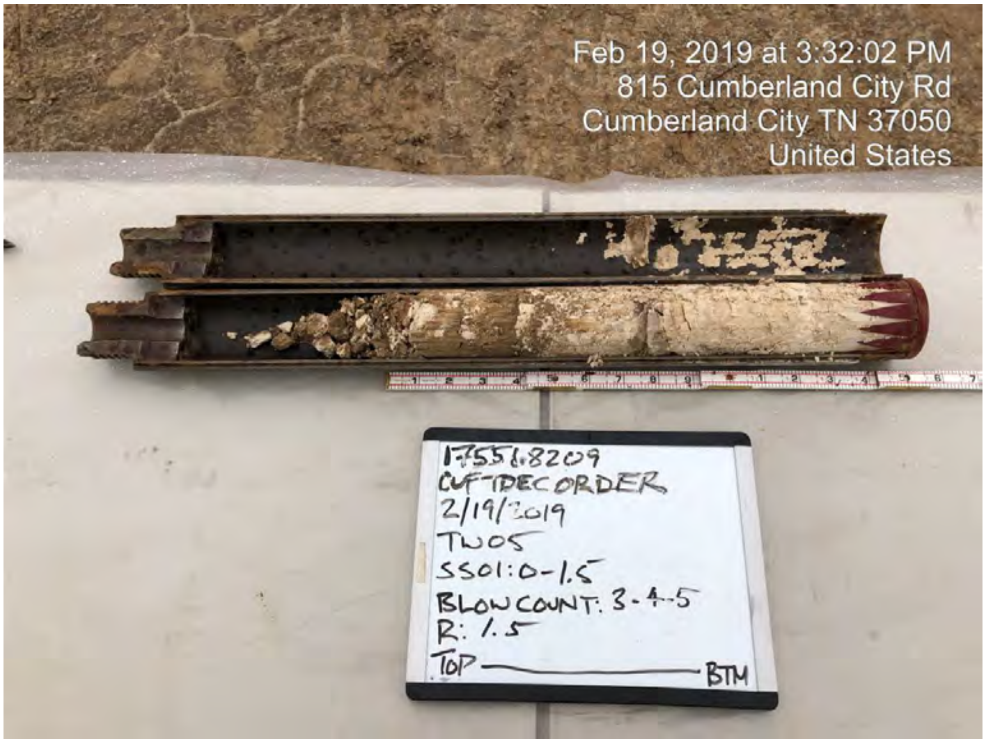
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 137

Photo Location: CUF-TW05

Photo Date: 2/19/2019

Comments: Interval (0.0-1.5 feet). Depth interval shown on white board should be 0.0-1.5.

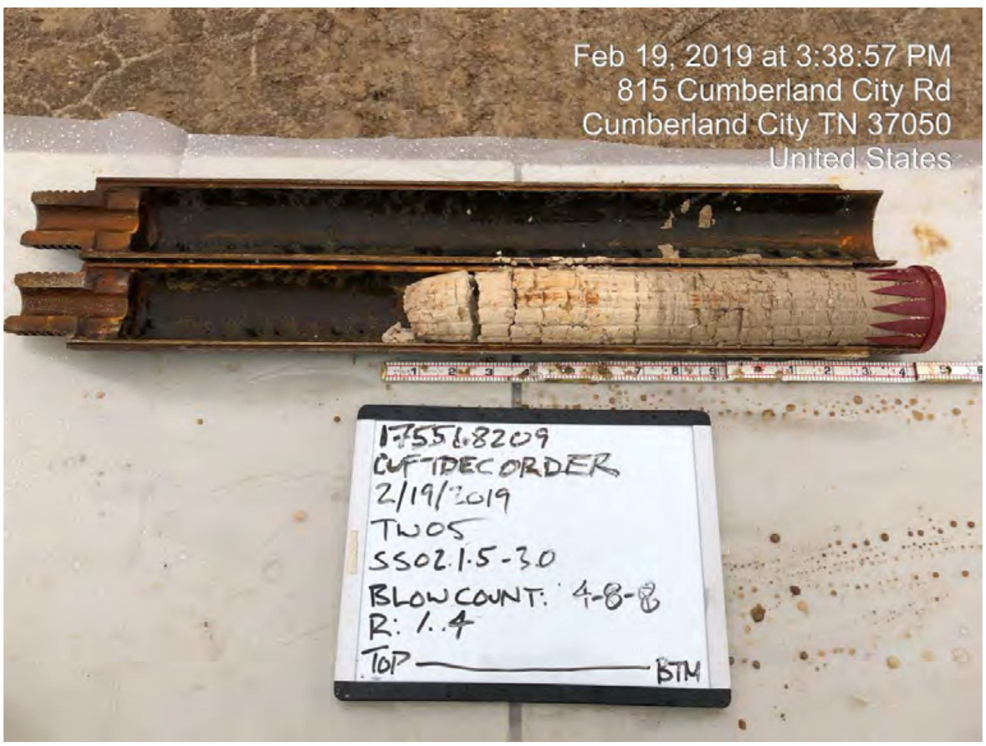


Photograph ID: 138

Photo Location: CUF-TW05

Photo Date: 2/19/2019

Comments: Interval (1.5-3.0 feet).



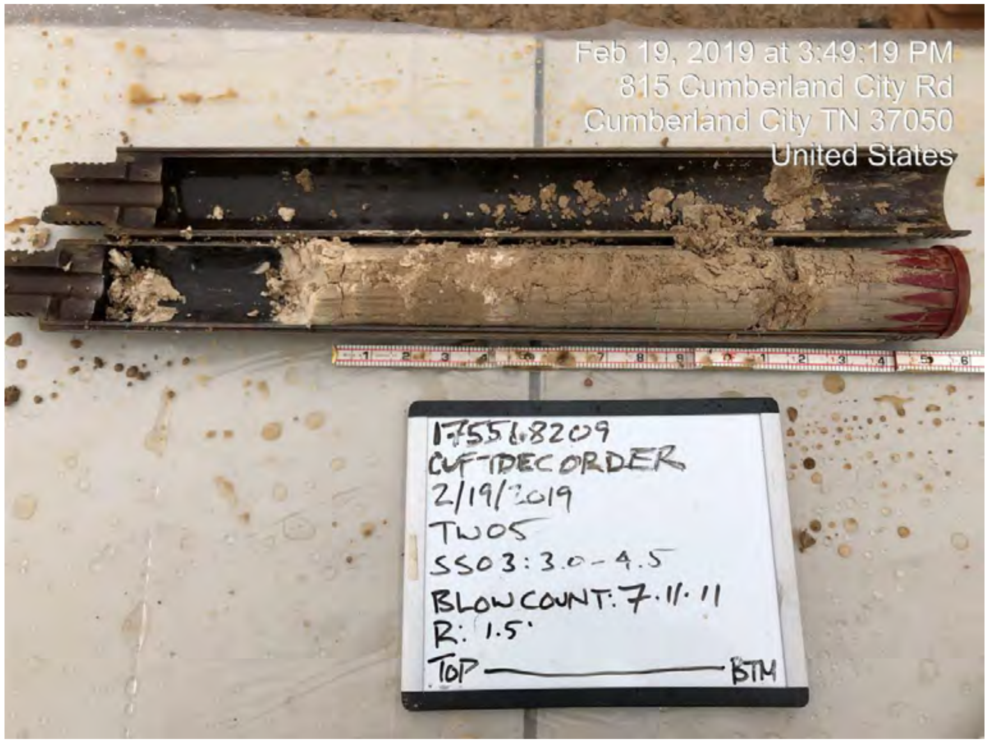
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 139

Photo Location:
CUF-TW05

Photo Date:
2/19/2019

Comments:
Interval (3.0-4.5 feet).



Photograph ID: 140

Photo Location:
CUF-TW05

Photo Date:

Comments:
Photo of interval (4.5-6.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

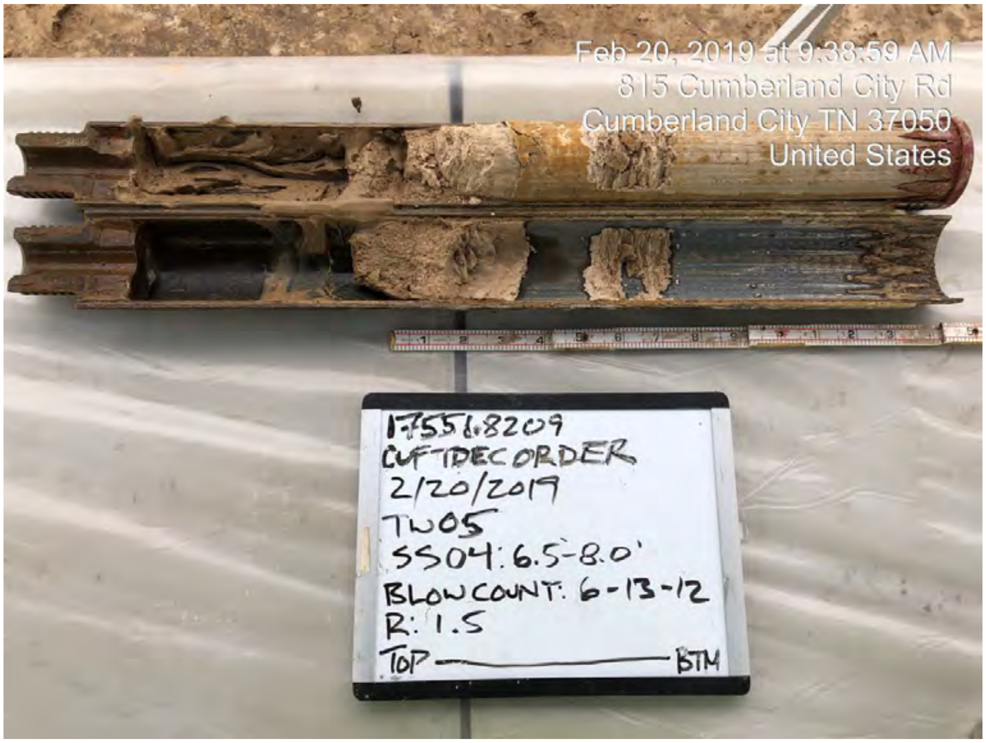
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 141

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (6.5-8.0 feet).

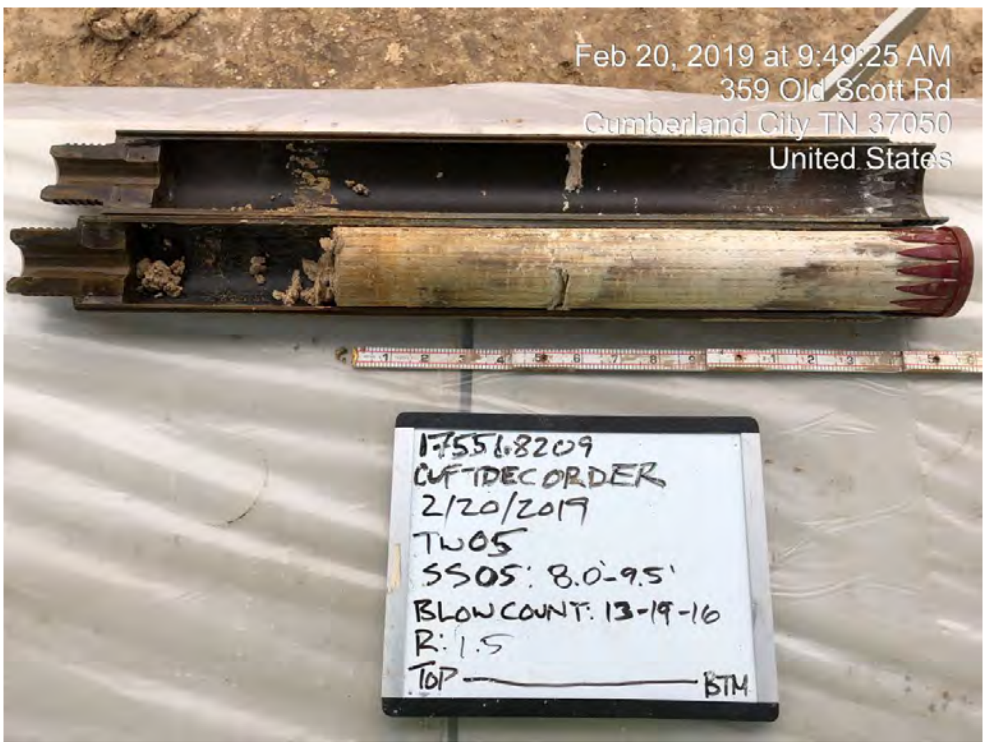


Photograph ID: 142

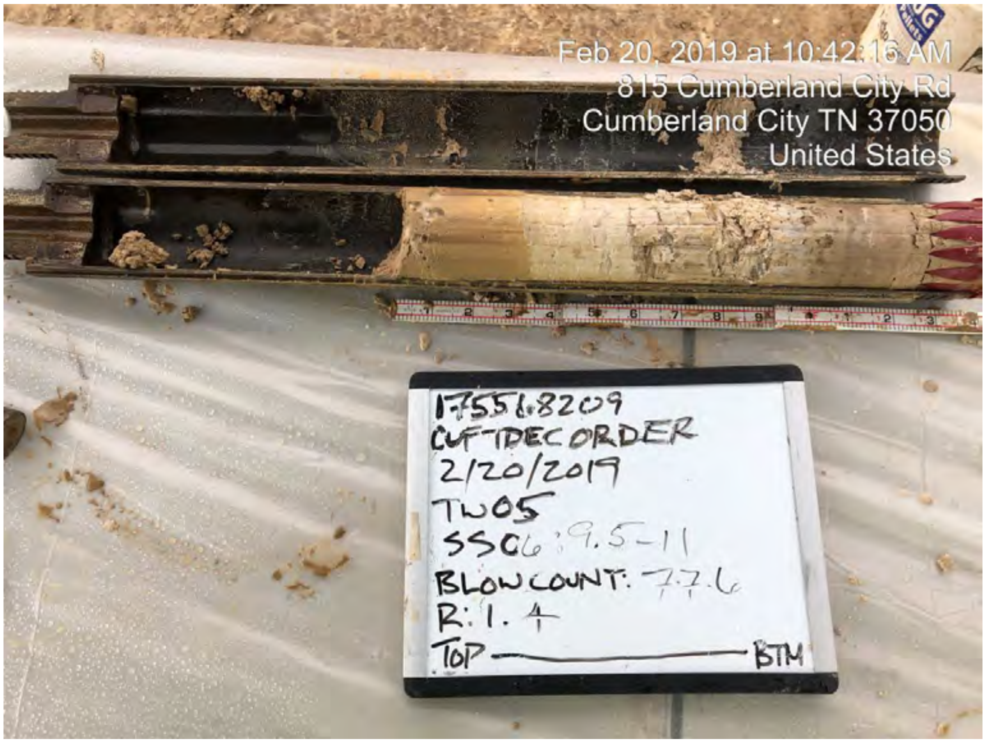
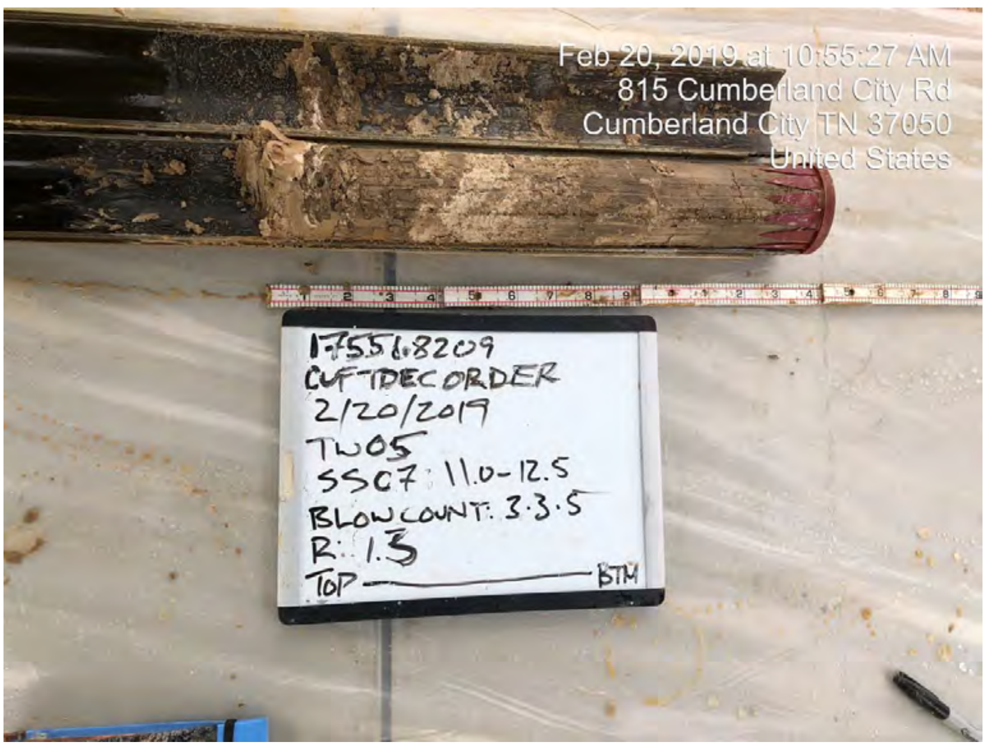
Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (8.0-9.5 feet).



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 143 **Photo Location:** CUF-TW05 **Photo Date:** 2/20/2019 **Comments:** Interval (9.5-11.0 feet). Depth interval shown on white board should be 9.5-11.0.	
Photograph ID: 144 **Photo Location:** CUF-TW05 **Photo Date:** 2/20/2019 **Comments:** Interval (11.0-12.5 feet).	

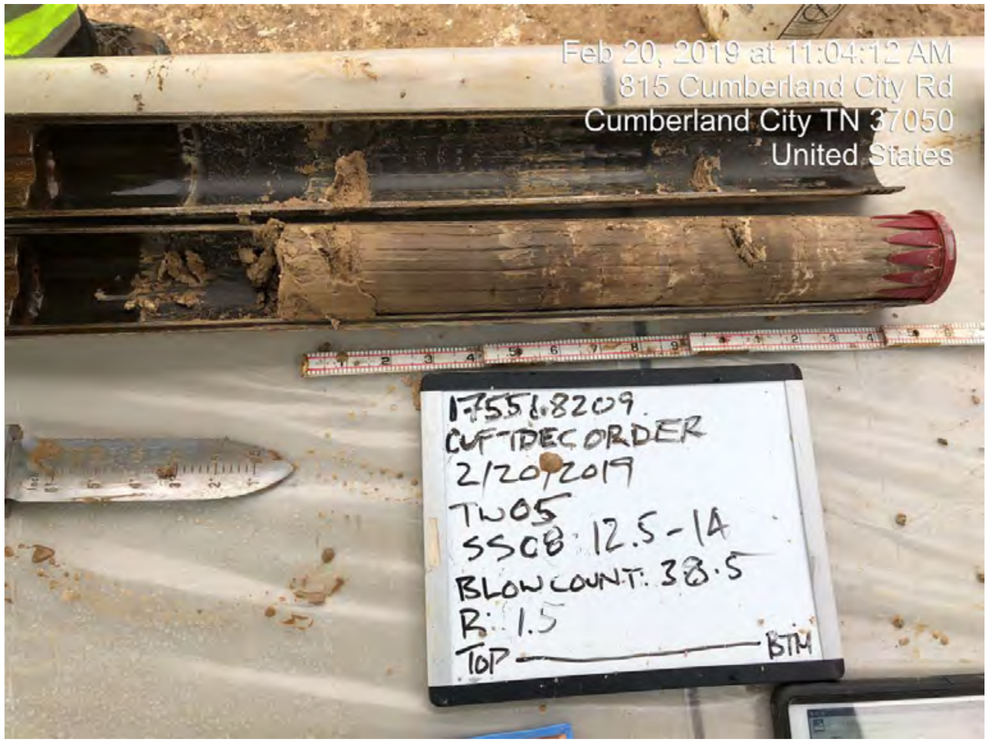
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 145

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (12.5-14.0 feet). Depth interval shown on white board should be 12.5-14.0.



Photograph ID: 146

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Photo of interval (14.0-15.5 feet) unavailable.

No Photo Applicable

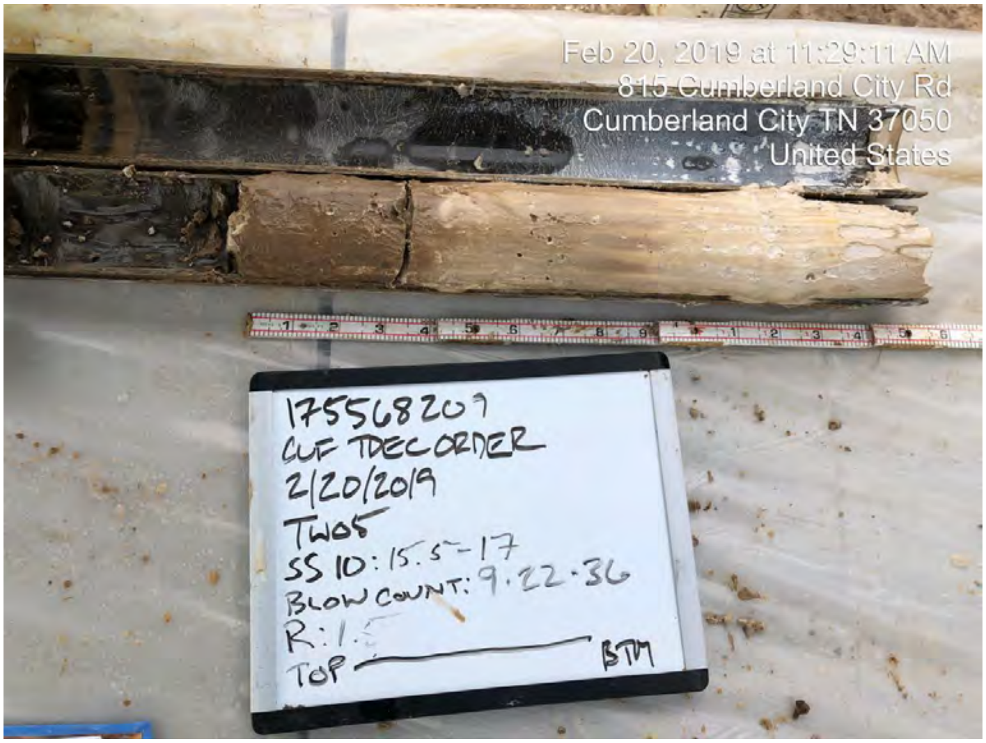
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 147

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (15.5-17.0 feet). Depth interval shown on white board should be 15.5-17.0. Recovery shown on white board is 1.5.



Photograph ID: 148

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (17.0-18.5 feet). Depth interval shown on white board should be 17.0-18.5.

Stantec

Photographic Log

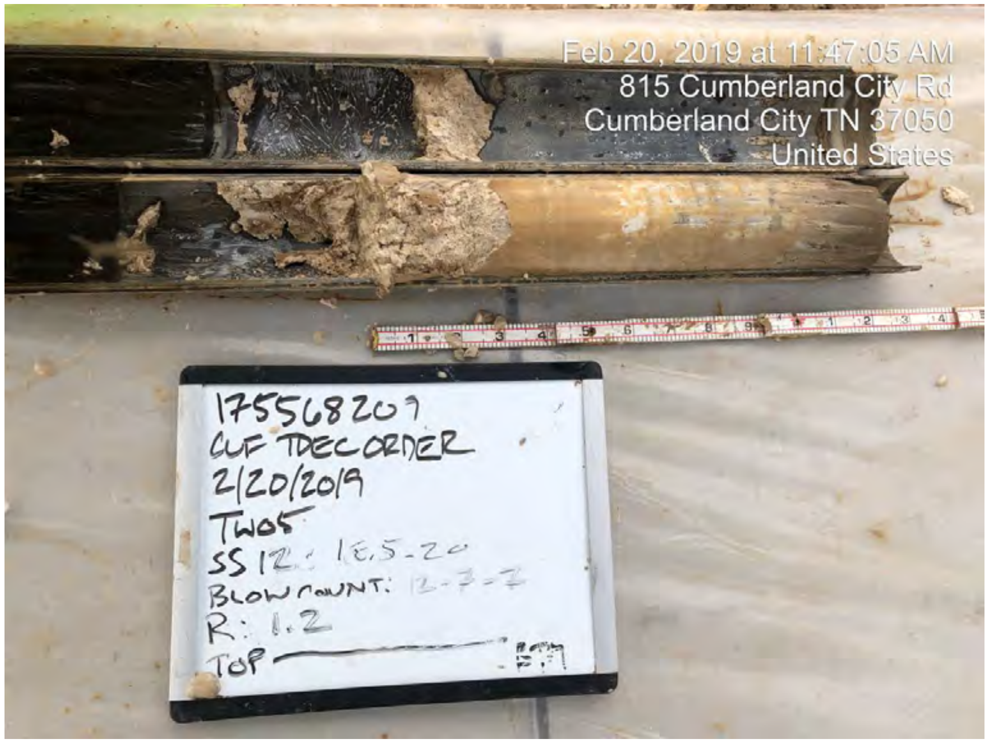
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 149

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (18.5-20.0 feet). Depth interval shown on white board should be 18.5-20.0. Blow count shown on white board is 12-7-7.

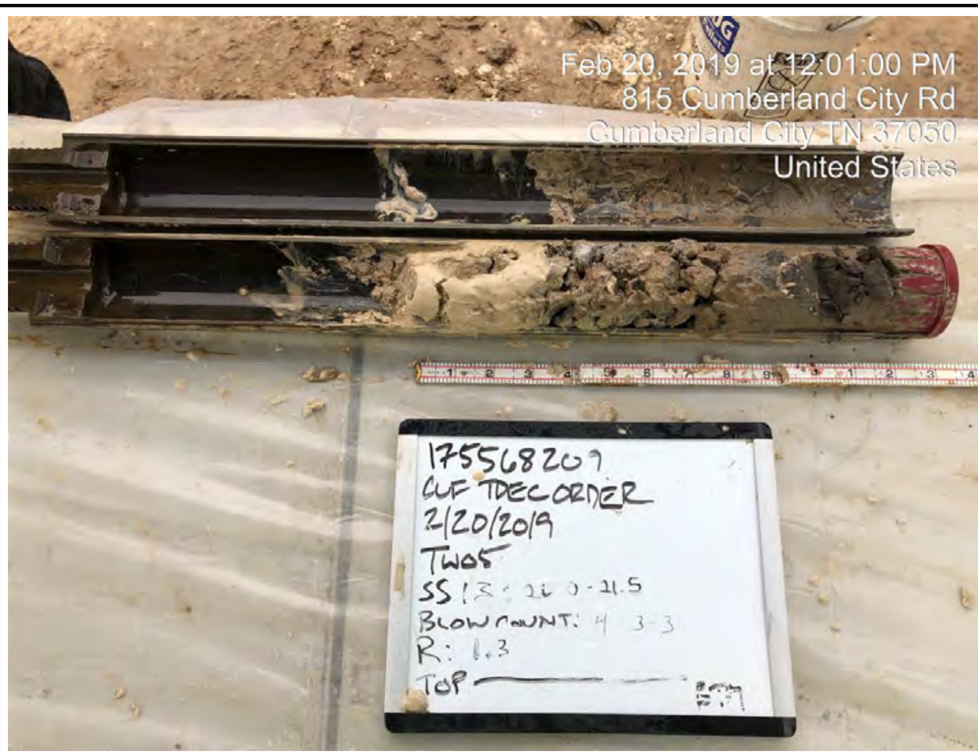


Photograph ID: 150

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (20.0-21.5 feet). Depth interval shown on white board is 20.0-21.5. Blow count shown on white board is 4-3-3.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 151

Photo Location: CUF-TW05

Photo Date: 2/20/2019

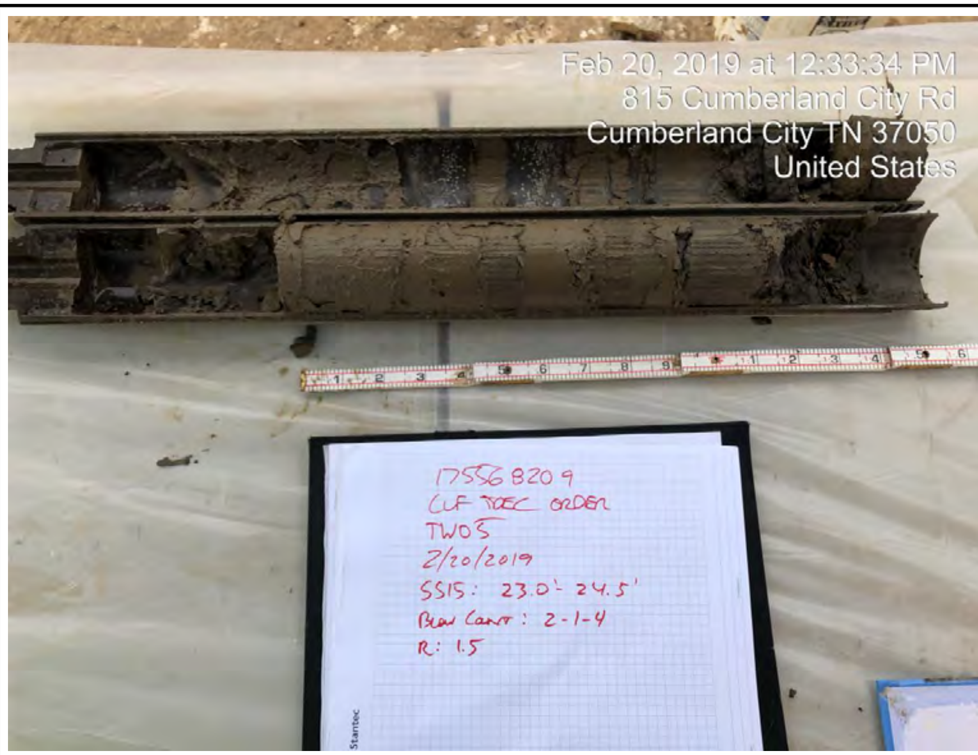
Comments: Interval (21.5-23.0 feet).

Photograph ID: 152

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (23.0-24.5 feet).



Stantec

Photographic Log

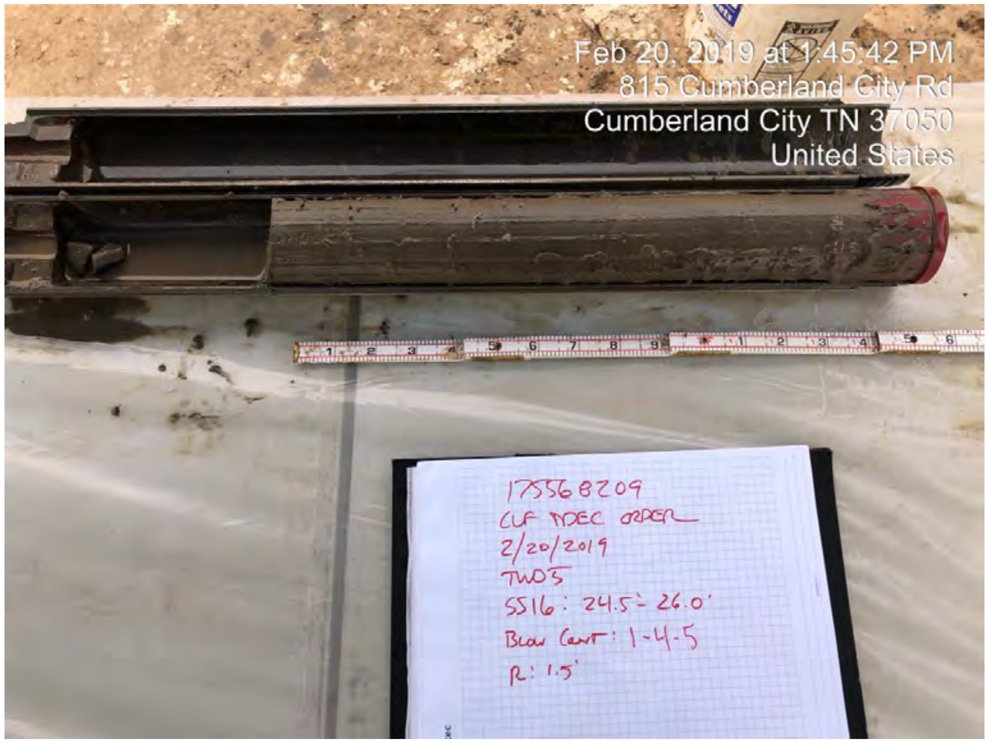
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 153

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (24.5-26.0 feet).

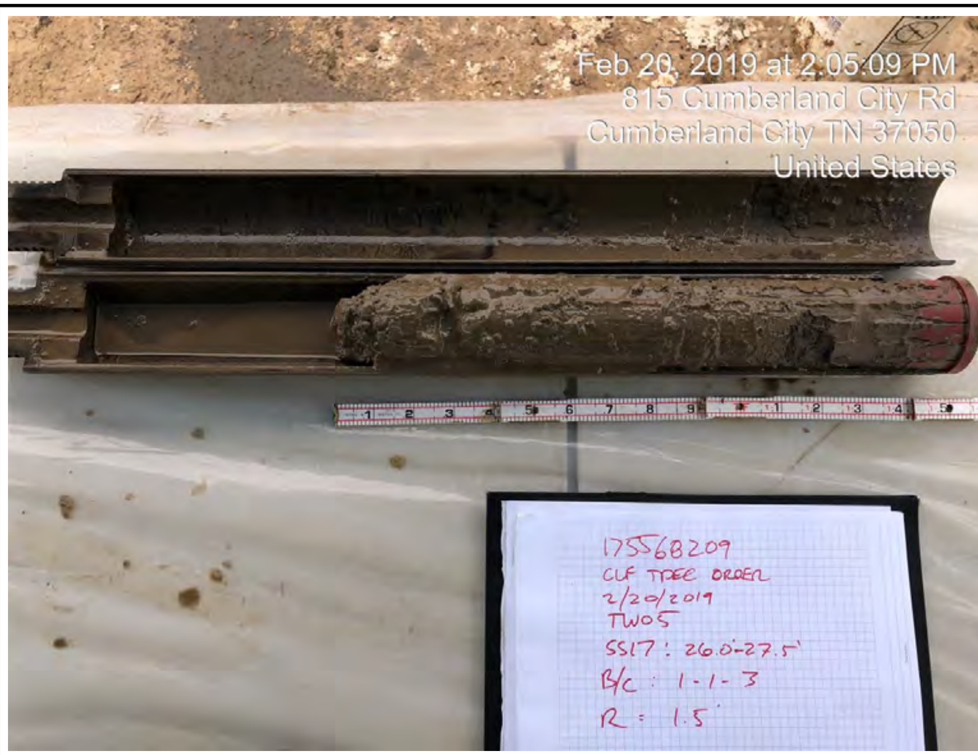


Photograph ID: 154

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (26.0-27.5 feet).



Stantec

Photographic Log

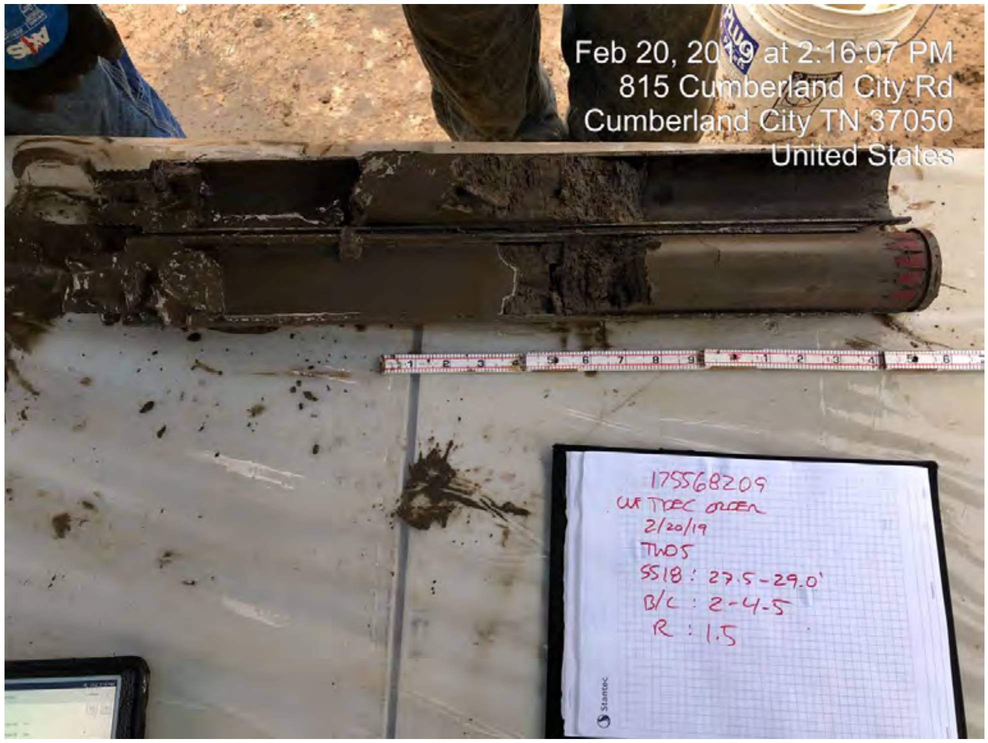
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 155

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Interval (27.5-29.0 feet).



Photograph ID: 156

Photo Location:
CUF-TW05

Photo Date:
2/20/2019

Comments:
Photo of interval (29.0-31.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 157

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (31.0-32.5 feet).

Photograph ID: 158

Photo Location: CUF-TW05

Photo Date: 2/20/2019

Comments: Interval (32.5-34.0 feet).

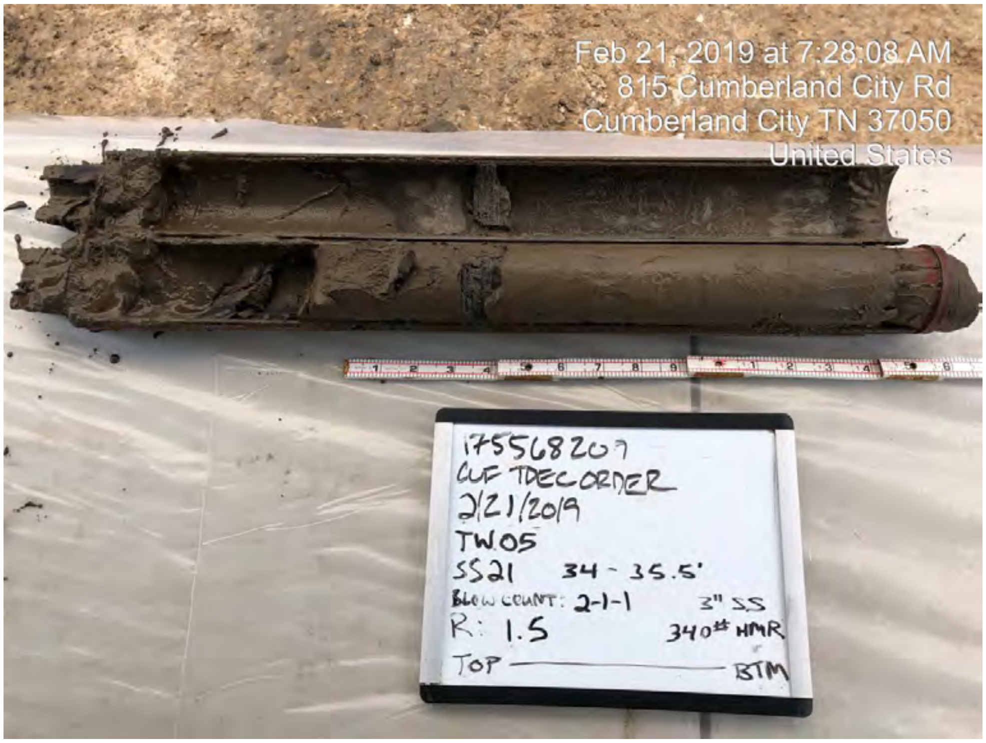
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 159

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (34.0-35.5 feet). Depth interval shown on white board should be 34.0-35.5.

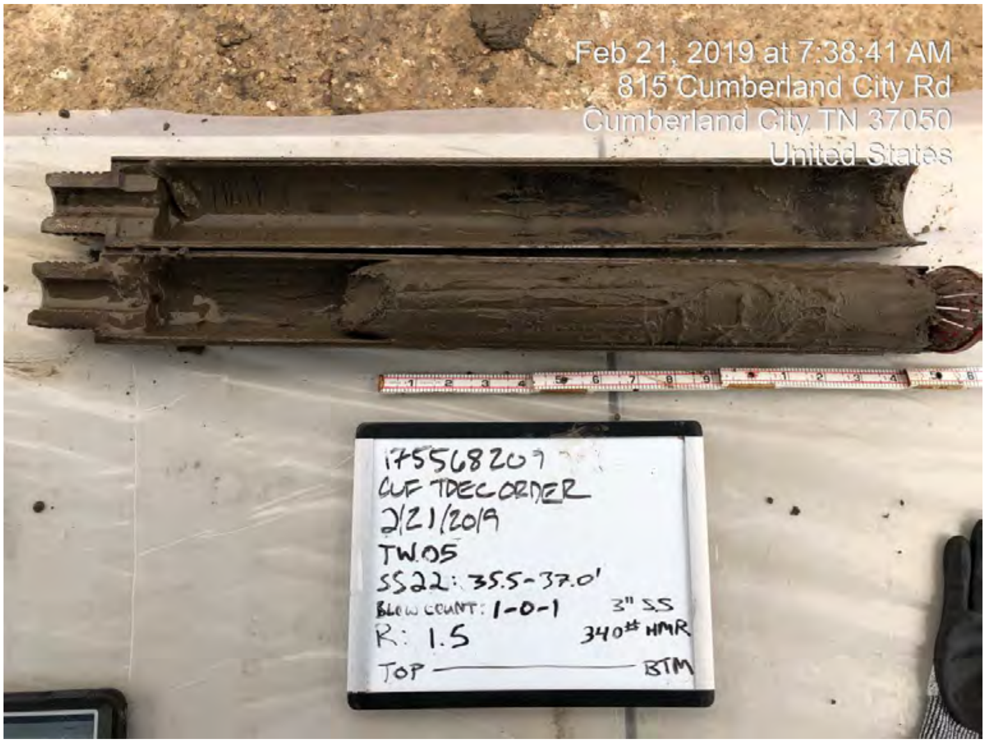


Photograph ID: 160

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (35.5-37.0 feet). Blow count shown on white board should be 1-WH-1.



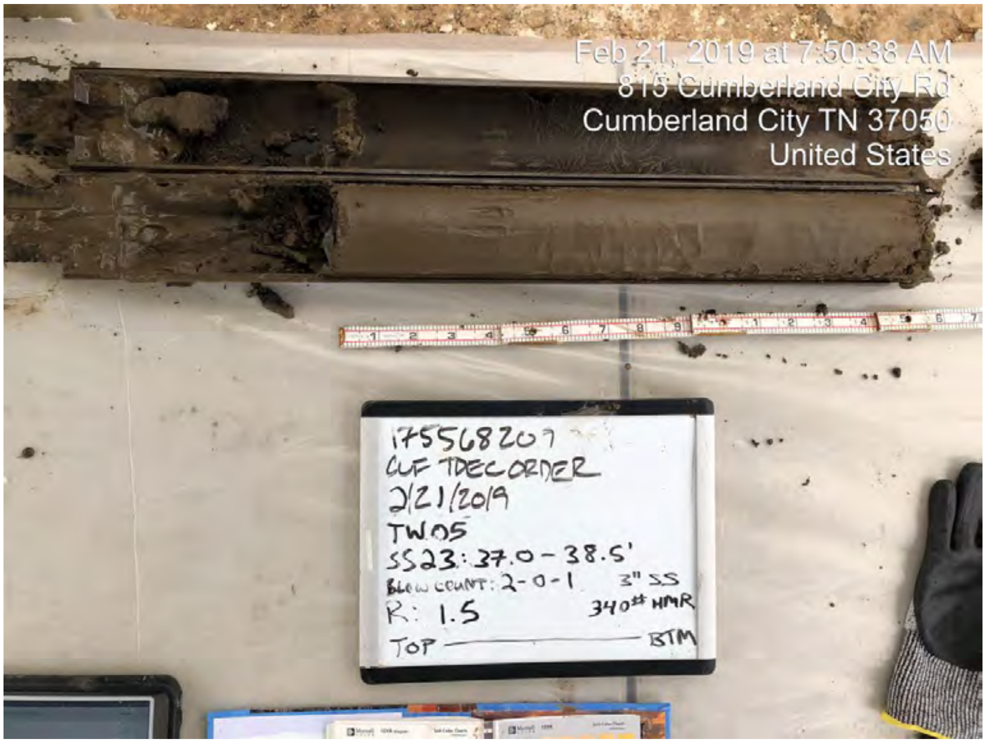
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 161

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (37.0-38.5 feet). Blow count shown on white board should be 2-WH-1.



Photograph ID: 162

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (38.5-40.0 feet). Depth interval shown on white board should be 38.5-40.0. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 163

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Photo of interval (40.0-41.5 feet) unavailable.

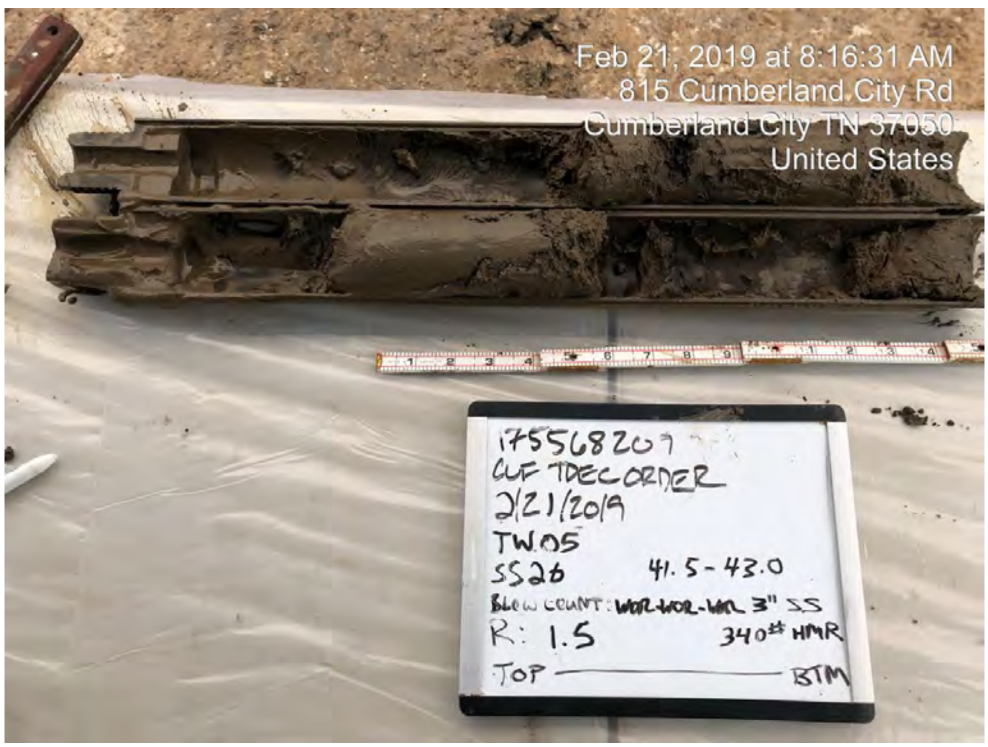
No Photo Applicable

Photograph ID: 164

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (41.5-43.0 feet). WOR on white board is the same as WR on the boring log.



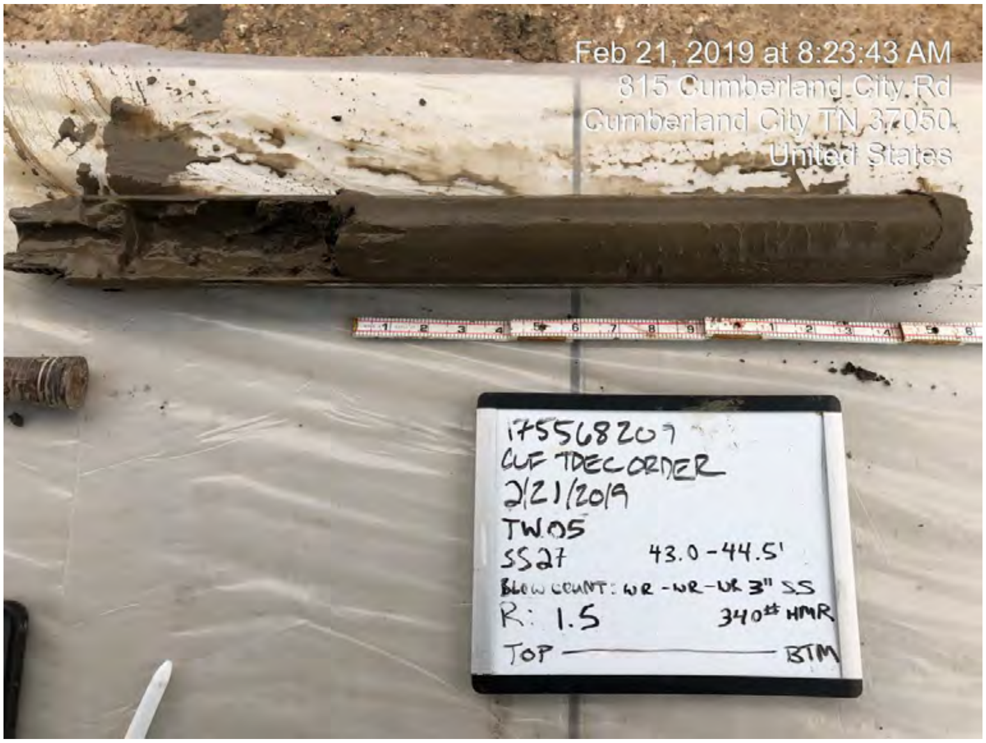
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 165

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (43.0-44.5 feet).

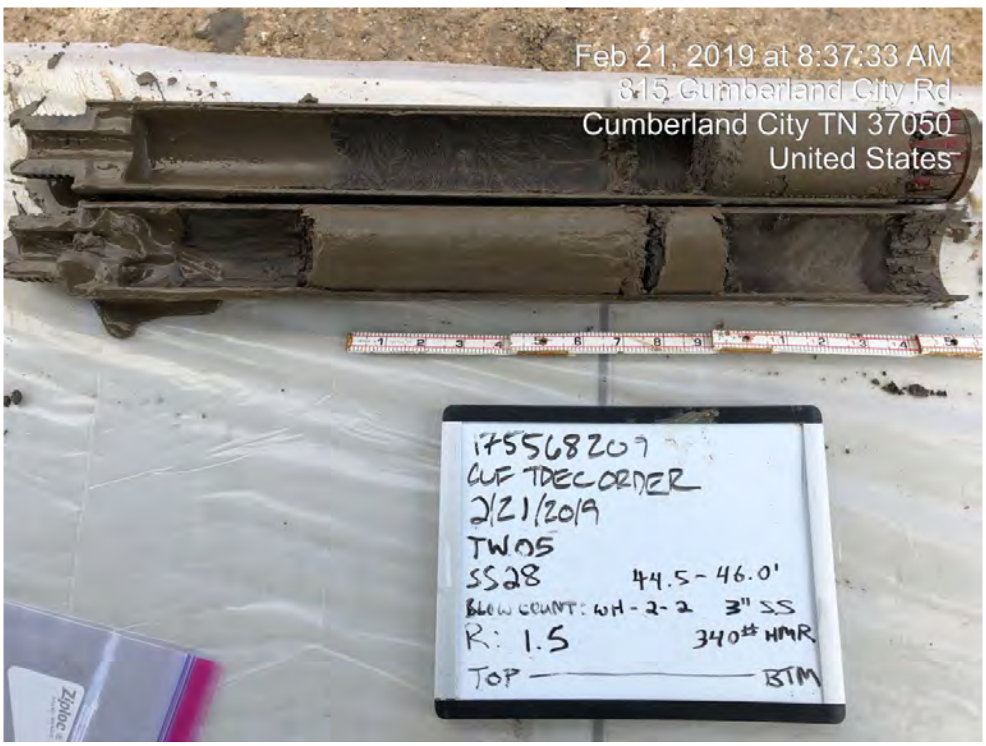


Photograph ID: 166

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (44.5-46.0 feet).



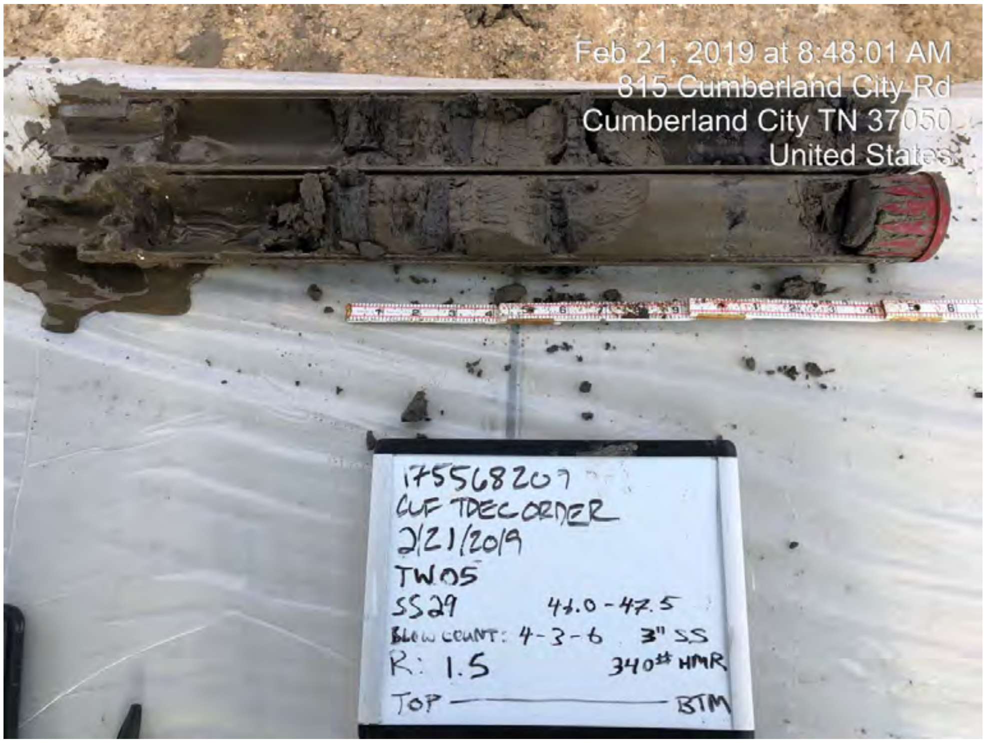
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 167

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (46.0-47.5 feet).



Photograph ID: 168

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (47.5-49.0 feet).

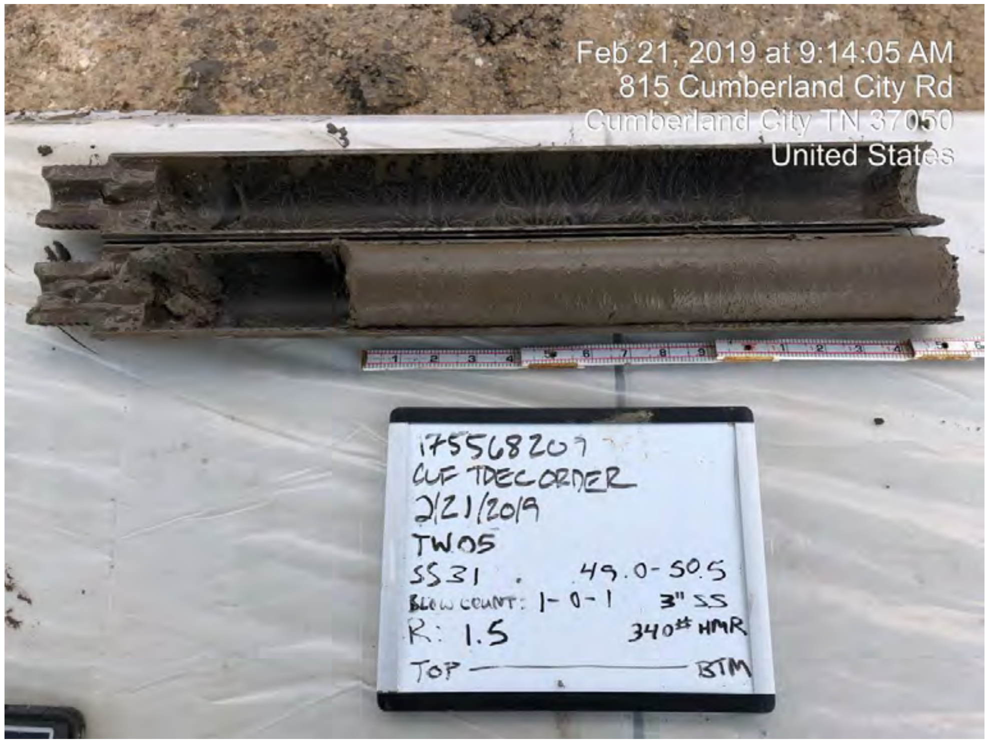
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 169

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (49.0-50.5 feet). Blow count shown on white board should be 1-WH-1.



Photograph ID: 170

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (50.5-52.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 171

Photo Location: CUF-TW05

Photo Date: 2/21/2019

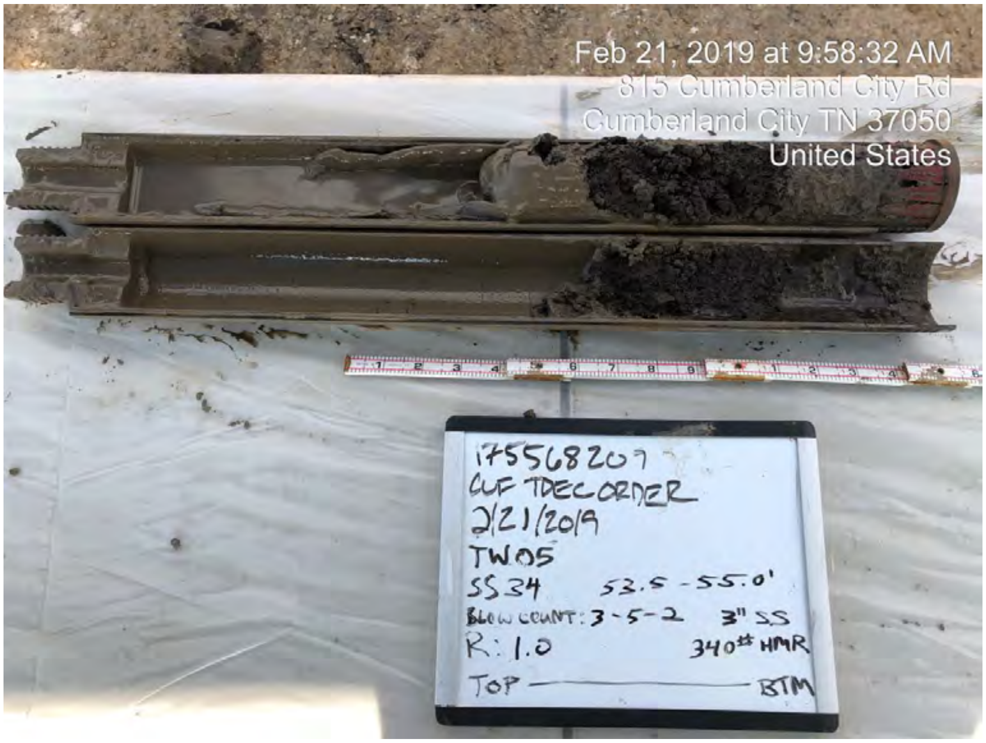
Comments: Interval (52.0-53.5 feet).

Photograph ID: 172

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (53.5-55.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 173

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (55.0-56.5 feet).

Photograph ID: 174

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (56.5-58.0 feet). Blow count shown on white board should be 1-WH-1.

Stantec **Photographic Log**

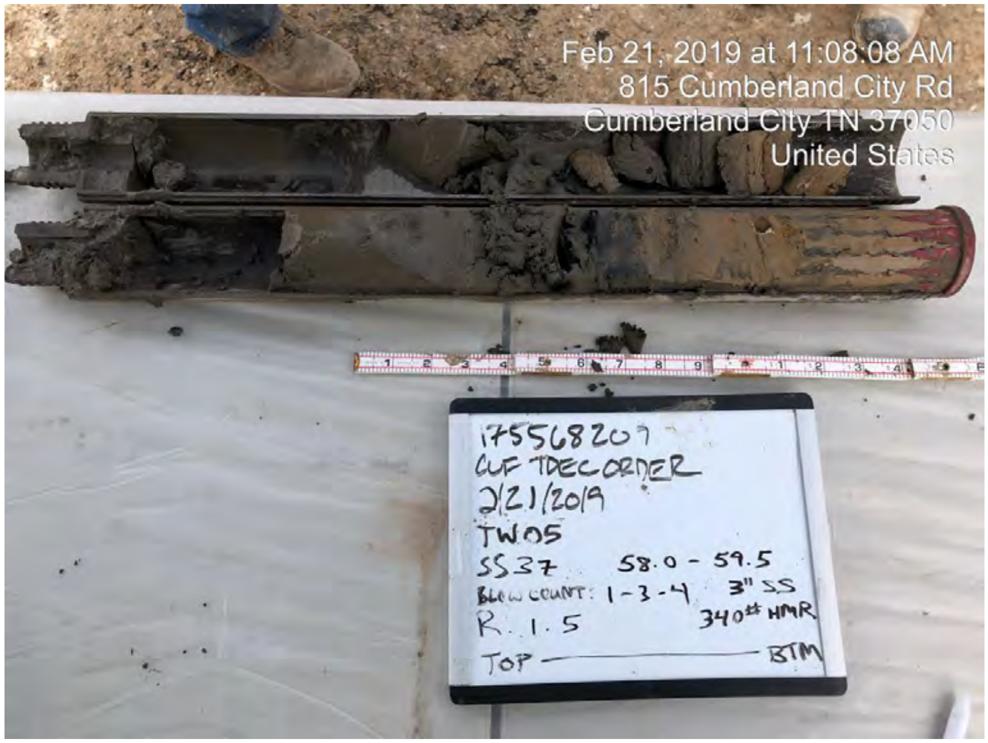
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 175

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (58.0-59.5 feet).



Photograph ID: 176

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Photo of interval (59.5-61.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 177

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (61.5-63.0 feet).

Photograph ID: 178

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (63.0-64.5 feet). Depth interval shown on white board should be 63.0-64.5.

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 179

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Photo of interval (65.5-67.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photograph ID: 180

Photo Location: CUF-TW05

Photo Date: 2/21/2019

Comments: Interval (68.0-69.5 feet). Depth interval shown on white board should be 68.0-69.5.

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 181

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (70.5-72.0 feet). Depth interval shown on white board should be 70.5-72.0. Recovery shown on white board should be 1.5.

Photograph ID: 182

Photo Location:
CUF-TW05

Photo Date:
2/21/2019

Comments:
Interval (73.0-74.5 feet). Depth interval shown on white board should be 73.0-74.5.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 183

Photo Location:
CUF-TW05

Photo Date:
2/25/2019

Comments:
Interval (75.0-85.5 feet).

Photograph ID: 184

Photo Location:
CUF-TW05

Photo Date:
2/26/2019

Comments:
Interval (85.5-95.7 feet).

ATTACHMENT D.1b

Photographic Logs of Soil Cores –
CUF-TW06 Through CUF-TW08

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 1

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (0.0-1.5 feet). Depth interval shown on white board should be 0.0-1.5.

Photograph ID: 2

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (1.5-3.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 3

Photo Location: CUF-TW06

Photo Date: 3/7/2019

Comments: Interval (3.0-4.5 feet).

Photograph ID: 4

Photo Location: CUF-TW06

Photo Date: 3/7/2019

Comments: Interval (4.5-6.0 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 5

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (6.0-7.5 feet).

Photograph ID: 6

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (7.5-9.0 feet). Blow count shown on white board is 27-45-49.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 7

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Interval (9.0-10.5 feet).

Photograph ID: 8

Photo Location:
CUF-TW06

Photo Date:
3/7/2019

Comments:
Photo of interval (10.5-12.3 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 9

Photo Location: CUF-TW06

Photo Date: 3/7/2019

Comments: Interval (12.5-14.0 feet).

Photograph ID: 10

Photo Location: CUF-TW06

Photo Date: 3/7/2019

Comments: Interval (14.0-15.5 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 11

Photo Location: CUF-TW06

Photo Date: 3/7/2019

Comments: Interval (15.5-16.9 feet). Depth interval shown on white board should be 15.5-16.9.

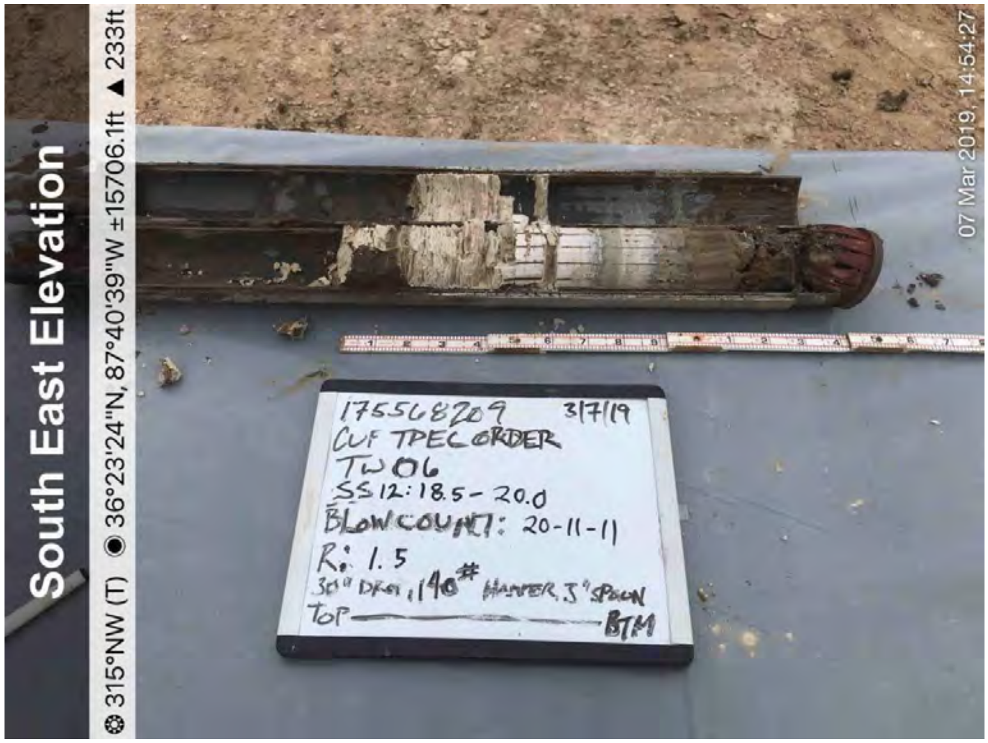
Photograph ID: 12

Photo Location: CUF-TW06

Photo Date: 3/7/2019

Comments: Interval (17.0-17.9 feet). Depth interval shown on white board should be 17.0-17.9.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 13 **Photo Location:** CUF-TW06 **Photo Date:** 3/7/2019 **Comments:** Interval (18.5-20.0 feet).	
Photograph ID: 14 **Photo Location:** CUF-TW06 **Photo Date:** 3/7/2019 **Comments:** Interval (20.0-21.5 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 15

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

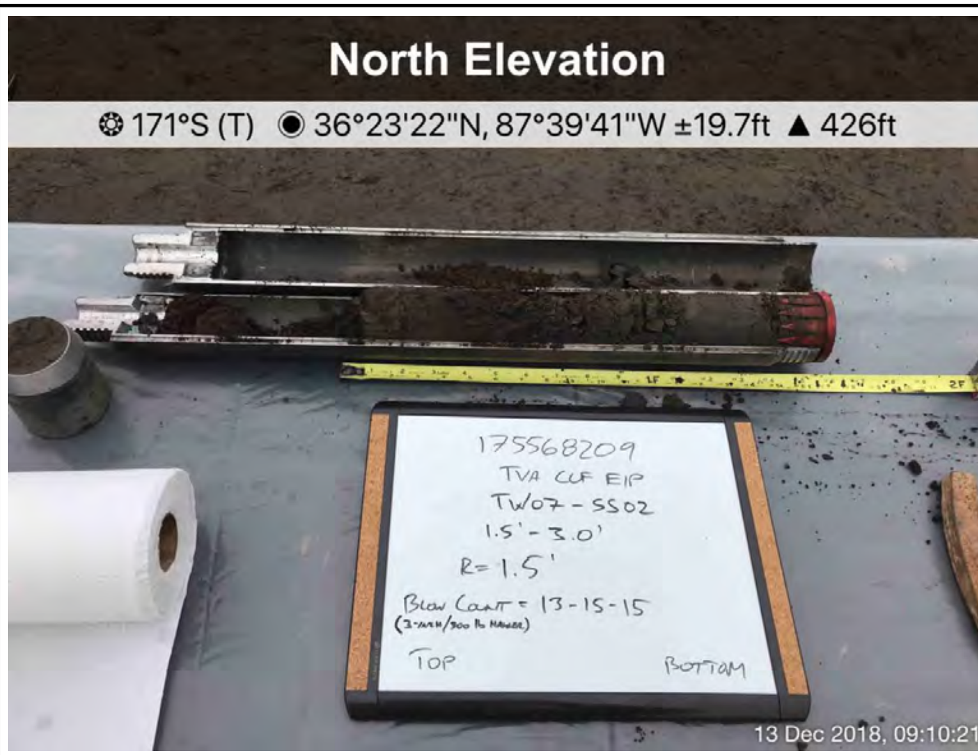
Comments:
Interval (0.0-1.5 feet).

Photograph ID: 16

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (1.5-3.0 feet).



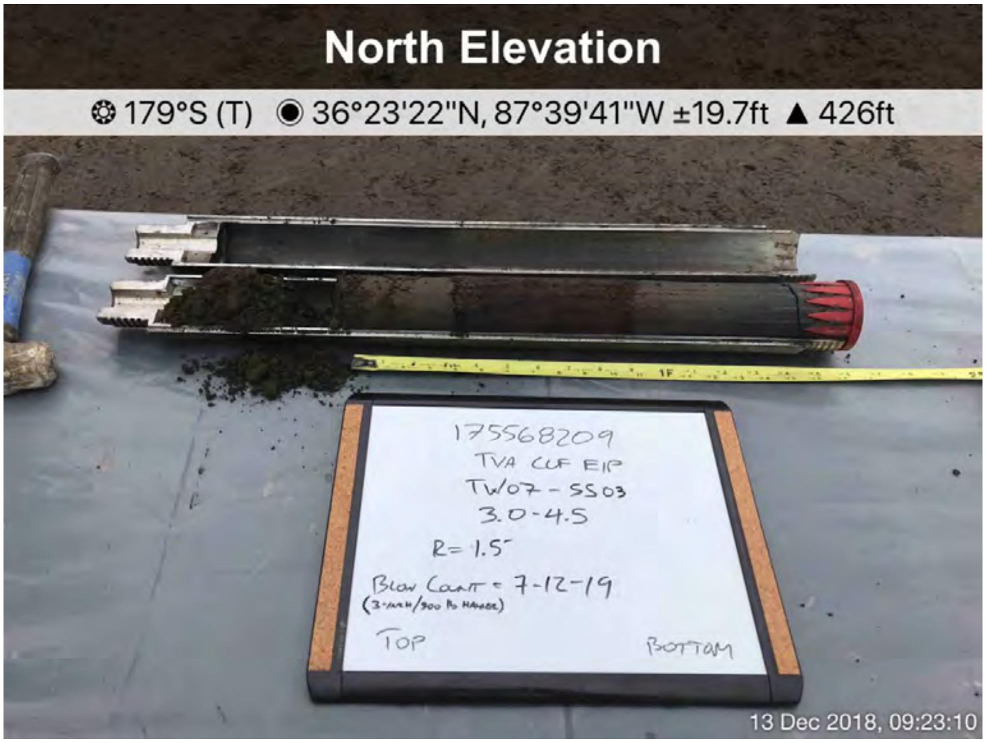
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 17

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (3.0-4.5 feet).

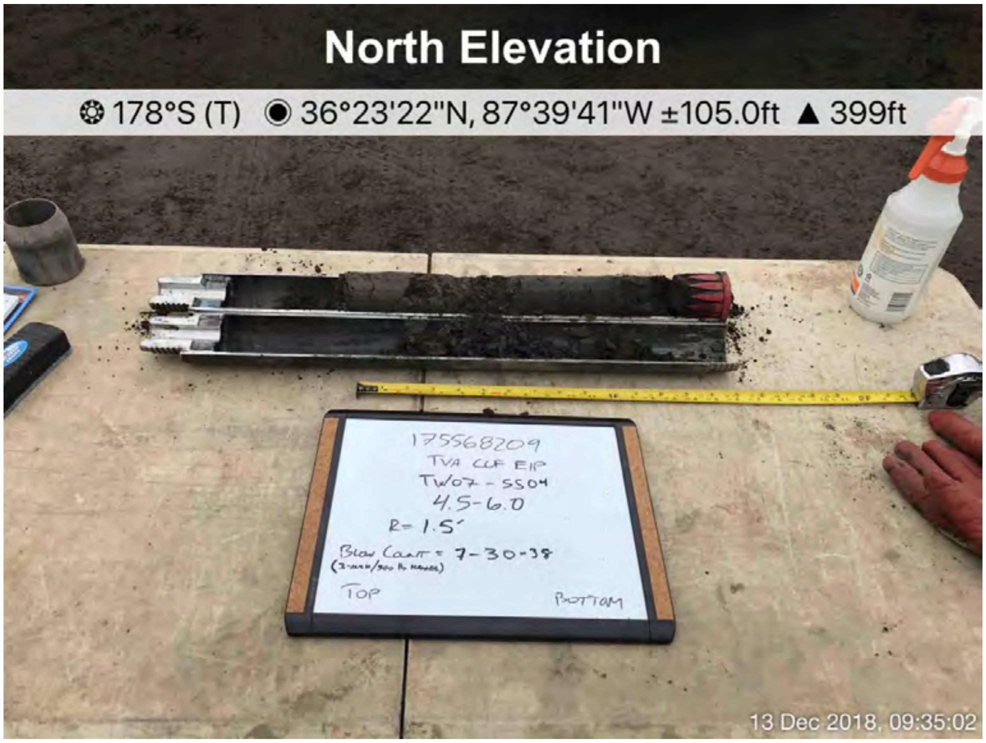


Photograph ID: 18

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (4.5-6.0 feet).



Stantec

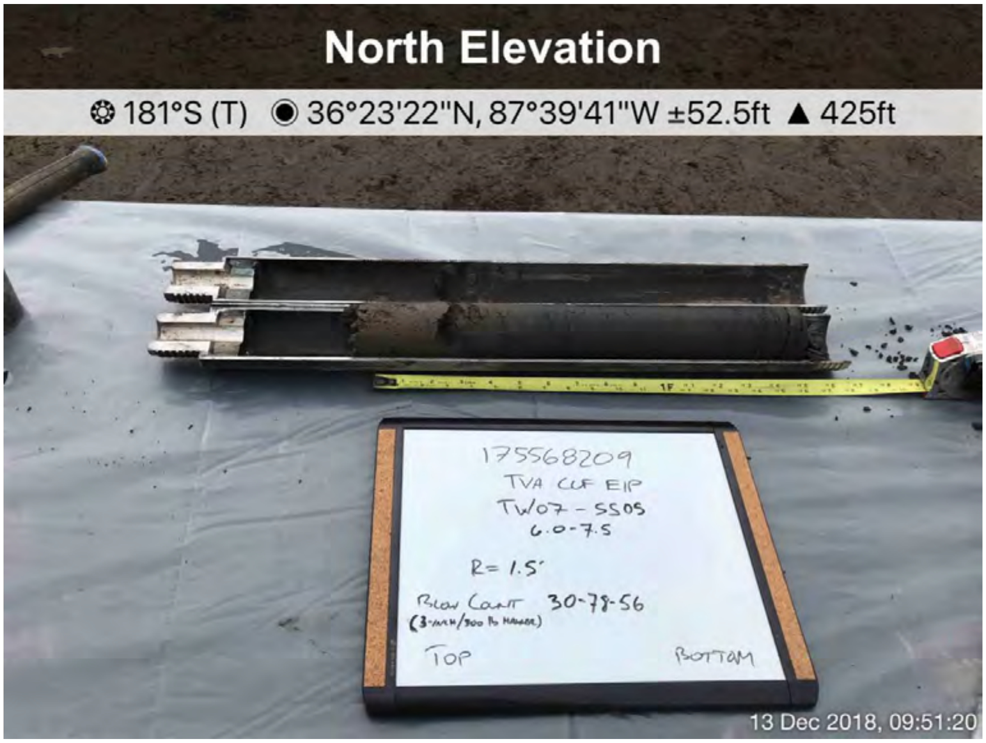
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 19

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (6.0-7.5 feet).

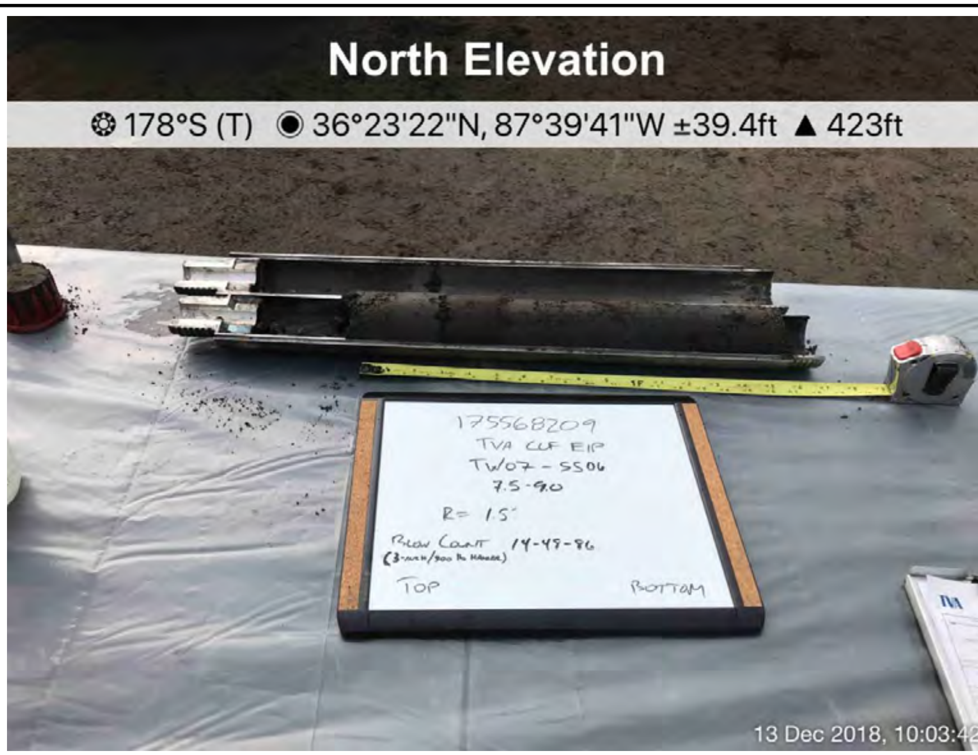


Photograph ID: 20

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (7.5-9.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 21

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

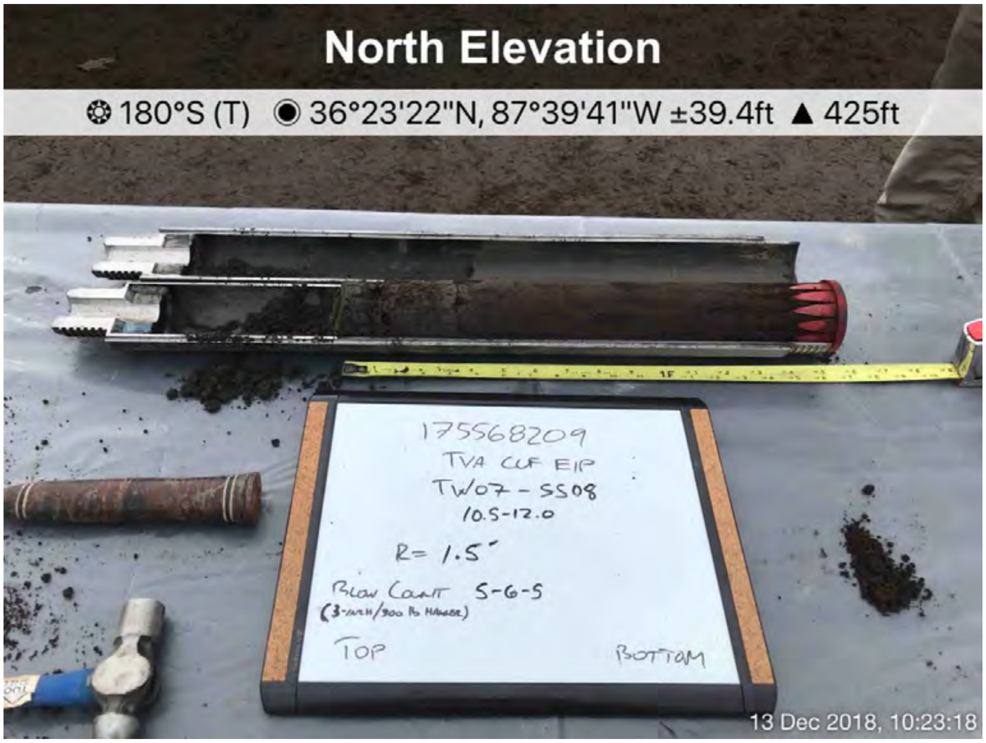
Comments:
Interval (9.0-10.5 feet).

Photograph ID: 22

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (10.5-12.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 23

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

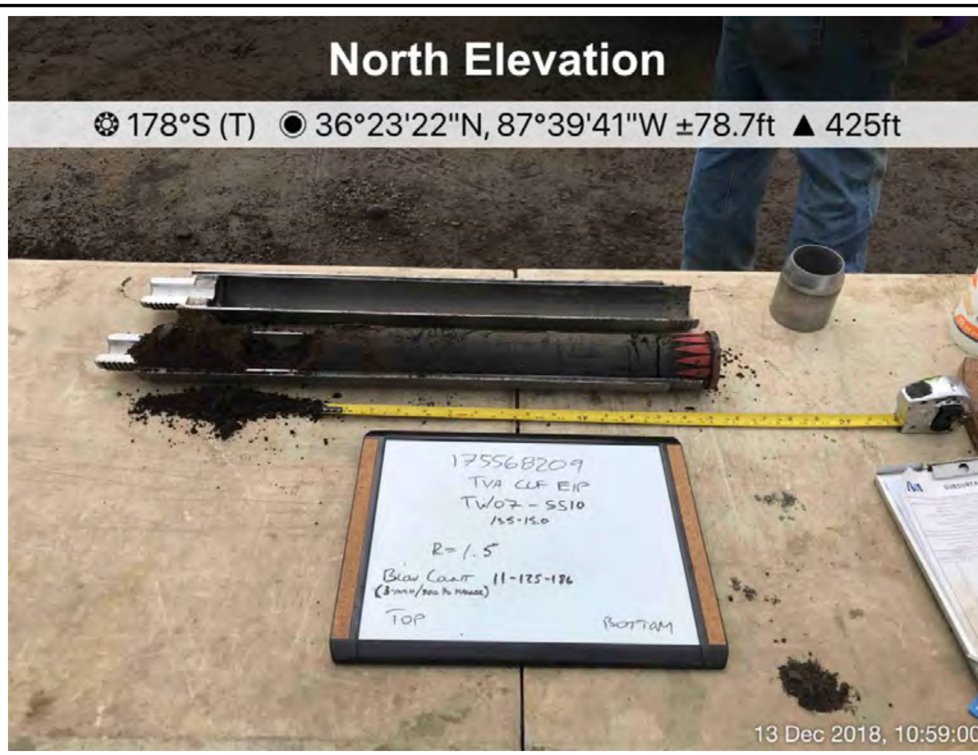
Comments:
Interval (12.0-13.5 feet).

Photograph ID: 24

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (13.5-15.0 feet).



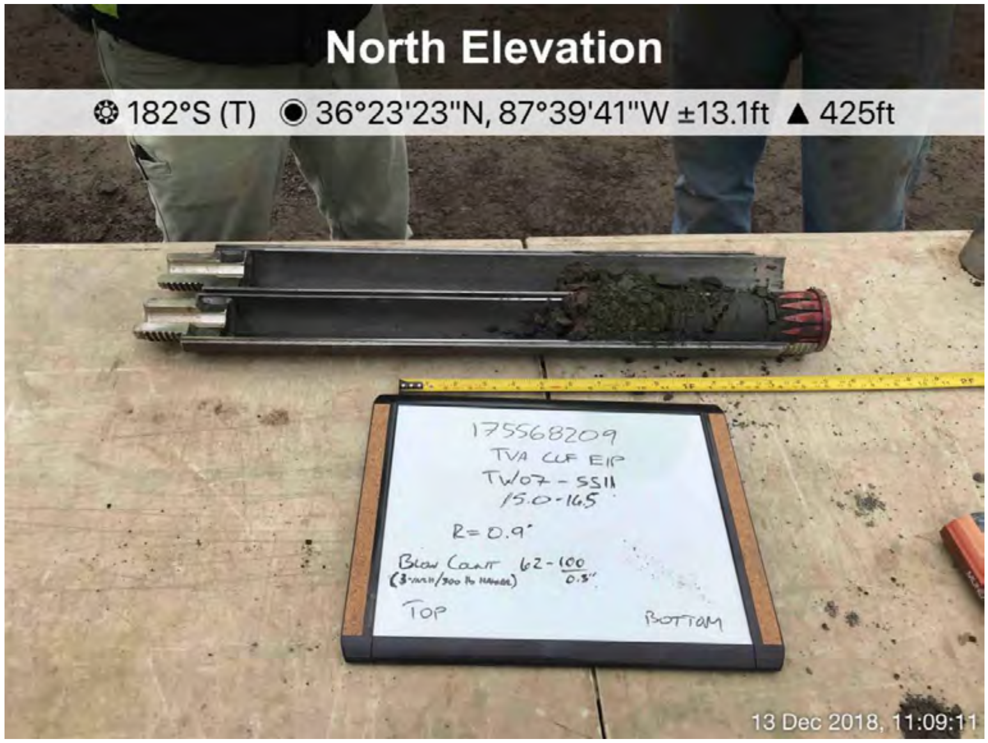
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 25

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (15.0-15.8 feet). Depth interval shown on white board should be 15.0-15.8. Blow count shown on white board should be 62-100/0.3'.



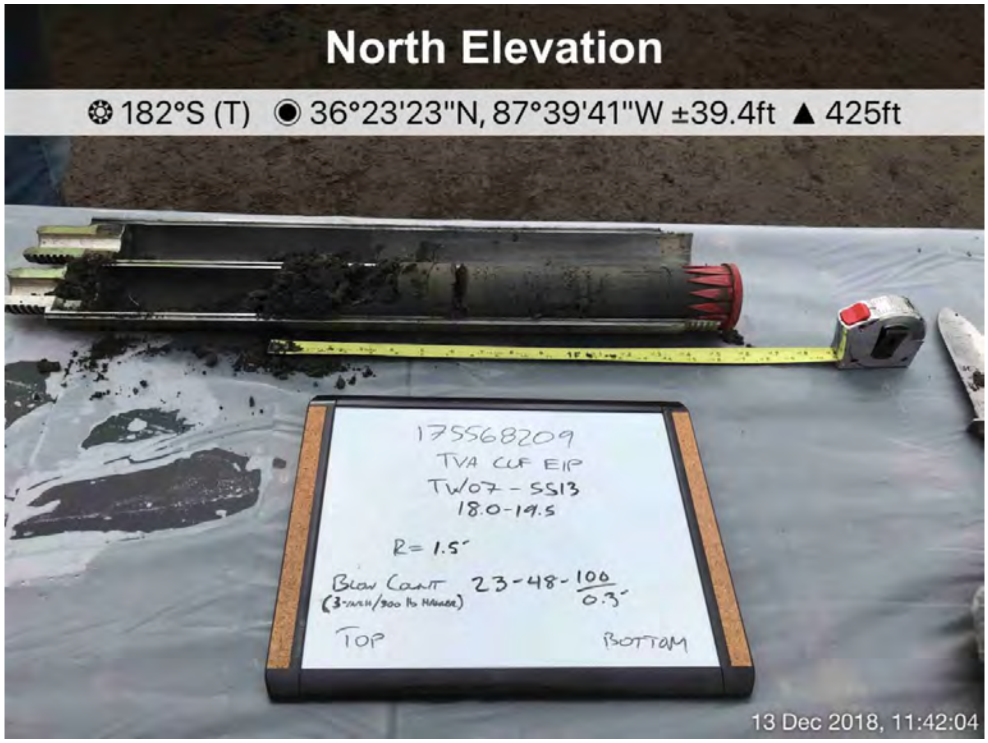
Photograph ID: 26

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (16.5-17.9 feet). Depth interval shown on white board should be 16.5-17.9.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 27 **Photo Location:** CUF-TW07 **Photo Date:** 12/13/2018 **Comments:** Interval (18.0-19.3 feet). Depth interval shown on white board should be 18.0-19.3.	
Photograph ID: 28 **Photo Location:** CUF-TW07 **Photo Date:** 12/13/2018 **Comments:** Interval (19.5-20.4 feet). Depth interval shown on white board should be 19.5-20.4. Blow count shown on white board should be 62-100/1.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 29

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (21.0-21.6 feet). Depth interval shown on white board should be 21.0-21.6.

Photograph ID: 30

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (22.5-23.4 feet). Depth interval shown on white board should be 22.5-23.4.

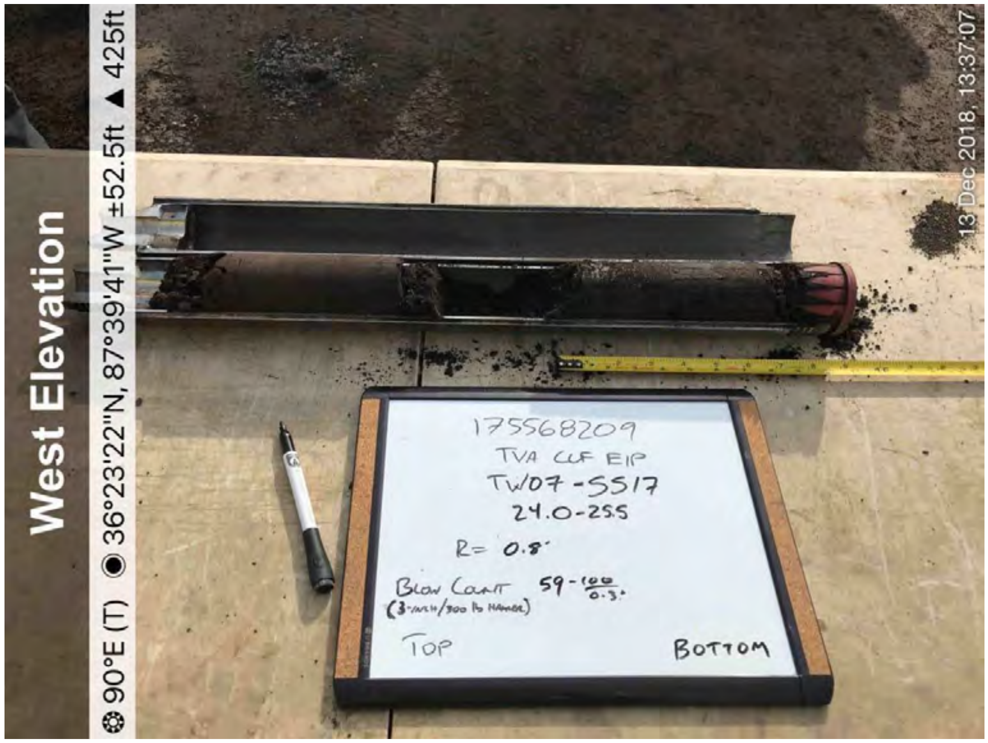
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 31

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (24.0-24.8 feet). Depth interval shown on white board should be 24.0-24.8.

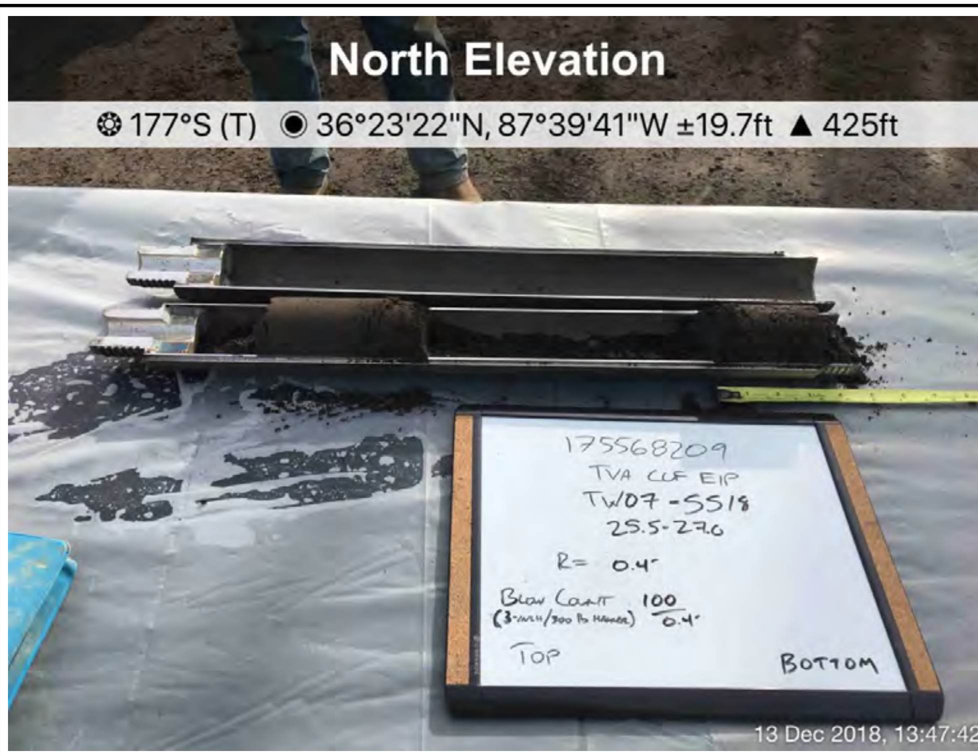


Photograph ID: 32

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (25.5-25.9 feet). Depth interval interval shown on white board should be 25.5-25.9.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 33

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (27.0-27.8 feet). Depth interval shown on white board should be 27.0-27.8.

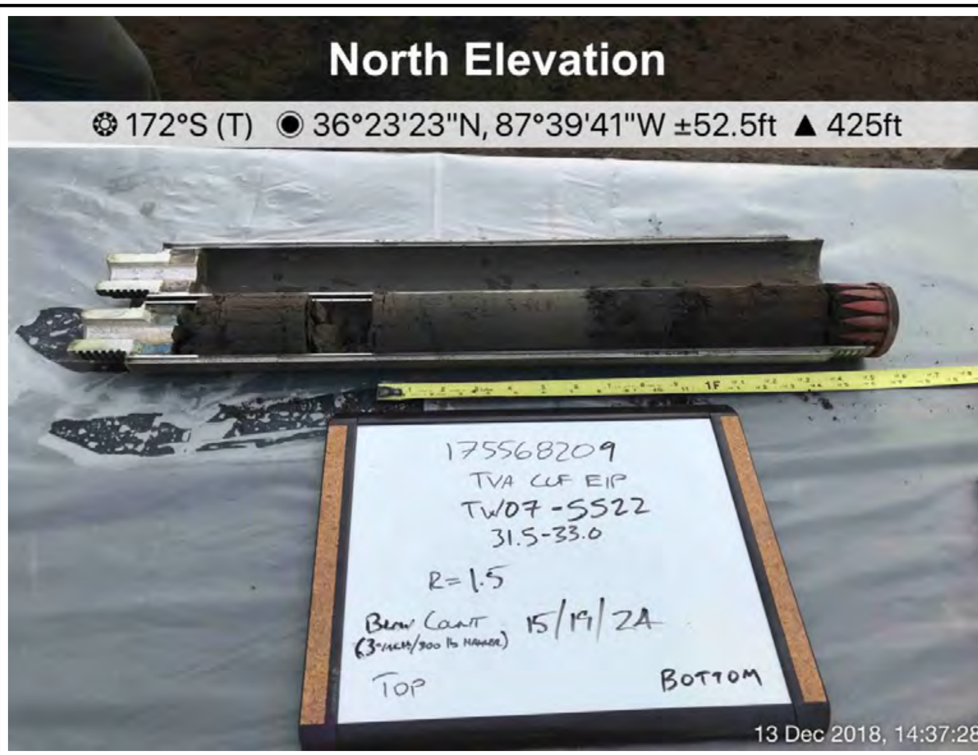
Photograph ID: 34

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (28.5-30.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 35 **Photo Location:** CUF-TW07 **Photo Date:** 12/13/2018 **Comments:** Interval (30.0-30.1 feet). Depth interval shown on white board should be 30.0-31.3.	
Photograph ID: 36 **Photo Location:** CUF-TW07 **Photo Date:** 12/13/2018 **Comments:** Interval (31.5-33.0 feet).	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 37

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (33.0-34.5 feet). Depth interval shown on white board should be 33.0-34.5.

Photograph ID: 38

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Photo of interval (34.5-36.0 feet) unavailable.

No Photo Applicable

Stantec

Photographic Log

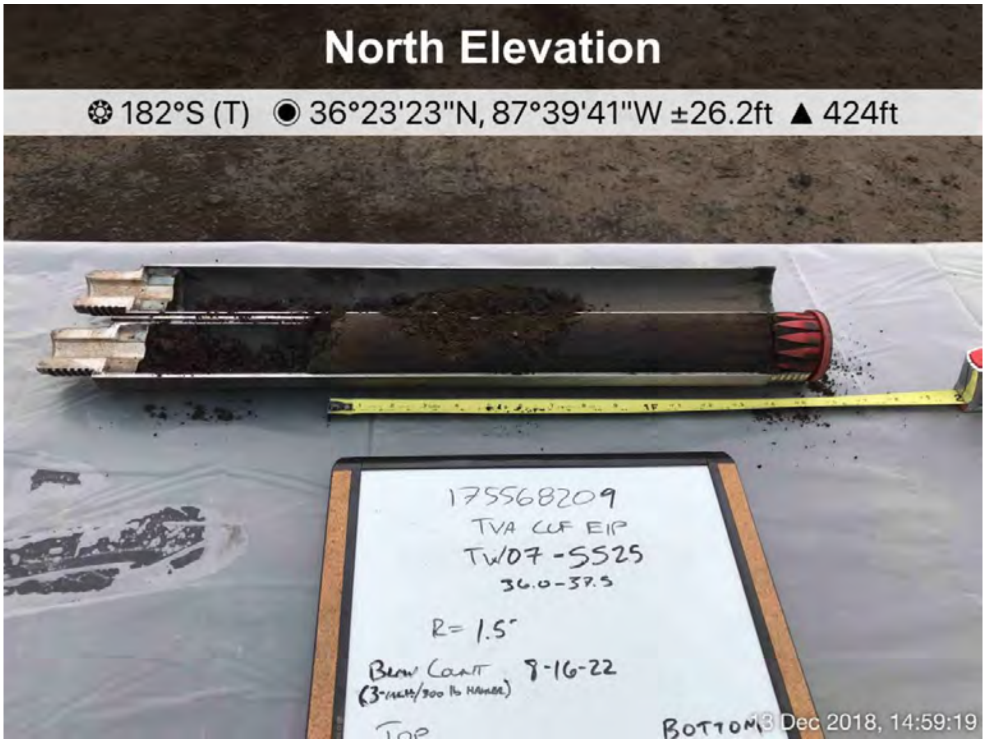
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 39

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (36.0-37.5 feet).



Photograph ID: 40

Photo Location: CUF-TW07

Photo Date: 12/13/2018

Comments: Interval (37.5-39.0 feet).

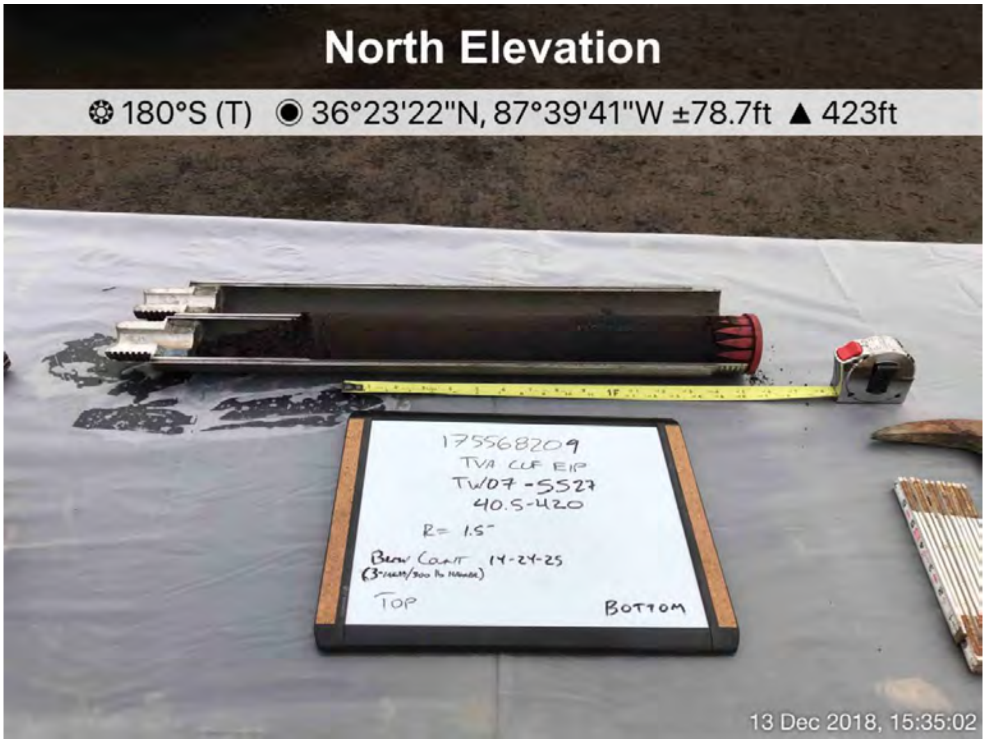
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 41

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (40.5-42.0 feet).

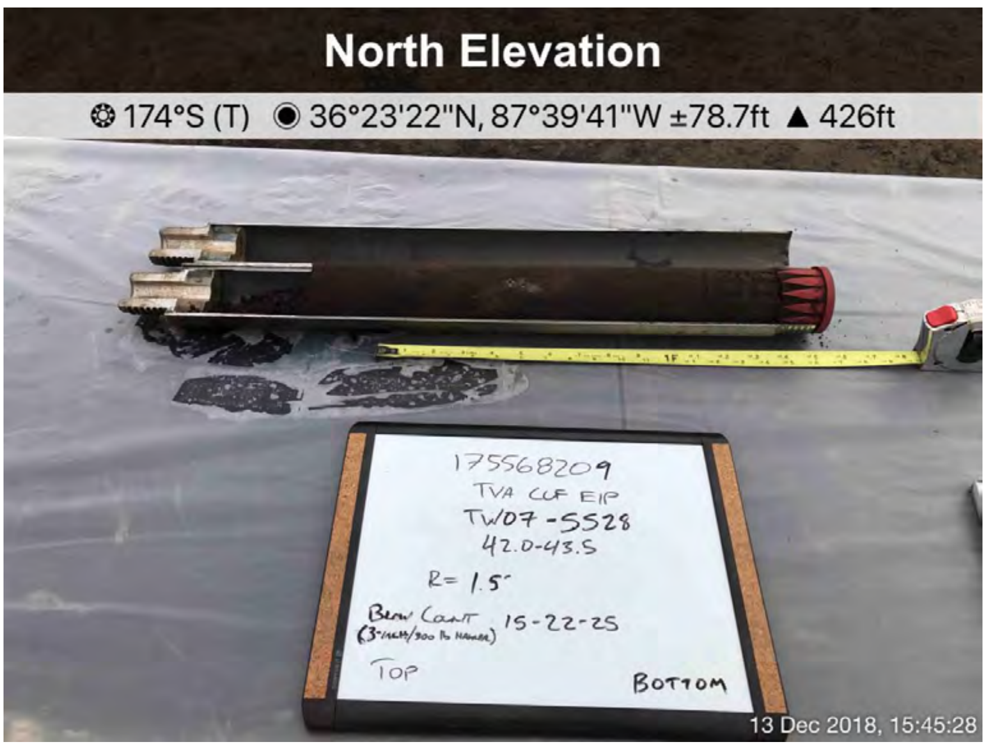


Photograph ID: 42

Photo Location:
CUF-TW07

Photo Date:
12/13/2018

Comments:
Interval (42.0-43.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 43

Photo Location: CUF-TW07

Photo Date: 12/17/2018

Comments: Interval (43.5-45.0 feet).

Photograph ID: 44

Photo Location: CUF-TW07

Photo Date: 12/17/2018

Comments: Interval (45.0-46.5 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 45

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (46.5-48.0 feet).

Photograph ID: 46

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (48.0-49.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 47

Photo Location: CUF-TW07

Photo Date: 12/17/2018

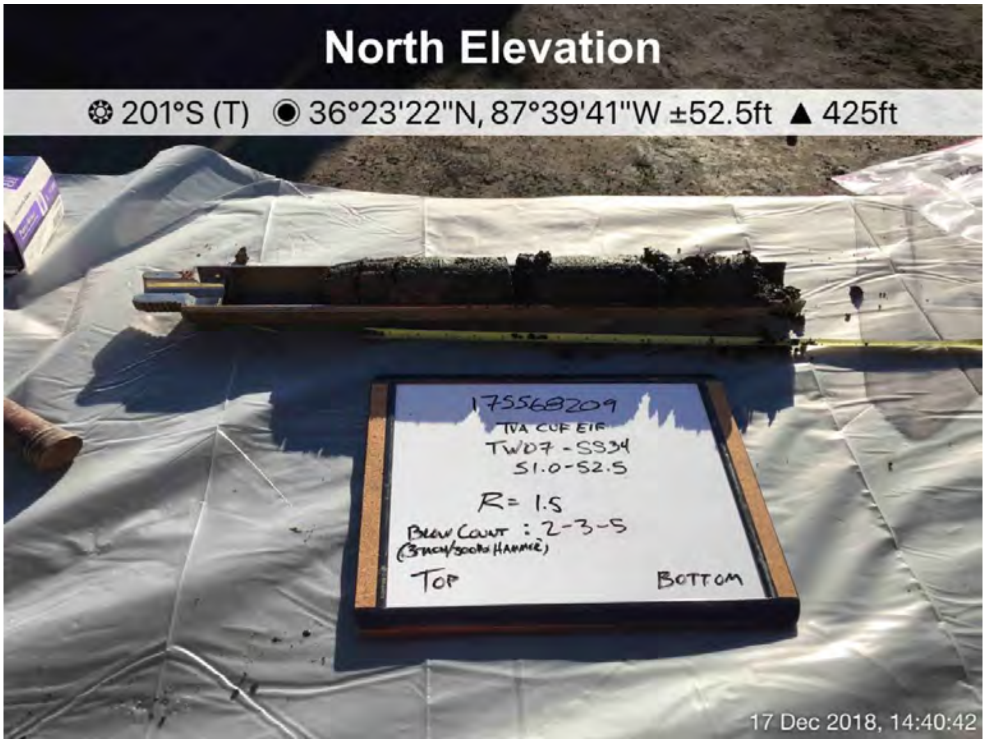
Comments: Interval (49.5-51.0 feet).

Photograph ID: 48

Photo Location: CUF-TW07

Photo Date: 12/17/2018

Comments: Interval (51.0-52.5 feet).



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 49

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Photo of interval (52.5-54.0 feet) unavailable.

No Photo Applicable

Photograph ID: 50

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (54.0-55.5 feet).

Stantec

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 51

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (55.5-57.0 feet).

Photograph ID: 52

Photo Location:
CUF-TW07

Photo Date:
12/17/2018

Comments:
Interval (57.0-58.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 53 **Photo Location:** CUF-TW07 **Photo Date:** 12/17/2018 **Comments:** Interval (58.5-60.0 feet). WOH on white board is the same as WH on the boring log.	
Photograph ID: 54 **Photo Location:** CUF-TW07 **Photo Date:** 12/17/2018 **Comments:** Photo of interval (60.0-62.0 feet) unavailable because sample collected with shelby tube.	No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 55

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (62.0-63.5 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 56

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (63.5-65.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 57

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (65.0-66.5 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 58

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (66.5-68.0 feet). WOR on white board is the same as WR on the boring log.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 59 **Photo Location:** CUF-TW07 **Photo Date:** 12/18/2018 **Comments:** Interval (68.0-69.5 feet). WOR on white board is the same as WR on the boring log.	
Photograph ID: 60 **Photo Location:** CUF-TW07 **Photo Date:** 12/18/2018 **Comments:** Interval (69.5-71.0 feet).	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 61

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (71.0-72.5 feet).

Photograph ID: 62

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (72.5-74.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 63

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

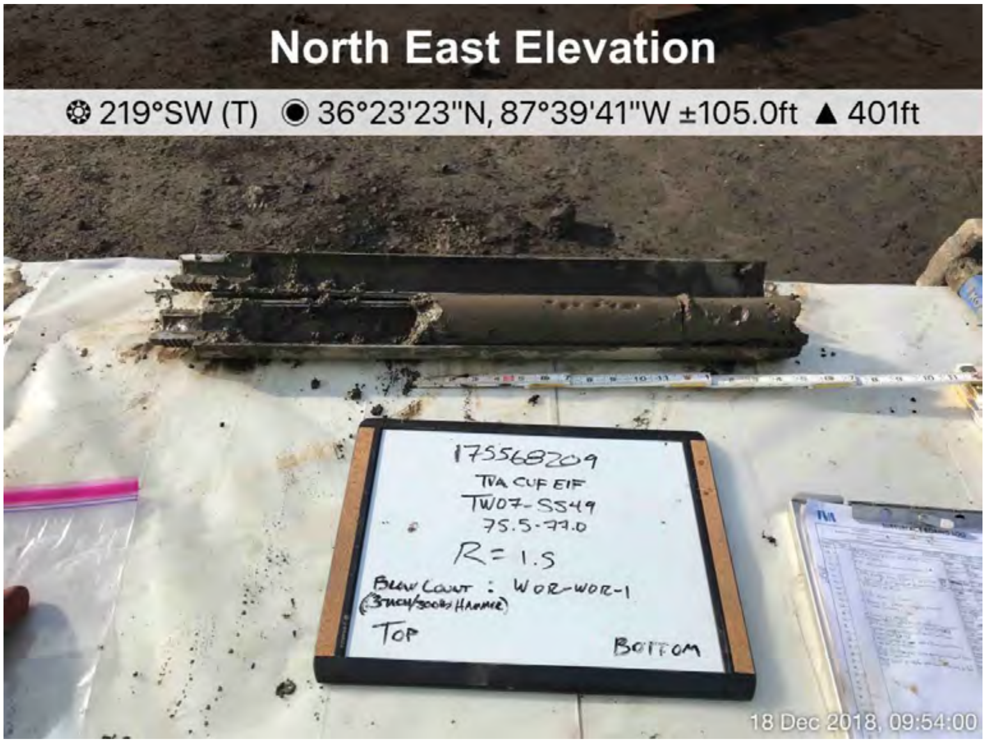
Comments:
Interval (74.0-75.5 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 64

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (75.5-77.0 feet). WOR on white board is the same as WR on the boring log.



Stantec

Photographic Log

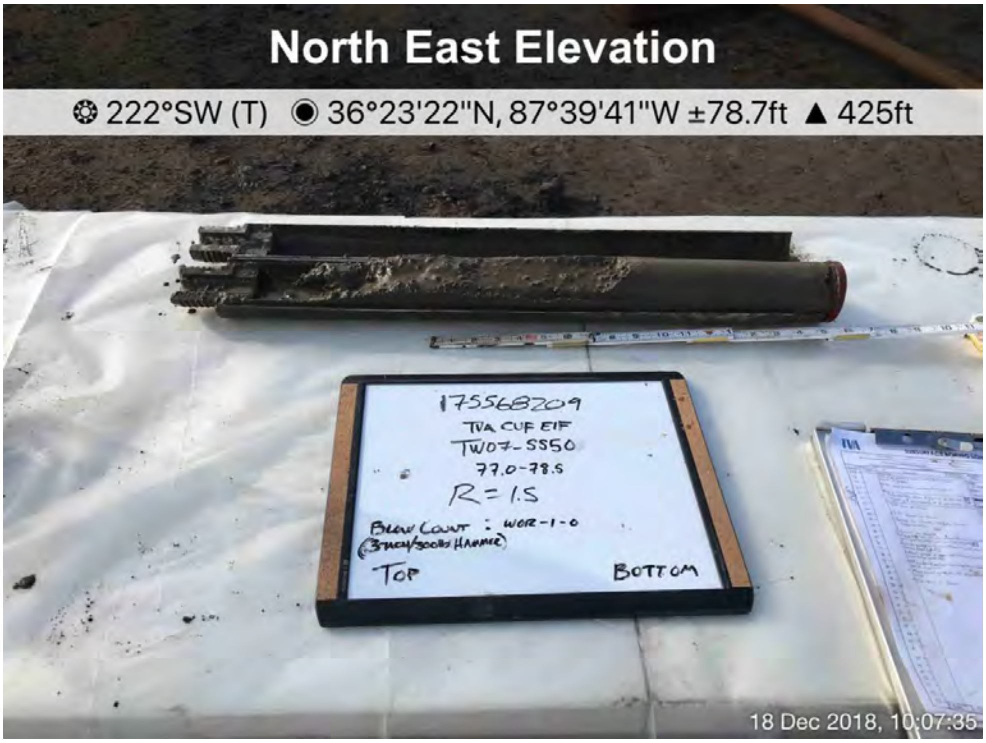
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 65

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (77.0-78.5 feet). Blow count shown on white board should be WR-1-WH.



Photograph ID: 66

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (78.5-80.0 feet). Blow count shown on white board should be WR-1-WH.

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Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 67

Photo Location: CUF-TW07

Photo Date: 12/18/2018

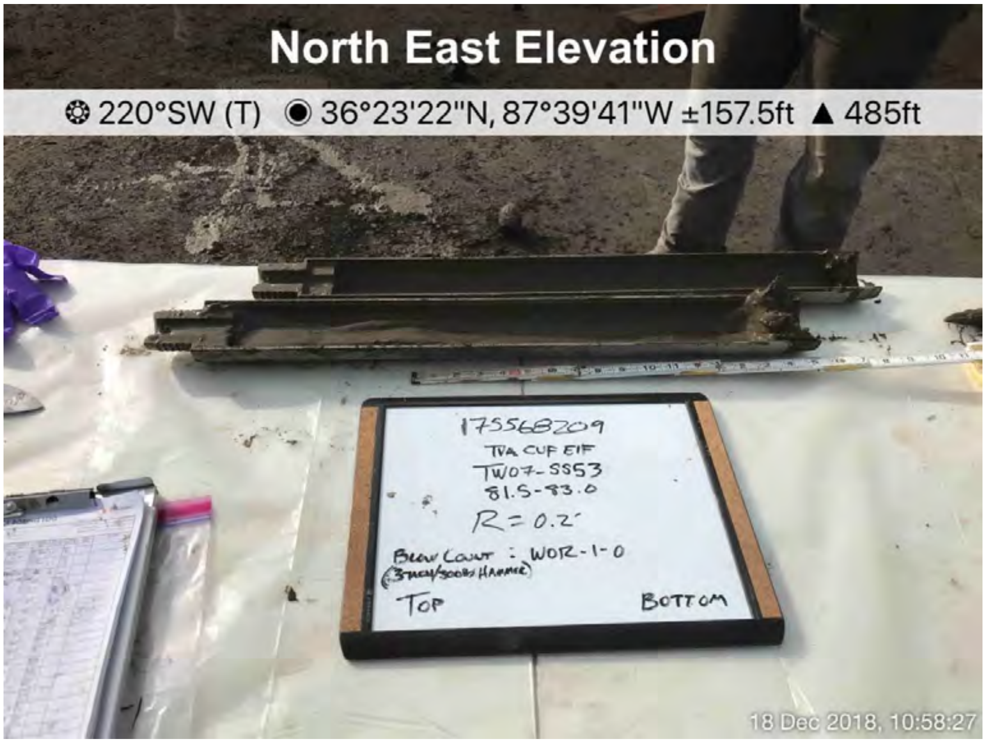
Comments: Interval (80.0-81.5 feet).

Photograph ID: 68

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (81.5-83.0 feet). Blow count shown on white board should be WR-1-WH.



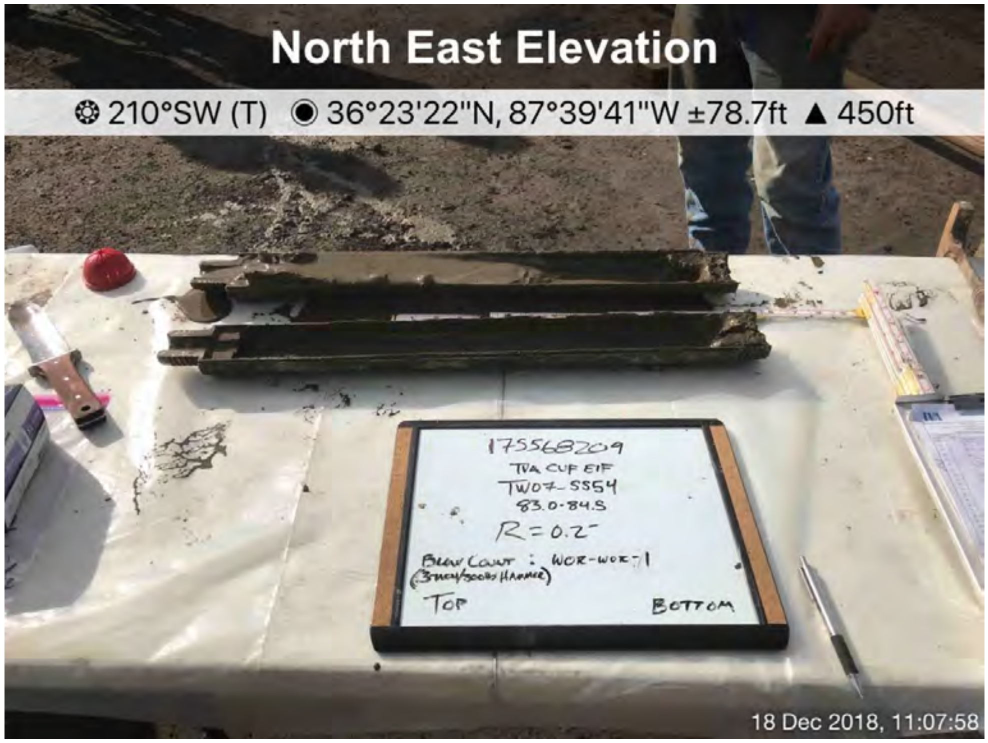
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 69

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (83.0-84.5 feet). WOR on white board is the same as WR on the boring log.



Photograph ID: 70

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (84.5-86.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 71

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

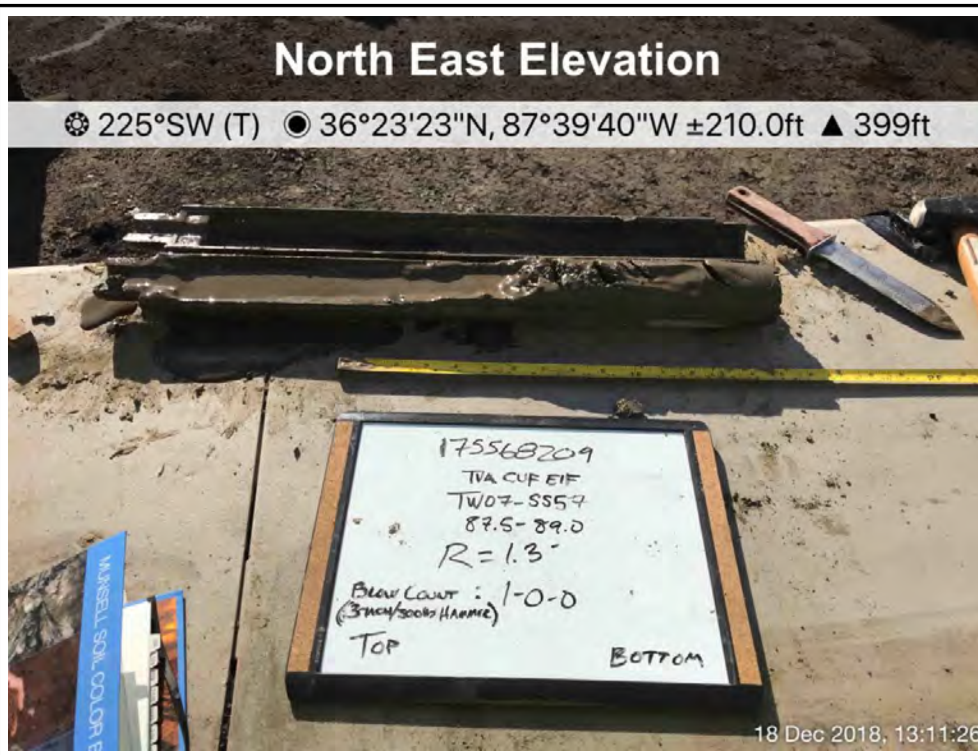
Comments:
Interval (86.0-87.5 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 72

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (87.5-89.0 feet). Blow count on white board should be 1-WH-WH.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 73

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

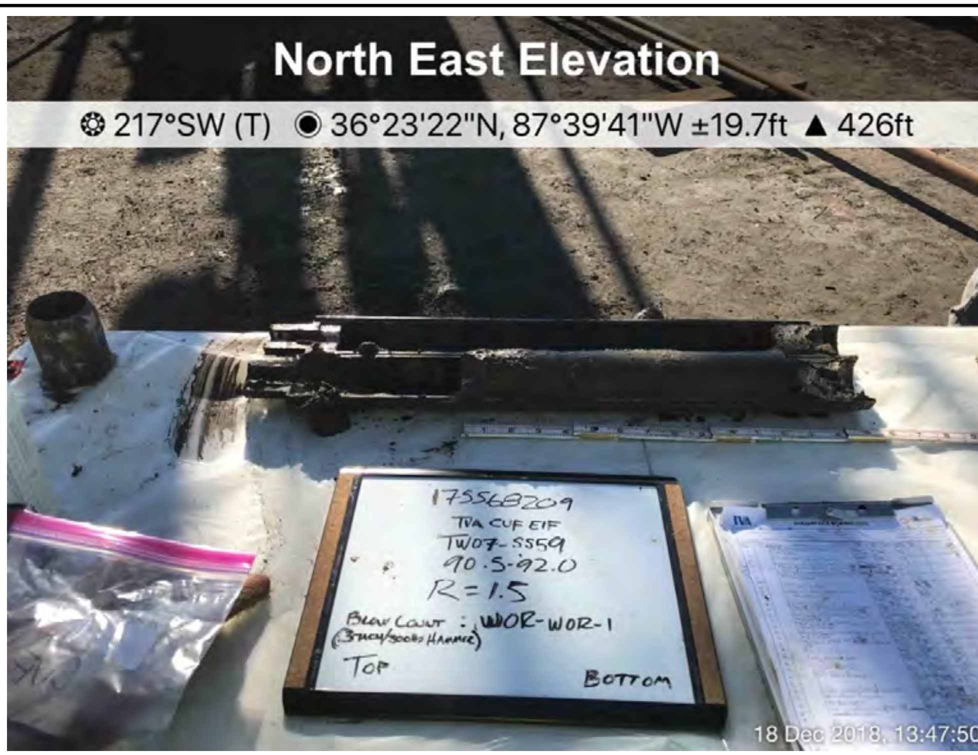
Comments:
Interval (89.0-90.5 feet). Blow count shown on white board should be WH-WH-1.

Photograph ID: 74

Photo Location:
CUF-TW07

Photo Date:
12/18/2018

Comments:
Interval (90.5-92.0 feet). WOR on white board is the same as WR on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 75

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (92.0-94.0 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 76

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (94.0-95.5 feet). WOR on white board is the same as WR on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 77

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (95.5-97.0 feet). Blow count shown on white board should be 1-WH-2.

Photograph ID: 78

Photo Location: CUF-TW07

Photo Date: 12/18/2018

Comments: Interval (97.0-98.3 feet) no recovery, photo unavailable.

No Photo Applicable

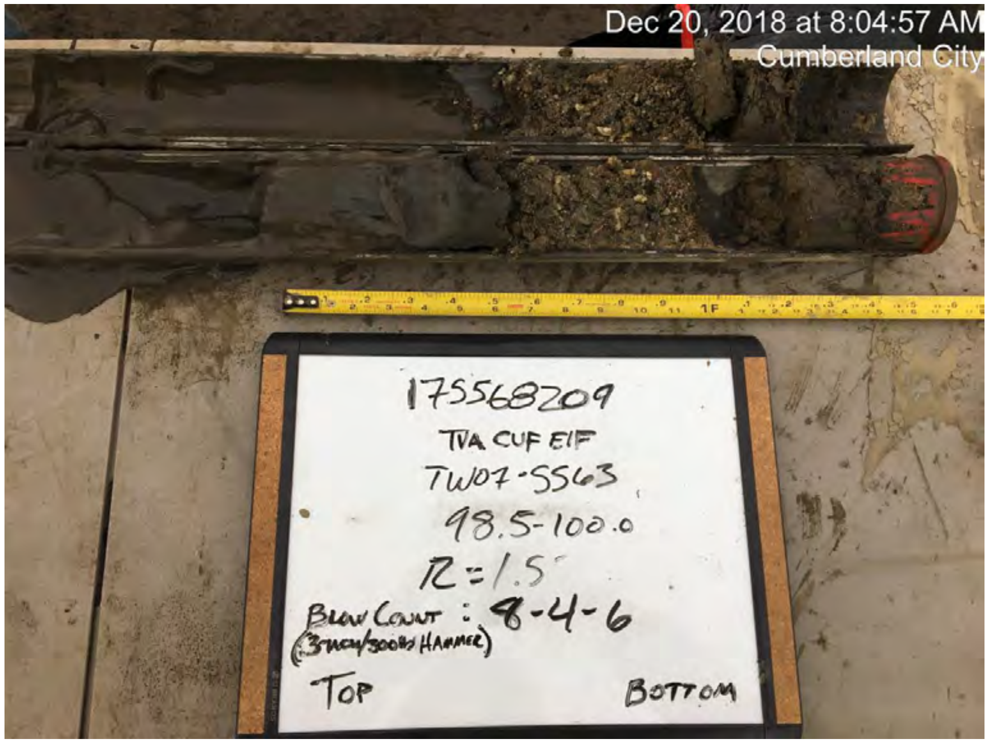
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 79

Photo Location: CUF-TW07

Photo Date: 12/20/2018

Comments: Interval (98.5-100.0 feet).

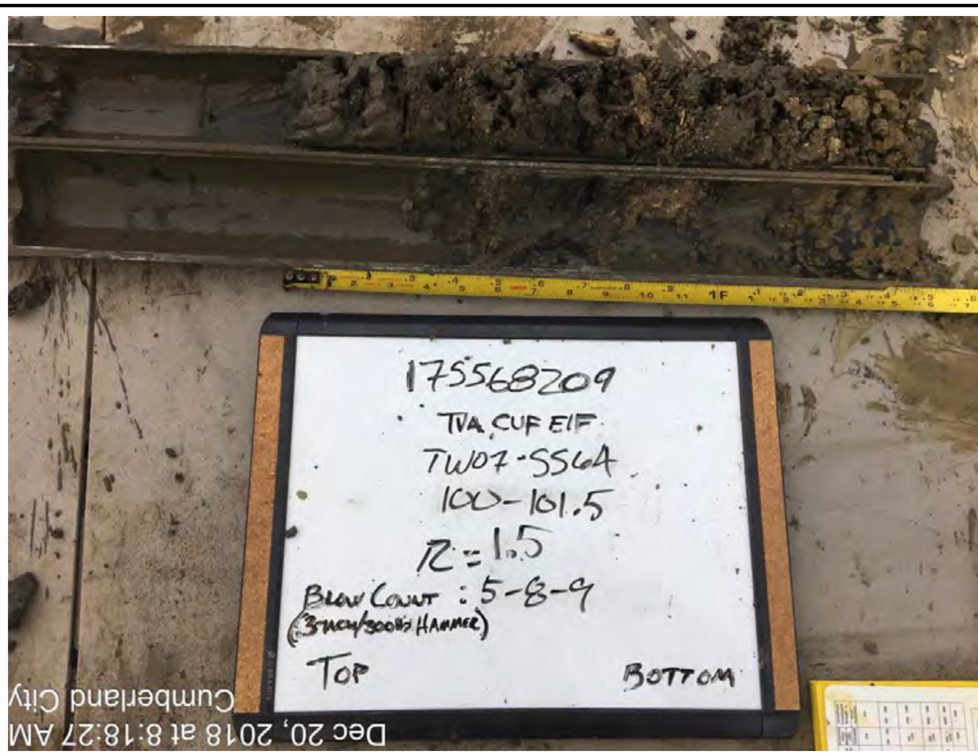


Photograph ID: 80

Photo Location: CUF-TW07

Photo Date: 12/20/2018

Comments: Interval (100.0-101.5 feet). Depth interval shown on white board should be 100.0-101.5.



Stantec **Photographic Log**

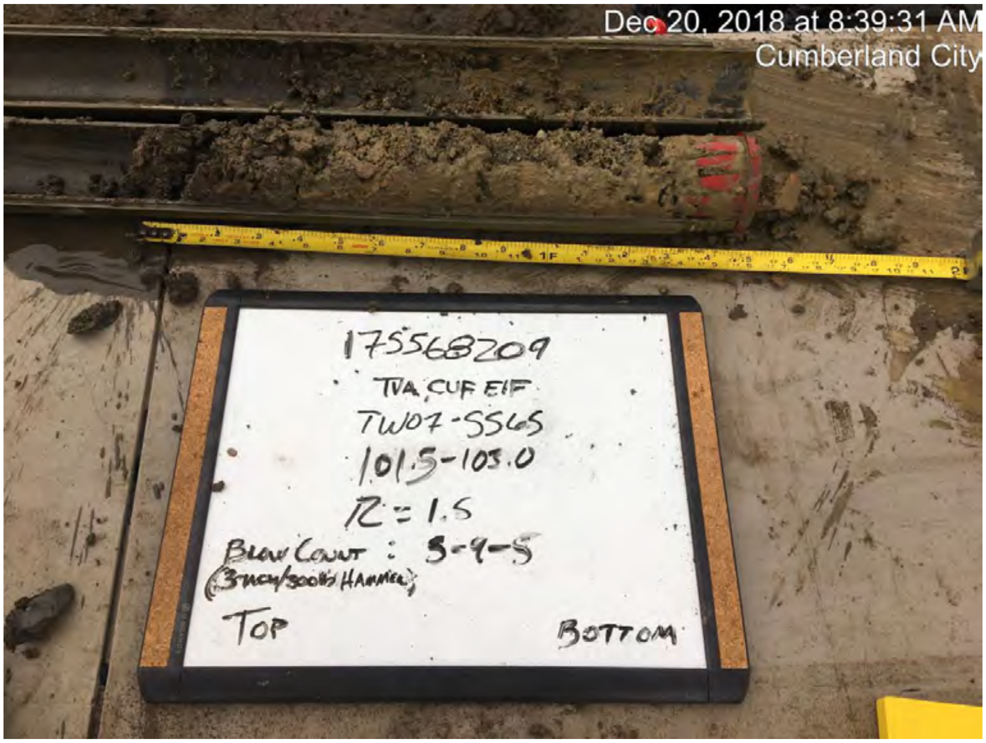
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 81

Photo Location:
CUF-TW07

Photo Date:
12/20/2018

Comments:
Interval (101.5-103.0 feet). Blow count shown on white board is 5-9-5.

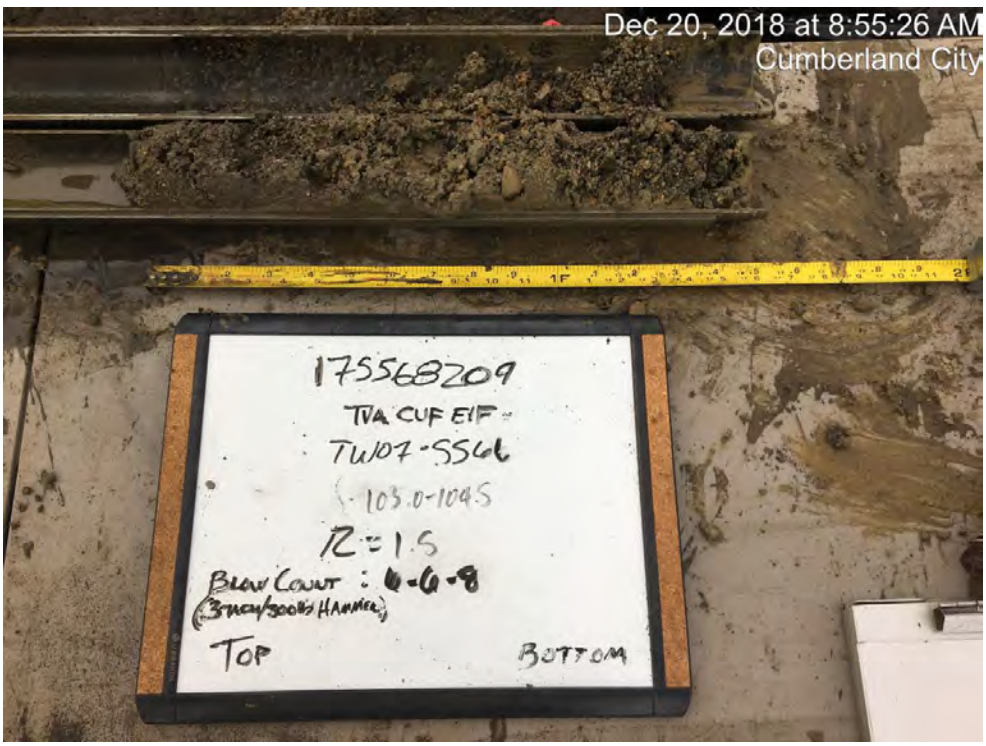


Photograph ID: 82

Photo Location:
CUF-TW07

Photo Date:
12/20/2018

Comments:
Interval (103.0-104.5 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 83

Photo Location:
CUF-TW07

Photo Date:
12/20/2018

Comments:
Interval (104.5-106.0 feet). Depth interval shown on white board is 104.5-106.0.

Photograph ID: 84

Photo Location:
CUF-TW07

Photo Date:
12/20/2018

Comments:
Interval (106.0-107.5 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 85

Photo Location: CUF-TW07

Photo Date: 1/2/2019

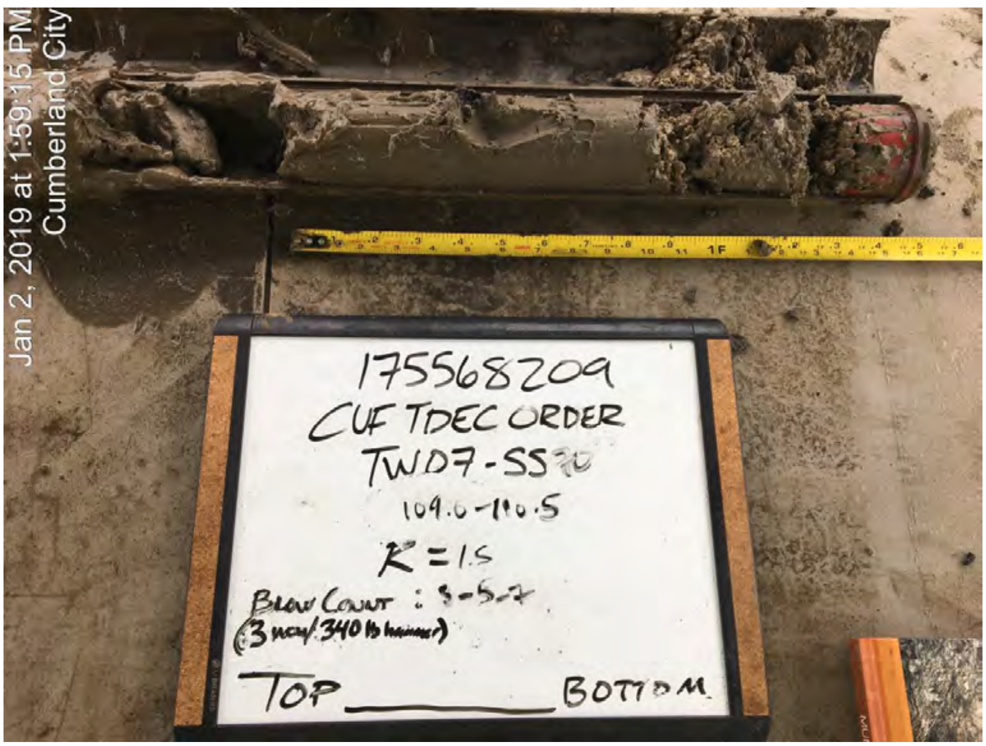
Comments: Interval (107.5-109.0 feet).

Photograph ID: 86

Photo Location: CUF-TW07

Photo Date: 1/2/2019

Comments: Interval (109.0-110.5 feet). Split spoon shown on white board is SS70.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 87

Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (110.5-112.0 feet). Depth interval shown on white board is 110.5-112.0.

Photograph ID: 88

Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (112.0-113.5 feet). Depth interval shown on white board is 112.0-113.5.

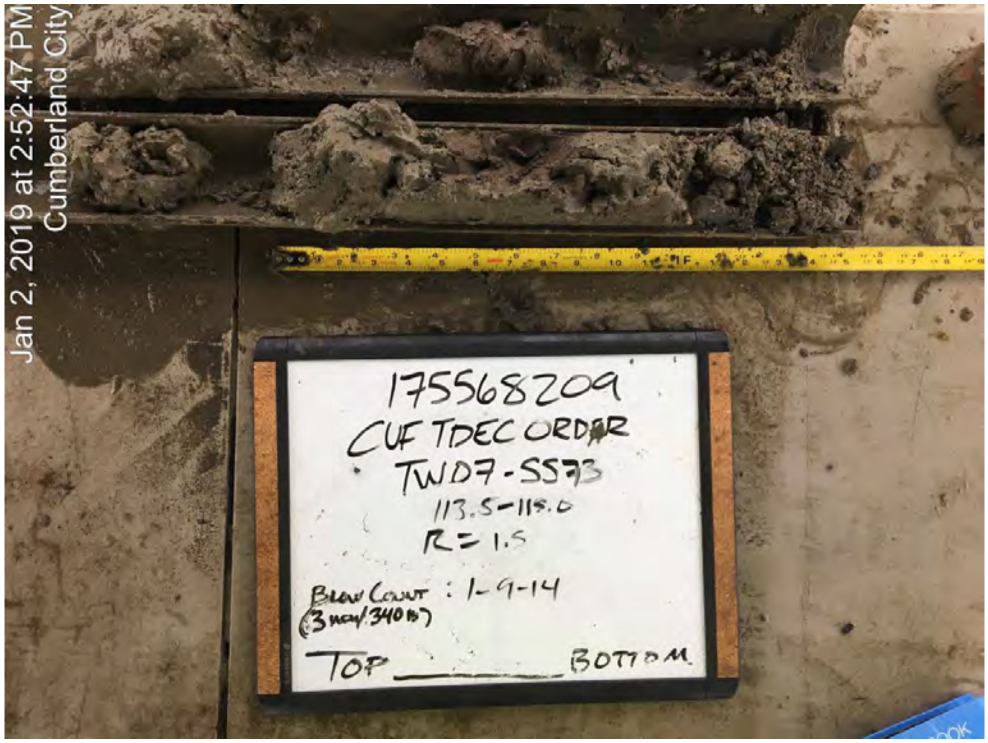
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 89

Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (113.5-115.0 feet).

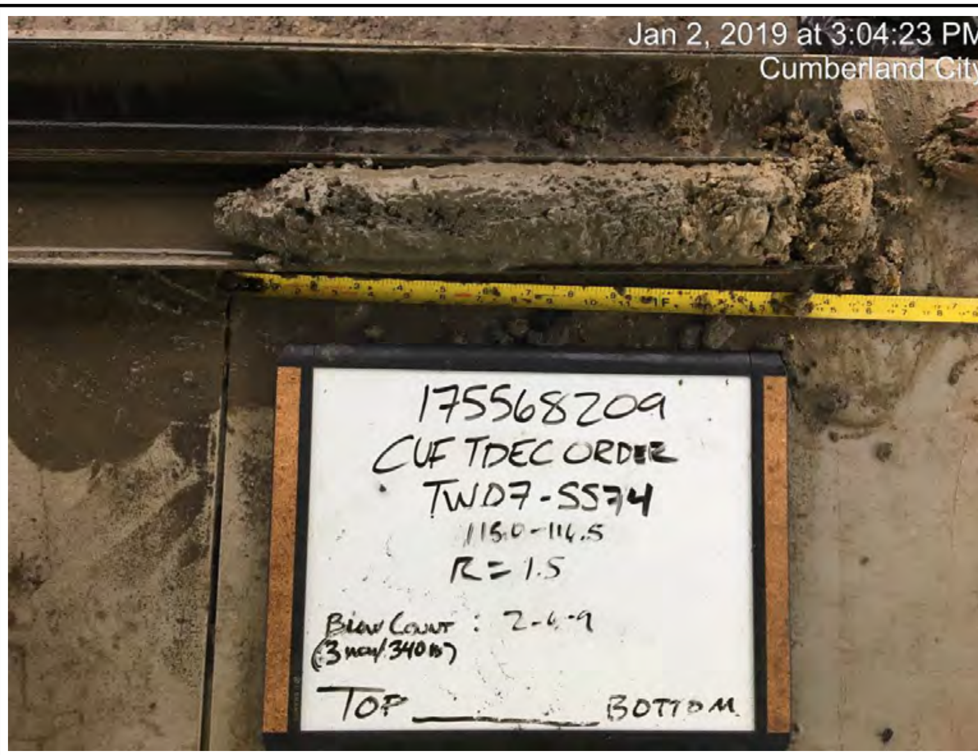


Photograph ID: 90

Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (115.0-116.5 feet). Blow count shown on white board is 2-6-9.



Stantec

Photographic Log

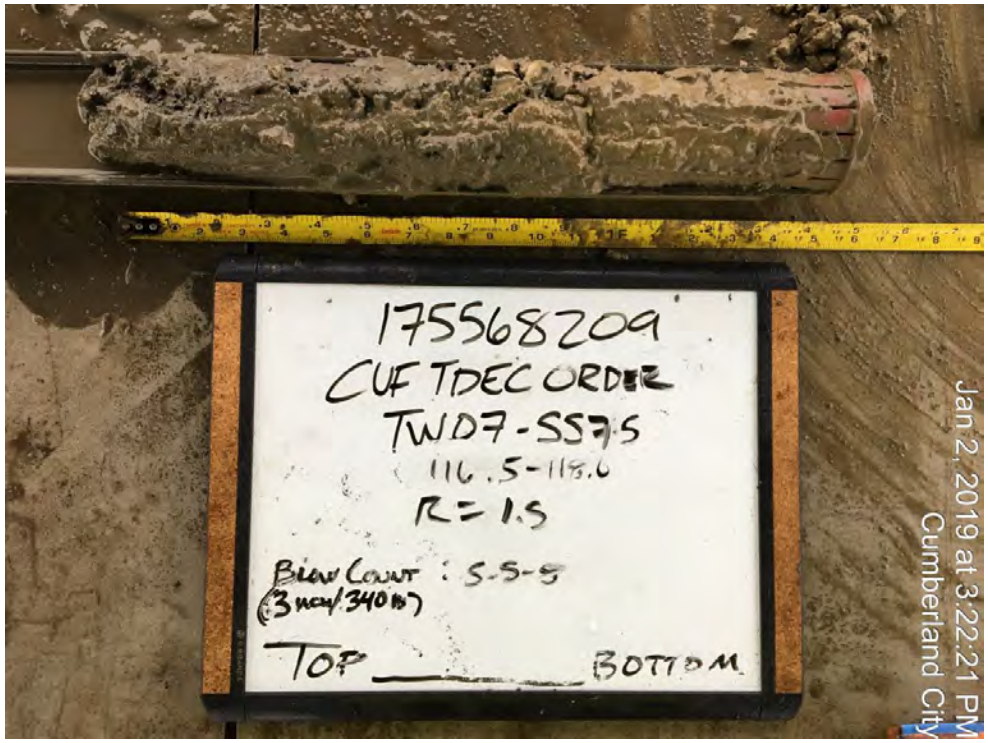
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 91

Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (116.5-118.0 feet). Blow count shown on white board is 5-5-8.

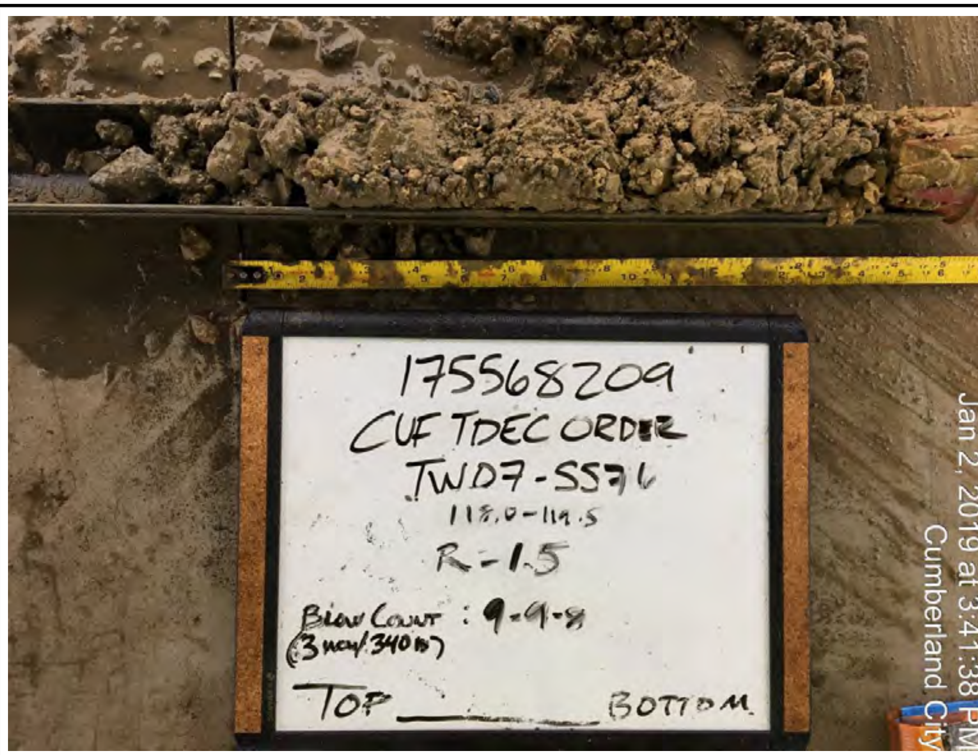


Photograph ID: 92

Photo Location:
CUF-TW07

Photo Date:
1/2/2019

Comments:
Interval (118.0-119.5 feet).



Photographic Log

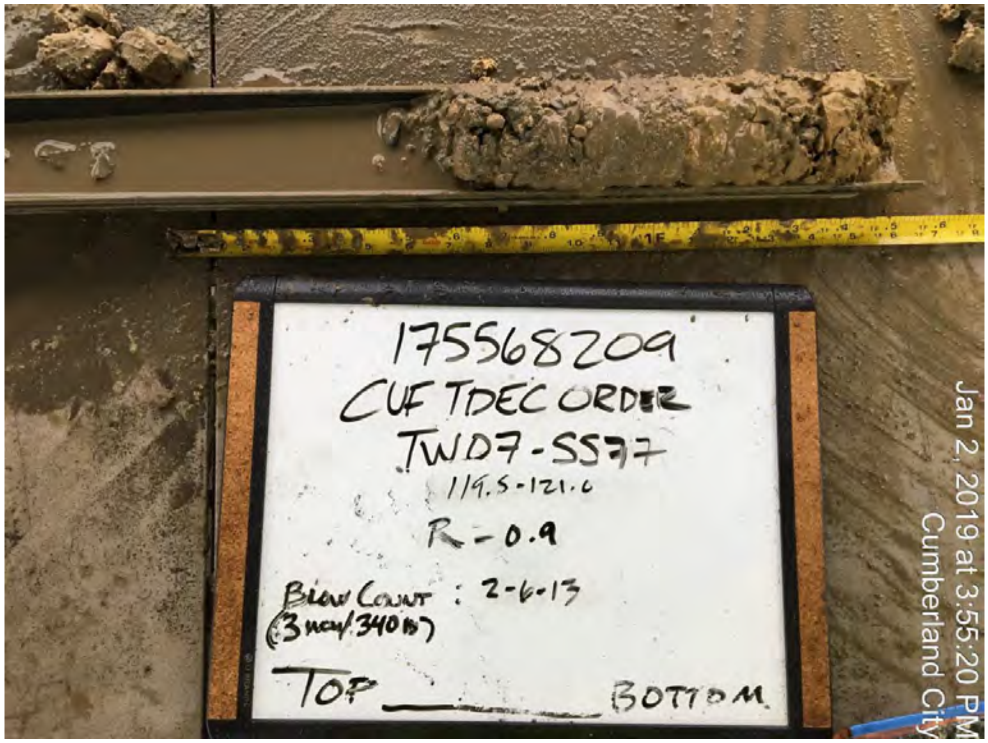
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 93

Photo Location: CUF-TW07

Photo Date: 1/2/2019

Comments: Interval (119.5-121.0 feet).



Photograph ID: 94

Photo Location: CUF-TW07

Photo Date: 1/3/2019

Comments: Interval (121.0-122.5 feet).

Stantec

Photographic Log

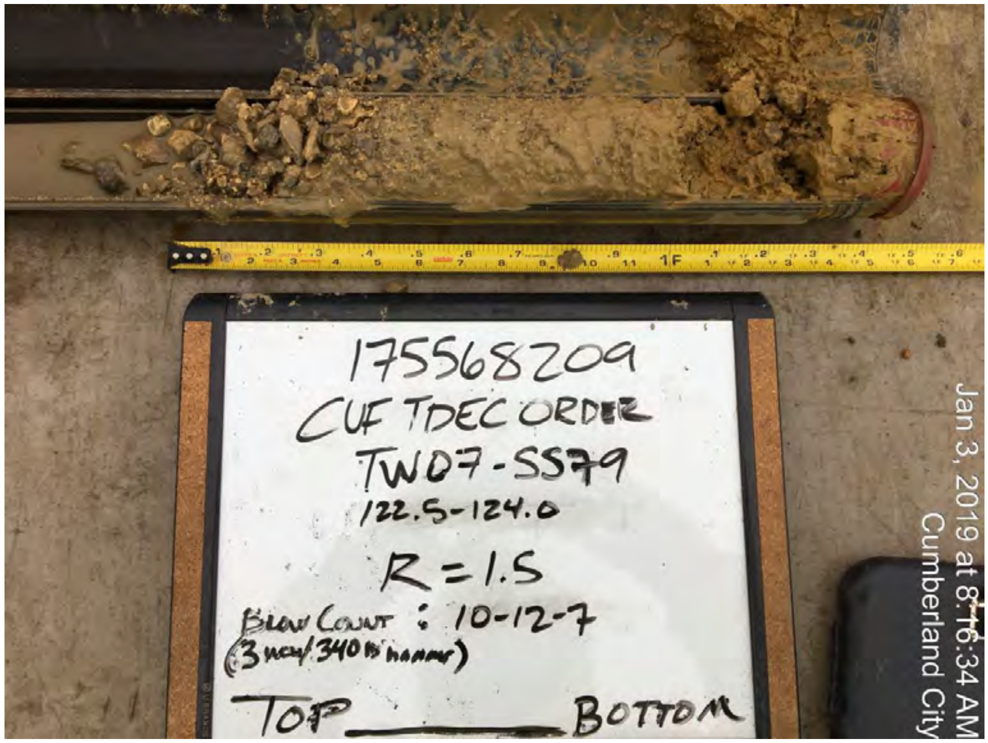
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 95

Photo Location: CUF-TW07

Photo Date: 1/3/2019

Comments: Interval (122.5-124.0 feet).



Photograph ID: 96

Photo Location: CUF-TW07

Photo Date: 1/3/2019

Comments: Interval (124.0-125.2 feet). Blow count shown on white board should be 10-7-50/2.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 97

Photo Location:
CUF-TW07

Photo Date:
4/4/2019

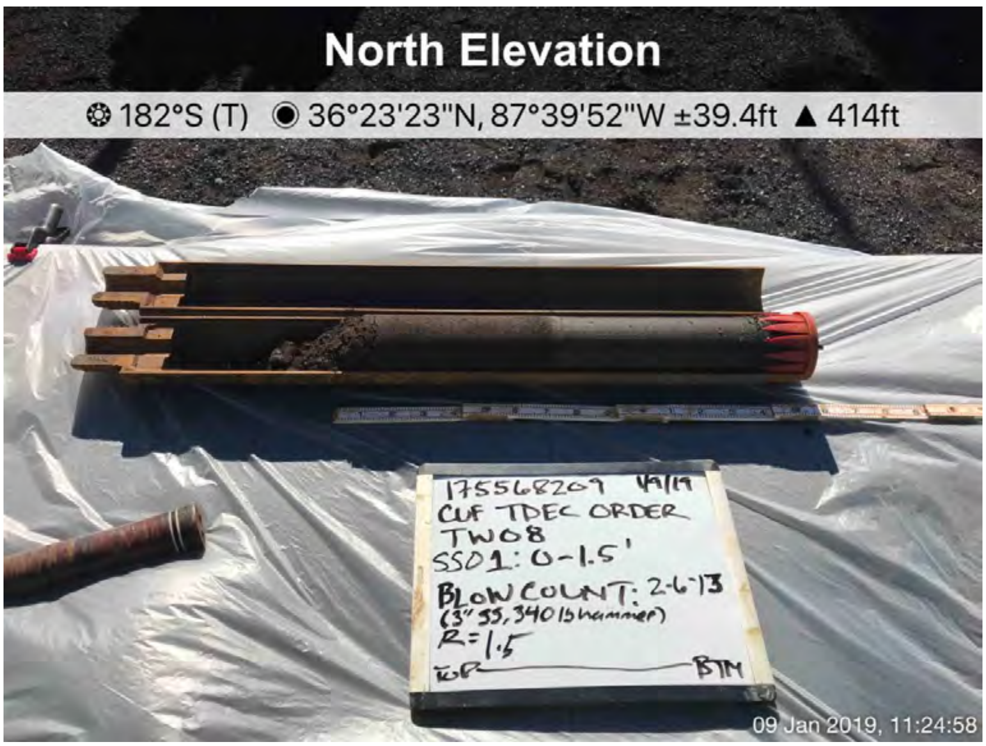
Comments:
Interval (125.5-145.5 feet).

Photograph ID: 98

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (0.0-1.5 feet). Depth interval shown on white board should be 0.0-1.5.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 99

Photo Location: CUF-TW08

Photo Date: 1/9/2019

Comments: Interval (1.5-3.0 feet).

Photograph ID: 100

Photo Location: CUF-TW08

Photo Date: 1/9/2019

Comments: Interval (3.0-4.5 feet). Depth interval shown on white board should be 3.0-4.5.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 101

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Photo of interval (4.5-6.0 feet) unavailable.

No Photo Applicable

Photograph ID: 102

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (6.0-7.5 feet). Depth interval shown on white board should be 6.0-7.5.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 103

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

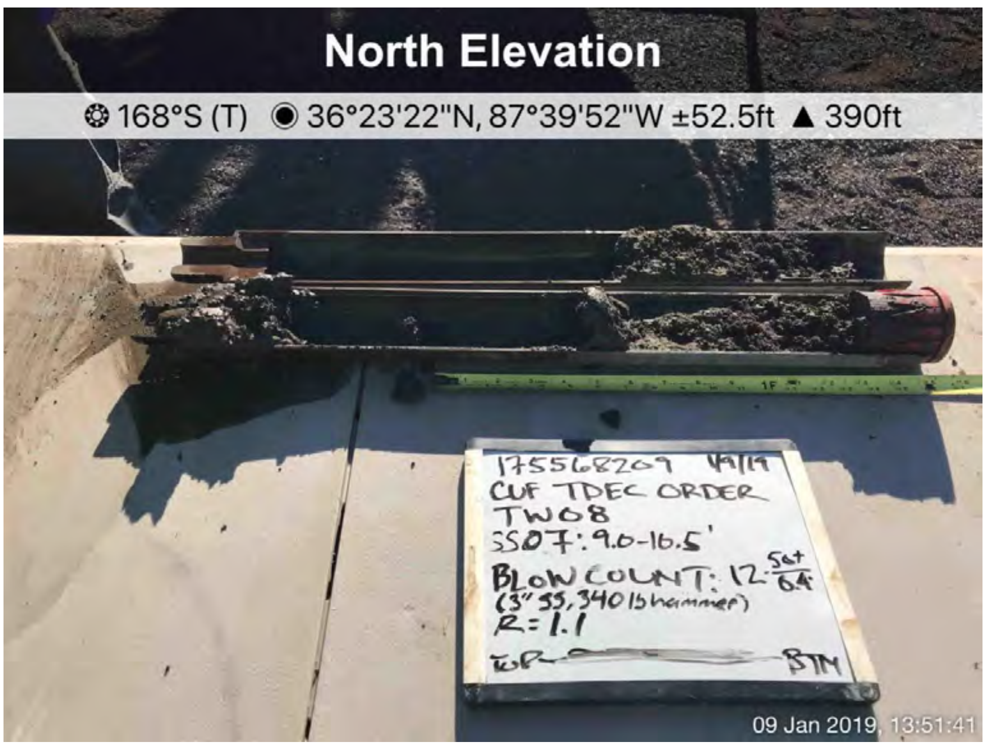
Comments:
Interval (7.5-7.8 feet). Split spoon shown on white board should be SS06. Depth interval shown on white board should be 7.5-7.8.

Photograph ID: 104

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (9.0-9.9 feet). Depth interval shown on white board should be 9.0-9.9.



Stantec

Photographic Log

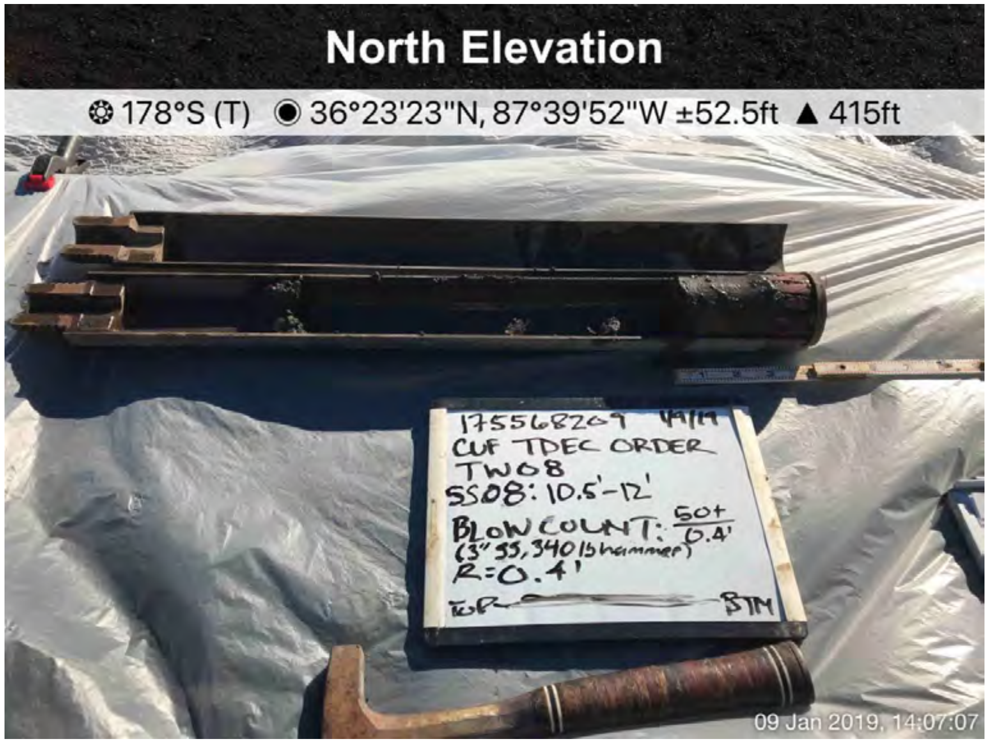
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 105

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (10.5-10.9 feet). Depth interval shown on white board should be 10.5-10.9.



Photograph ID: 106

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Photo of interval (12.0-12.1 feet) unavailable.

No Photo Applicable

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 107

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (13.5-15.0 feet). Depth interval shown on white board should be 13.5-15.0.

Photograph ID: 108

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (15.0-15.6 feet). Depth interval shown on white board should be 15.0-15.6. Recovery shown on white board should be 0.6.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 109

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

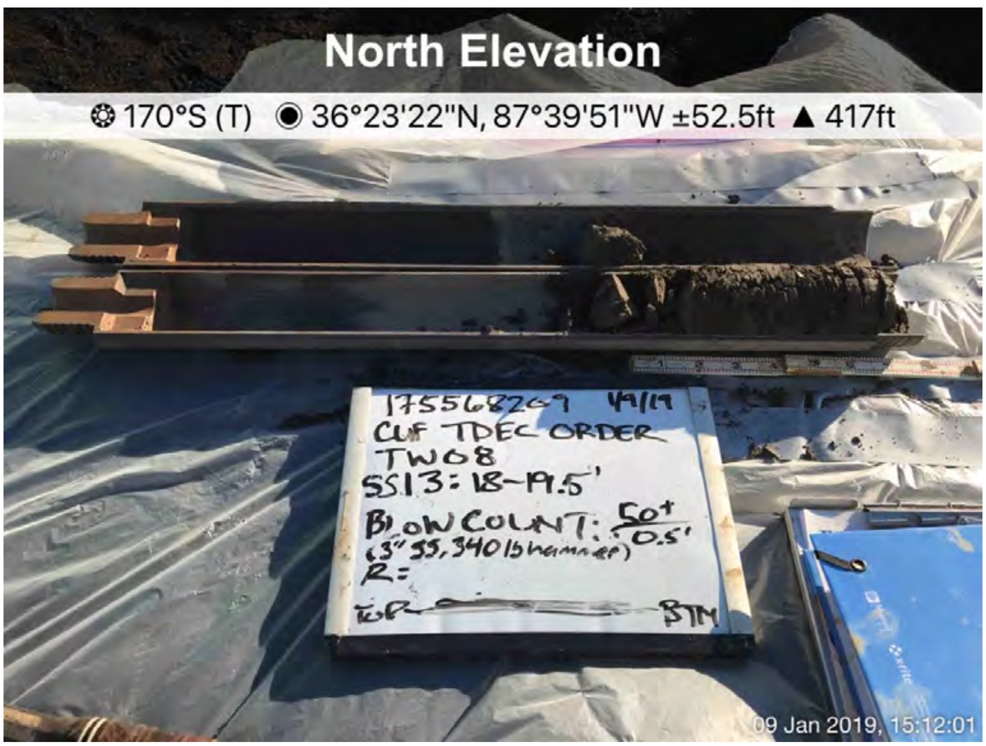
Comments:
Interval (16.5-17.3 feet). Depth interval shown on white board should be 16.5-17.3. Recovery shown on white board should be 0.8.

Photograph ID: 110

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (18.0-18.5 feet). Depth interval shown on white board should be 18.0-18.5. Blow count shown on white board should be 50. Recovery shown on white board should be 0.5.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 111

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (19.5-19.9 feet). Depth interval shown on white board should be 19.5-19.9.

Photograph ID: 112

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (21.0-21.6 feet). Depth interval shown on white board should be 21.0-21.6. Recovery shown on white board should be 0.6.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 113

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

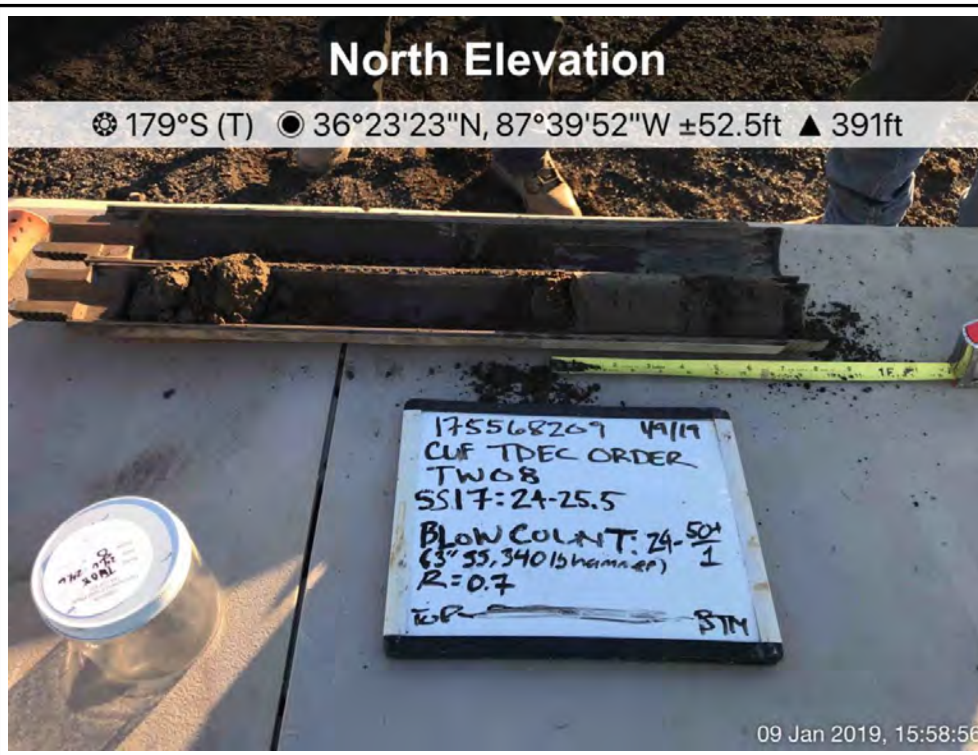
Comments:
Interval (22.5-23.0 feet). Depth interval shown on white board should be 22.5-23.0. Blow count shown on white board should be 50. Recovery shown on white board should be 0.5.

Photograph ID: 114

Photo Location:
CUF-TW08

Photo Date:
1/9/2019

Comments:
Interval (24.0-24.6 feet). Depth interval shown on white board should be 24.0-24.6. Recovery shown on white board should be 0.6.



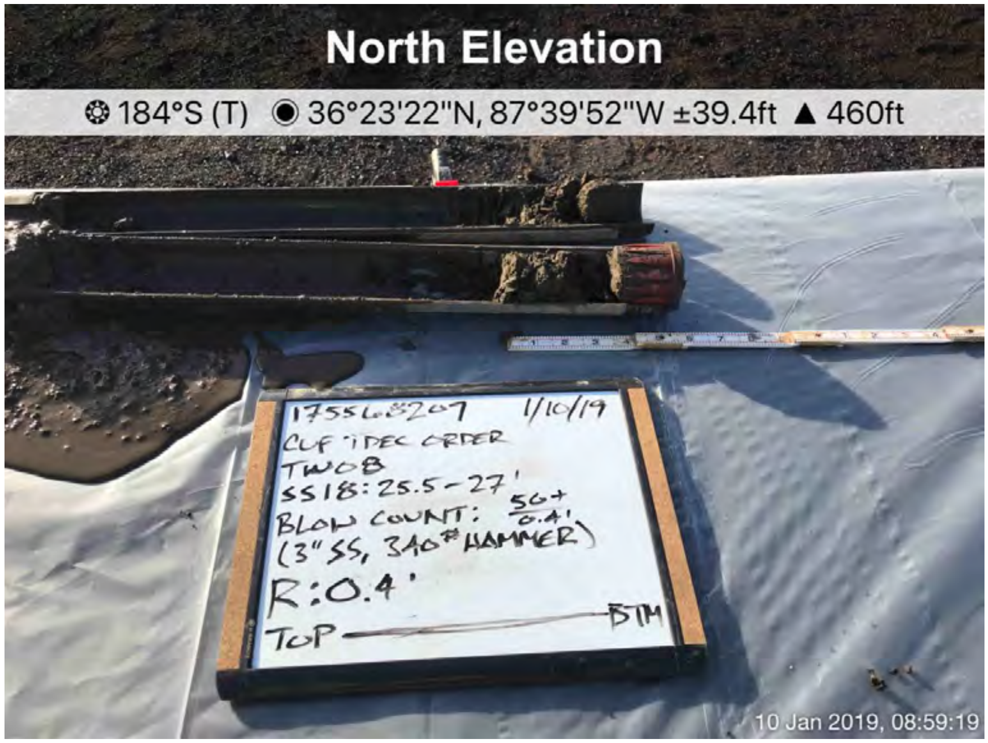
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 115

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (25.5-25.9 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 25.5-25.9.

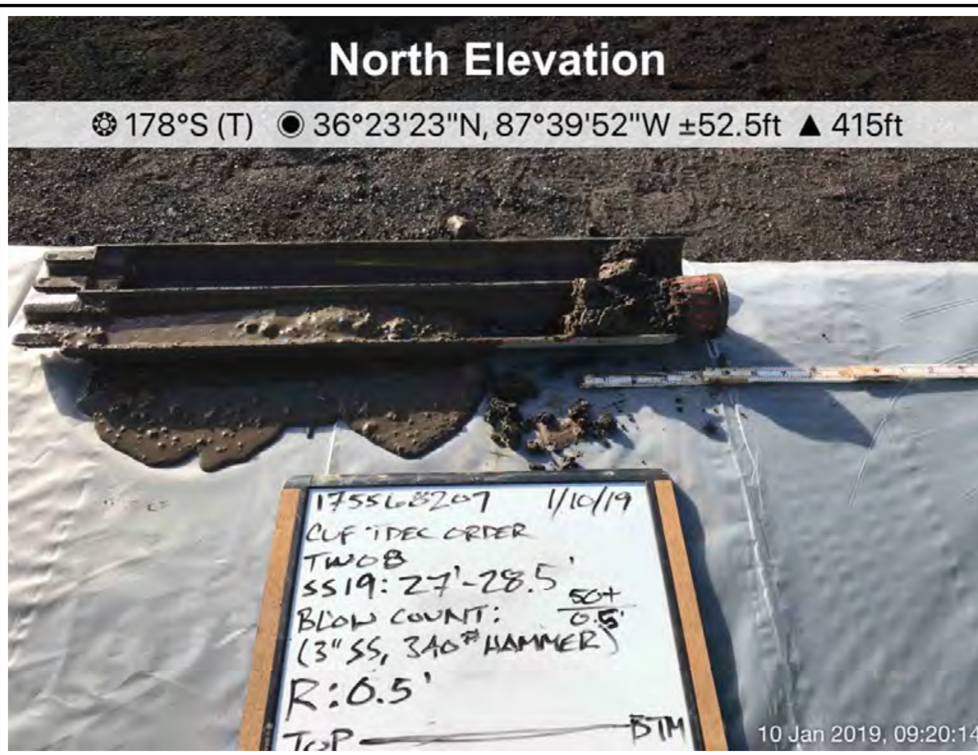


Photograph ID: 116

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (27.0-27.5 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 27.0-27.5. Blow count shown on white board should be 50.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 117

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

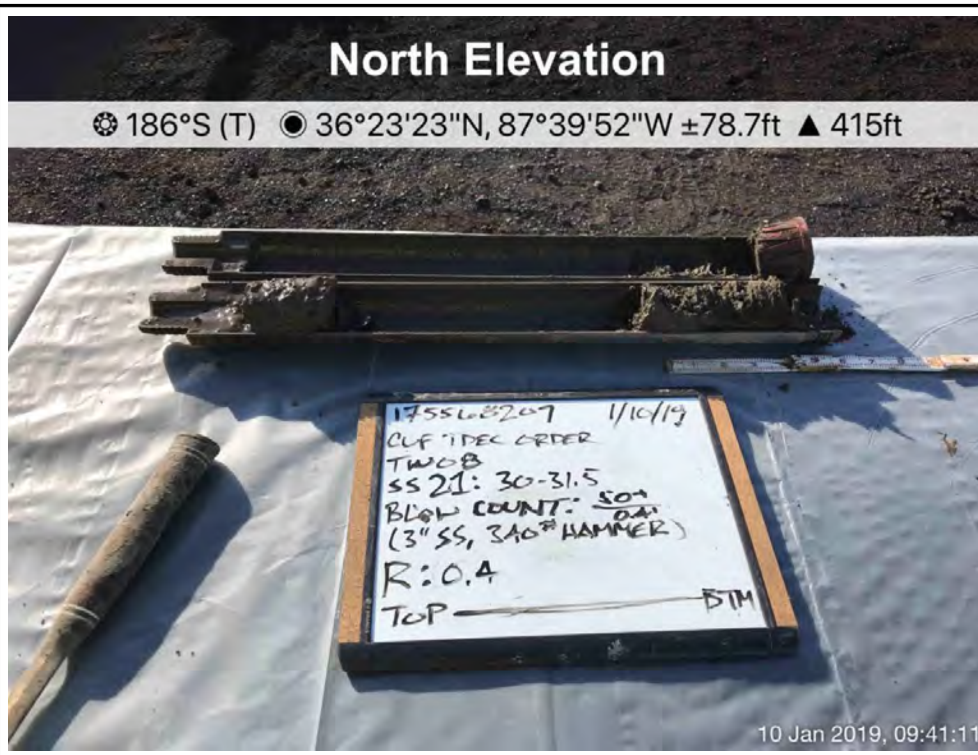
Comments:
Interval (28.5-28.8 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 28.5-28.8.

Photograph ID: 118

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (30.0-30.4 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 30.0-30.4.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 119

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (31.5-33.0 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 31.5-33.0.

Photograph ID: 120

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (33.0-34.5 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 33.0-34.5.

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 121

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (34.5-36.0 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 34.5-36.0.

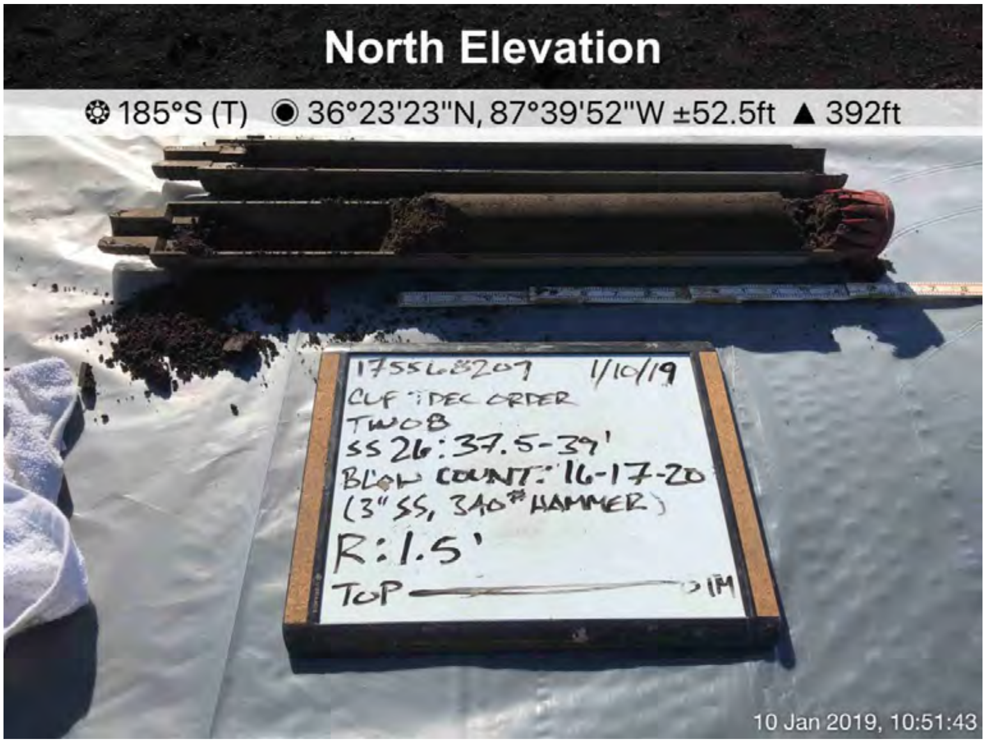
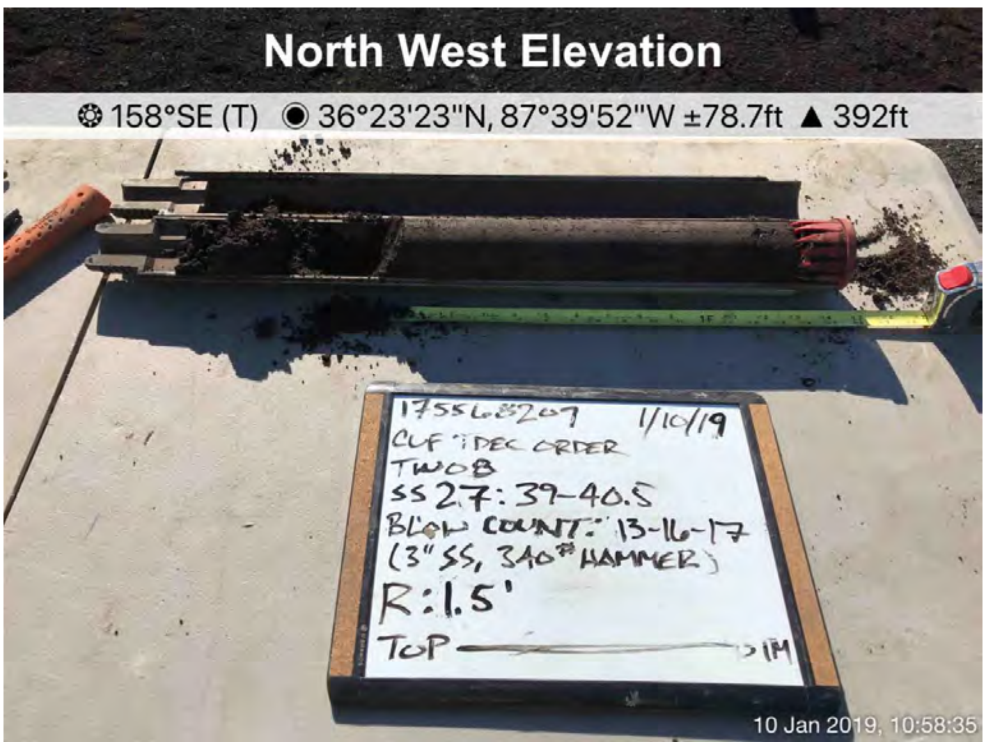
Photograph ID: 122

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (36.0-37.5 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 36.0-37.5.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 123 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (37.5-39.0 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 37.5-39.0.	
Photograph ID: 124 **Photo Location:** CUF-TW08 **Photo Date:** 1/10/2019 **Comments:** Interval (39.0-40.5 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 39.0-40.5.	

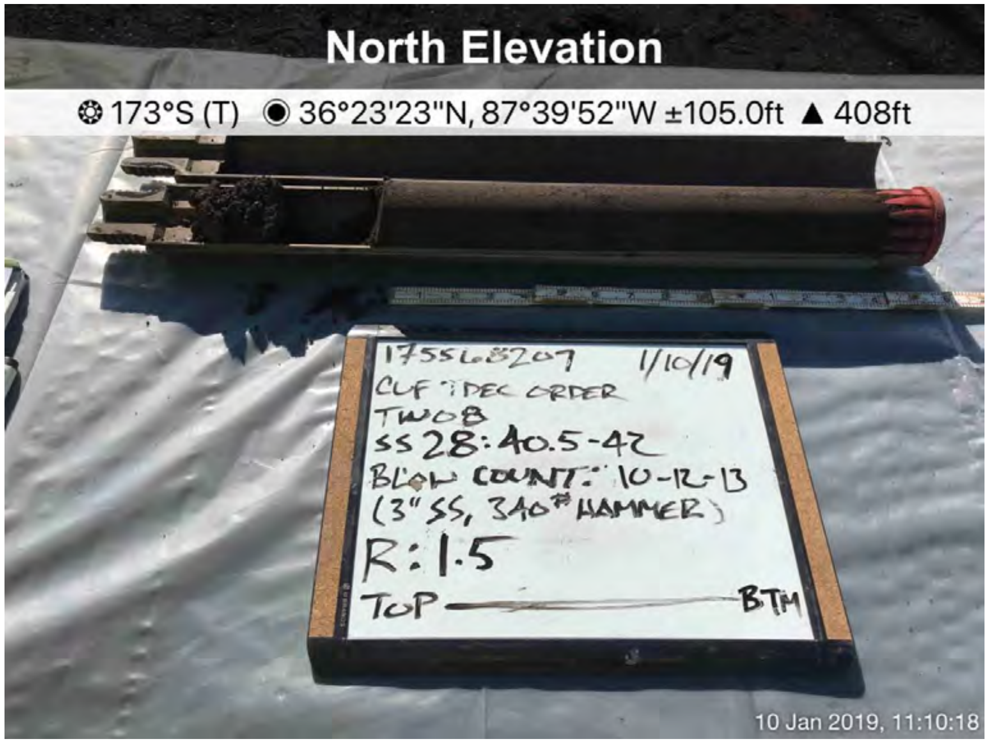
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 125

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (40.5-42.0 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 40.5-42.0.



Photograph ID: 126

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (42.0-43.5 feet). Depth interval shown on white board should be 42.0-43.5.

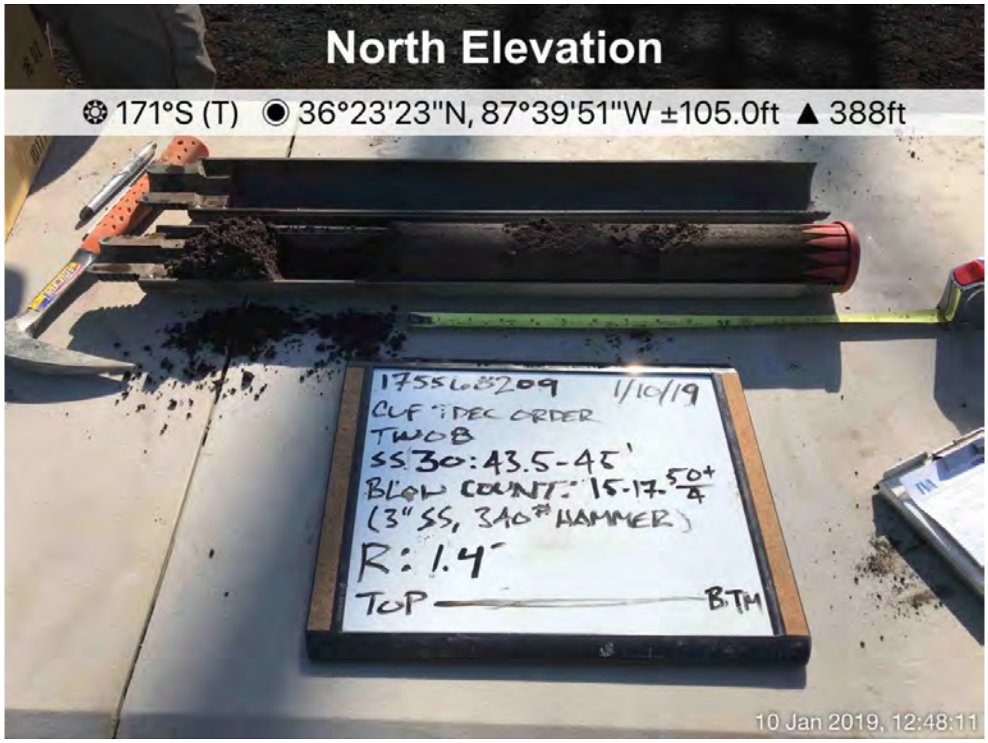
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 127

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (43.5-44.9 feet). Depth interval shown on white board should be 43.5-44.9.

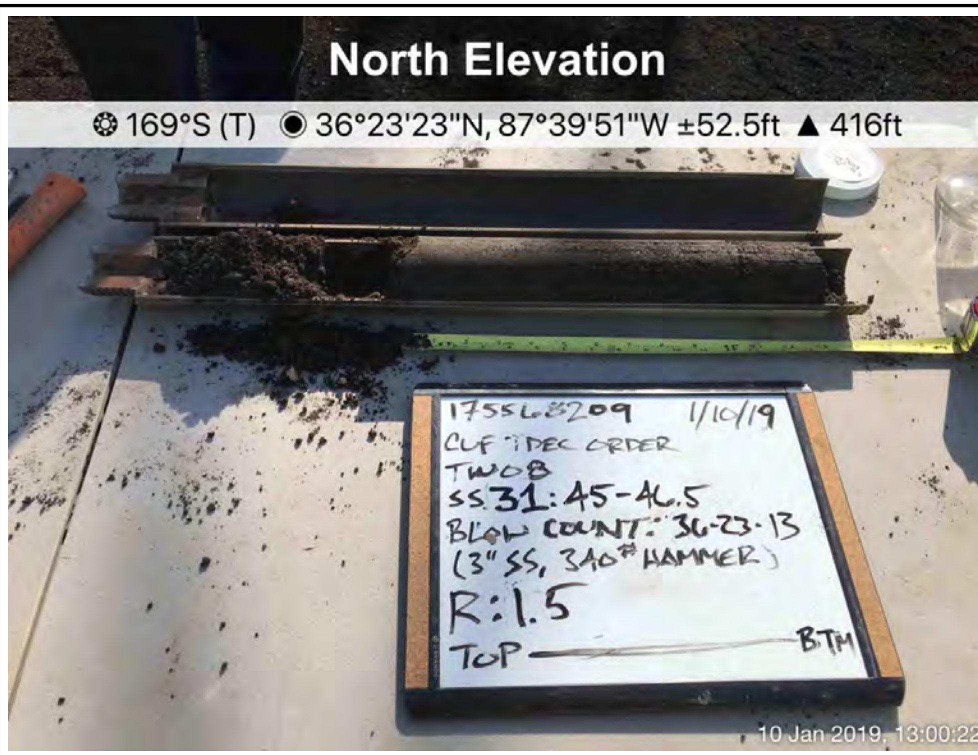


Photograph ID: 128

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (45.0-46.5 feet). Depth interval shown on white board should be 45.0-46.5.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 129

Photo Location: CUF-TW08

Photo Date: 1/10/2019

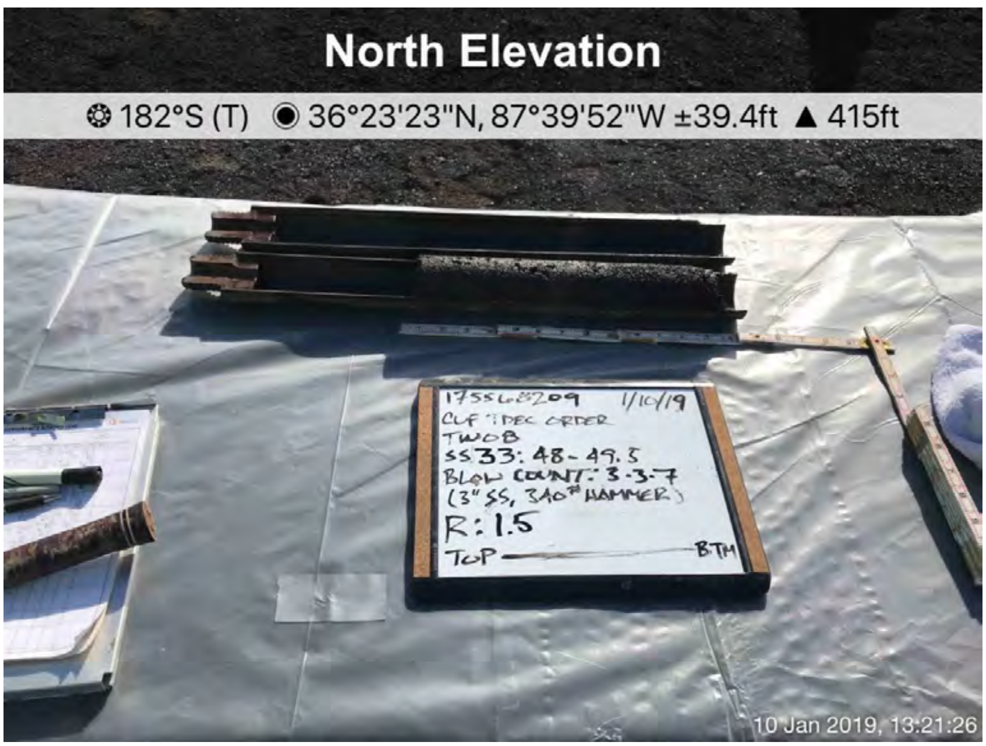
Comments: Interval (46.5-48.0 feet). Depth interval shown on white board should be 46.5-48.0.

Photograph ID: 130

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (48.0-49.5 feet). Depth interval shown on white board should be 48.0-49.5.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 131

Photo Location: CUF-TW08

Photo Date: 1/10/2019

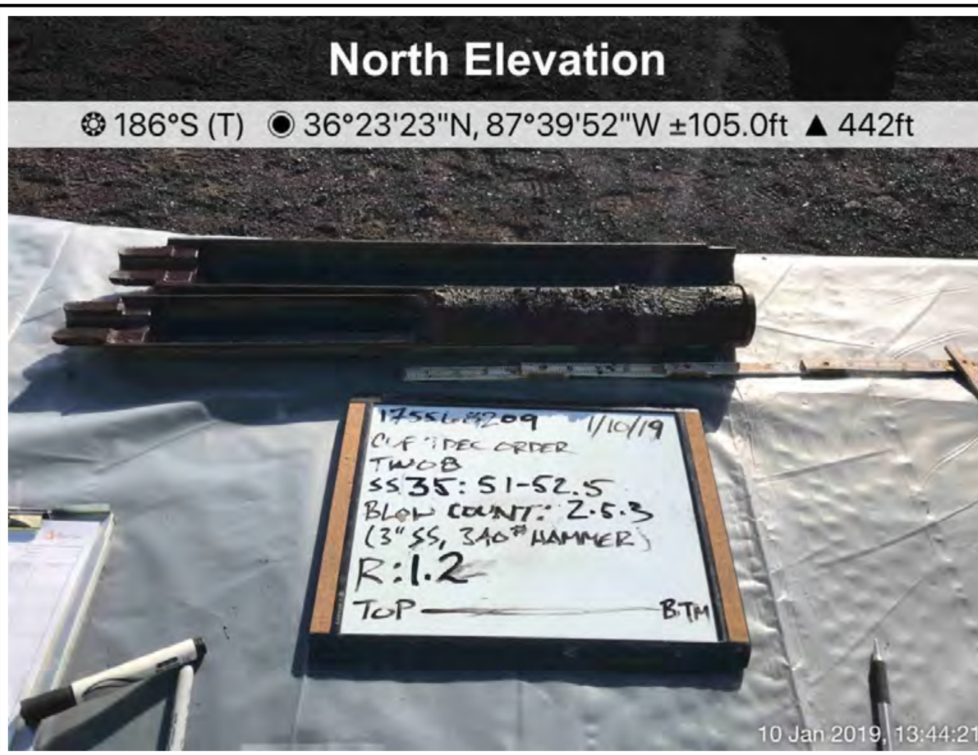
Comments: Interval (49.5-51.0 feet). Depth interval shown on white board should be 49.5-51.0.

Photograph ID: 132

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (51.0-52.5 feet). Depth interval shown on white board should be 51.0-52.5.



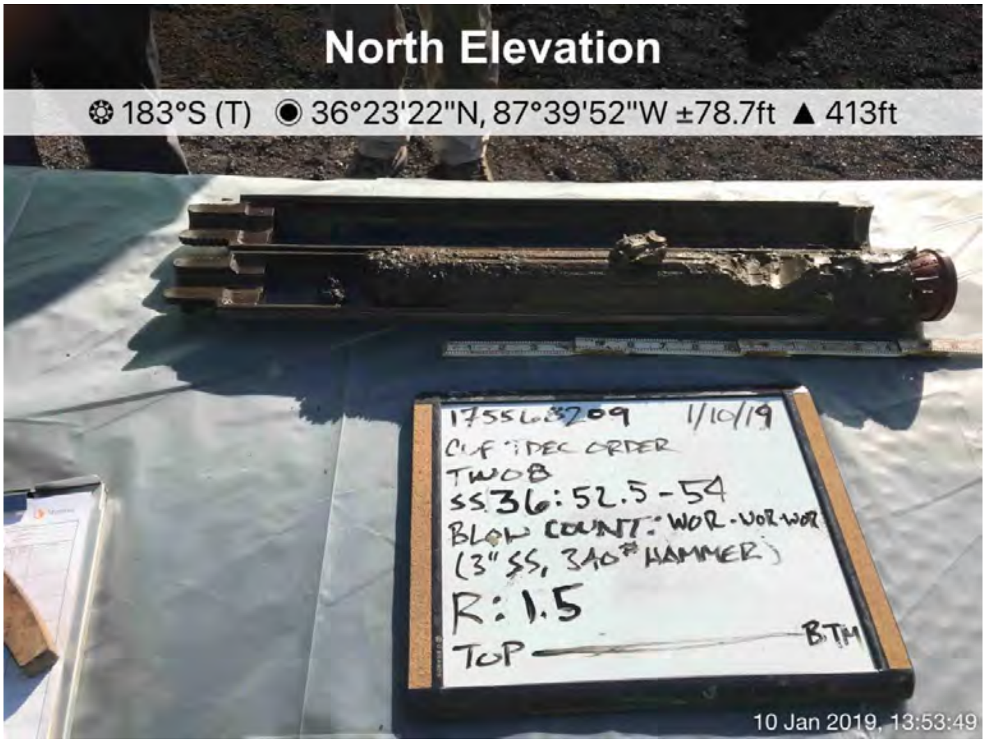
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 133

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (52.5-54.0 feet). Depth interval shown on white board should be 52.5-54.0. WOR on white board is the same as WR on the boring log.



Photograph ID: 134

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (54.0-55.5 feet). Depth interval shown on white board should be 54.0-55.5. Blow count shown on white board should be 1-WH-WH.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 135

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (55.5-57.0 feet). Depth interval shown on white board should be 55.5-57.0. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log. Recovery shown on white board is 1.3.

Photograph ID: 136

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (57.0-58.5 feet). Depth interval shown on white board should be 57.0-58.5. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

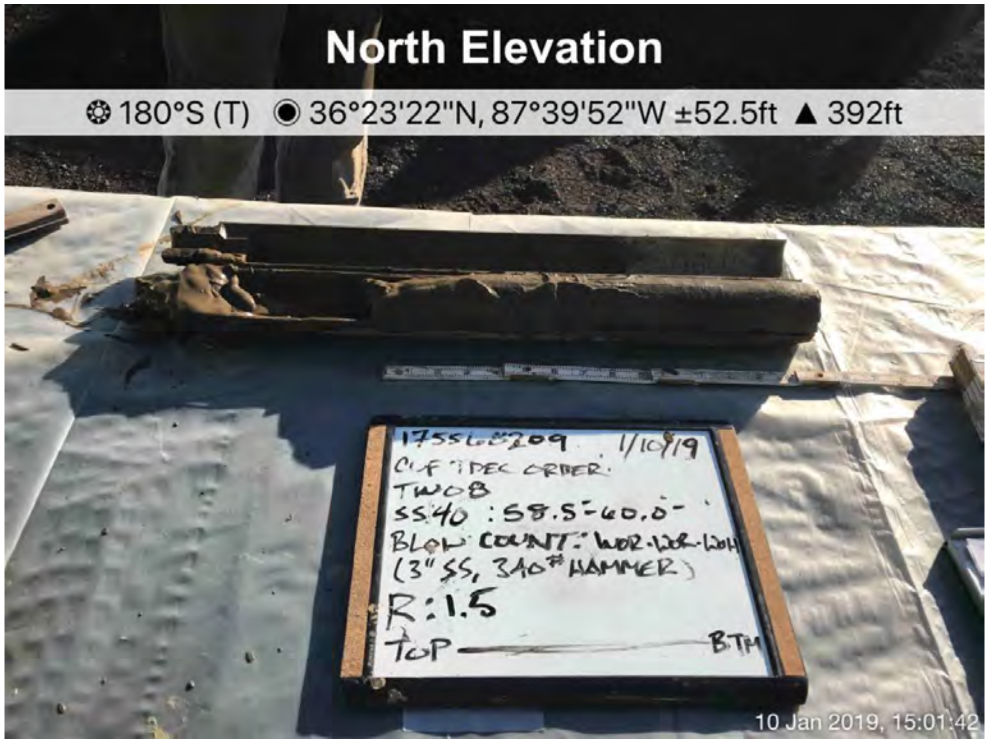
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 137

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (58.5-60.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

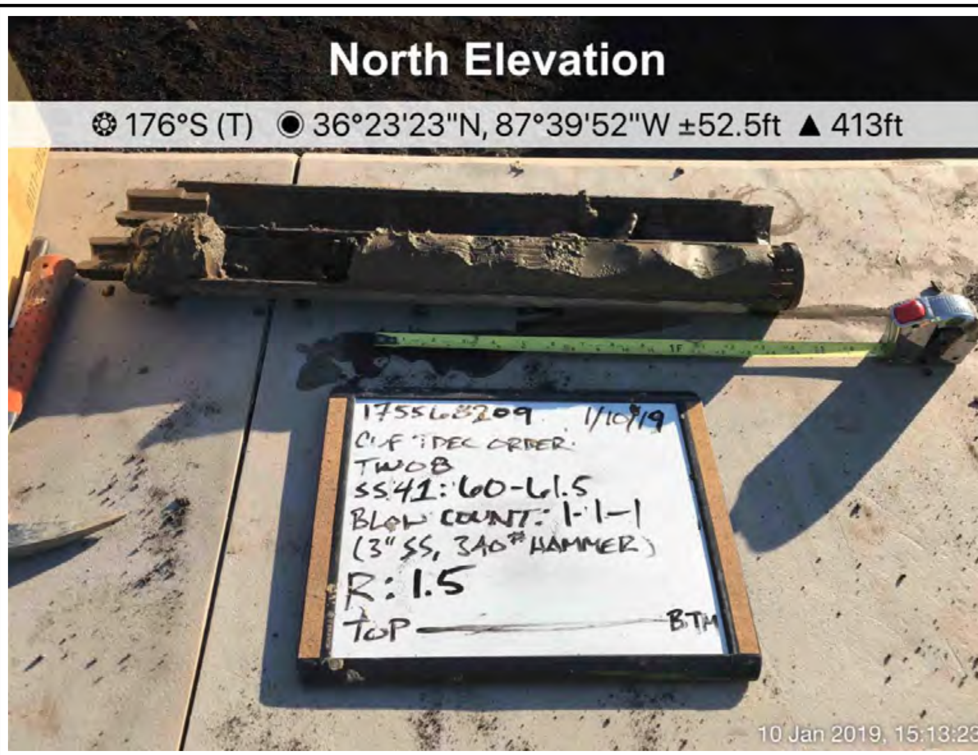


Photograph ID: 138

Photo Location:
CUF-TW08

Photo Date:
1/10/2019

Comments:
Interval (60.0-61.5 feet). Depth interval shown on white board should be 60.0-61.5.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 139

Photo Location: CUF-TW08

Photo Date: 1/10/2019

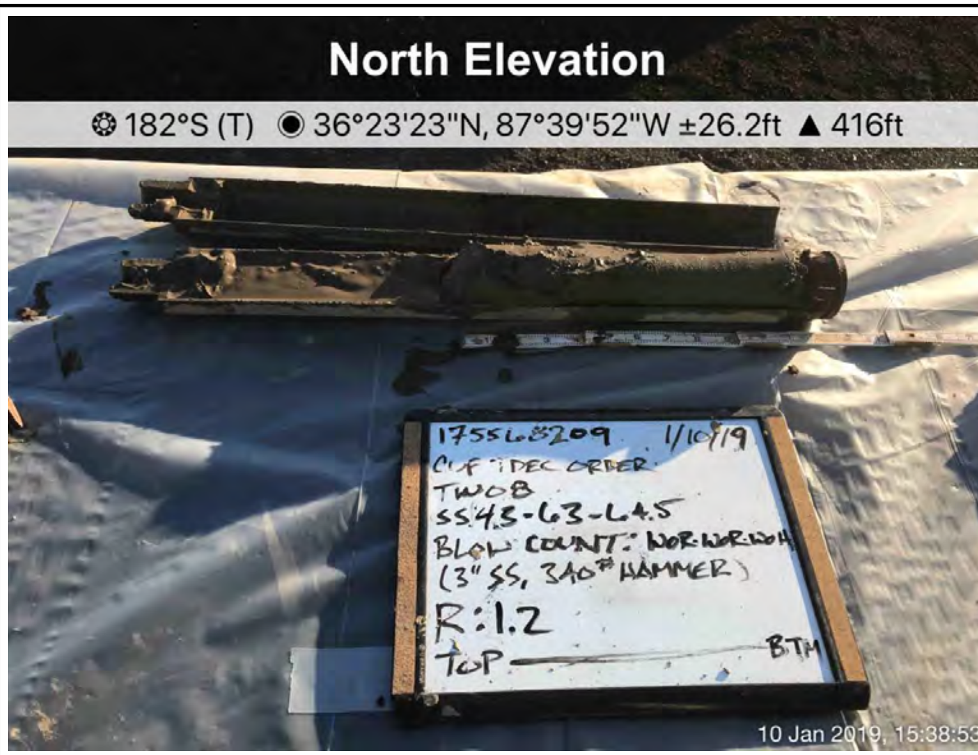
Comments: Interval (61.5-63.0 feet). Depth interval shown on white board should be 61.5-63.0. WOH on white board is the same as WH on the boring log.

Photograph ID: 140

Photo Location: CUF-TW08

Photo Date: 1/10/2019

Comments: Interval (63.0-64.5 feet). Depth interval shown on white board should be 63.0-64.5. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.



Stantec

Photographic Log

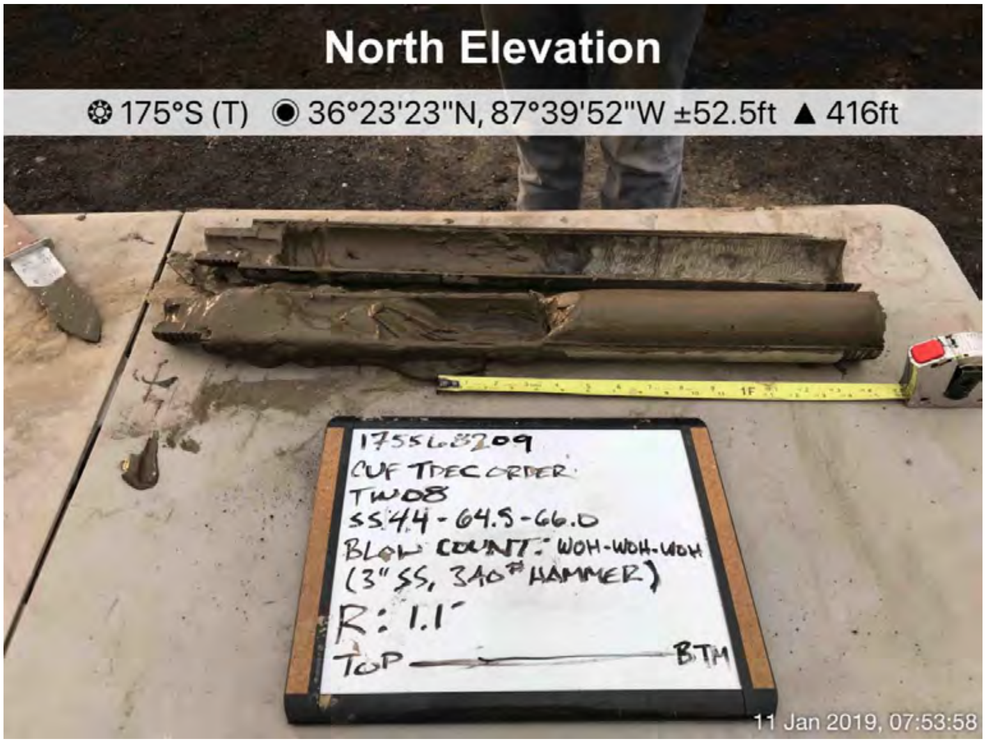
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 141

Photo Location:
CUF-TW08

Photo Date:
1/11/2019

Comments:
Interval (64.5-66.0 feet). WOH on white board is the same as WH on the boring log.

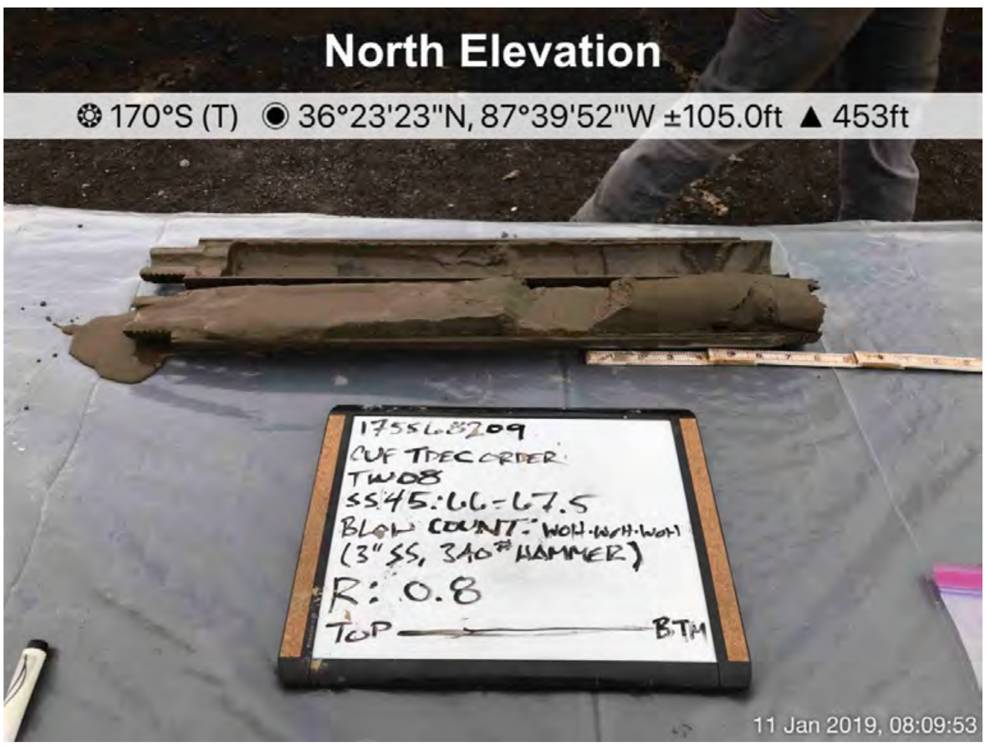


Photograph ID: 142

Photo Location:
CUF-TW08

Photo Date:
1/11/2019

Comments:
Interval (66.0-67.5 feet). Depth interval shown on white board should be 66.0-67.5. WOH on white board is the same as WH on the boring log.



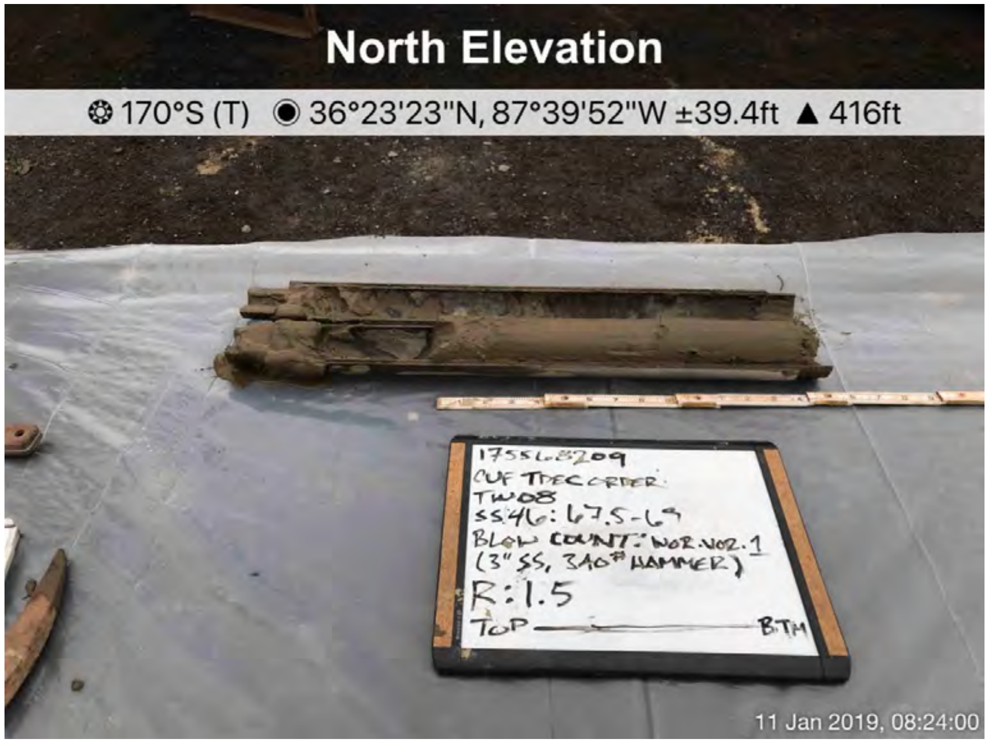
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 143

Photo Location: CUF-TW08

Photo Date: 1/11/2019

Comments: Interval (67.5-69.0 feet). Depth interval shown on white board should be 67.5-69.0. WOR on white board is the same as WR on the boring log.



Photograph ID: 144

Photo Location: CUF-TW08

Photo Date: 1/11/2019

Comments: Photo of interval (69.0-71.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

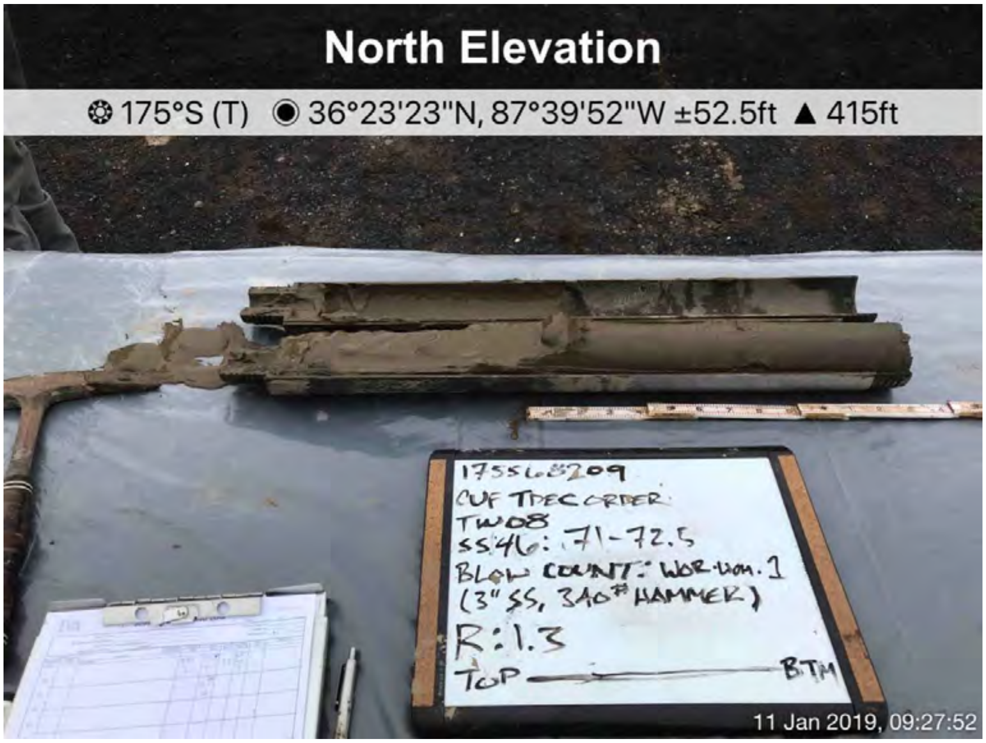
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 145

Photo Location: CUF-TW08

Photo Date: 1/11/2019

Comments: Interval (71.0-72.5 feet). Split spoon shown on white board should be SS47. Depth interval shown on white board should be 71.0-72.5. WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

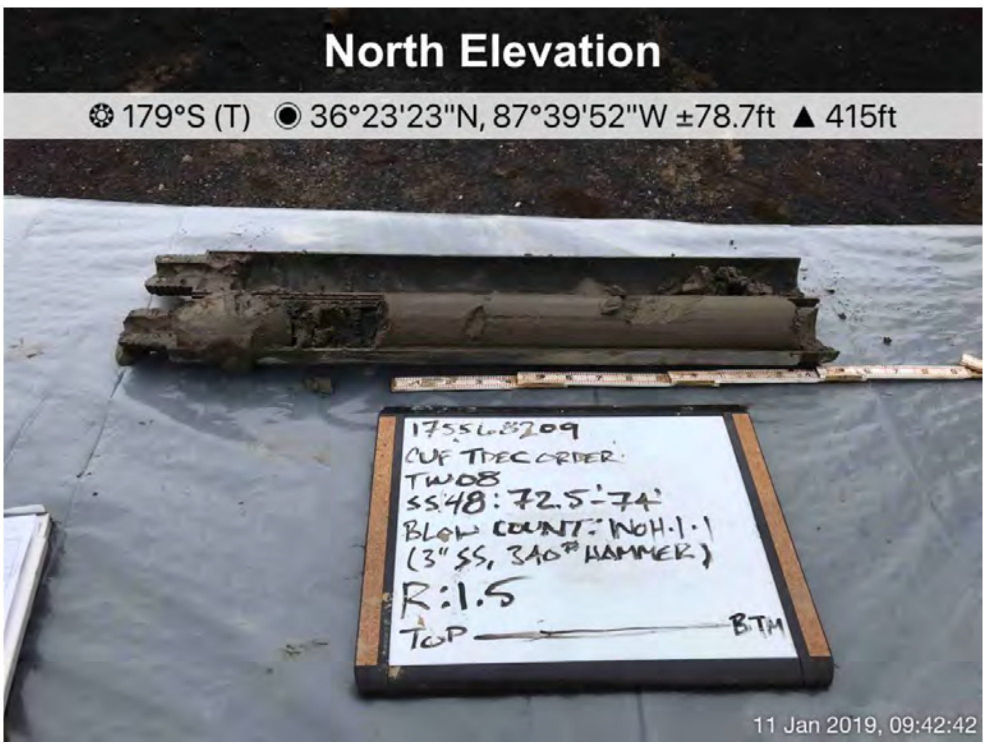


Photograph ID: 146

Photo Location: CUF-TW08

Photo Date: 1/11/2019

Comments: Interval (72.5-74.0 feet). Depth interval shown on white board should be 72.5-74.0. WOH on white board is the same as WH on the boring log.



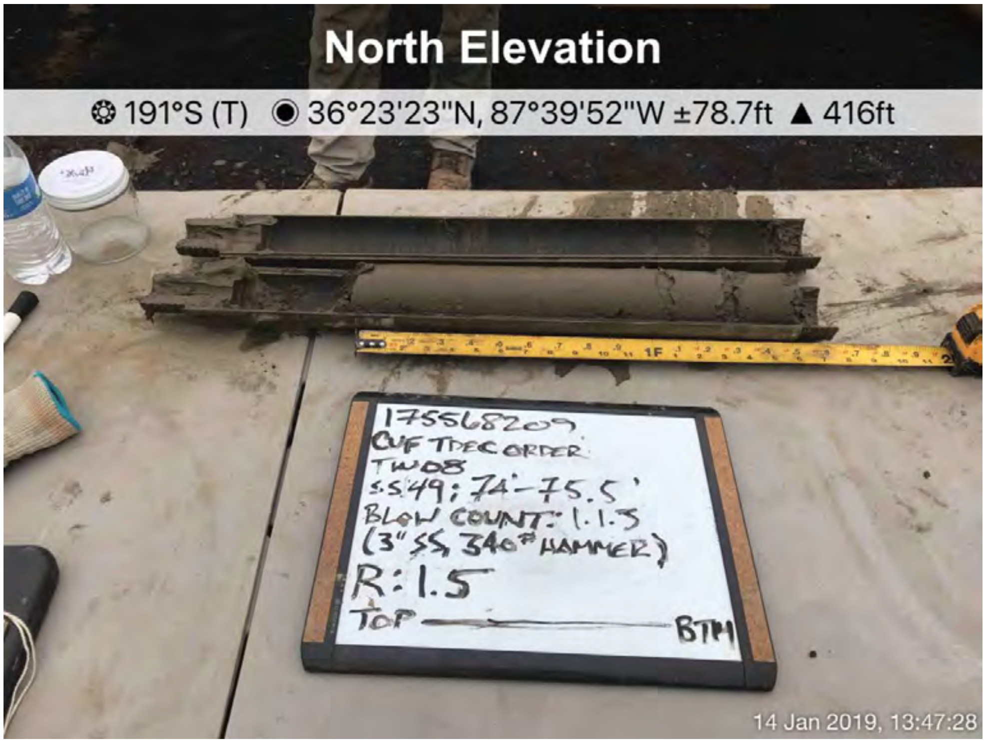
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 147

Photo Location:
CUF-TW08

Photo Date:
1/14/2019

Comments:
Interval (74.0-75.5 feet). Depth interval shown on white board should be 74.0-75.5.

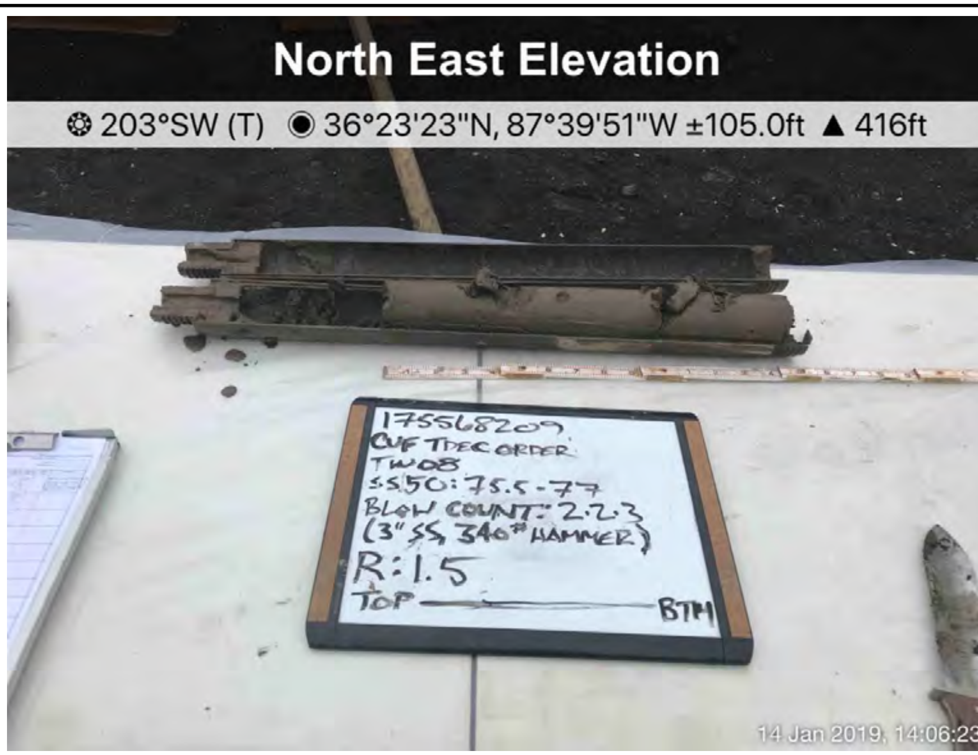


Photograph ID: 148

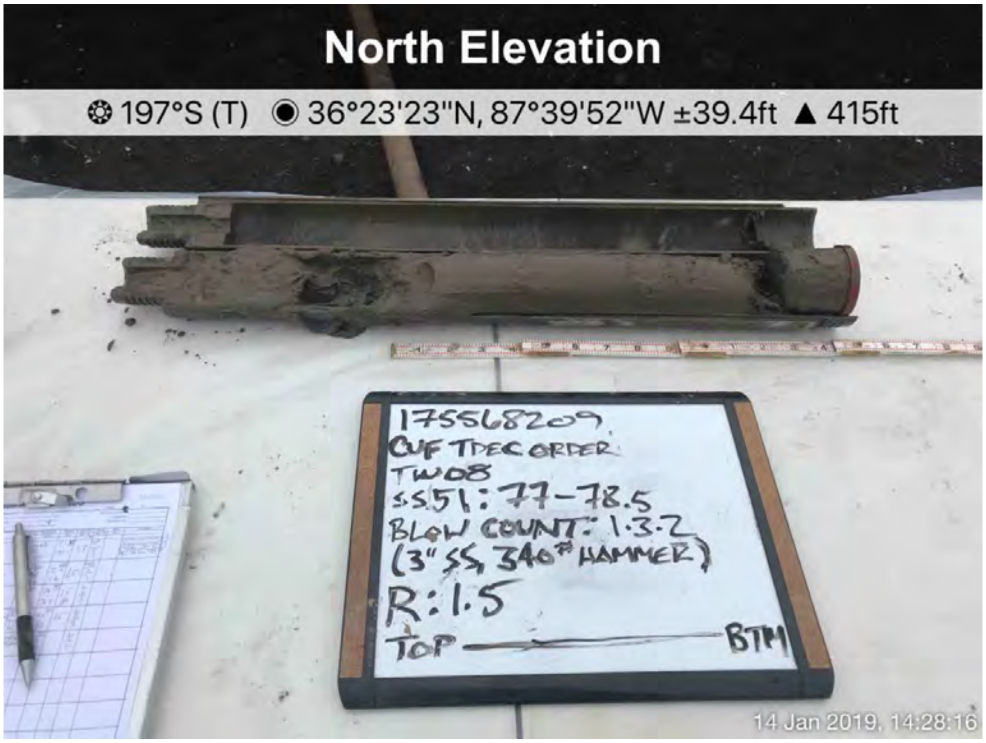
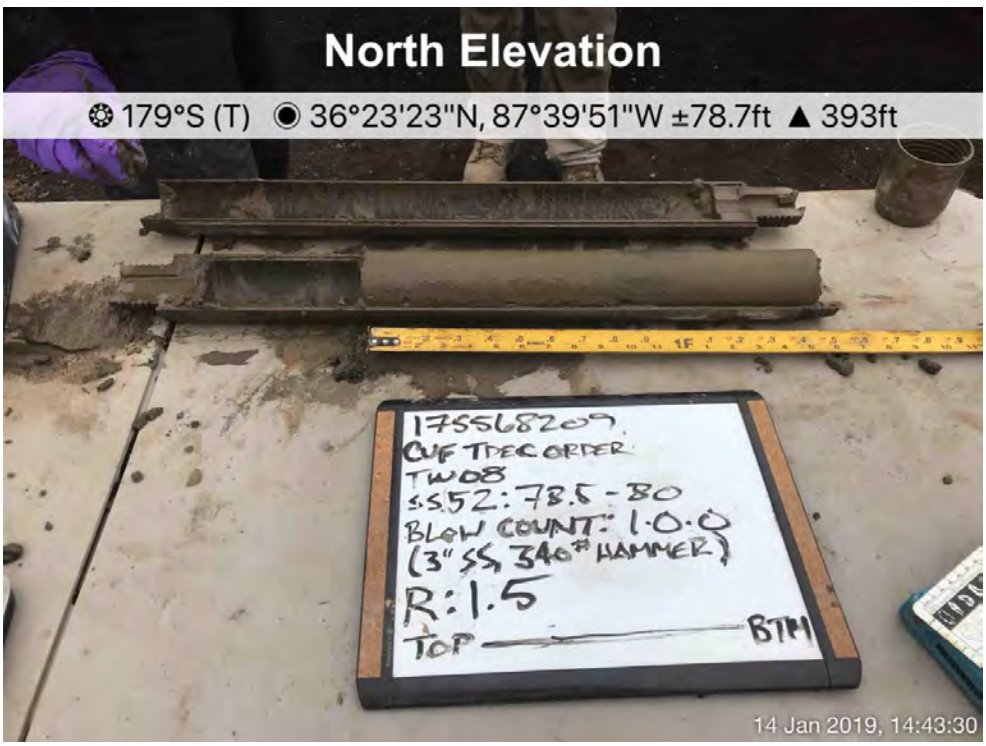
Photo Location:
CUF-TW08

Photo Date:
1/14/2019

Comments:
Interval (75.5-77.0 feet). Depth interval shown on white board should be 75.5-77.0.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 149 **Photo Location:** CUF-TW08 **Photo Date:** 1/14/2019 **Comments:** Interval (77.0-78.5 feet). Depth interval shown on white board should be 77.0-78.5.	
Photograph ID: 150 **Photo Location:** CUF-TW08 **Photo Date:** 1/14/2019 **Comments:** Interval (78.5-80.0 feet). Depth interval shown on white board should be 78.5-80.0. Blow count shown on white board should be 1-WH-WH.	

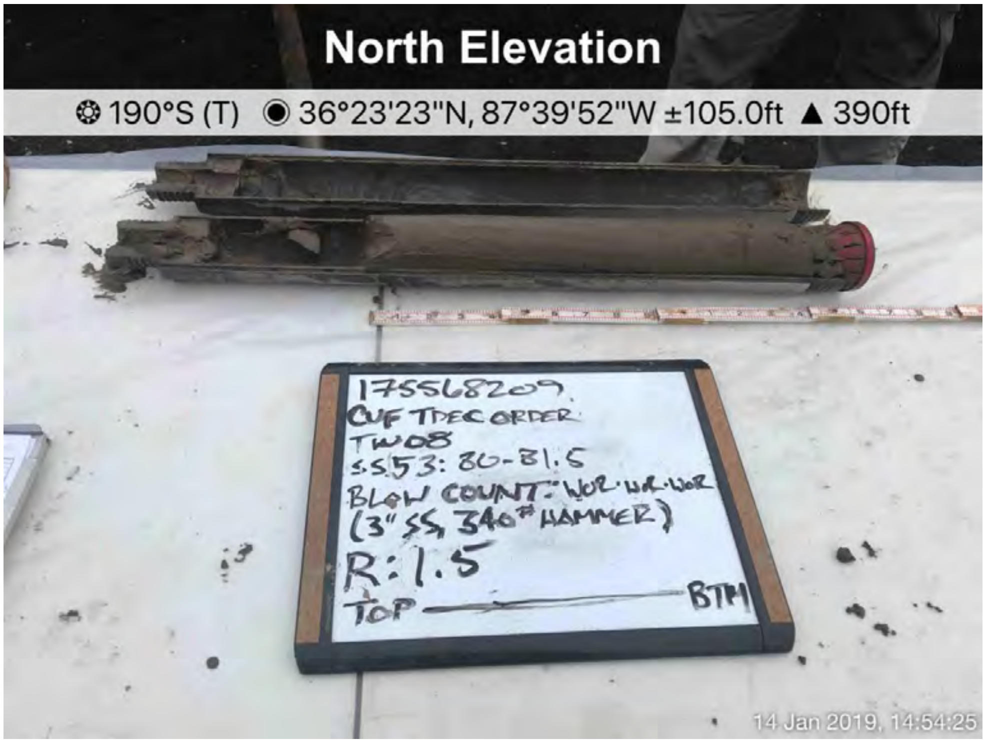
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 151

Photo Location:
CUF-TW08

Photo Date:
1/14/2019

Comments:
Interval (80.0-81.5 feet). Depth interval shown on white board should be 80.0-81.5. WOR on white board is the same as WR on the boring log.

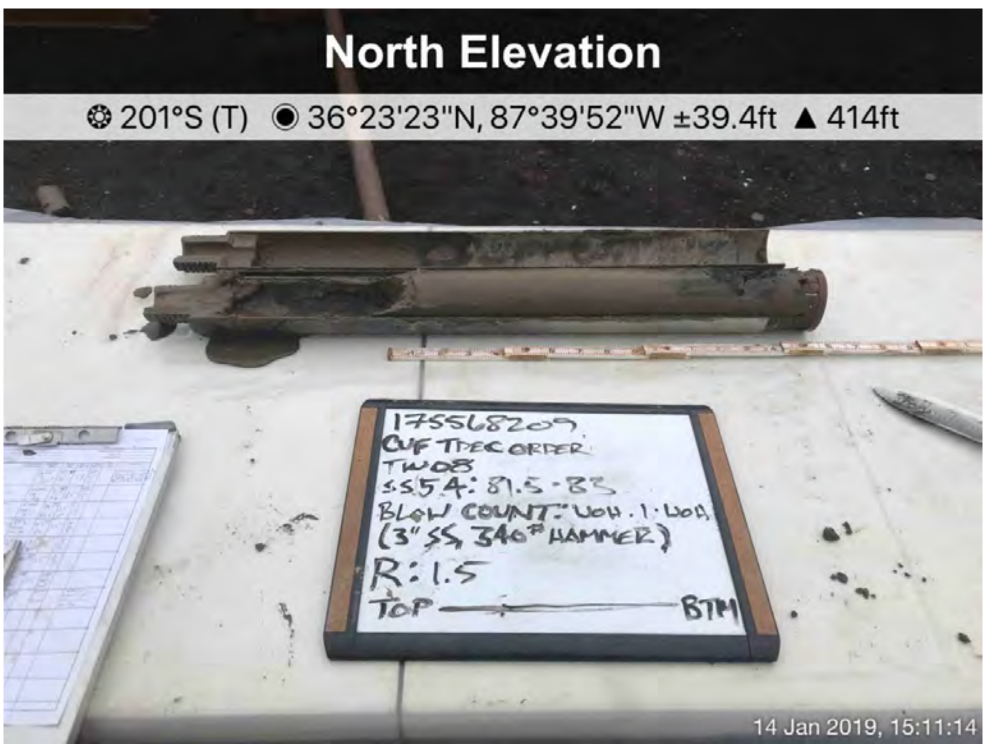


Photograph ID: 152

Photo Location:
CUF-TW08

Photo Date:
1/14/2019

Comments:
Interval (81.5-83.0 feet). Depth interval shown on white board should be 81.5-83.0. WOH on white board is the same as WH on the boring log.



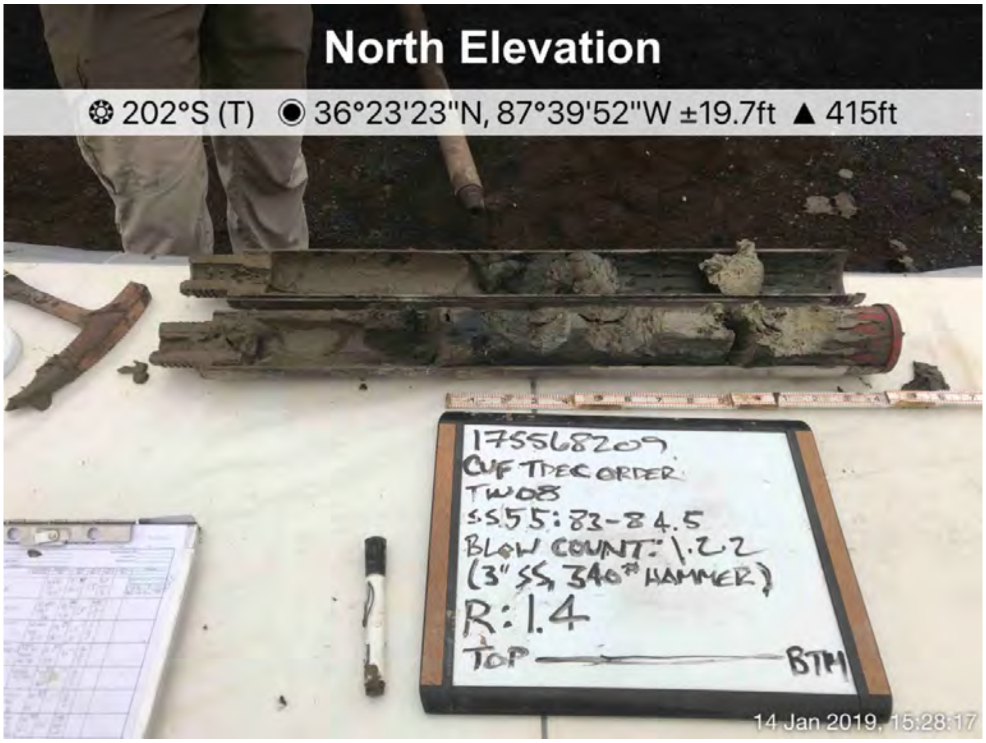
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 153

Photo Location:
CUF-TW08

Photo Date:
1/14/2019

Comments:
Interval (83.0-84.5 feet). Depth interval shown on white board should be 83.0-84.5.



Photograph ID: 154

Photo Location:
CUF-TW08

Photo Date:
1/14/2019

Comments:
Photo of interval (84.5-86.5 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Stantec **Photographic Log**

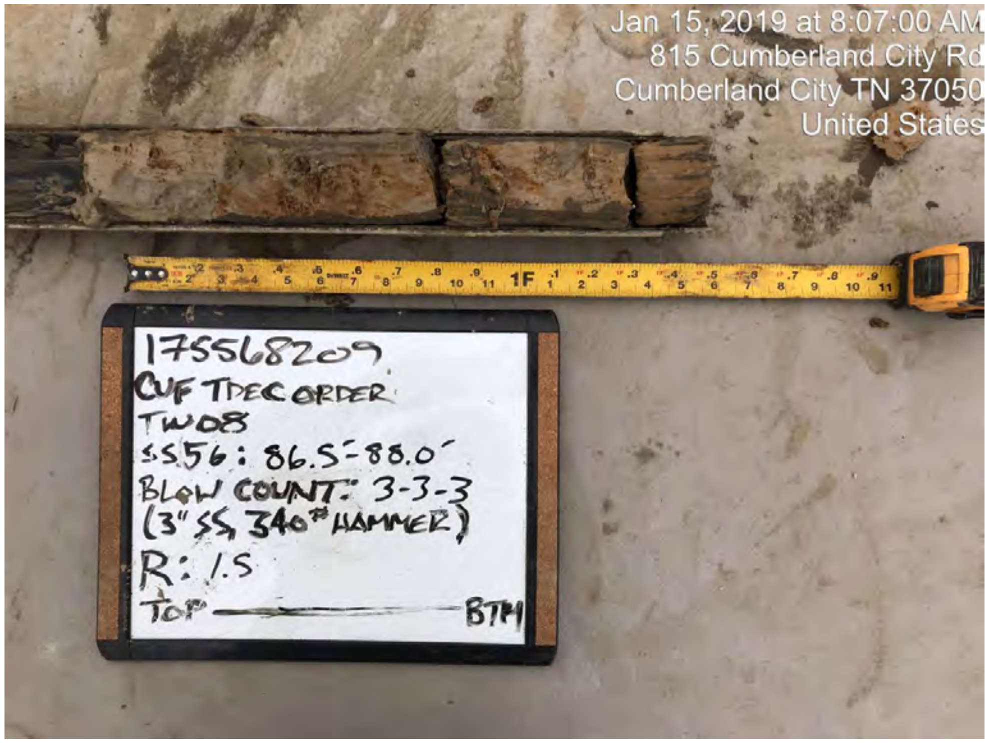
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 155

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (86.5-88.0 feet).



Photograph ID: 156

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Photo of interval (88.0-90.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

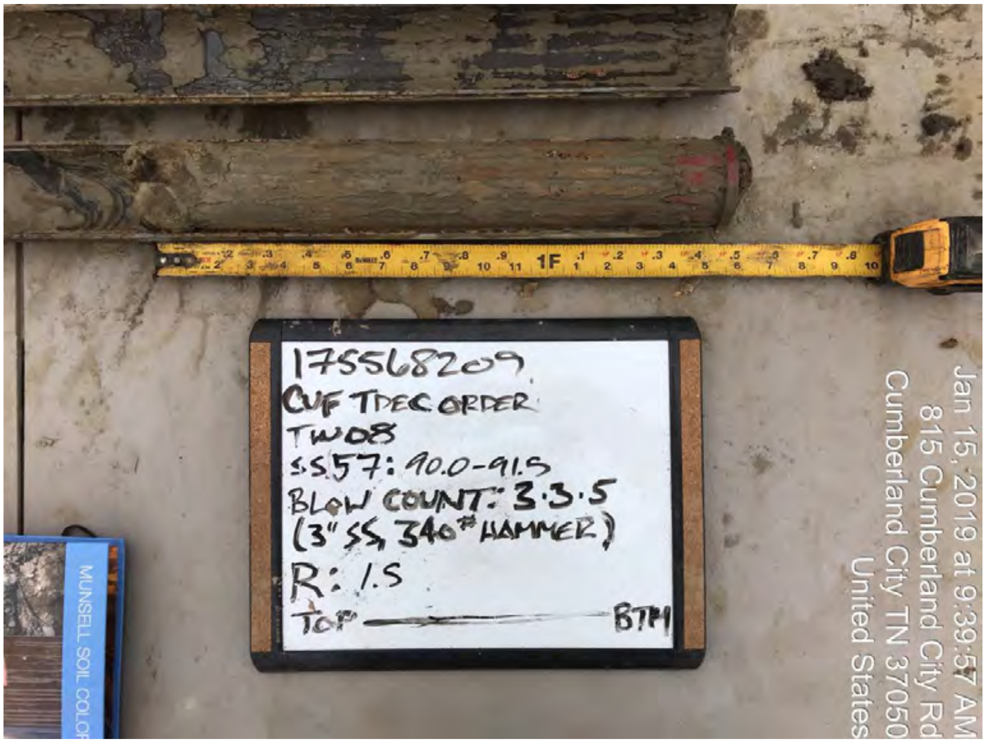
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 157

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (90.0-91.5 feet).

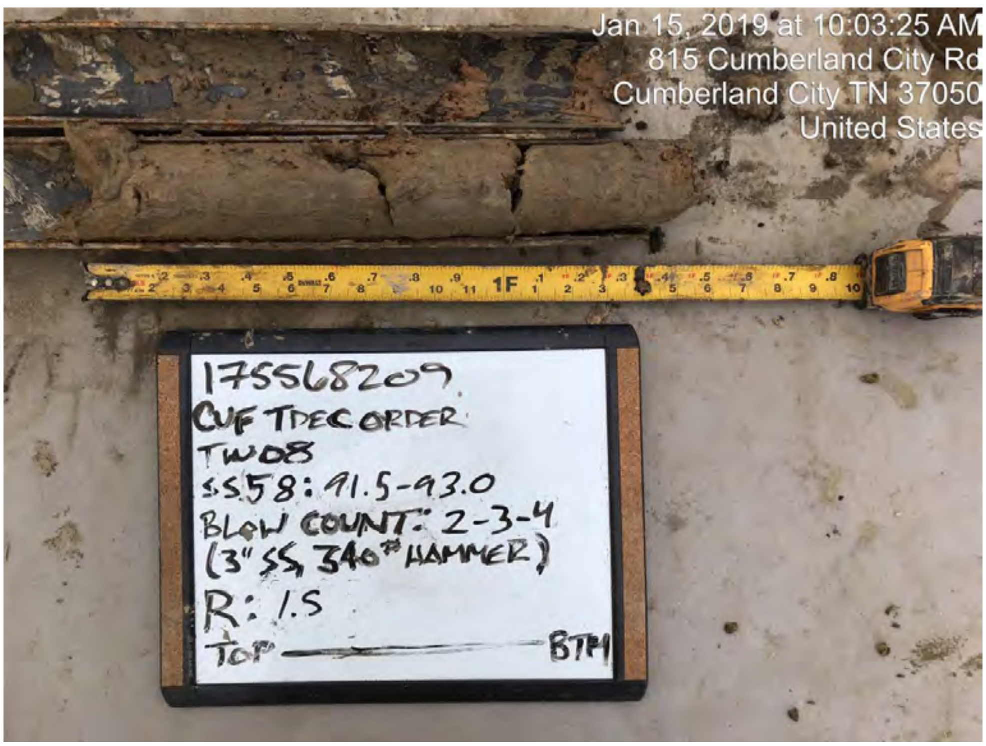


Photograph ID: 158

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (91.5-93.0 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 159

Photo Location: CUF-TW08

Photo Date: 1/15/2019

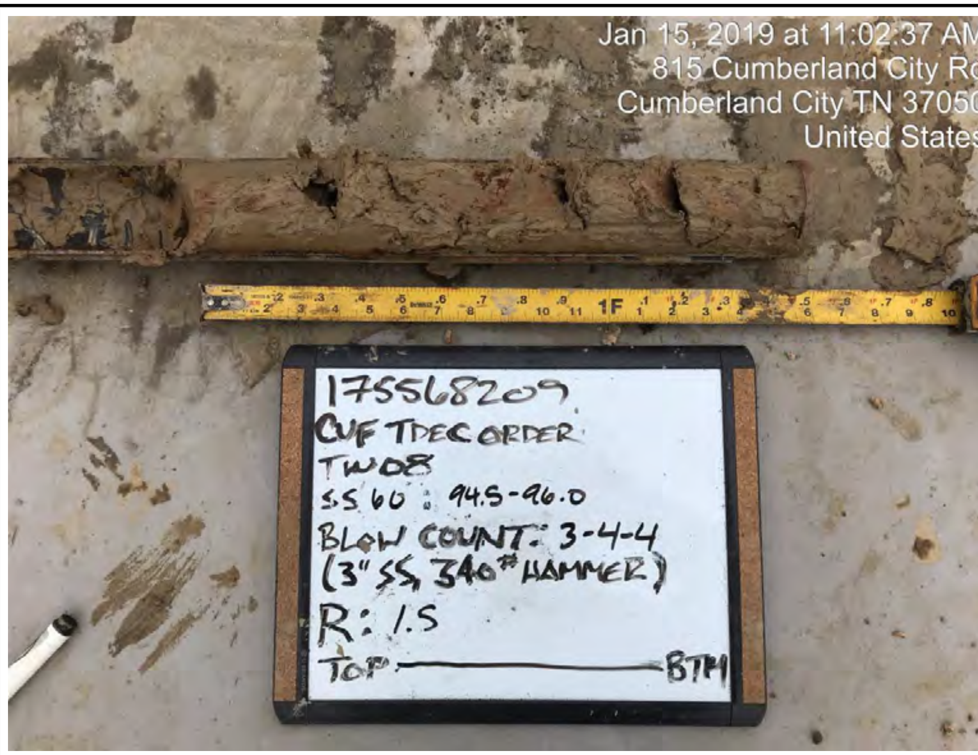
Comments: Interval (93.0-94.5 feet).

Photograph ID: 160

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (94.5-96.0 feet).



Stantec

Photographic Log

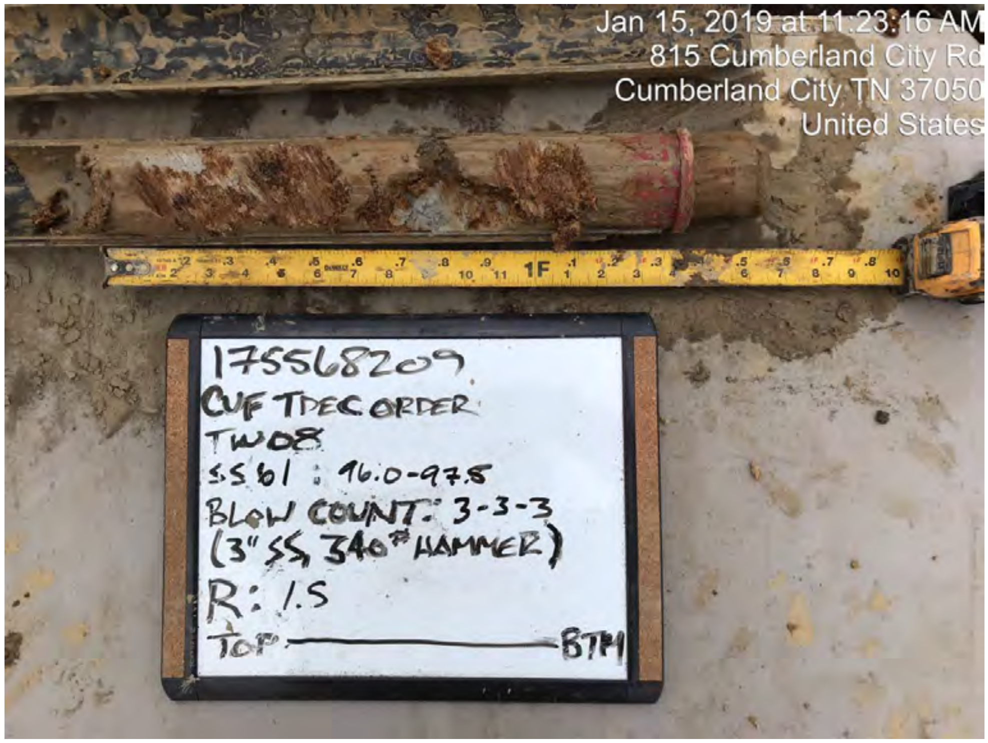
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 161

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (96.0-97.5 feet).

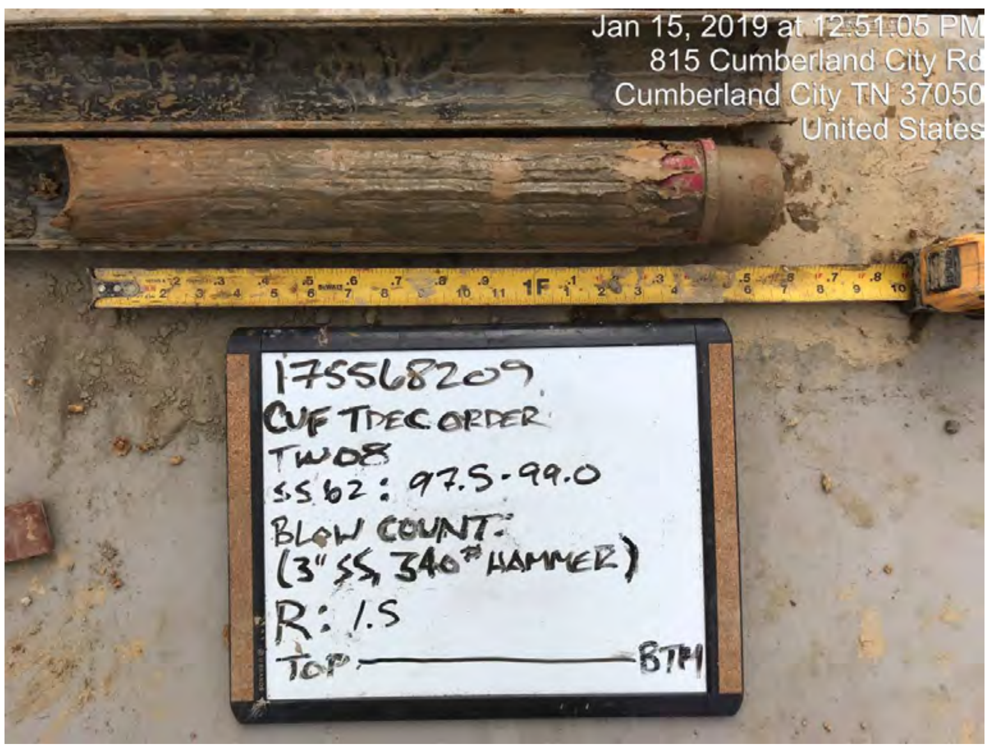


Photograph ID: 162

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (97.5-99.0 feet). Blow count shown on white board should be 2-3-3.



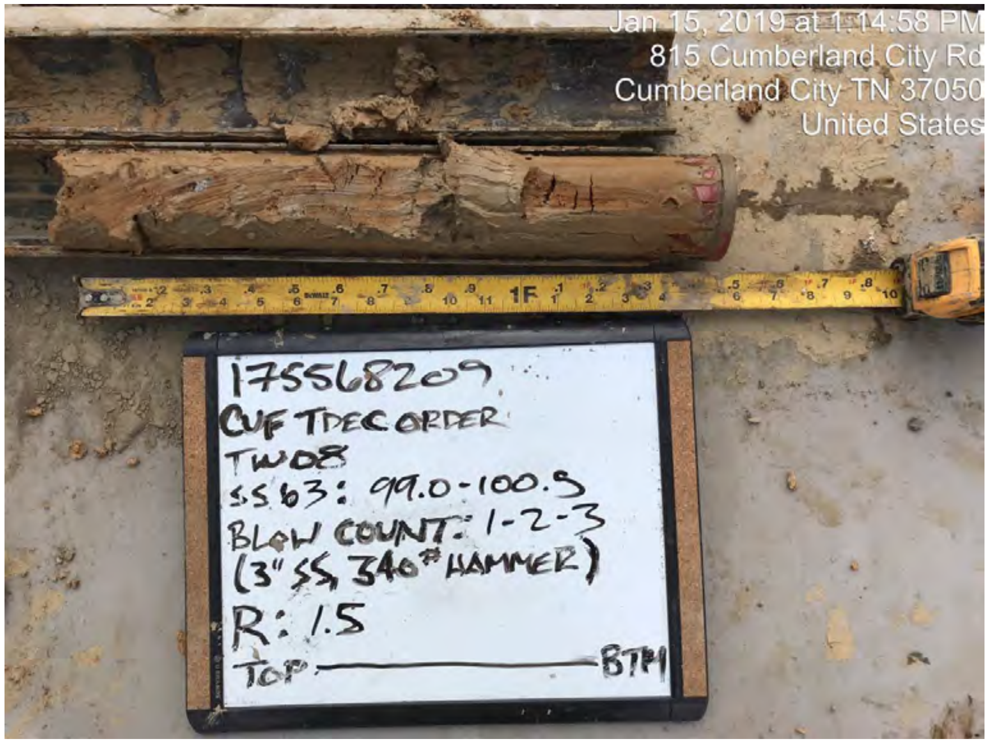
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 163

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (99.0-100.5 feet).

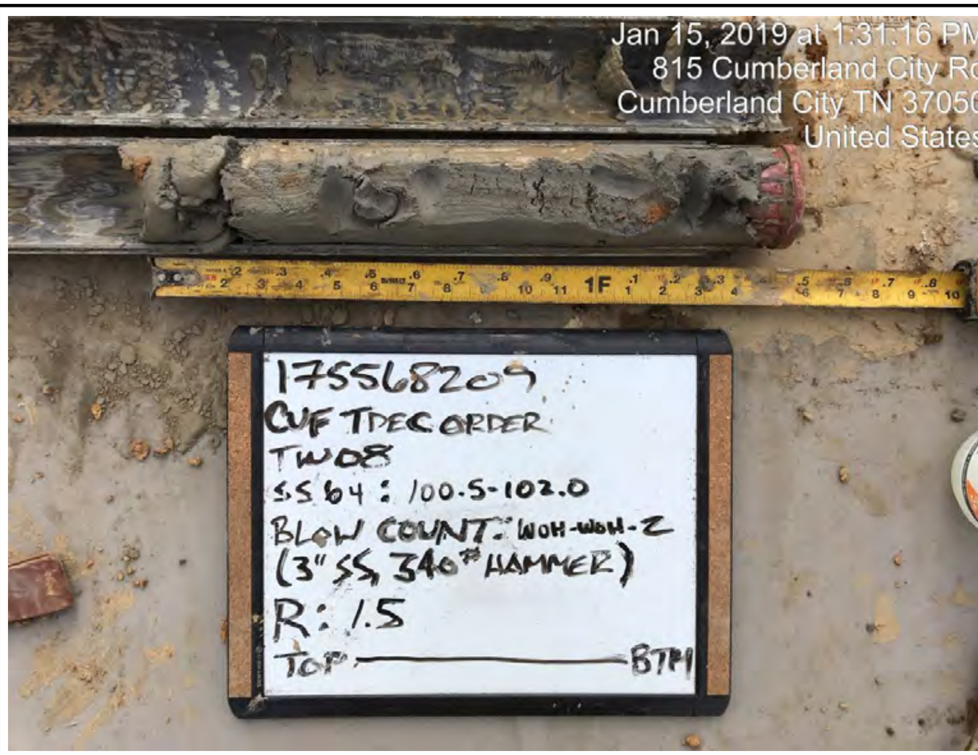


Photograph ID: 164

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (100.5-102.0 feet). WOH on white board is the same as WH on the boring log.



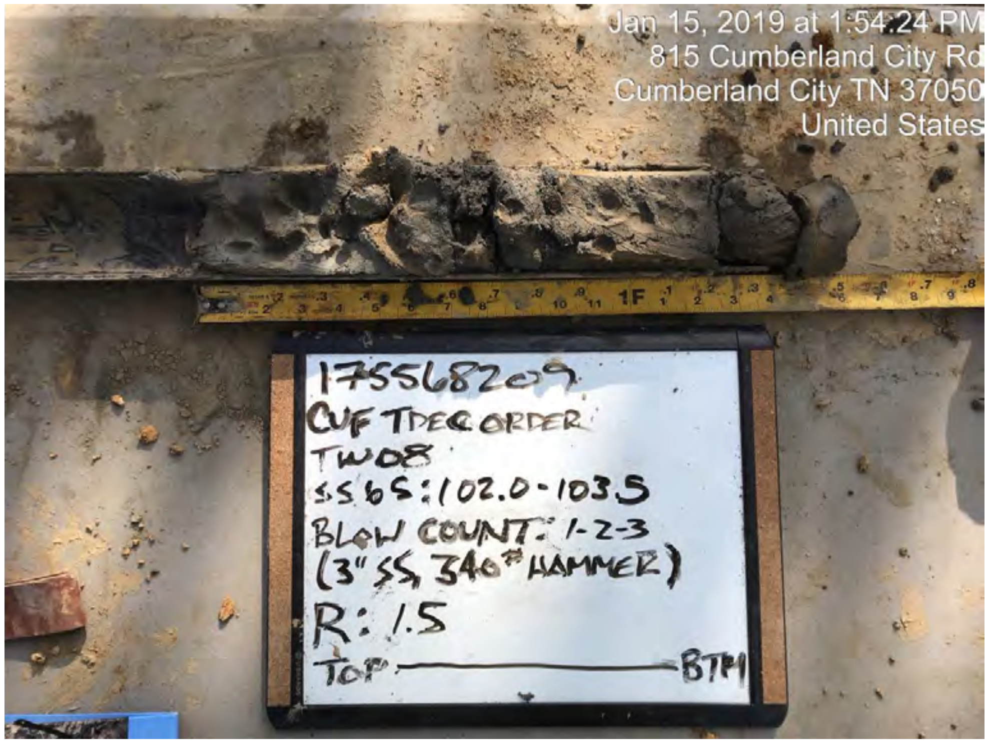
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 165

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (102.0-103.5 feet).

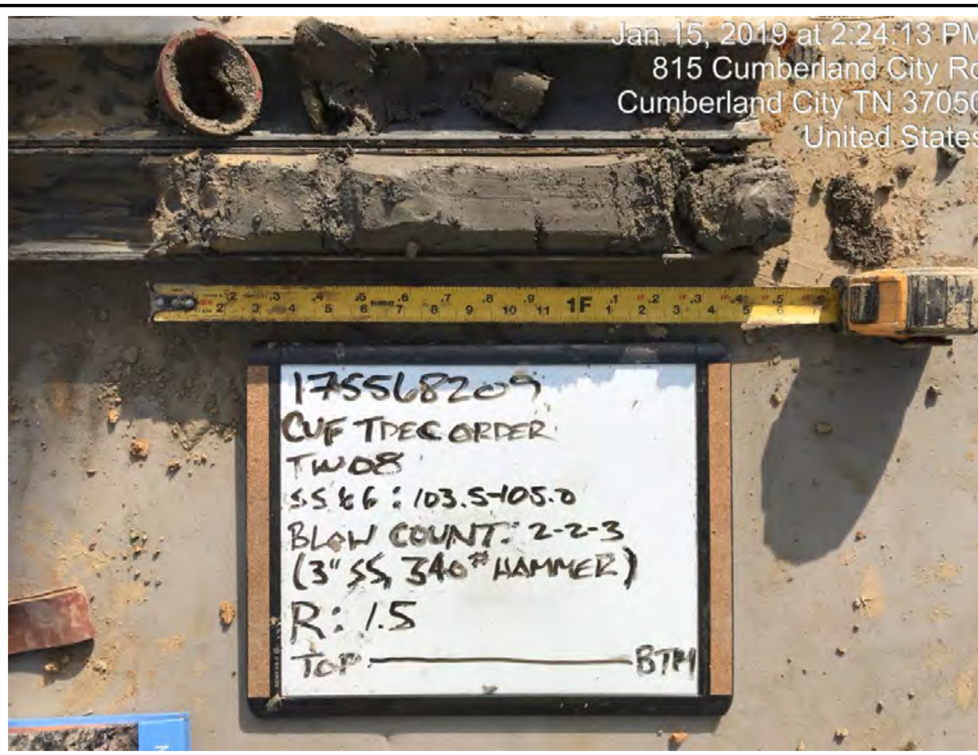


Photograph ID: 166

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (103.5-105.0 feet).



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 167

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (105.0-106.5 feet).

Photograph ID: 168

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (106.5-108.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 169

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (108.0-109.5 feet).

Photograph ID: 170

Photo Location: CUF-TW08

Photo Date: 1/15/2019

Comments: Interval (109.5-111.0 feet).

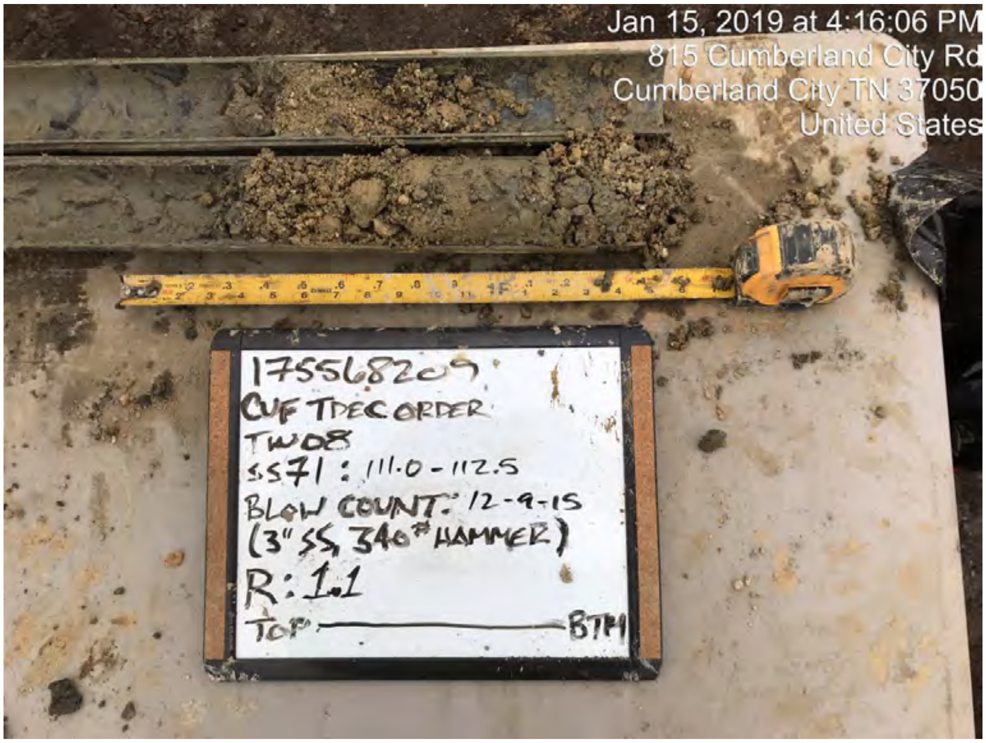
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 171

Photo Location:
CUF-TW08

Photo Date:
1/15/2019

Comments:
Interval (111.0-112.5 feet).

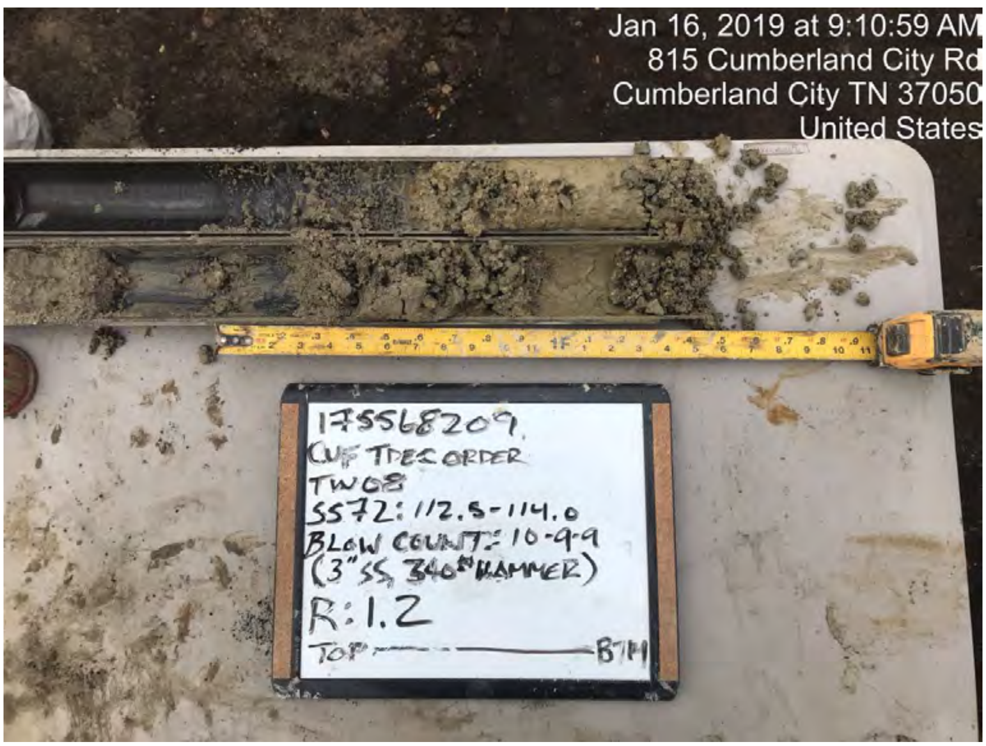


Photograph ID: 172

Photo Location:
CUF-TW08

Photo Date:
1/16/2019

Comments:
Interval (112.5-114.0 feet).



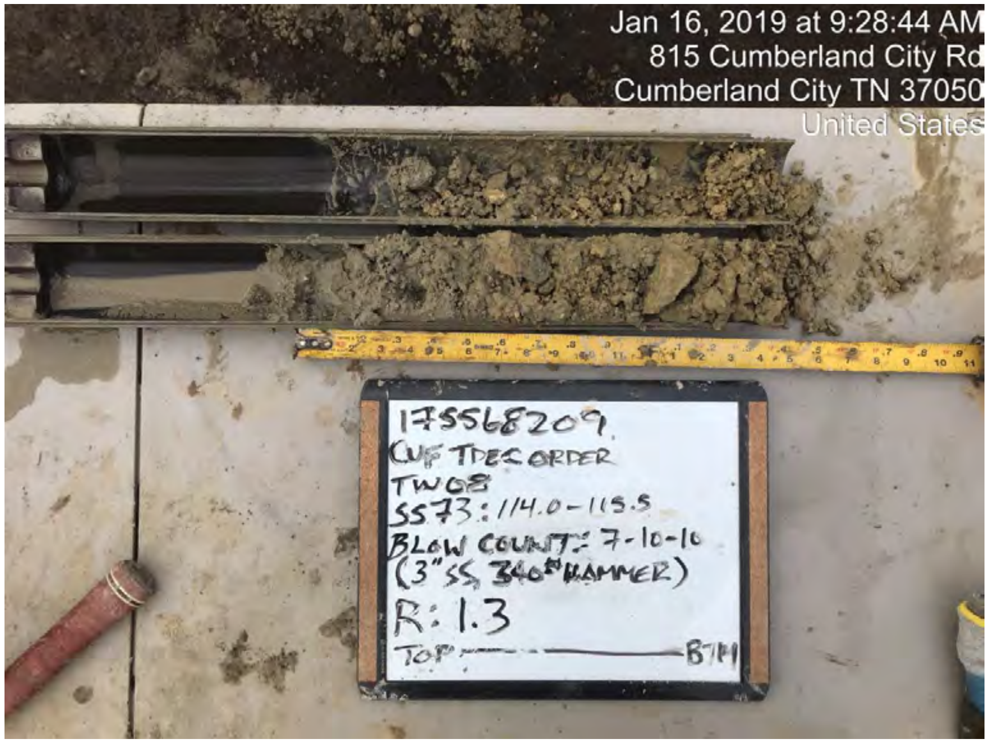
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 173

Photo Location: CUF-TW08

Photo Date: 1/16/2019

Comments: Interval (114.0-115.5 feet).



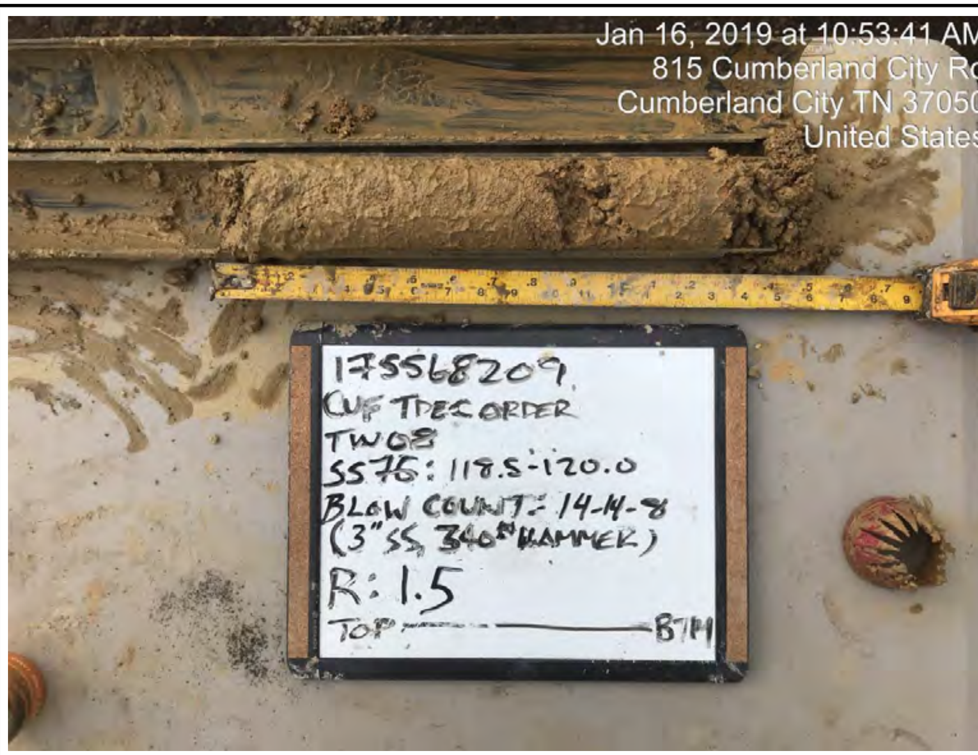
Photograph ID: 174

Photo Location: CUF-TW08

Photo Date: 1/16/2019

Comments: Interval (115.5-117.0 feet).

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 175 **Photo Location:** CUF-TW08 **Photo Date:** 1/16/2019 **Comments:** Interval (117.0-118.5 feet).	
Photograph ID: 176 **Photo Location:** CUF-TW08 **Photo Date:** 1/16/2019 **Comments:** Interval (118.5-120.0 feet).	

Stantec

Photographic Log

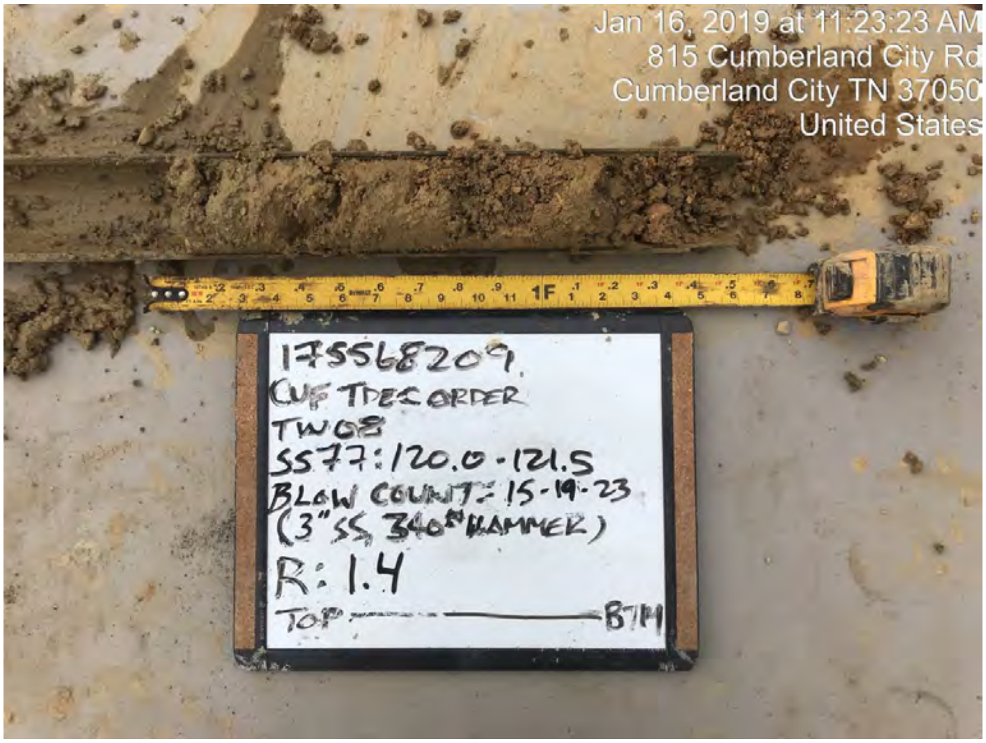
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 177

Photo Location:
CUF-TW08

Photo Date:
1/16/2019

Comments:
Interval (120.0-121.5 feet).



Photograph ID: 178

Photo Location:
CUF-TW08

Photo Date:
1/16/2019

Comments:
Interval (121.5-123.0 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 179

Photo Location: CUF-TW08

Photo Date: 1/16/2019

Comments: Interval (123.0-124.5 feet).

Photograph ID: 180

Photo Location: CUF-TW08

Photo Date: 1/16/2019

Comments: Interval (124.5-126.0 feet).

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 181

Photo Location: CUF-TW08

Photo Date: 1/16/2019

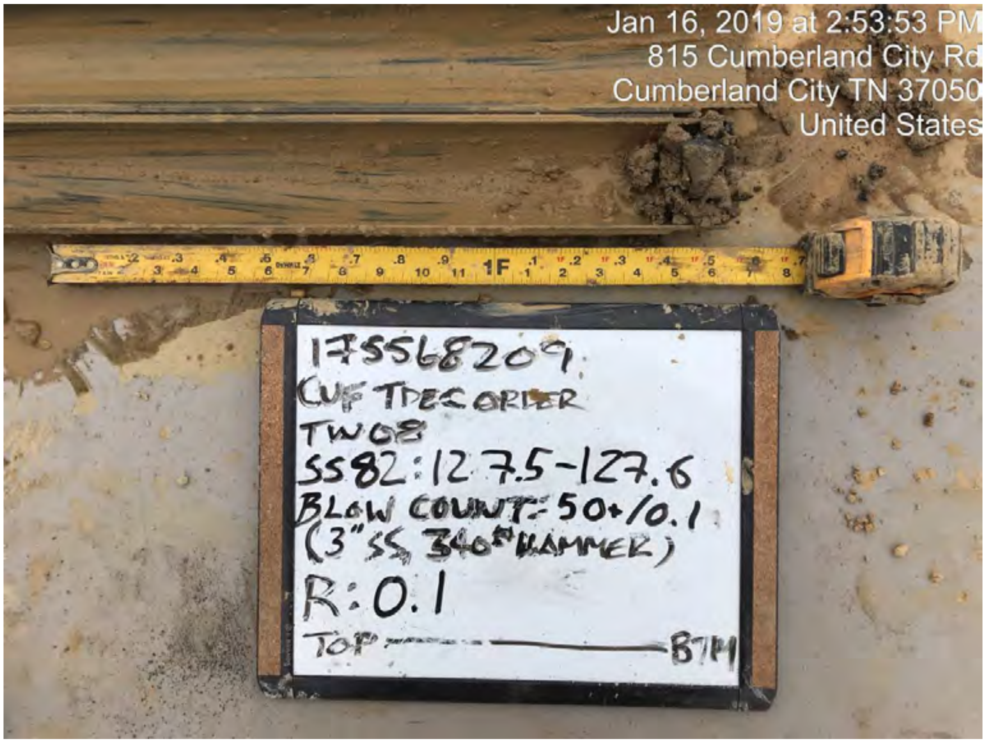
Comments: Interval (126.0-127.5 feet).

Photograph ID: 182

Photo Location: CUF-TW08

Photo Date: 1/16/2019

Comments: Interval (127.5-127.6 feet).



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 183

Photo Location:
CUF-TW08

Photo Date:
4/4/2019

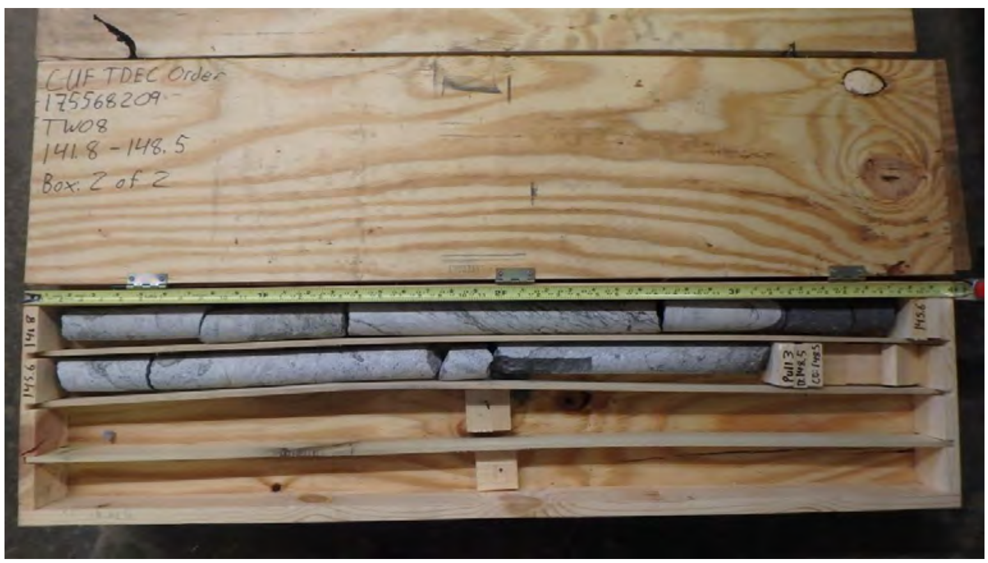
Comments:
Interval (128.4-141.8 feet).

Photograph ID: 184

Photo Location:
CUF-TW08

Photo Date:
4/4/2019

Comments:
Interval (141.8-148.5 feet).



ATTACHMENT D.1c

Photographic Logs of Soil Cores – CUF-TW09

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 1

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (0.0-1.5 feet).

Photograph ID: 2

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (1.5-3.0 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 3

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

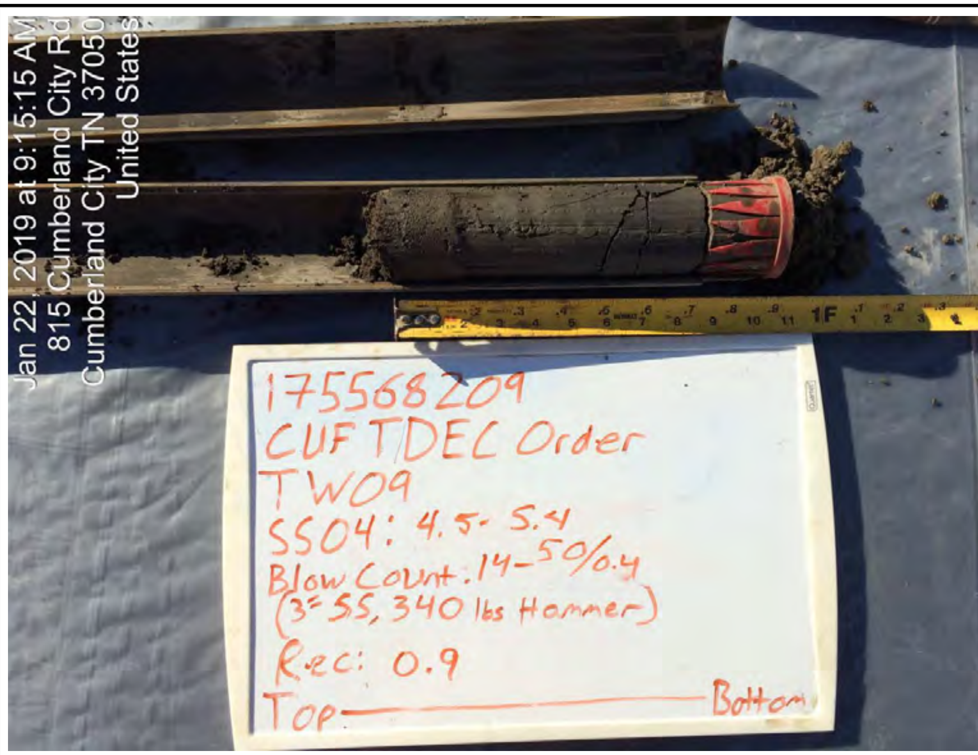
Comments:
Interval (3.0-4.5 feet).

Photograph ID: 4

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (4.5-5.4 feet).



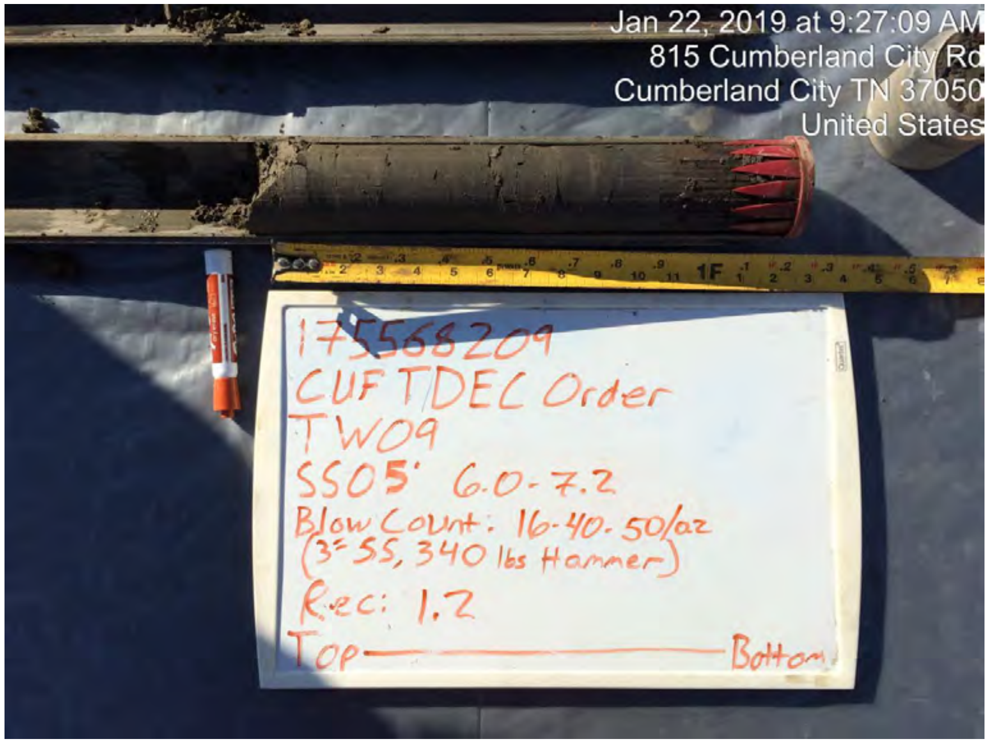
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 5

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (6.0-7.2 feet).

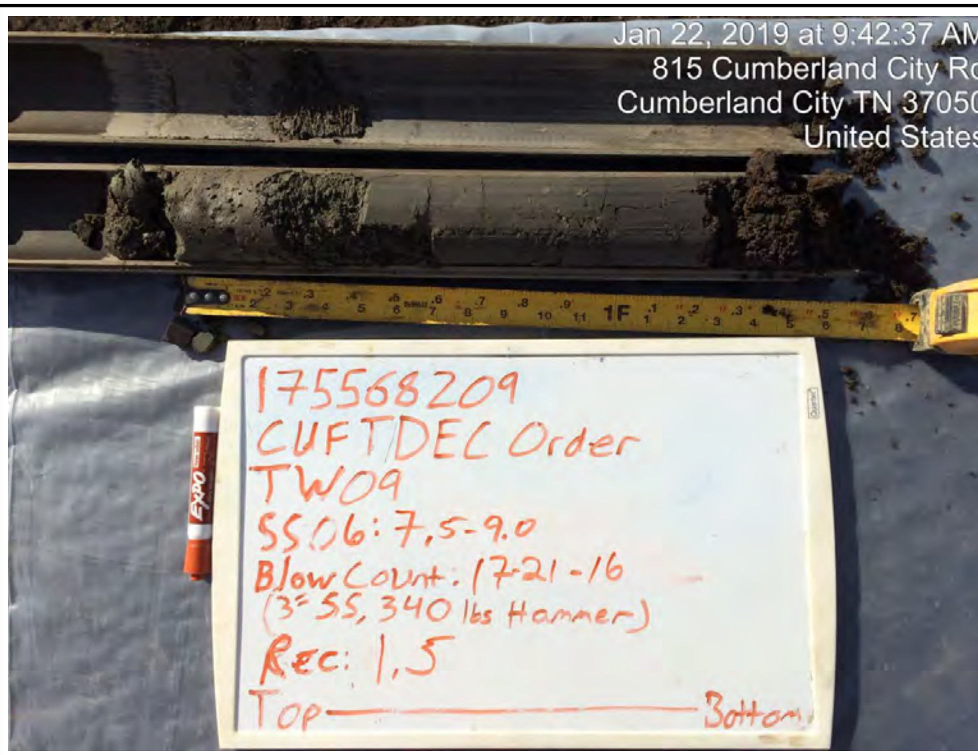


Photograph ID: 6

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (7.5-9.0 feet).



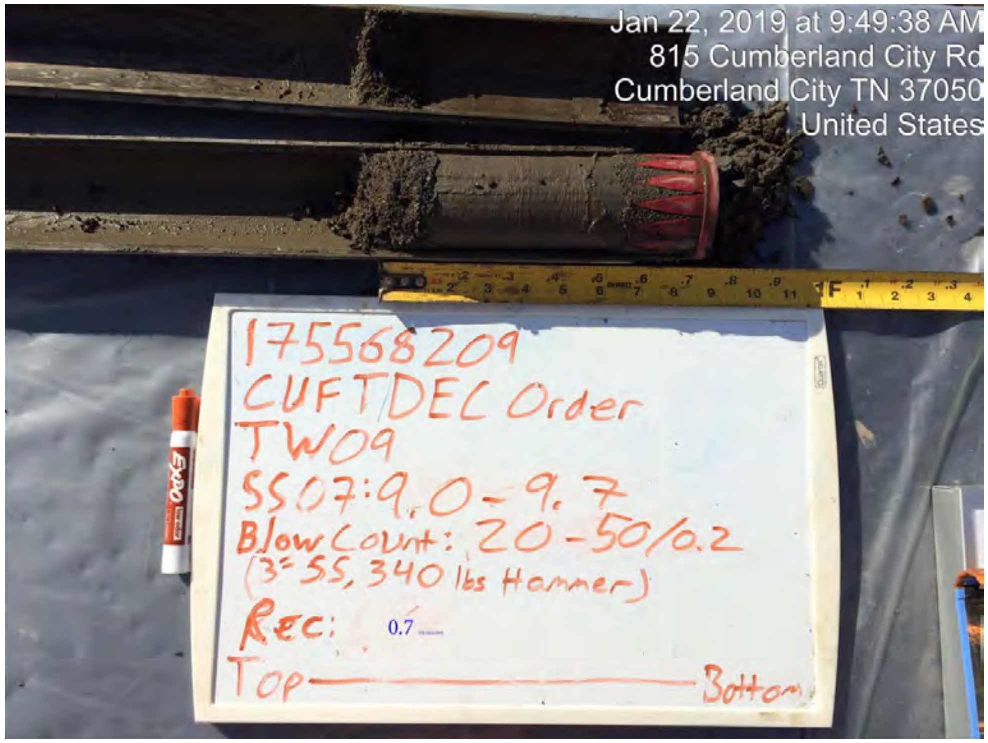
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 7

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (9.0-9.7 feet).

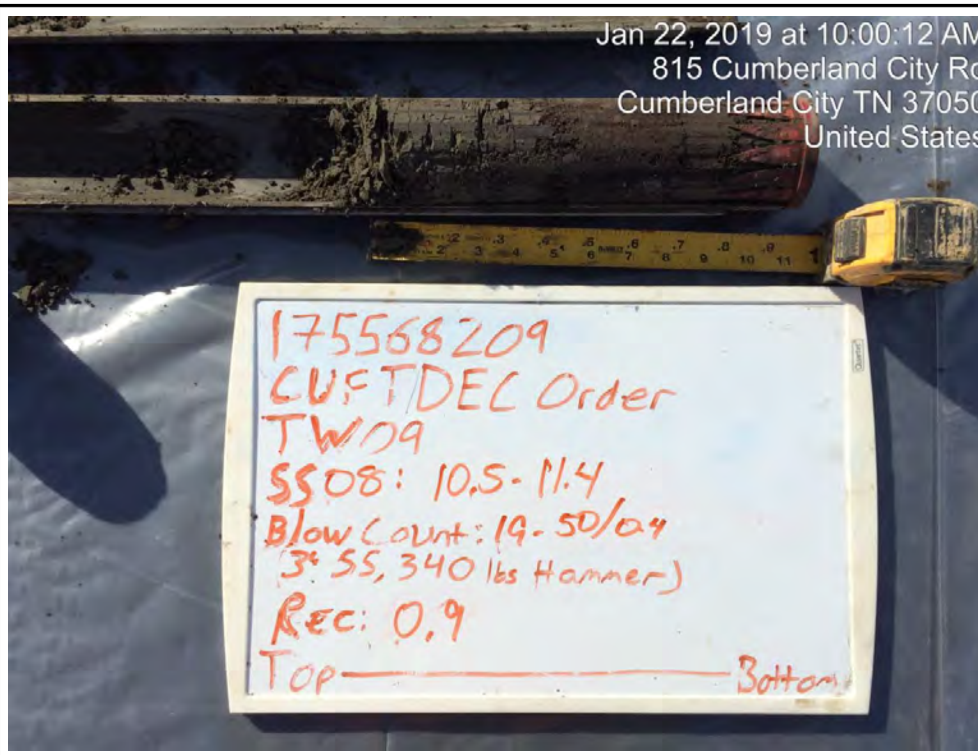


Photograph ID: 8

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (10.5-11.4 feet).



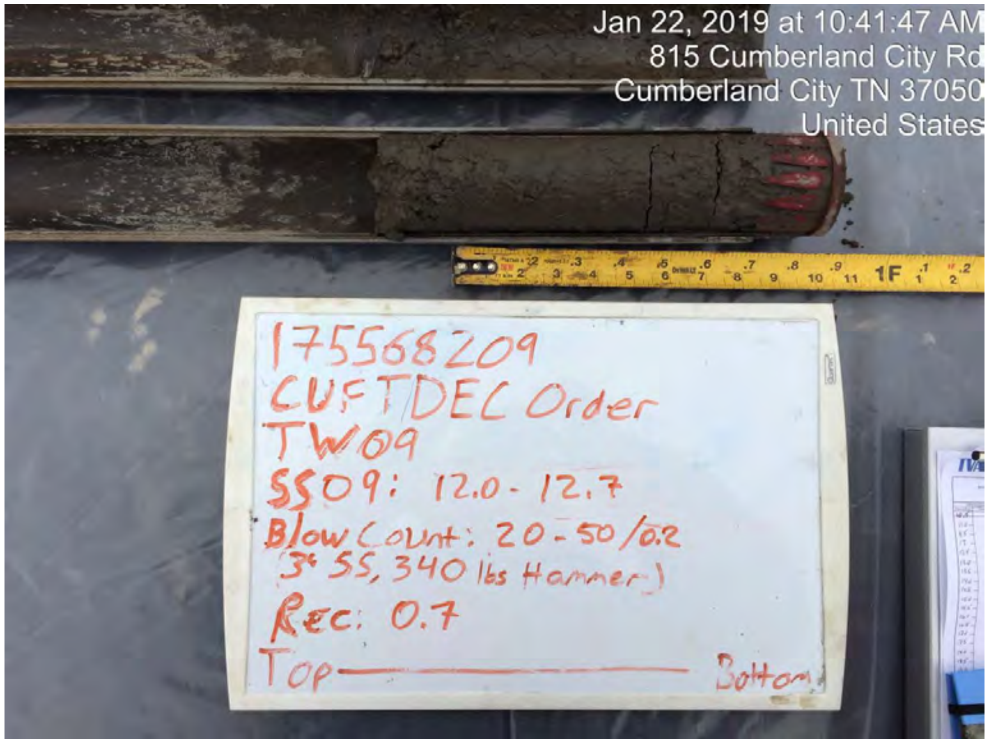
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 9

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (12.0-12.7 feet).

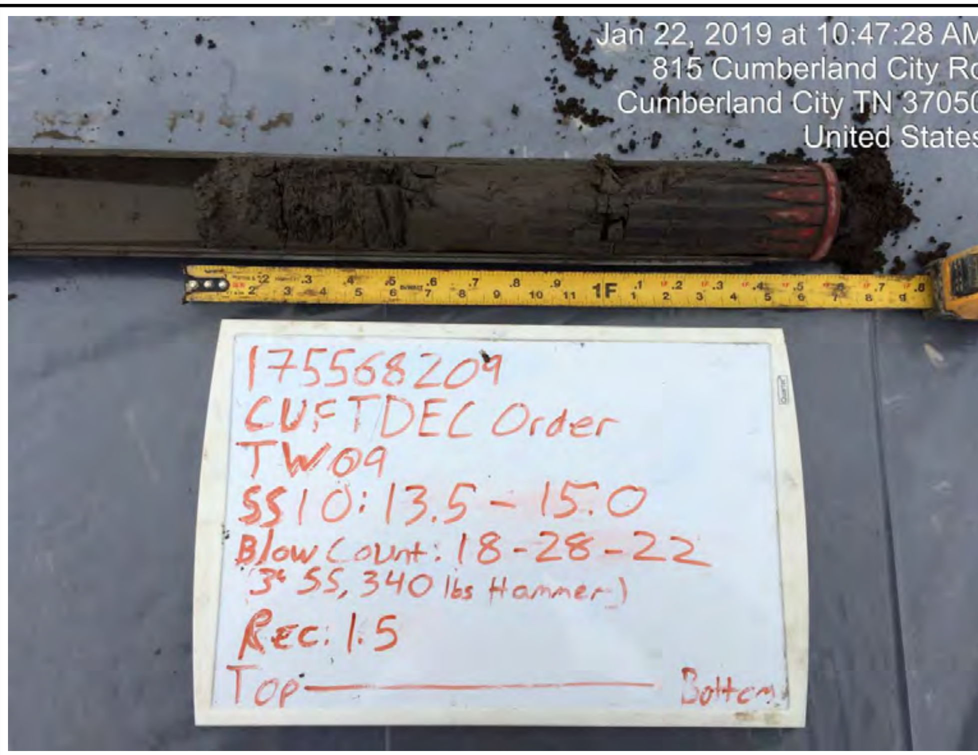


Photograph ID: 10

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (13.5-15.0 feet).



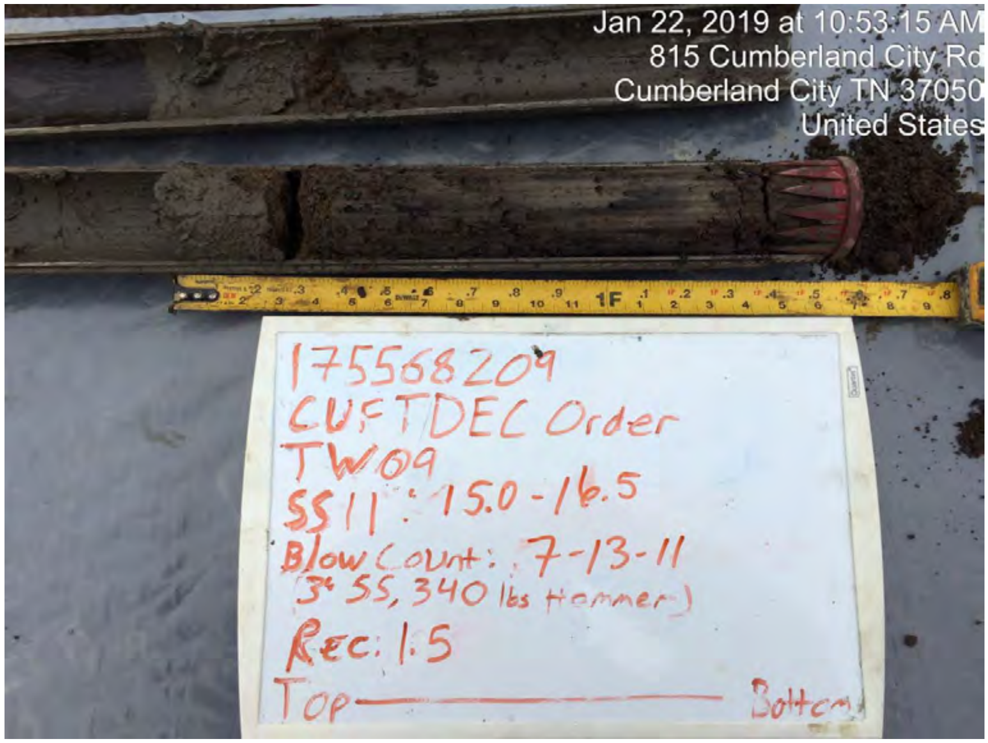
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 11

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (15.0-16.5 feet).

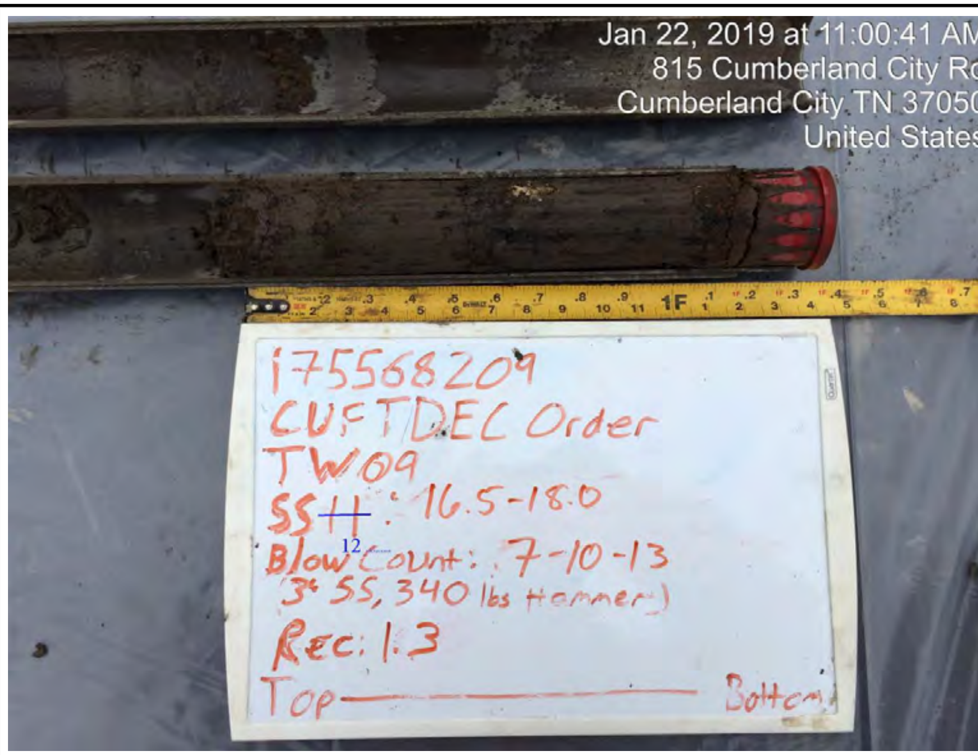


Photograph ID: 12

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (16.5-18.0 feet).



Stantec

Photographic Log

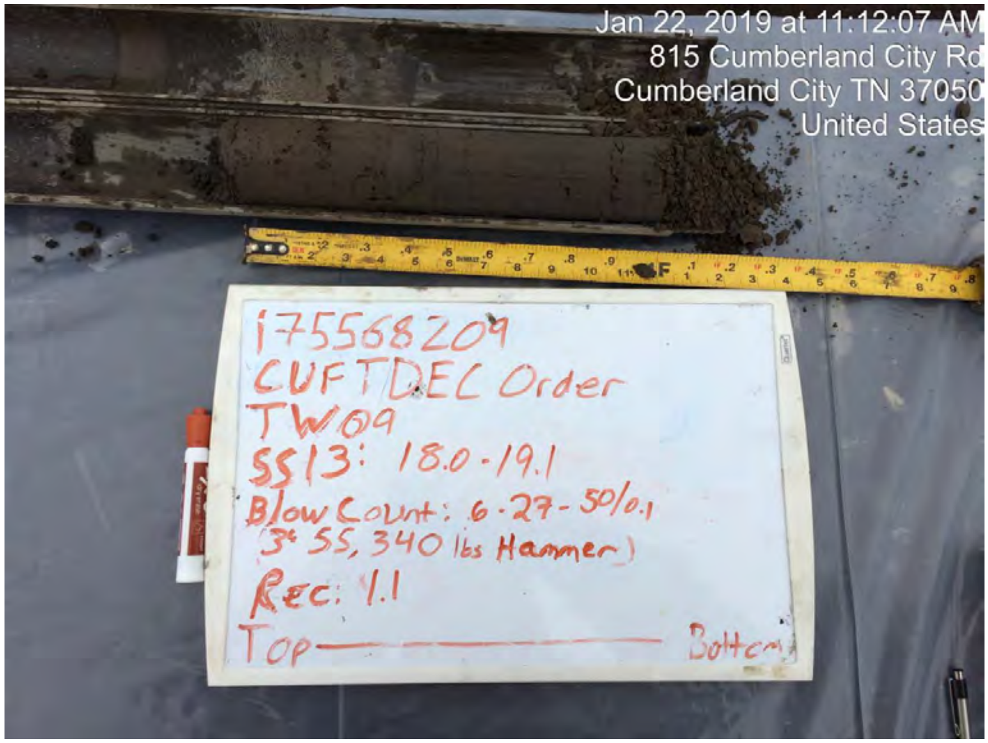
Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 13

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (18.0-19.1 feet).

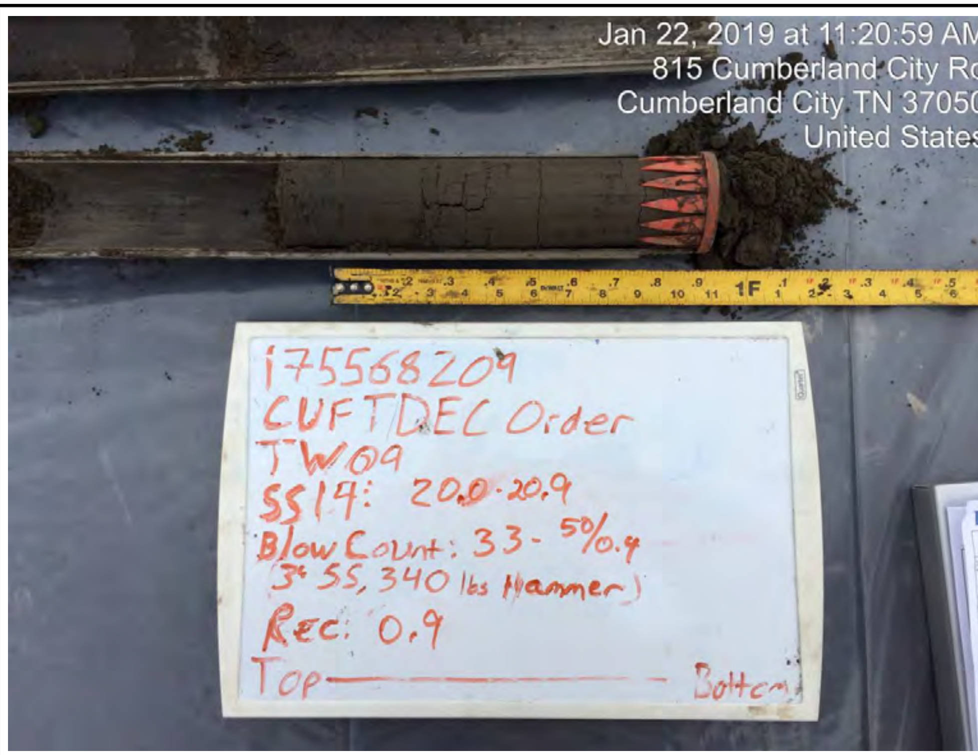


Photograph ID: 14

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

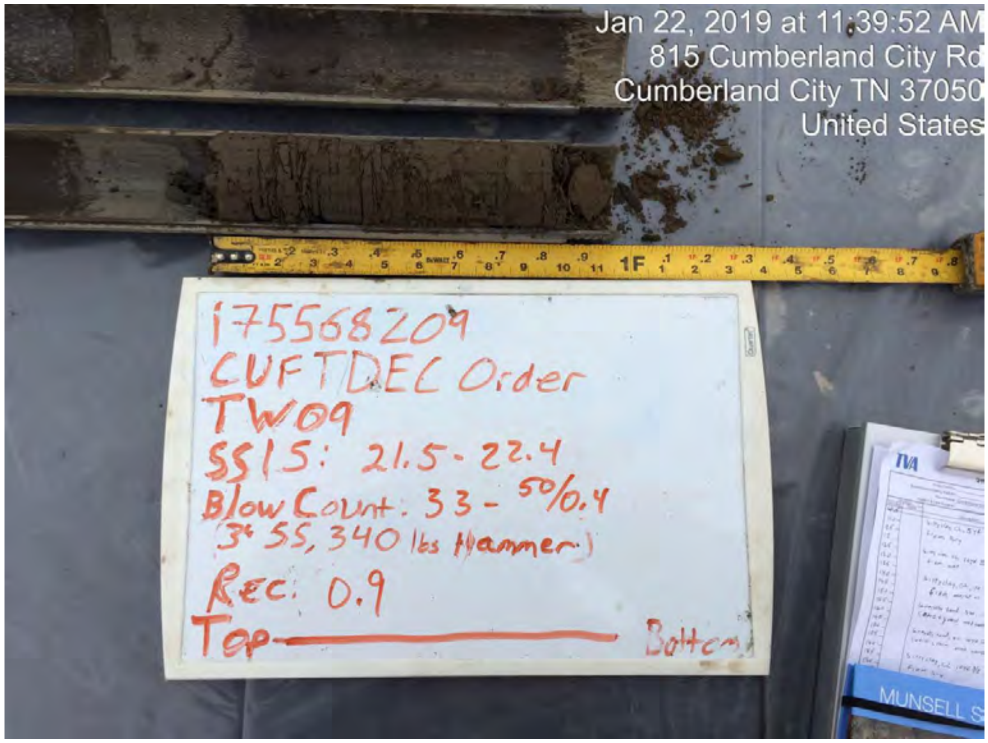
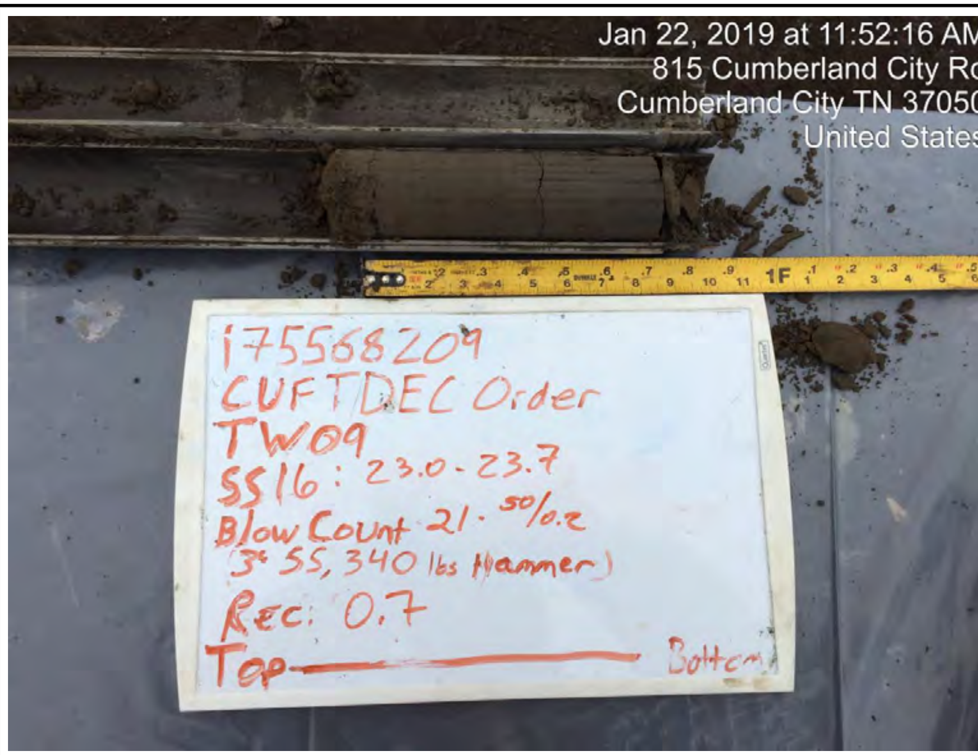
Comments:
Interval (20.0-20.9 feet).



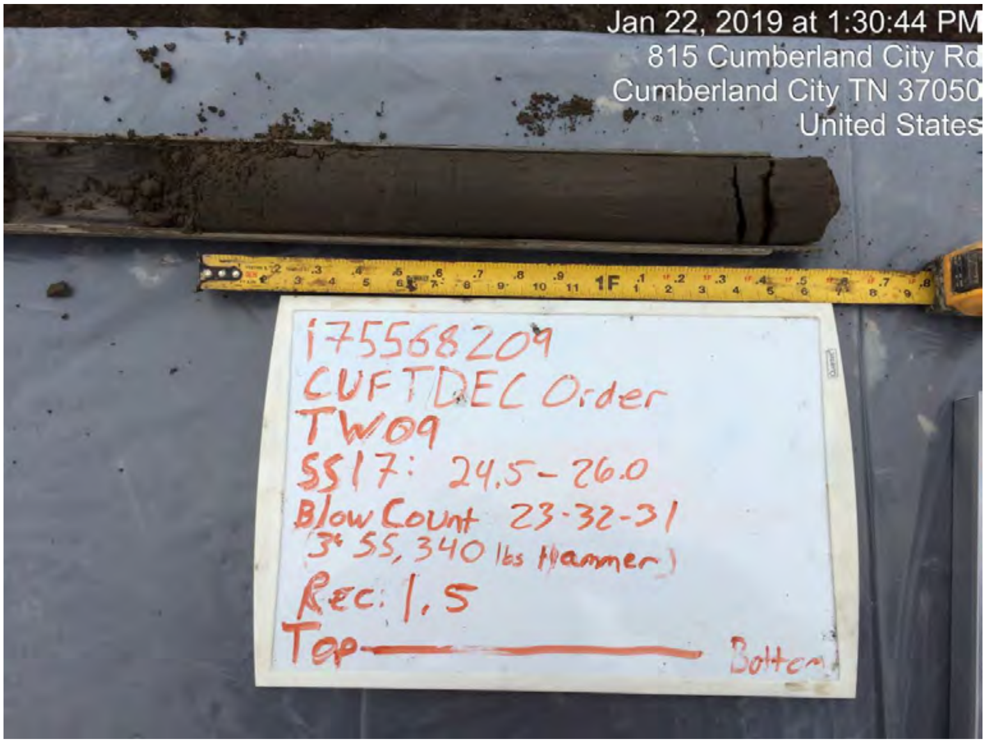
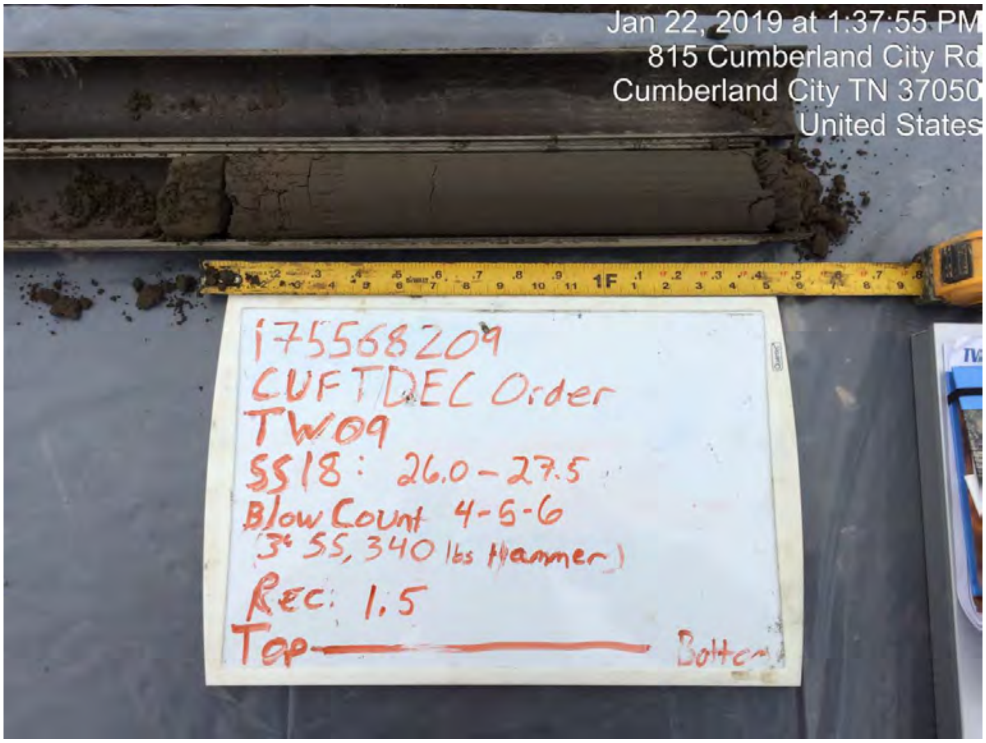
Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 15 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (21.5-22.4 feet).	
Photograph ID: 16 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (23.0-23.7 feet).	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 17 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (24.5-26.0 feet).	
Photograph ID: 18 **Photo Location:** CUF-TW09 **Photo Date:** 1/22/2019 **Comments:** Interval (26.0-27.5 feet).	

Stantec — **Photographic Log**

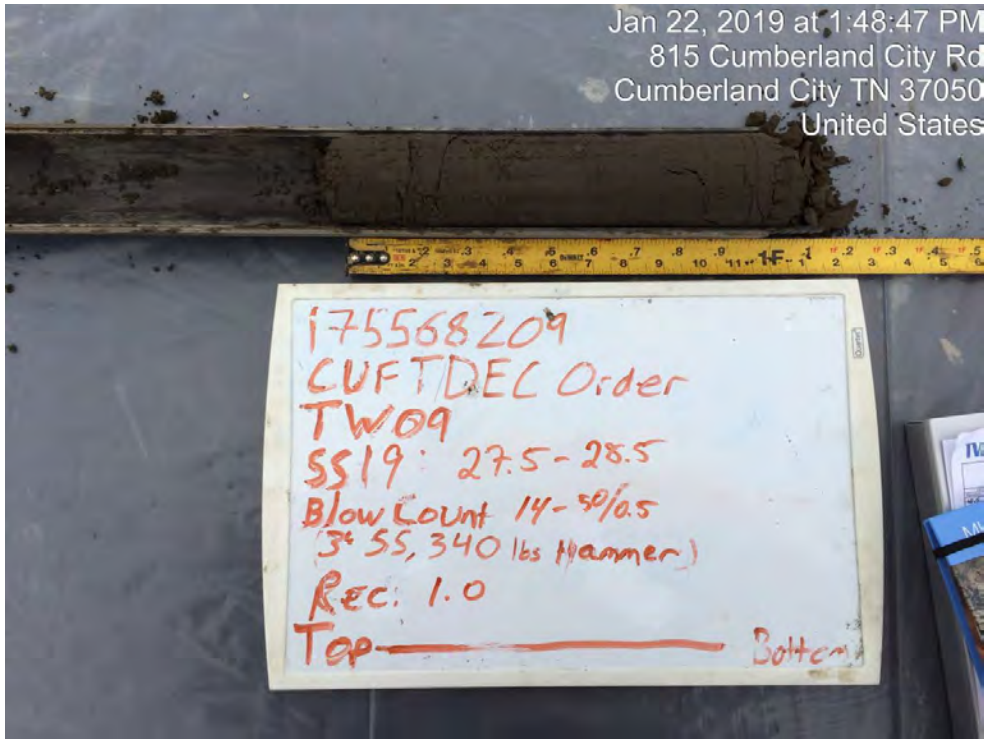
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 19

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (27.5-28.5 feet). Blow count shown on white board should be 14-50.

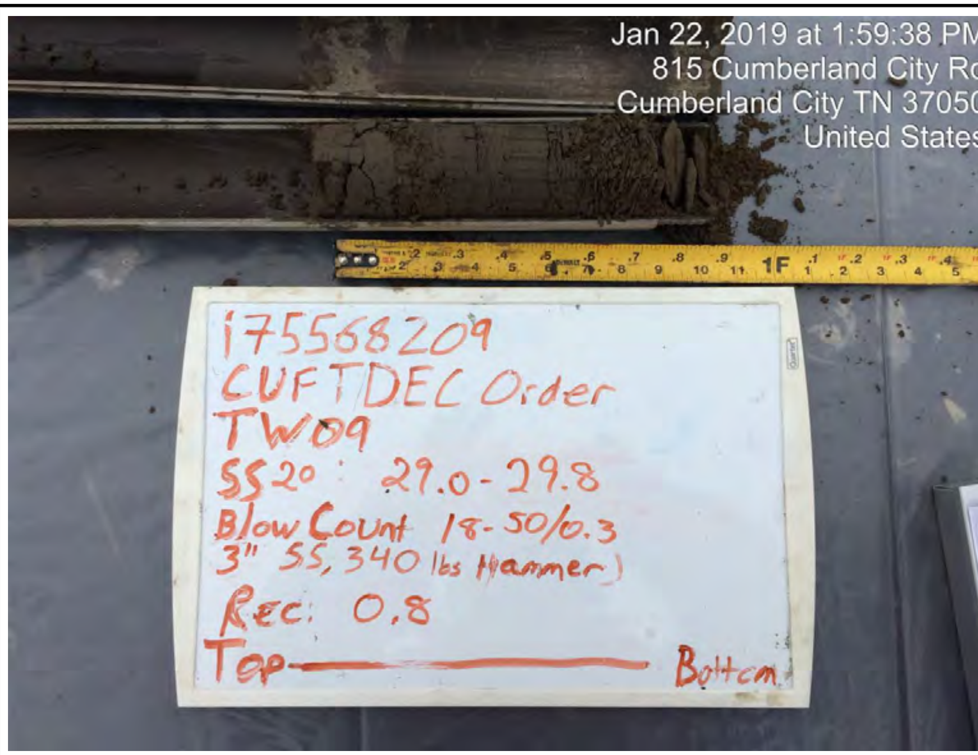


Photograph ID: 20

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (29.0-29.8 feet).



Stantec **Photographic Log**

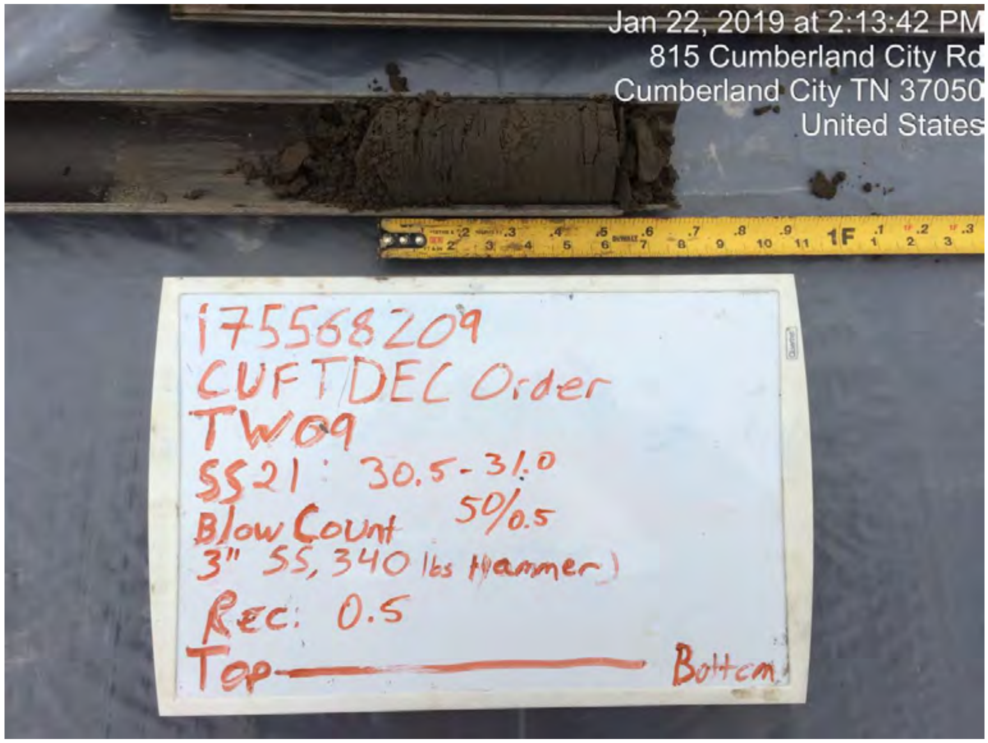
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 21

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (30.5-31.0 feet). Blow count shown on white board should be 50.

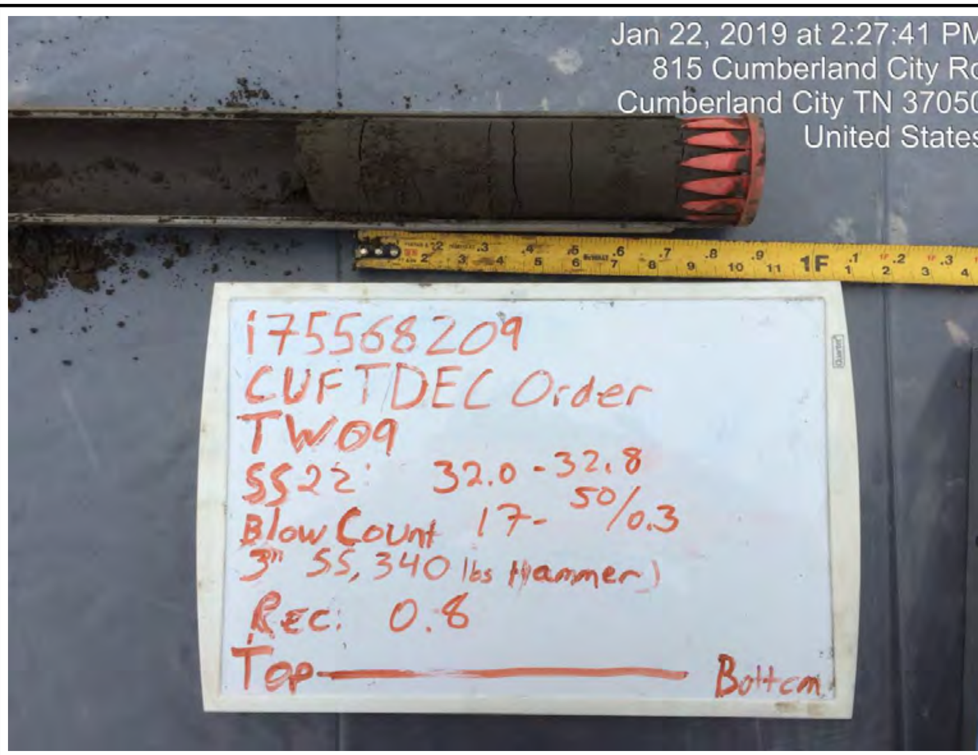


Photograph ID: 22

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (32.0-32.8 feet).



Stantec **Photographic Log**

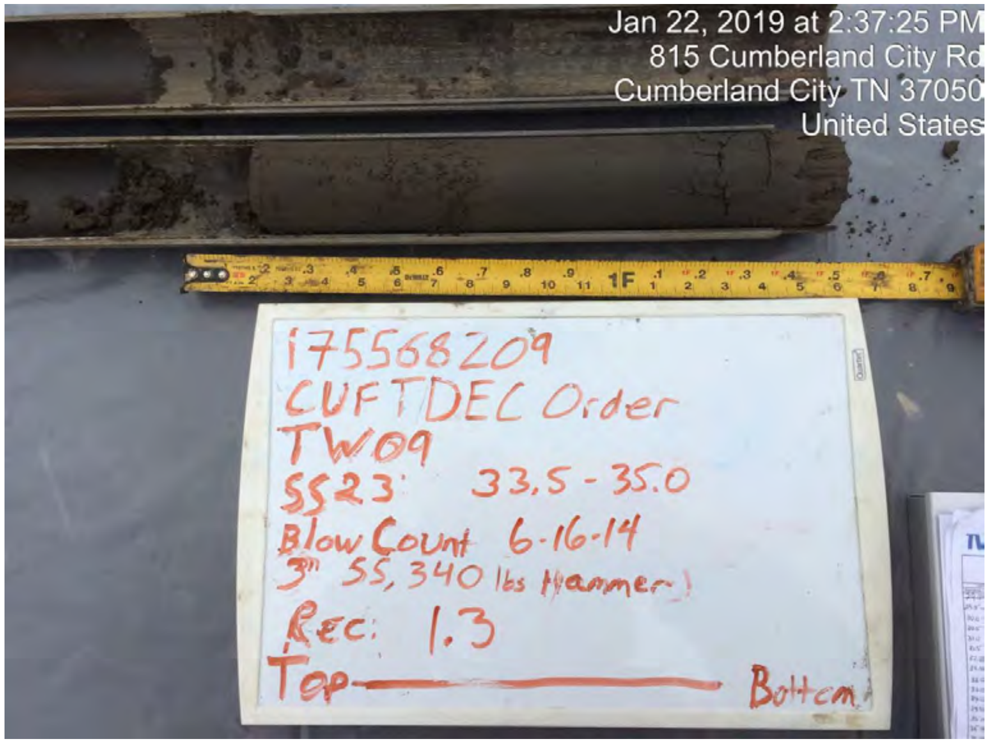
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 23

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (33.5-35.0 feet).

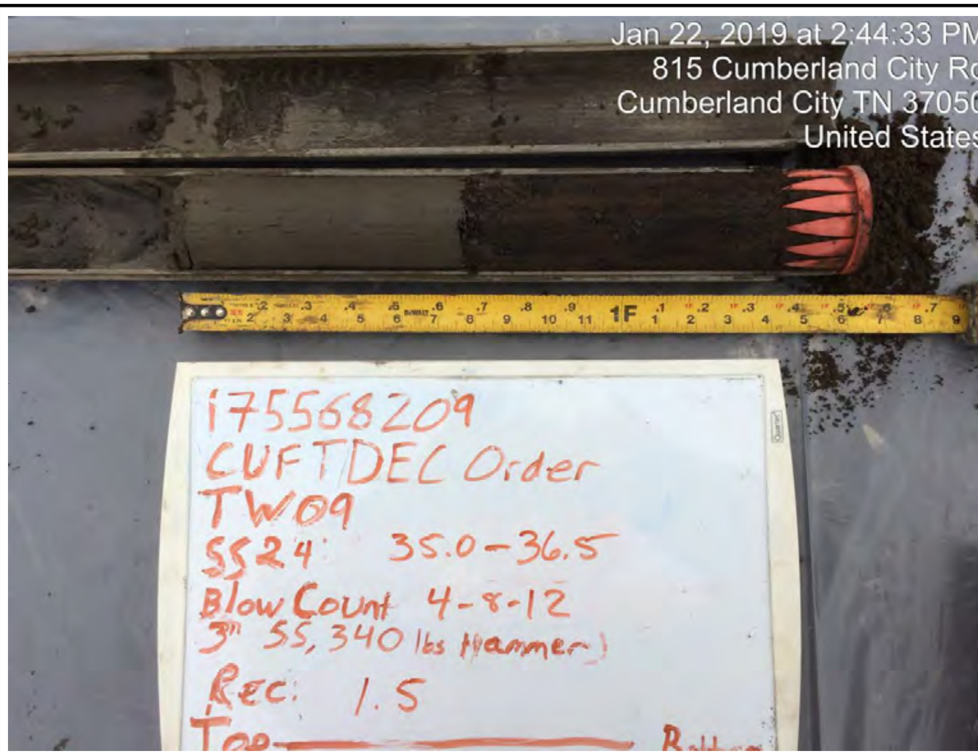


Photograph ID: 24

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (35.0-36.5 feet).



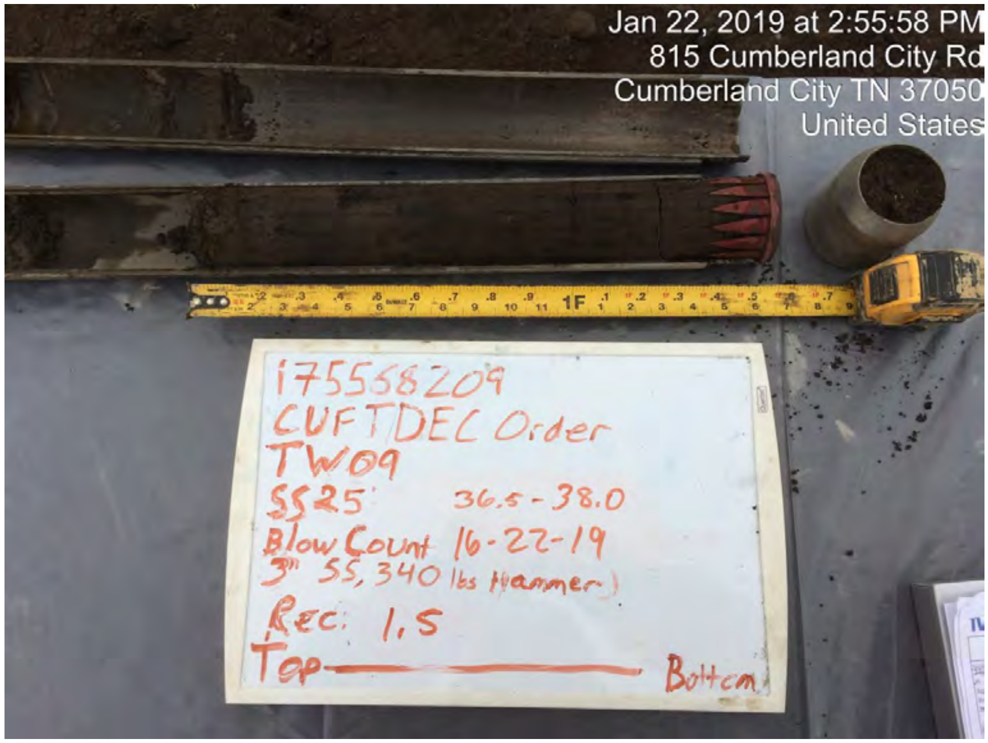
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 25

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (36.5-38.0 feet).

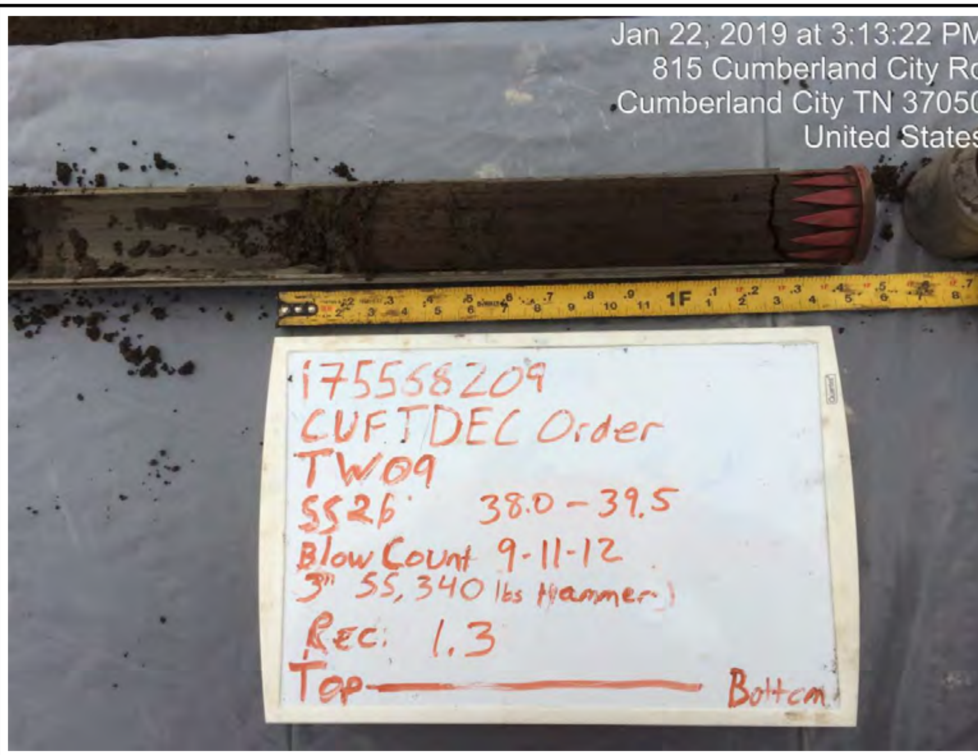


Photograph ID: 26

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (38.0-39.5 feet).



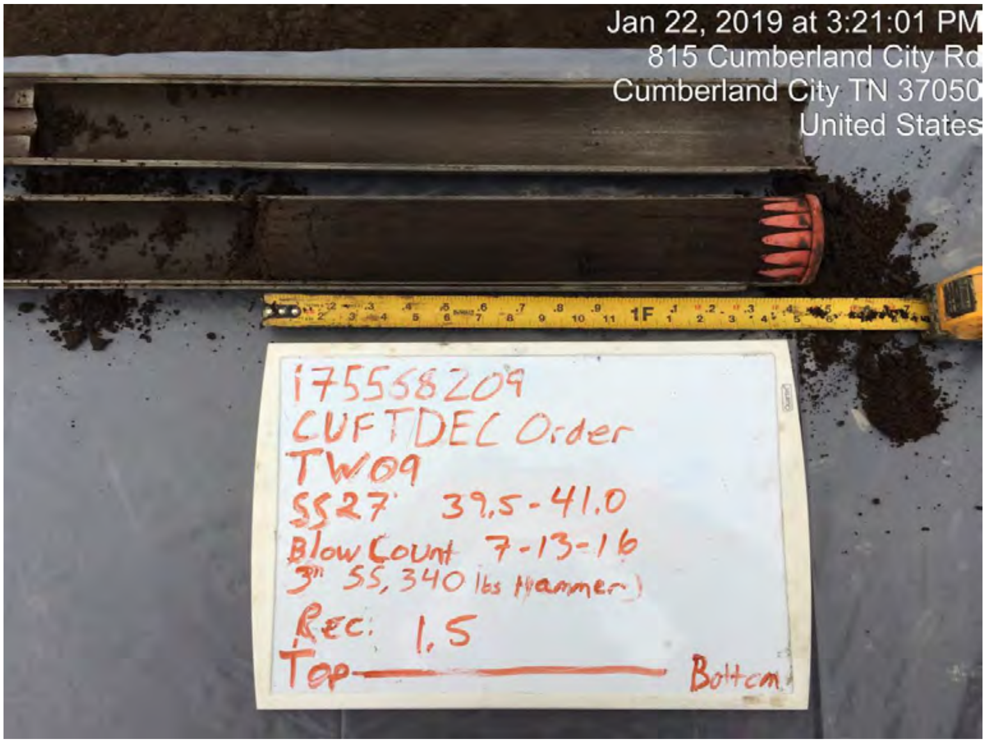
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 27

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (39.5-41.0 feet).

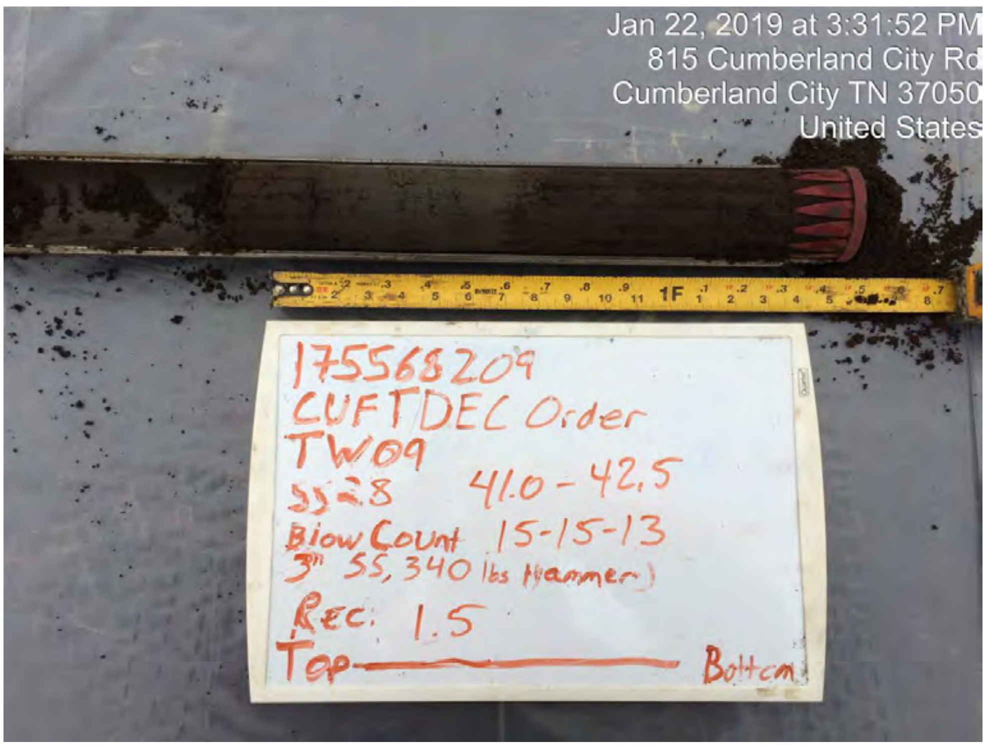


Photograph ID: 28

Photo Location: CUF-TW09

Photo Date: 1/22/2019

Comments: Interval (41.0-42.5 feet).



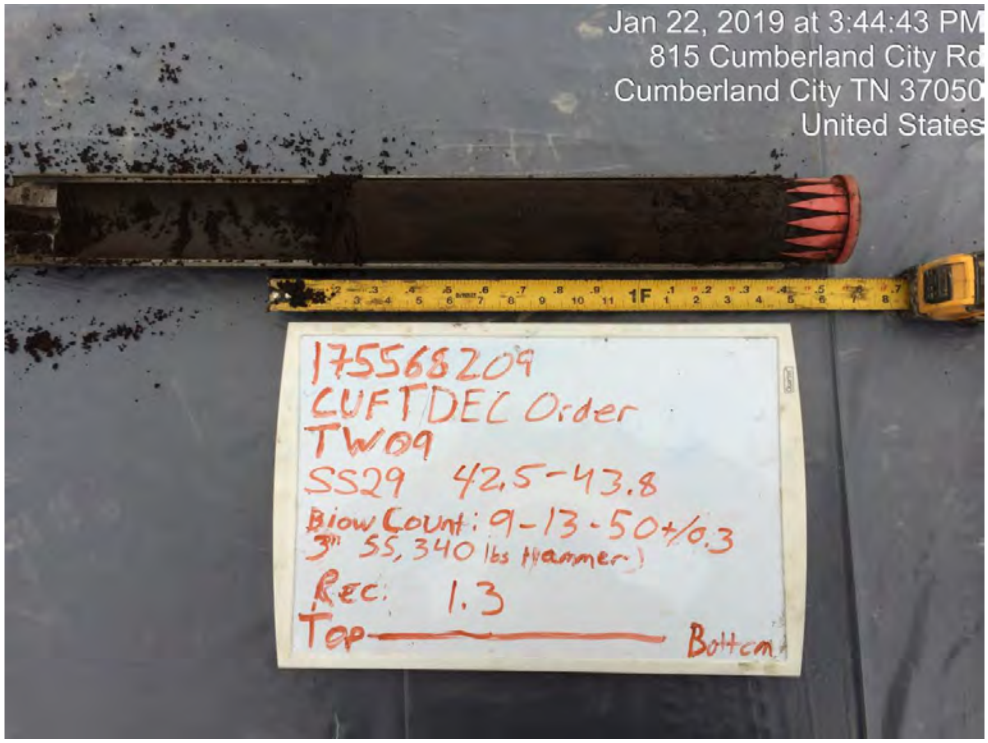
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 29

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (42.5-43.8 feet).

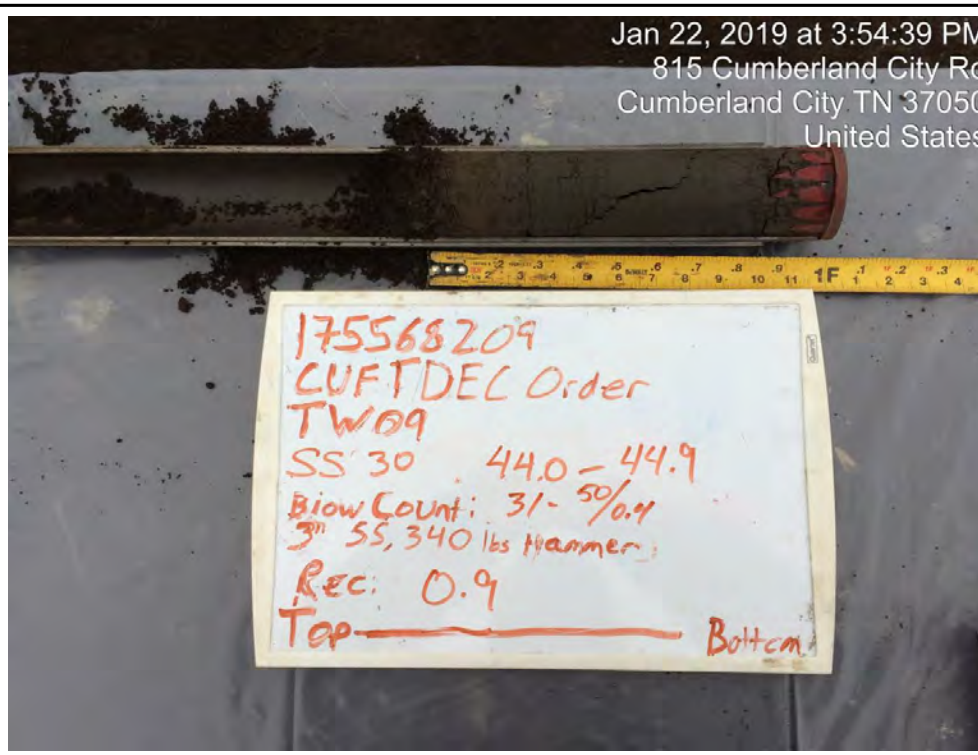


Photograph ID: 30

Photo Location:
CUF-TW09

Photo Date:
1/22/2019

Comments:
Interval (44.0-44.9 feet).



Stantec

Photographic Log

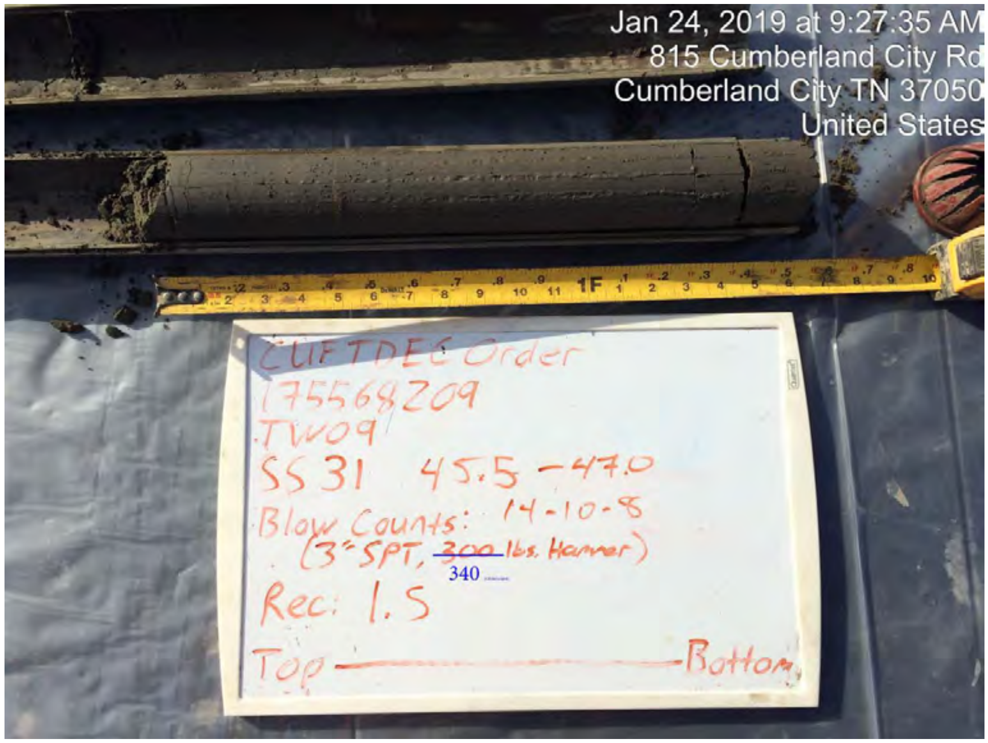
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 31

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (45.5-47.0 feet).

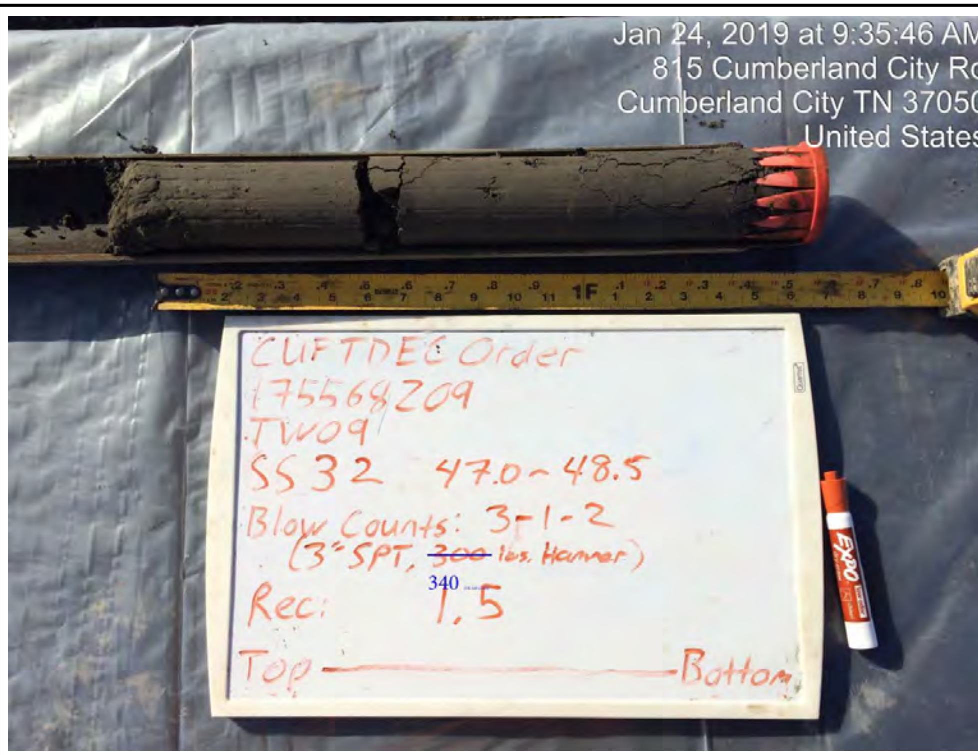


Photograph ID: 32

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (47.0-48.5 feet).



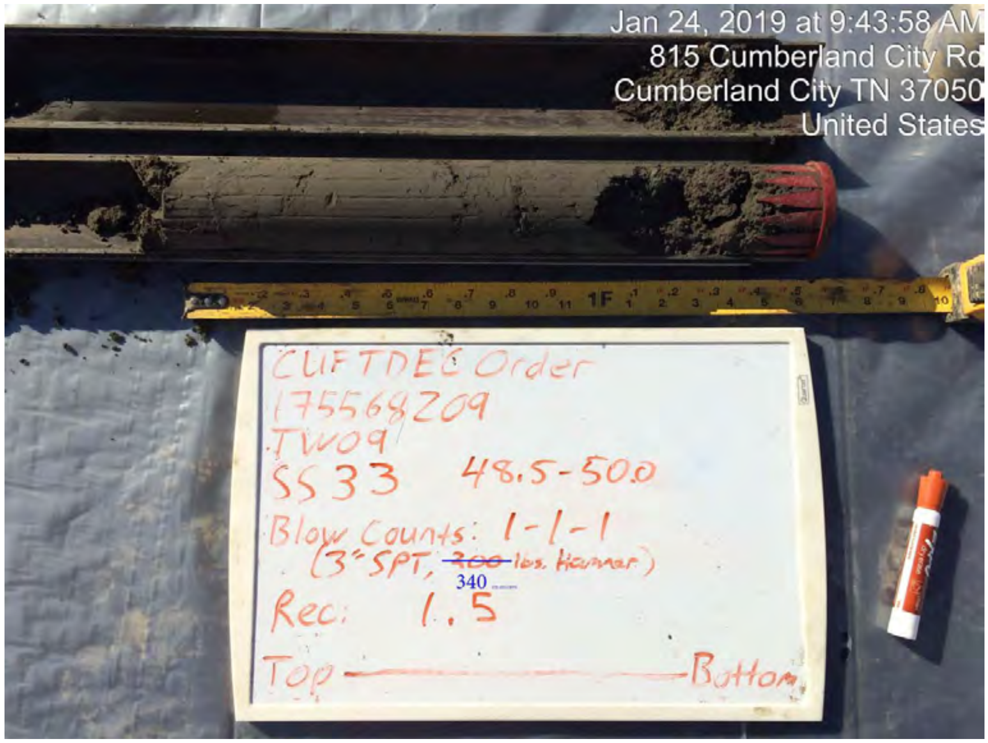
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 33

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (48.5-50.0 feet).

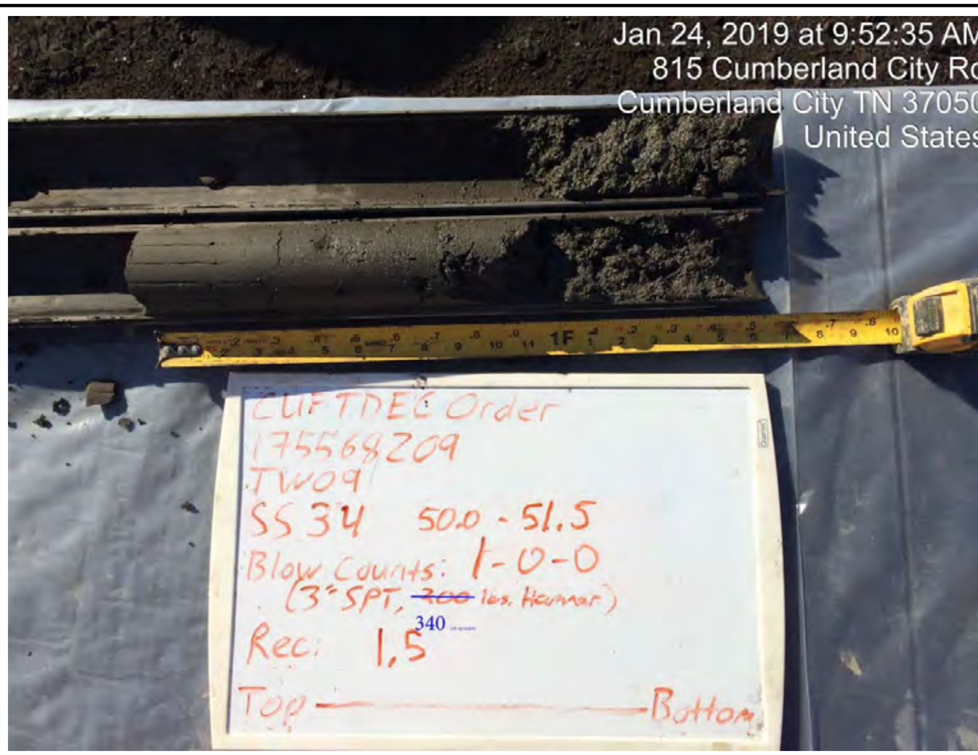


Photograph ID: 34

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (50.0-51.5 feet).
Blow count shown on white board should be 1-WH-WH.



Stantec

Photographic Log

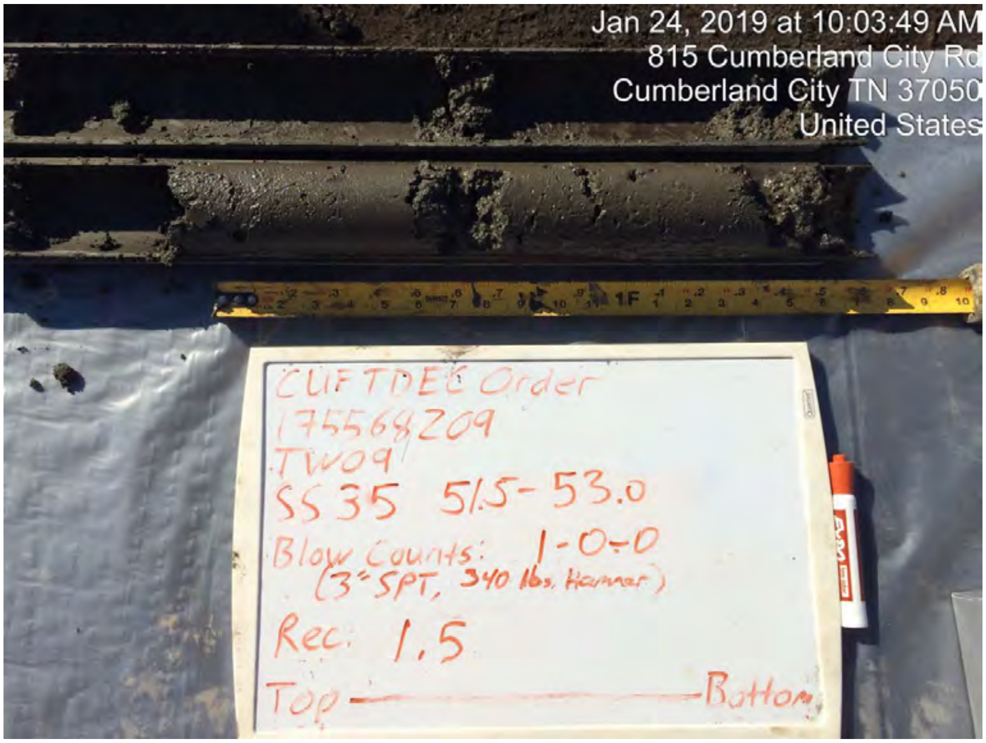
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 35

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (51.5-53.0 feet). Blow count shown on white board should be 1-WH-WH.



Photograph ID: 36

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (53.0-54.5 feet). WOR on white board is the same as WR on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 37

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (54.5-56.0 feet).

Photograph ID: 38

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (56.0-57.5 feet).

Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 39

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

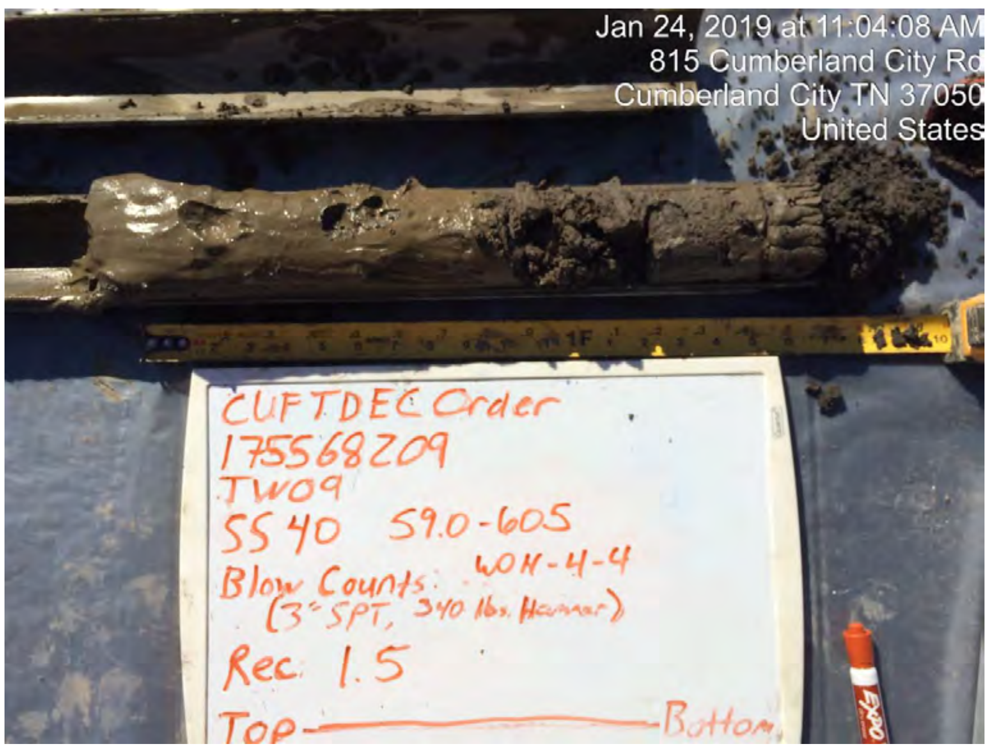
Comments:
Interval (57.5-59.0 feet). WOH on white board is the same as WH on the boring log.

Photograph ID: 40

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (59.0-60.5 feet). WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 41

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

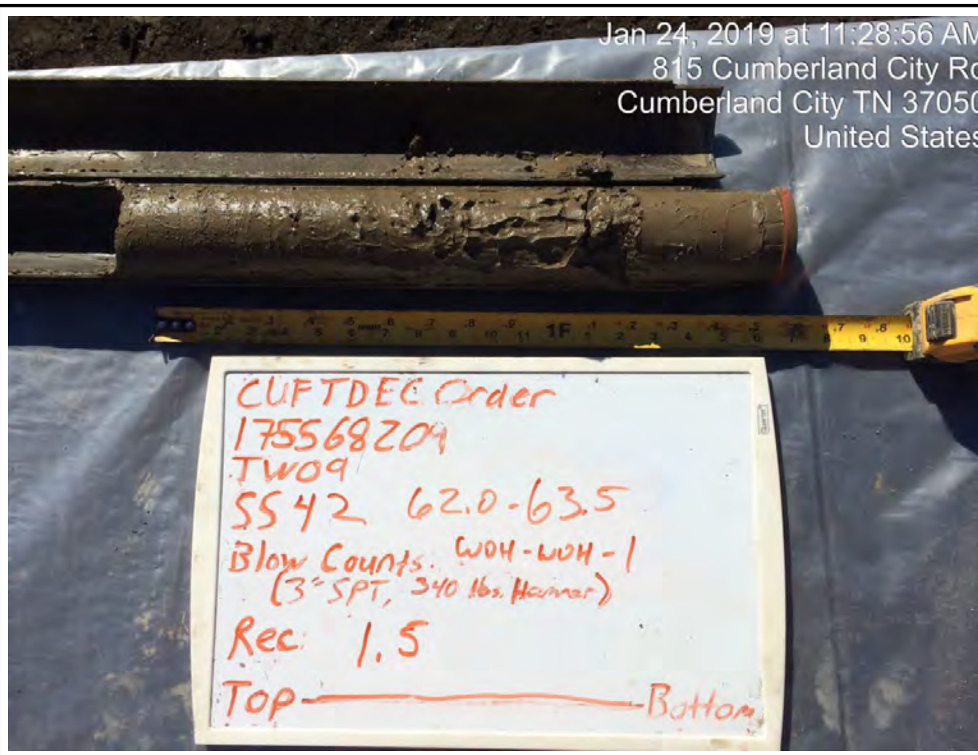
Comments:
Interval (60.5-62.0 feet).

Photograph ID: 42

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (62.0-63.5 feet). WOH on white board is the same as WH on the boring log.



Stantec

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 43

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Photo of interval (63.5-65.5 feet) unavailable because sample collected with shelby tube.

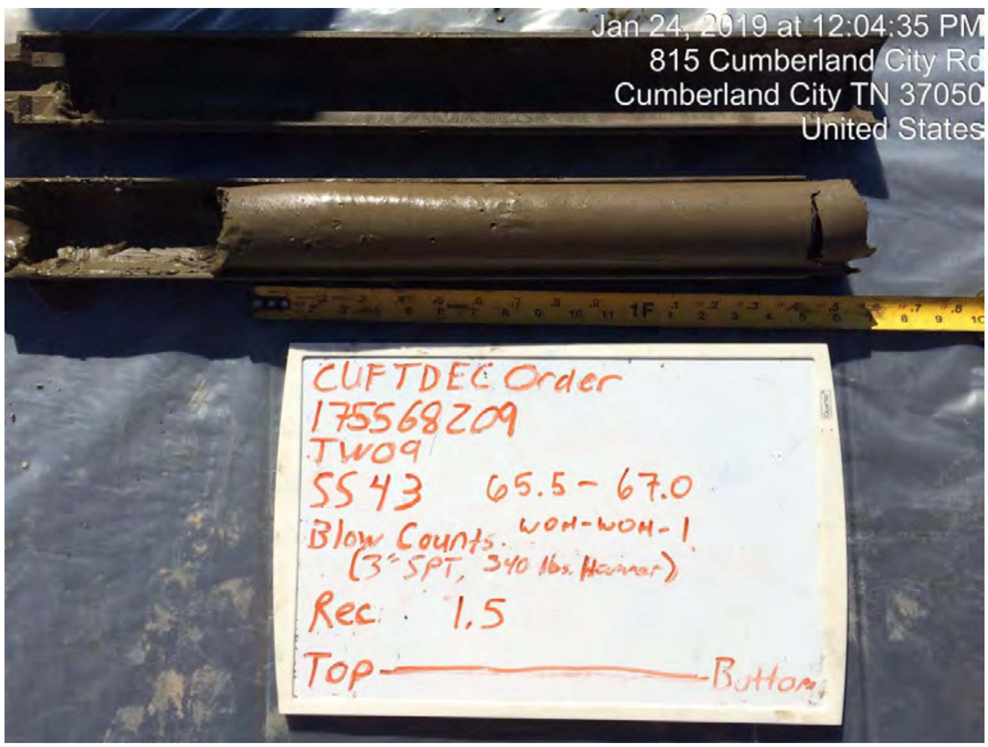
No Photo Applicable

Photograph ID: 44

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (65.5-67.0 feet). WOH on white board is the same as WH on the boring log.



Stantec **Photographic Log**

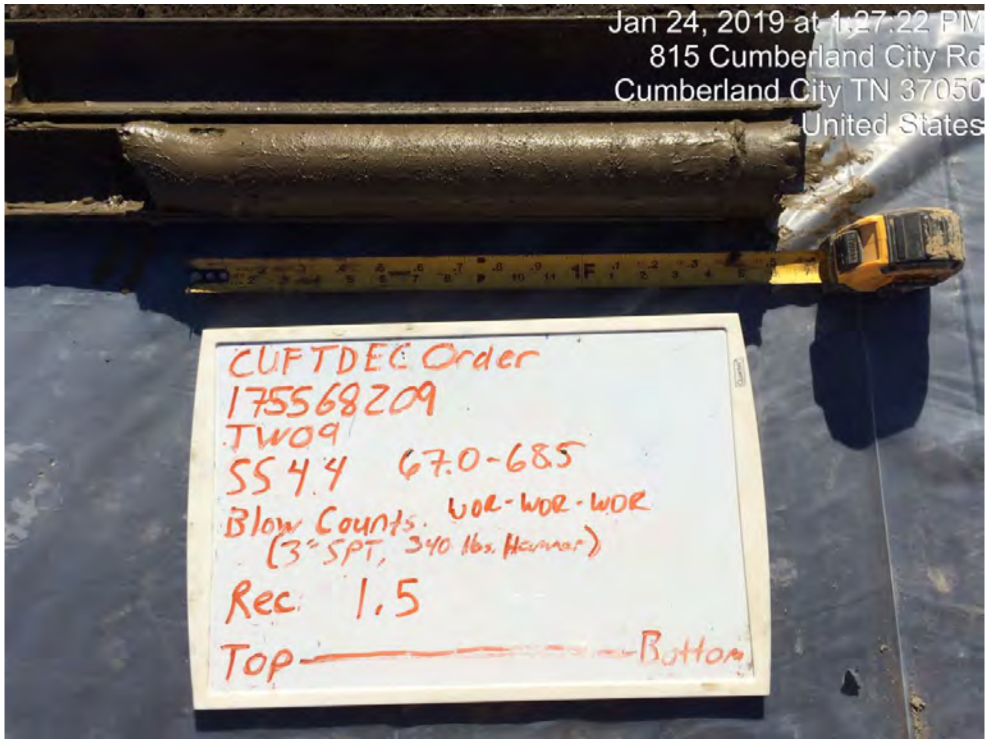
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 45

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (67.0-68.5 feet). WOR on white board is the same as WR on the boring log.



Photograph ID: 46

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (68.5-70.0 feet). WOR on white board is the same as WR on the boring log.

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 47

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Photo of interval (70.0-72.0 feet) unavailable because sample collected with shelby tube.

No Photo Applicable

Photograph ID: 48

Photo Location:
CUF-TW09

Photo Date:
1/24/2019

Comments:
Interval (72.0-73.5 feet). WOR on white board is the same as WR on the boring log.

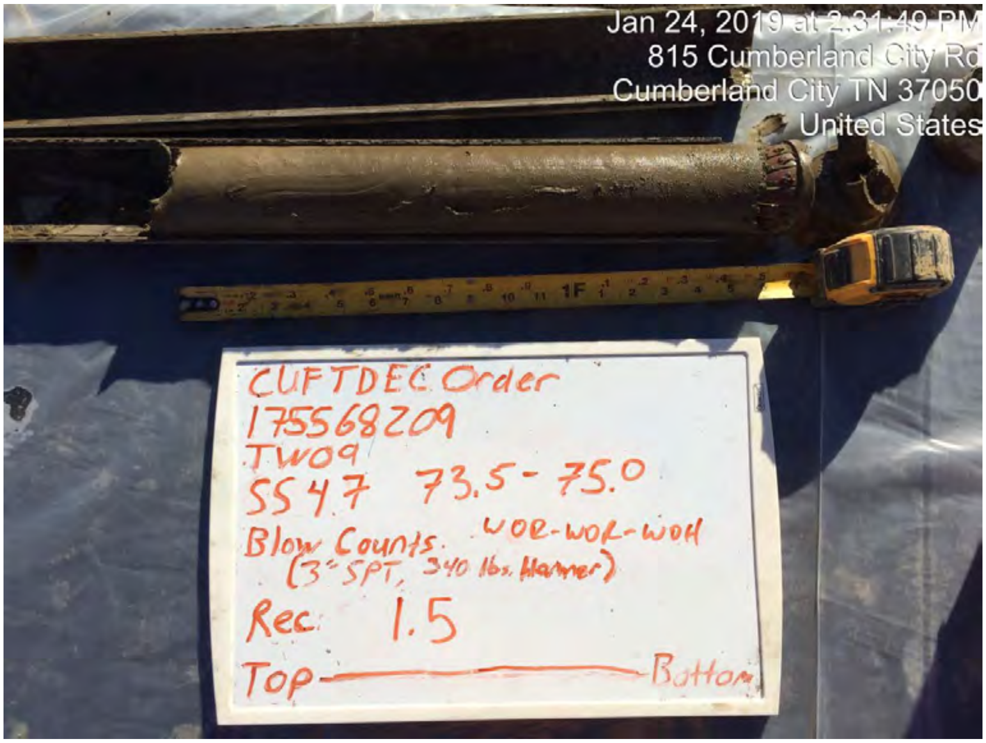
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 49

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (73.5-75.0 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.

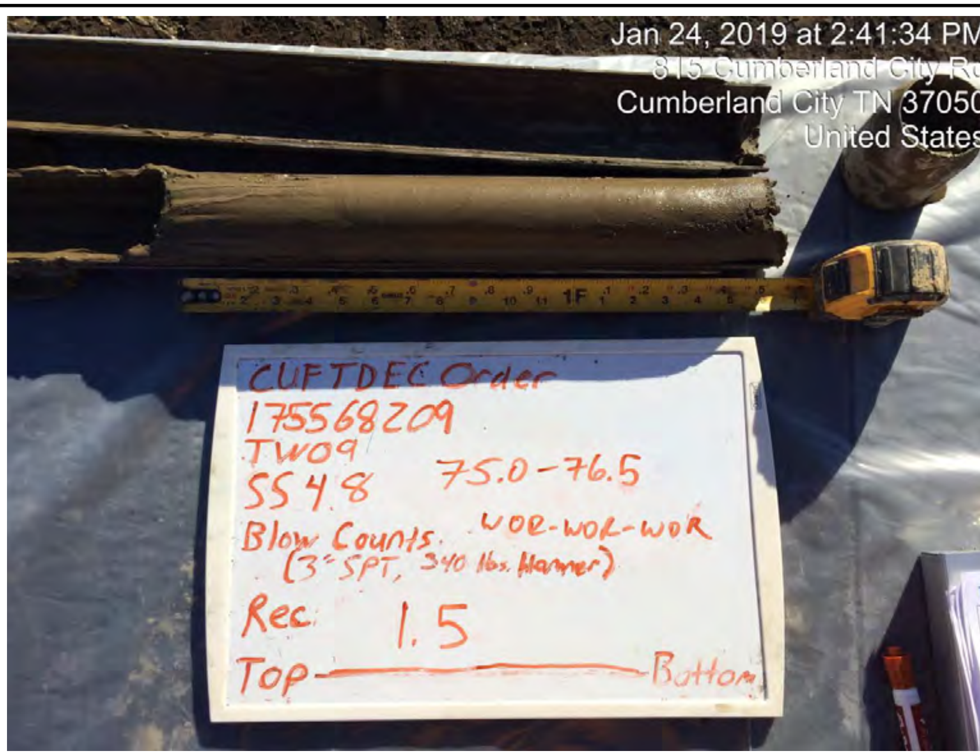


Photograph ID: 50

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (75.0-76.5 feet). WOR on white board is the same as WR on the boring log.



Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 51

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments:
Interval (76.5-78.0 feet).

Photograph ID: 52

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments:
Interval (78.0-79.5 feet). Blow count shown on white board should be 1-WH-WH.

Stantec

Photographic Log

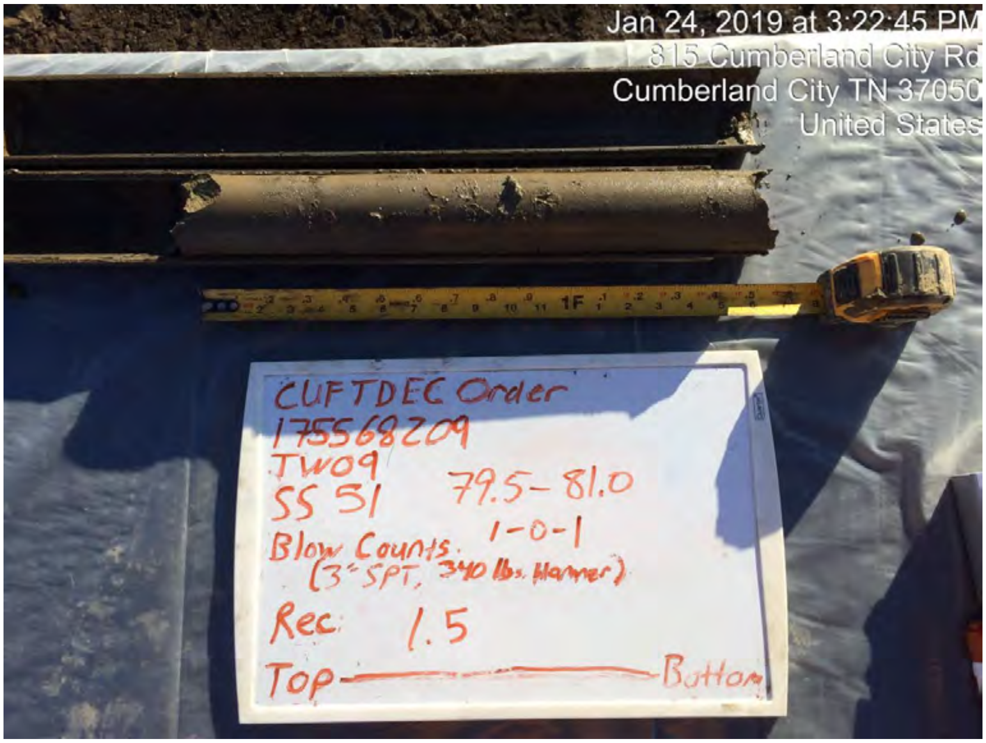
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 53

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (79.5-81.0 feet). Blow count shown on white board should be 1-WH-1.



Photograph ID: 54

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (81.0-82.5 feet). WOR on white board is the same as WR on the boring log.

Stantec

Photographic Log

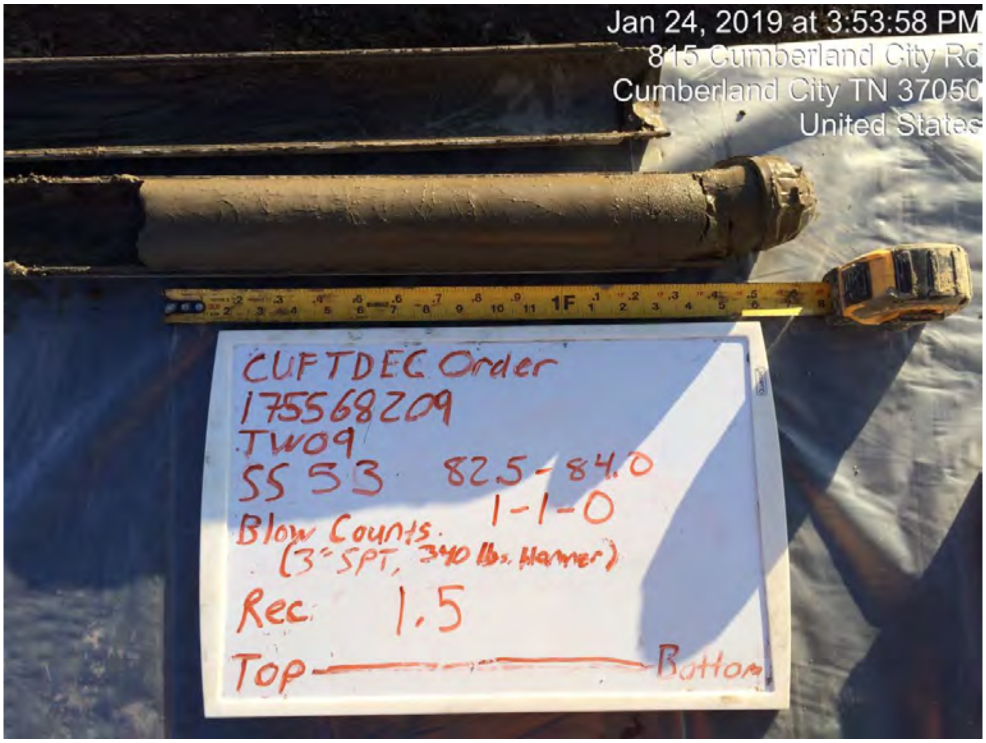
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 55

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (82.5-84.0 feet). Blow count shown on white board should be 1-1-WH.

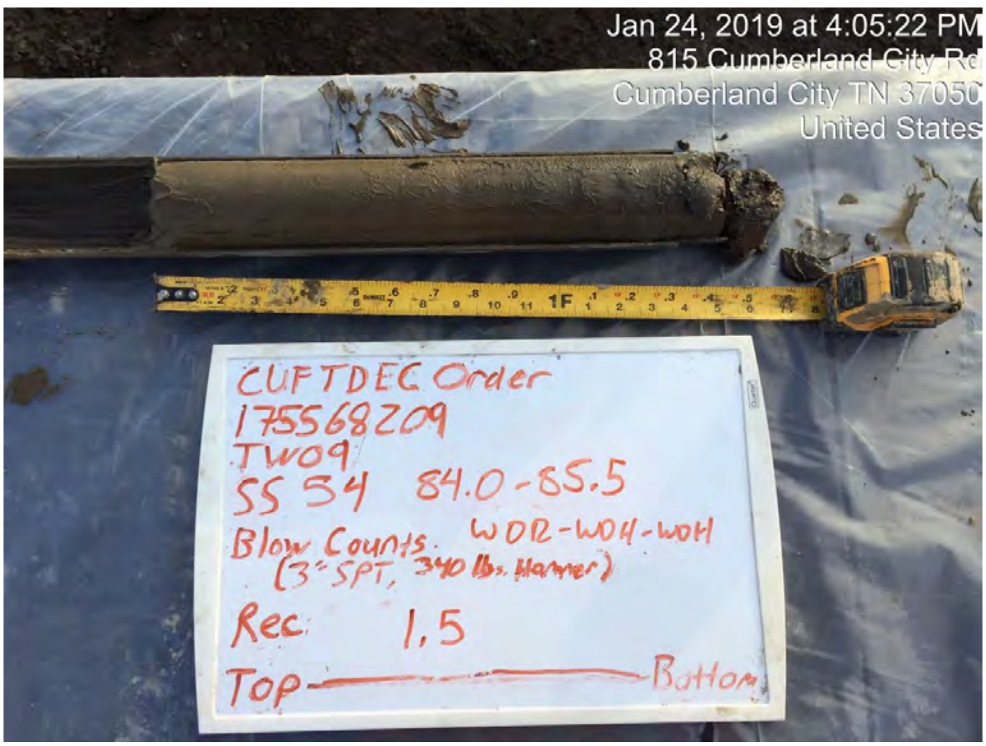


Photograph ID: 56

Photo Location: CUF-TW09

Photo Date: 1/24/2019

Comments: Interval (84.0-85.5 feet). WOR and WOH on white board are the same as WR and WH, respectively, on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 57

Photo Location:
CUF-TW09

Photo Date:
1/25/2019

Comments:
Interval (85.5-87.0 feet). WOR on white board is the same as WR on the boring log.

Photograph ID: 58

Photo Location:
CUF-TW09

Photo Date:
1/25/2019

Comments:
Interval (87.0-88.5 feet). WOR on white board is the same as WR on the boring log.

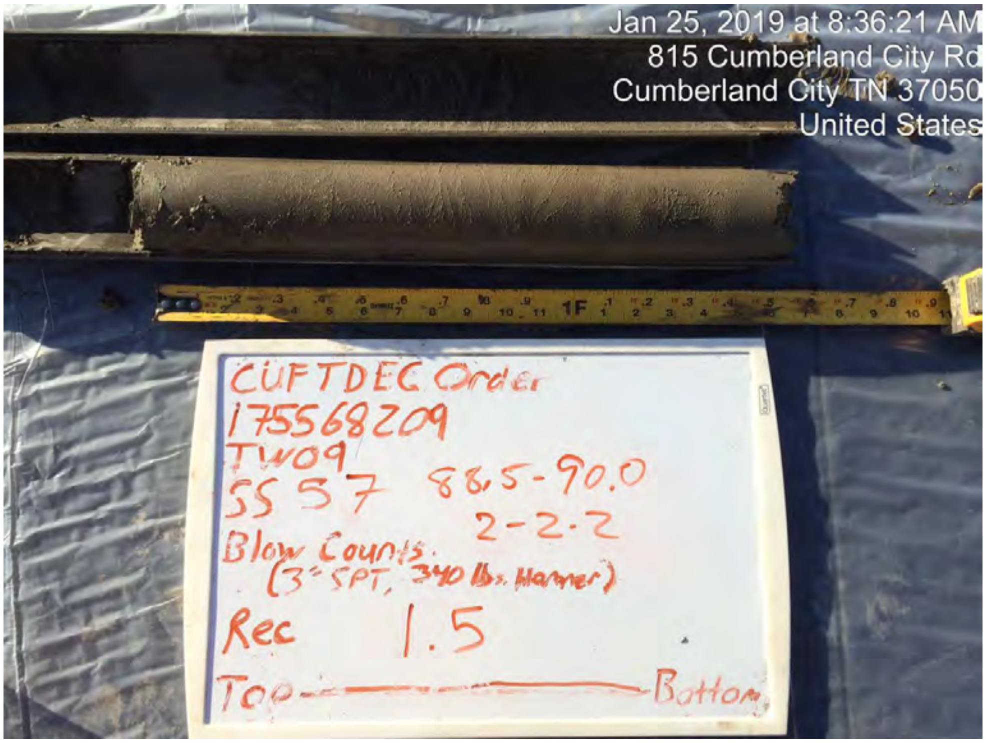
Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 59

Photo Location: CUF-TW09

Photo Date: 1/25/2019

Comments: Interval (88.5-90.0 feet).

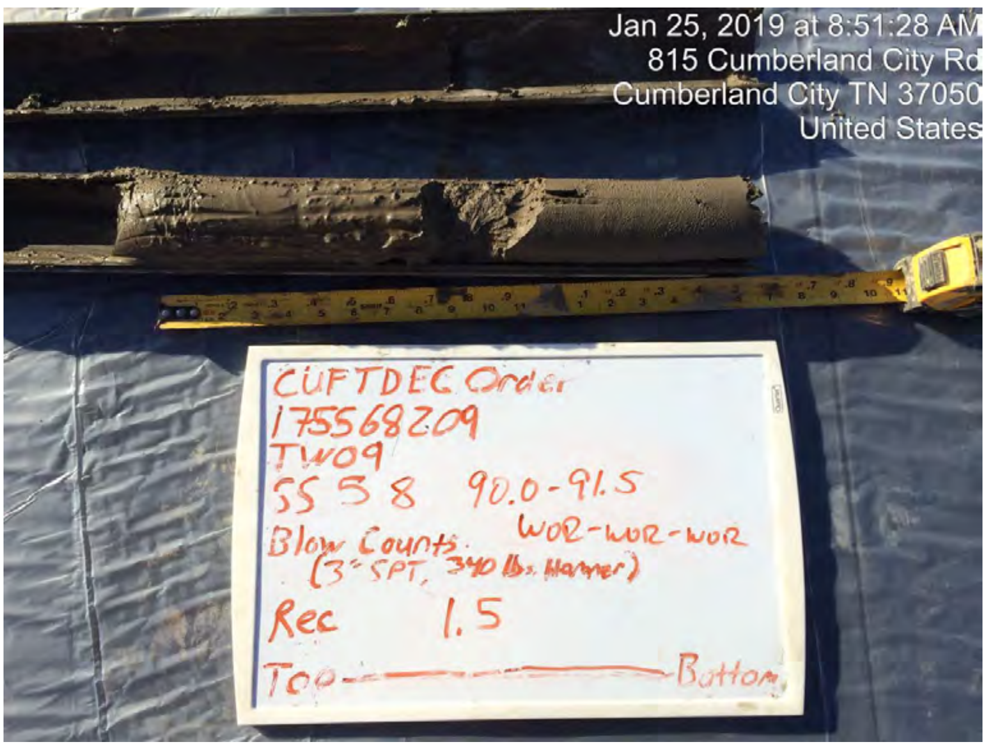


Photograph ID: 60

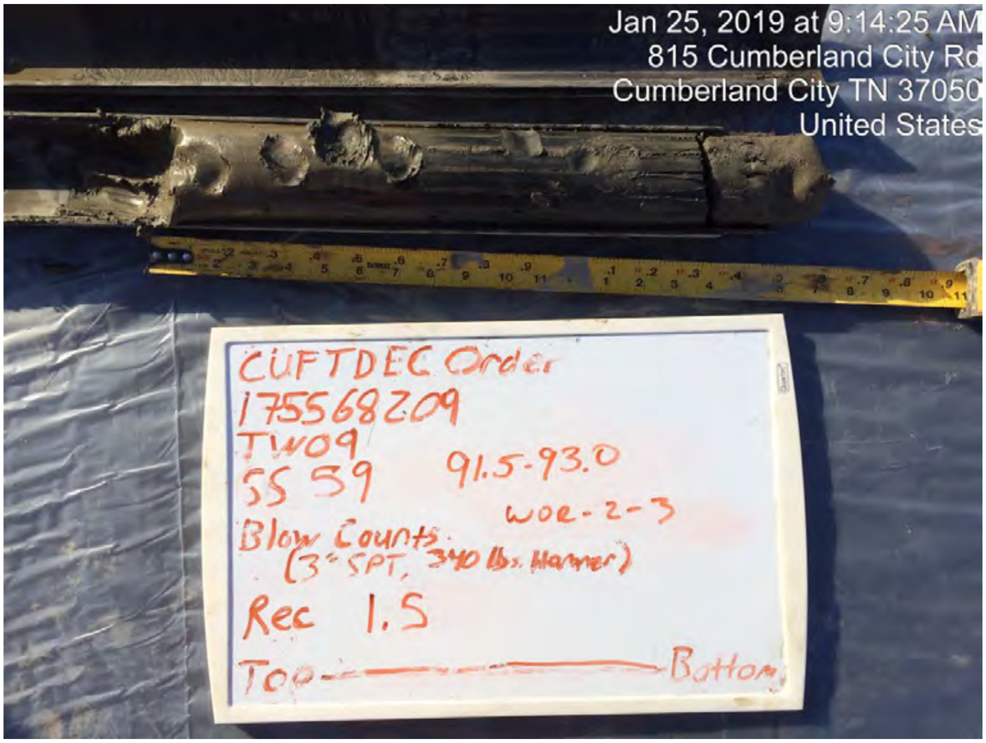
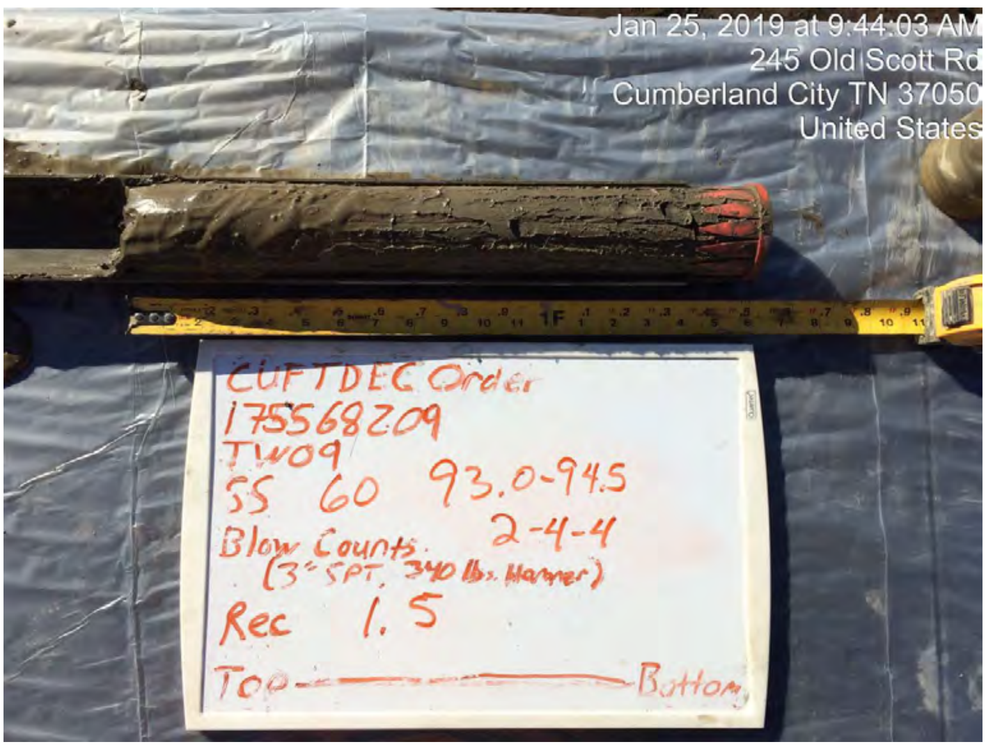
Photo Location: CUF-TW09

Photo Date: 1/25/2019

Comments: Interval (90.0-91.5 feet). WOR on white board is the same as WR on the boring log.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 61 **Photo Location:** CUF-TW09 **Photo Date:** 1/25/2019 **Comments:** Interval (91.5-93.0 feet). WOR on white board is the same as WR on the boring log.	
Photograph ID: 62 **Photo Location:** CUF-TW09 **Photo Date:** 1/25/2019 **Comments:** Interval (93.0-94.5 feet).	

Photographic Log

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 63

Photo Location: CUF-TW09

Photo Date: 1/25/2019

Comments: Photo of interval (94.5-96.5 feet) unavailable because sample collected with shelby tube.

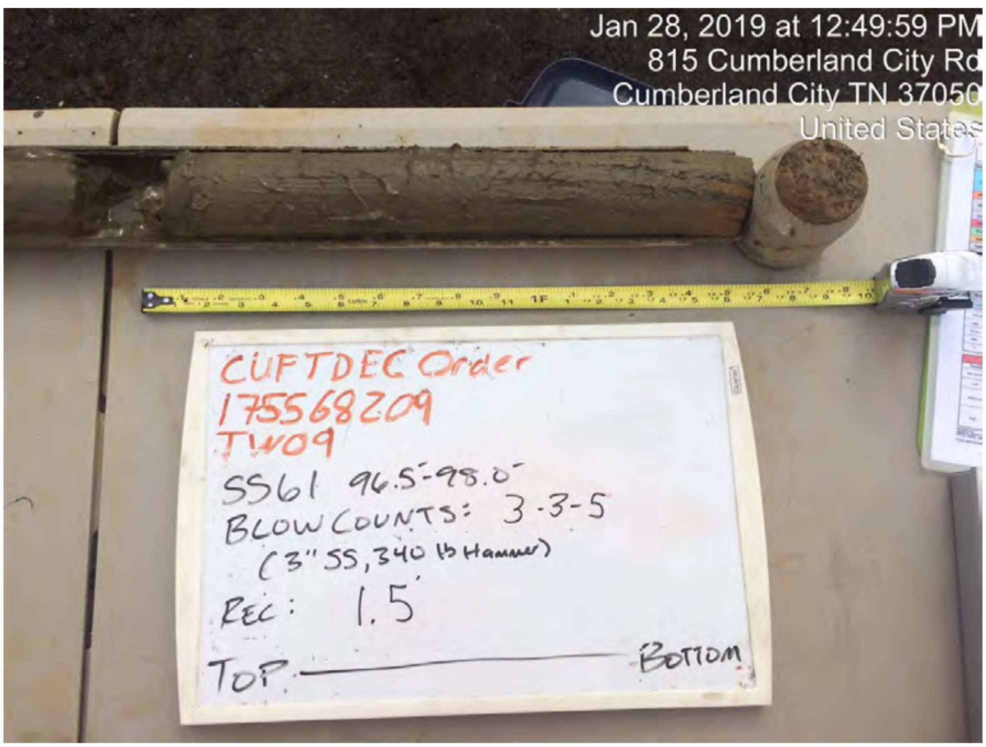
No Photo Applicable

Photograph ID: 64

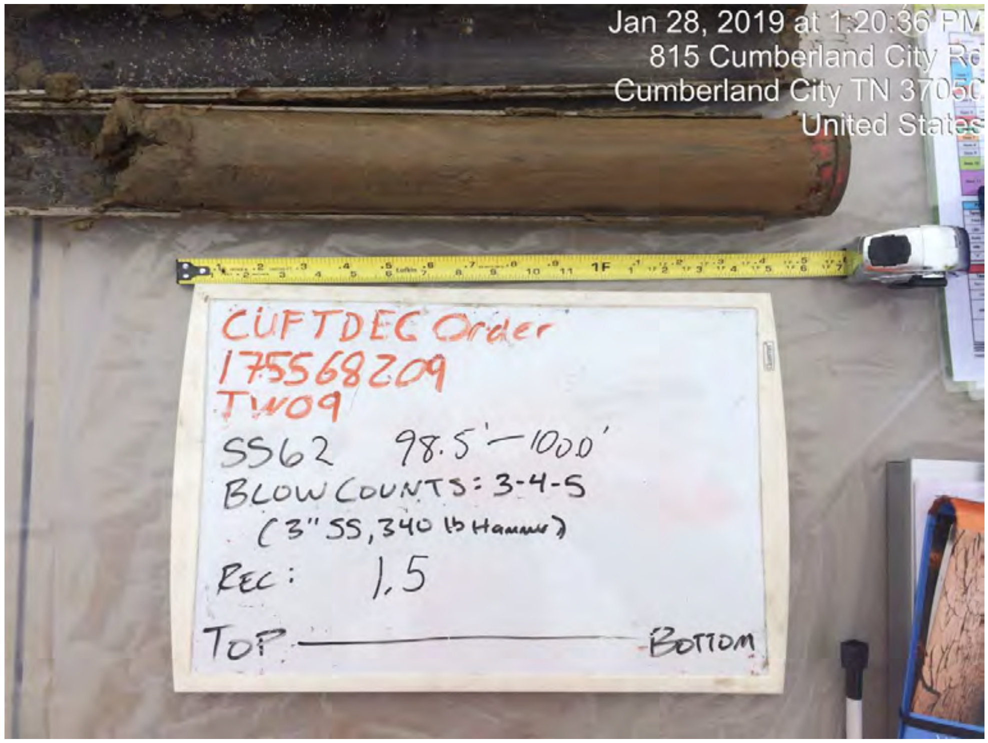
Photo Location: CUF-TW09

Photo Date: 1/28/2019

Comments: Interval (96.5-98.0 feet).

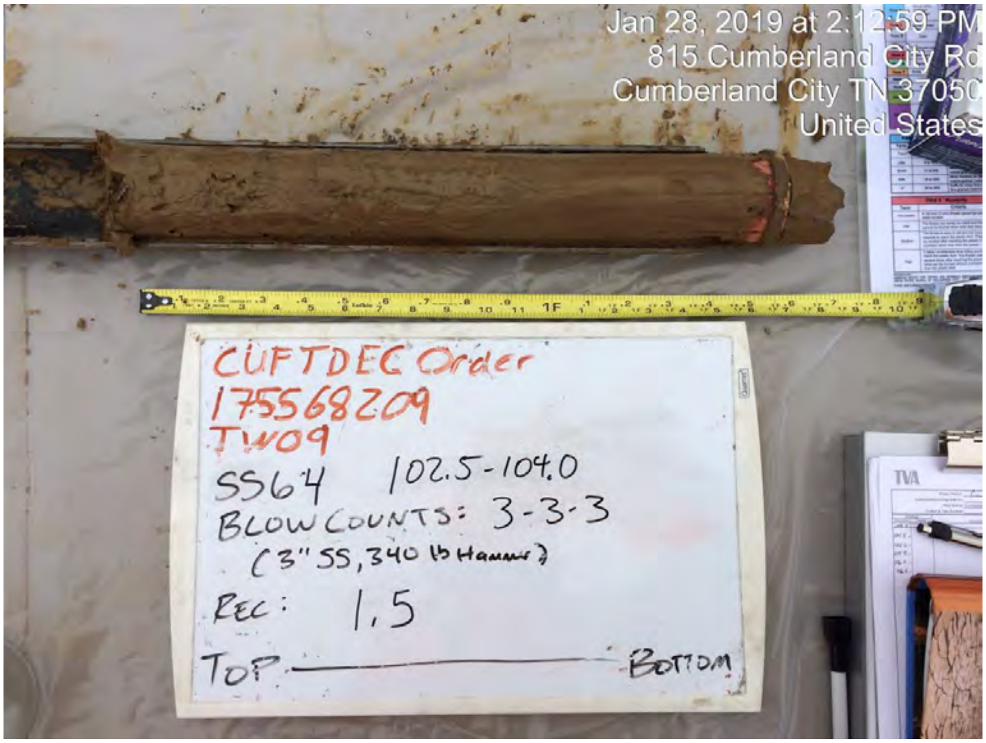
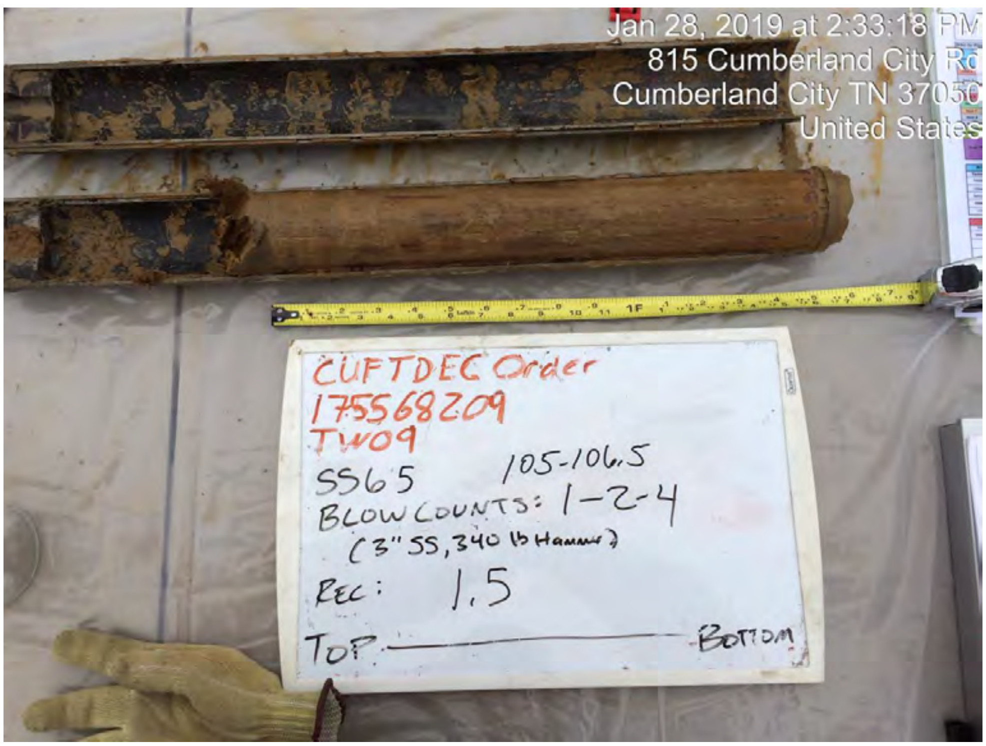


Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

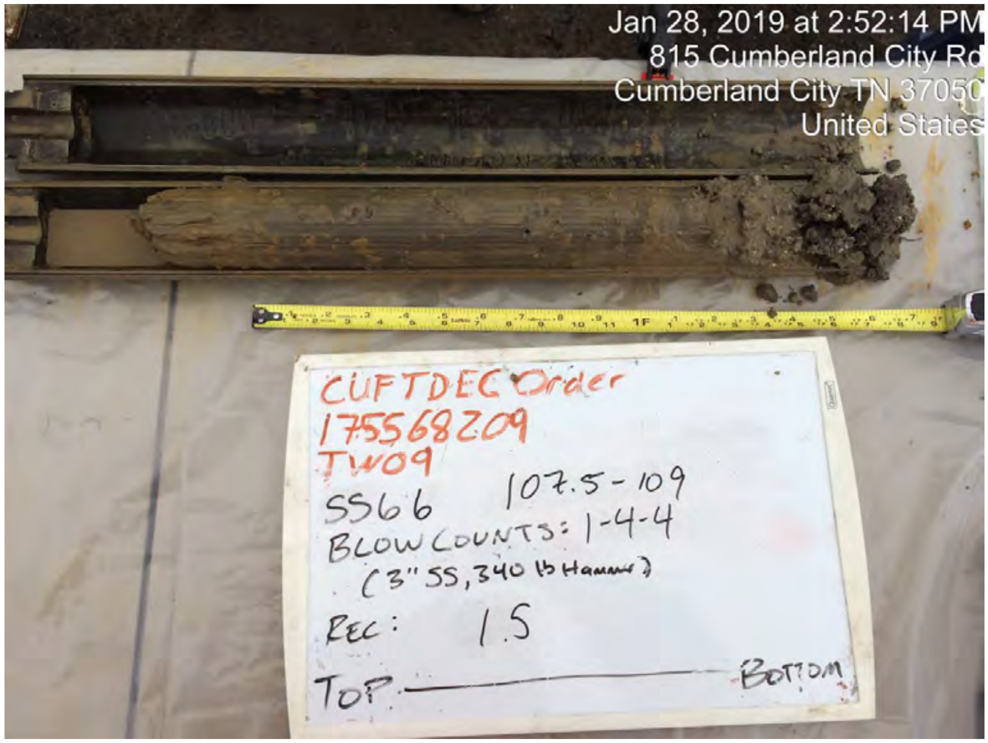
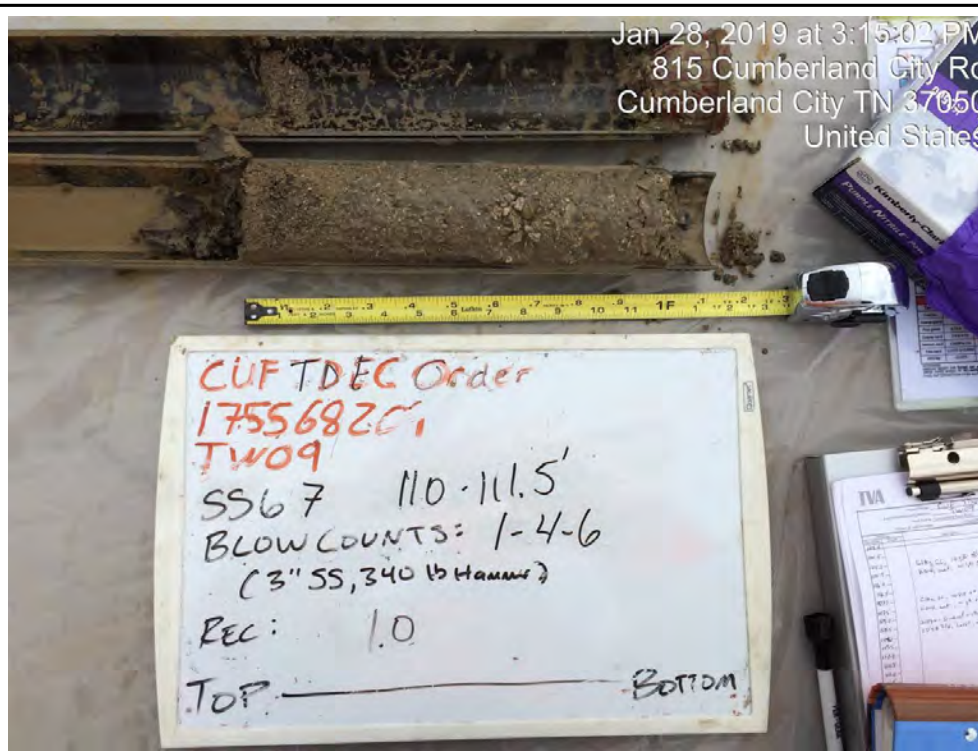
Photograph ID: 65 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (98.5-100.0 feet).	

Photograph ID: 66 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (100.0-101.5 feet). Depth interval shown on white board should be 100.0-101.5.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 67 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (102.5-104.0 feet).	
Photograph ID: 68 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (105.0-106.5 feet). Depth interval shown on white board should be 105.0-106.5.	

Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 69 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (107.5-109.0 feet). Depth interval shown on white board should be 107.5-109.0.	
Photograph ID: 70 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (110.0-111.5 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 110.0-111.5.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 71

Photo Location:
CUF-TW09

Photo Date:
1/28/2019

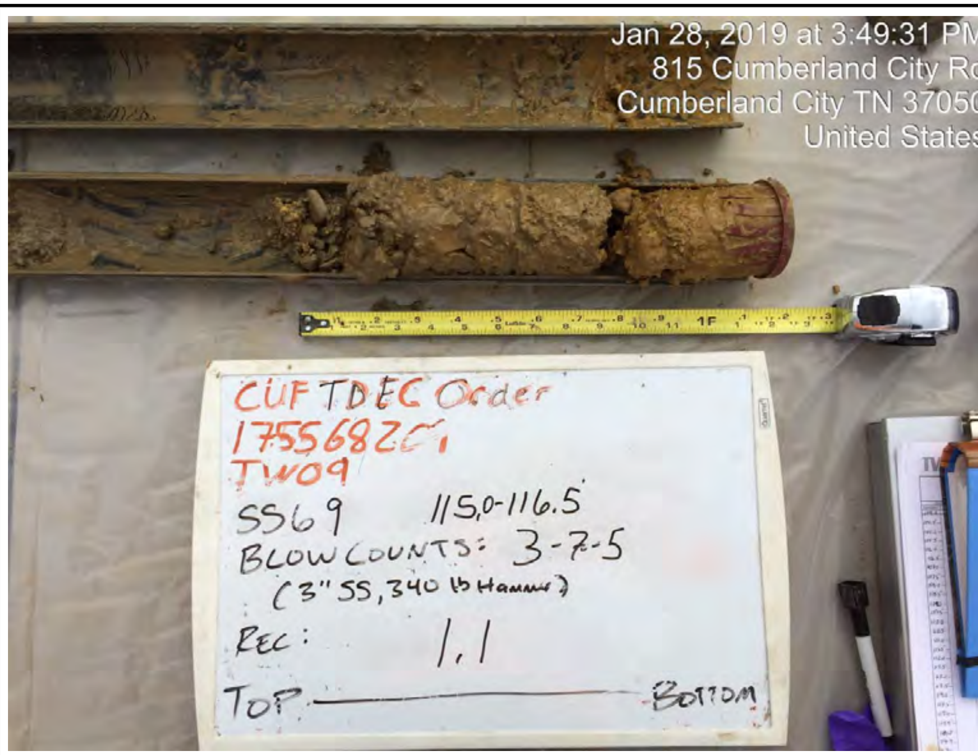
Comments:
Interval (112.5-114.0 feet). Project number shown on white board is 175568209.

Photograph ID: 72

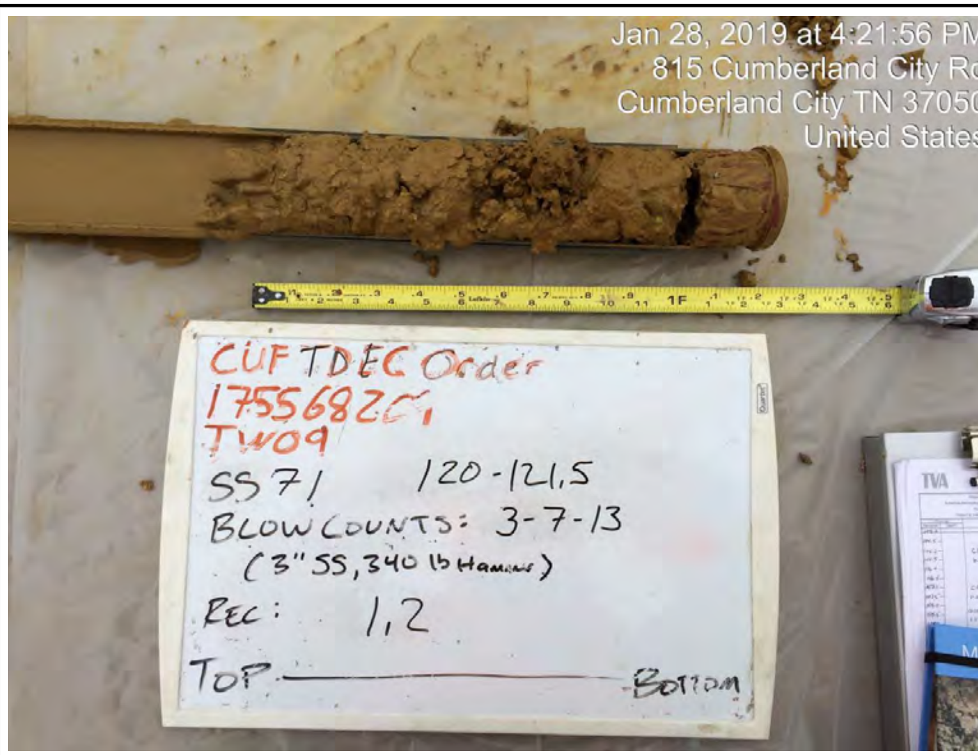
Photo Location:
CUF-TW09

Photo Date:
1/28/2019

Comments:
Interval (115.0-116.5 feet). Project number shown on white board is 175568209.



Client:	Tennessee Valley Authority	Project:	TDEC Order
Site Name:	Cumberland Fossil (CUF) Plant	Site Location:	Cumberland City, Tennessee

Photograph ID: 73 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (117.5-119.0 feet). Project number shown on white board is 175568209.	
Photograph ID: 74 **Photo Location:** CUF-TW09 **Photo Date:** 1/28/2019 **Comments:** Interval (120.0-121.5 feet). Project number shown on white board is 175568209. Depth interval shown on white board should be 120.0-121.5.	

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 75

Photo Location:
CUF-TW09

Photo Date:
1/29/2019

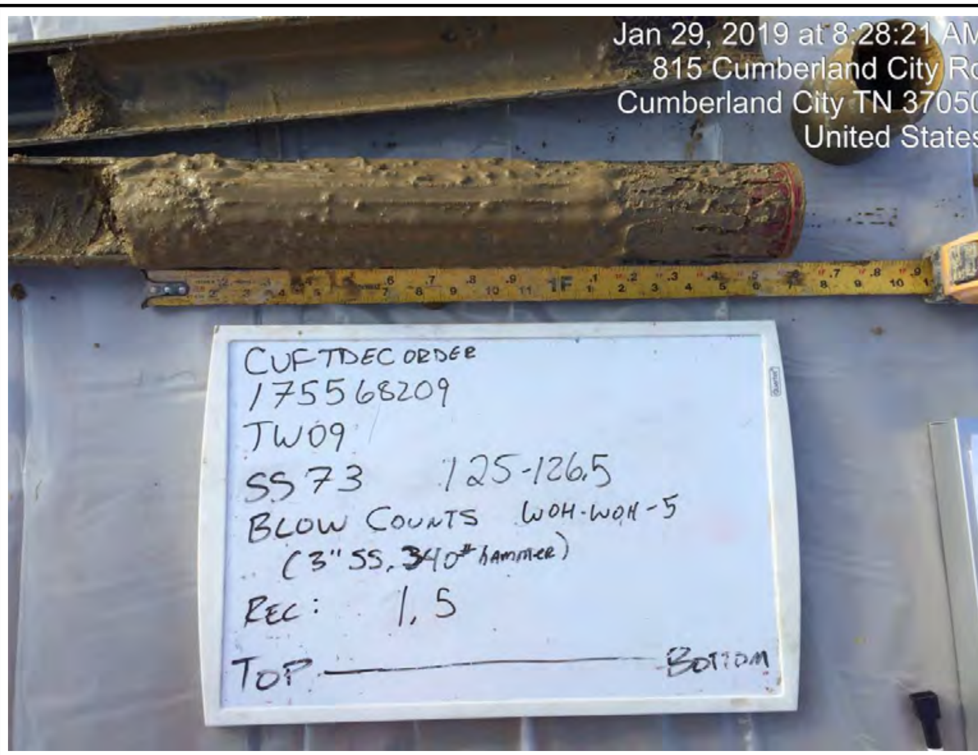
Comments:
Interval (122.5-124.0 feet).

Photograph ID: 76

Photo Location:
CUF-TW09

Photo Date:
1/29/2019

Comments:
Interval (125.0-126.5 feet). Depth interval shown on white board should be 125.0-126.5. WOH on white board is the same as WH on the boring log.



Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 77

Photo Location:
CUF-TW09

Photo Date:
1/29/2019

Comments:
Interval (127.5-129.0 feet). Blow count shown on white board should be 2-2-WH.

Photograph ID: 78

Photo Location:
CUF-TW09

Photo Date:
1/29/2019

Comments:
Interval (130.0-131.5 feet). WOH on white board is the same as WH on the boring log.

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 79

Photo Location:
CUF-TW09

Photo Date:
1/29/2019

Comments:
Interval (132.5-133.7 feet). Depth interval shown on white board should be 133.7.

Photograph ID: 80

Photo Location:
CUF-TW09

Photo Date:
4/4/2019

Comments:
Interval (137.2-151.7 feet).

Stantec **Photographic Log**

Client:	**Tennessee Valley Authority**	**Project:**	**TDEC Order**
Site Name:	**Cumberland Fossil (CUF) Plant**	**Site Location:**	**Cumberland City, Tennessee**

Photograph ID: 81

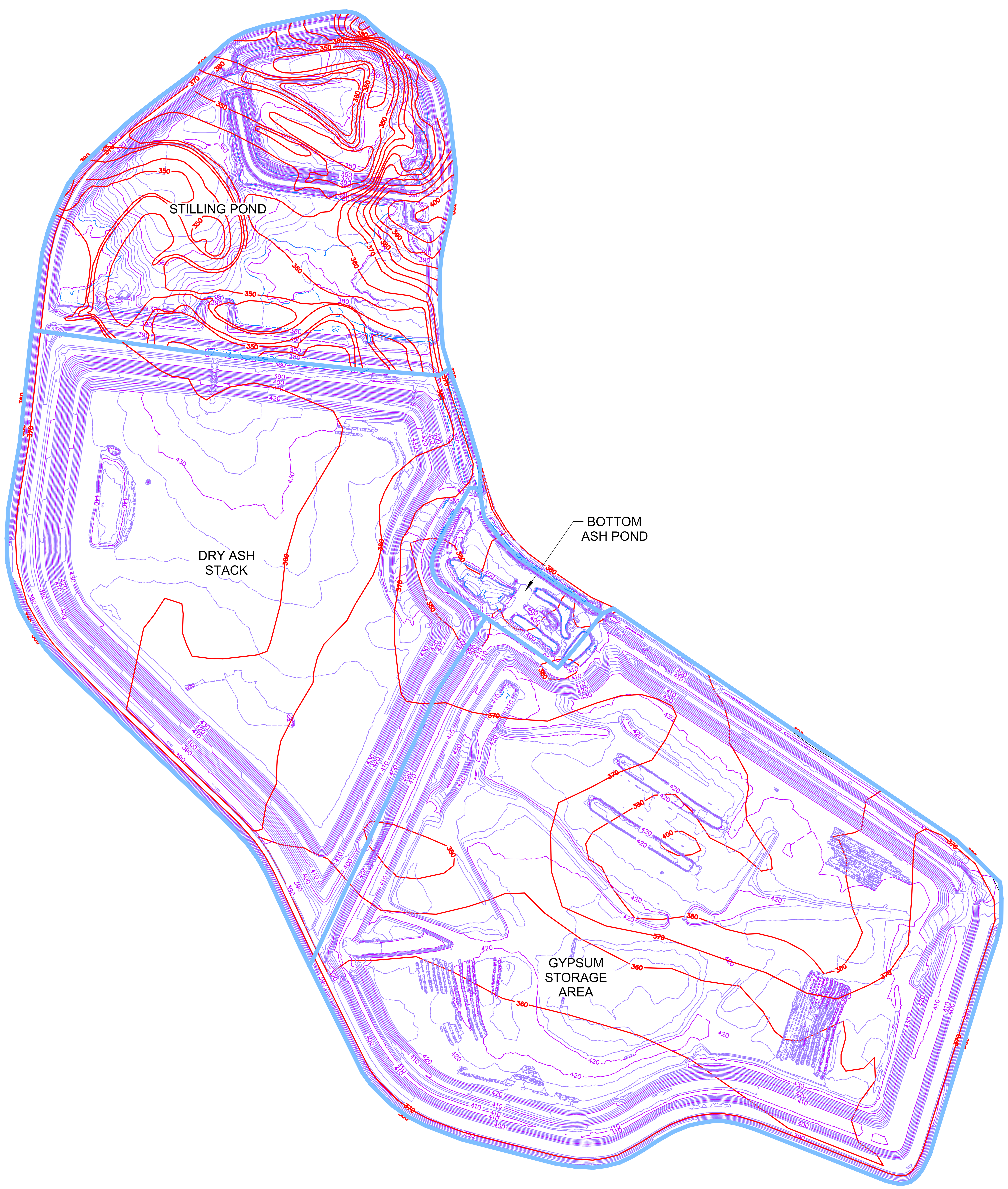
Photo Location:
CUF-TW09

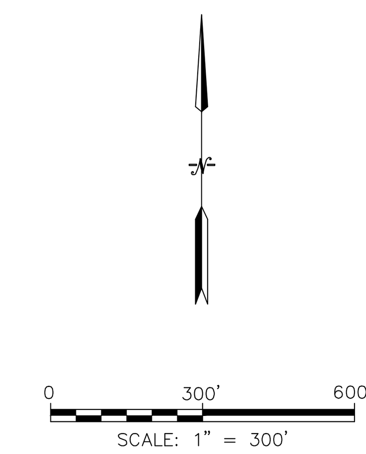
Photo Date:
4/4/2019

Comments:
Interval (151.7-157.7 feet).

APPENDIX G.4

MATERIAL QUANTITY ASSESSMENT HISTORIC INFORMATION AND SECONDARY VOLUME ESTIMATES





TOP OF ASH VS BOTTOM OF ASH			
UNIT	FILL (CY)	AREA (SF)	AREA (ACRES)
STILLING POND	1,574,121	2,776,101	64
DRY FLY ASH STACK	9,353,611	4,572,998	105
BOTTOM ASH POND	213,906	305,308	7
GYPSUM STORAGE AREA	10,317,552	6,587,792	151
TOTAL OF ALL AREAS	21,459,190	14,242,199	327

LEGEND

- 420 — TOP OF ASH CONTOUR
- 360 — BOTTOM OF ASH CONTOUR
- EDGE OF WATER
- ROAD
- UNIT BOUNDARY

NOTES:

1. TOP OF ASH CONTOURS FROM AN AERIAL SURVEY BY TUCK MAPPING DATED 3/23/2015, ADAPTED USING HYDROGRAPHIC SURVEY BY R.L.S. GROUP DATED 9/10/2015.
2. BOTTOM OF ASH CONTOURS FOR STILLING POND AREA DIGITIZED FROM TVA DRAWING 10N212 "ASH DISPOSAL AREAS" DATED 1/13/1969. BOTTOM OF ASH CONTOURS FOR THE DRY ASH STACK, BOTTOM ASH POND, AND GYPSUM STORAGE AREA DIGITIZED FROM TVA DRAWING 10N200, "GENERAL PLAN", DATED 2/1/1968 AND USGS TOPO CUMBERLAND CITY, TENNESSEE, DATED 1965.
3. SLUICE TRENCH DEPTH APPROXIMATED TO BE 5 FEET WITH 2 HORIZONTAL TO 1 VERTICAL (2:1) SIDE SLOPES STARTING AT EDGE OF WATER.
4. CALCULATED FILL VOLUME FOR STILLING POND AREA REDUCED BY 211,177 C.Y. FOR DIKE 2.
5. CALCULATED FILL VOLUME FOR DRY ASH STACK AREA REDUCED BY 138,288 C.Y. FOR DIKE 2, 28,000 C.Y. FOR DREDGE STOCKPILE, AND 231 C.Y. OF CUT.
6. CALCULATED FILL VOLUME FOR GYPSUM STORAGE AREA REDUCED BY 213,530 C.Y. FOR GRAVEL DRAINAGE LAYER AT 400 FEET MSL, 772,587 C.Y. FOR DIKE 2 AND DIKE 3, AND 1,309 C.Y. FOR CUT.

TriAD ENVIRONMENTAL CONSULTANTS, INC.
Suite 200, 207 Donelson Pike, Nashville, Tn 37214
615-889-6888 fax 615-889-4004

NO.	REVISION	BY	DATE

HISTORICAL ASH VOLUME CALCULATIONS
CUMBERLAND FOSSIL PLANT
CUMBERLAND CITY, TENNESSEE

TENNESSEE VALLEY AUTHORITY

DWN BY: LAF
CHK BY: NBS
DATE: 3/3/2017
SCALE: 1"=300'
PROJ. NUMBER: 13-TVA01-09

FIGURE 1

SURFACE TO SURFACE VOLUME REPORT

Trimble
5475 Kellenburger Road
Dayton, Ohio 45424-1099, USA
1-937-233-8921

Project:
C:\Data\Cumberland\ccr_quantities(rev1)\Cumberland-CCR_Quantities.pro
Report Generated: Friday, December 17, 2021 11:36:12 AM

Where the second surface is above the first the volume is reported as fill.
Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
CCR(BASE)	6,285	CCR-BAP	33,011

Volume limited to that within the constraining boundary - Object 2293809
Area within boundary: 361,411.49 Sq. Ft. (8.2969 Acres)
Total triangulated area: 361,385.29 Sq. Ft. (8.2963 Acres)

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
512.4	402,949.9

Net Difference: 402,437.5 Cu. Yd. Borrow

SURFACE TO SURFACE VOLUME REPORT

Trimble
5475 Kellenburger Road
Dayton, Ohio 45424-1099, USA
1-937-233-8921

Project:
C:\Data\Cumberland\ccr_quantities(rev1)\Cumberland-CCR_Quantities.pro
Report Generated: Friday, December 17, 2021 11:43:57 AM

Where the second surface is above the first the volume is reported as fill.
Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
CCR(BASE)	6,285	CCR-DAS	289,023

Volume limited to that within the constraining boundary - Object 2293811
Area within boundary: 4,839,759.56 Sq. Ft. (111.1056 Acres)
Total triangulated area: 4,839,756.22 Sq. Ft. (111.1055 Acres)

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
405.0	11,582,425.2

Net Difference: 11,582,020.2 Cu. Yd. Borrow

SURFACE TO SURFACE VOLUME REPORT

Trimble
5475 Kellenburger Road
Dayton, Ohio 45424-1099, USA
1-937-233-8921

Project:
C:\Data\Cumberland\ccr_quantities(rev1)\Cumberland-CCR_Quantities.pro
Report Generated: Monday, December 20, 2021 3:20:15 PM

Where the second surface is above the first the volume is reported as fill.
Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
CCR(BASE)	6,285	CCR-GSA	246,509

Volume limited to that within the constraining boundary - Object 2276268
Area within boundary: 6,173,126.18 Sq. Ft. (141.7155 Acres)
Total triangulated area: 6,173,126.18 Sq. Ft. (141.7155 Acres)

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
6.4	11,494,546.3

Net Difference: 11,494,539.9 Cu. Yd. Borrow

SURFACE TO SURFACE VOLUME REPORT

Trimble
5475 Kellenburger Road
Dayton, Ohio 45424-1099, USA
1-937-233-8921

Project:
C:\Data\Cumberland\ccr_quantities(rev1)\Cumberland-CCR_Quantities.pro
Report Generated: Monday, December 20, 2021 1:29:56 PM

Where the second surface is above the first the volume is reported as fill.
Where the second surface is below the first the volume is reported as excavation.

Shrinkage/swell factors: Excavation 1.0000 Fill 1.0000

First Surface Layer Name	Number of Points	Second Surface Layer Name	Number of Points
CCR(BASE)	6,285	CCR-SP	188,641

Volume limited to that within the constraining boundary - Object 2668965
Area within boundary: 2,488,971.42 Sq. Ft. (57.1389 Acres)
Total triangulated area: 2,488,971.42 Sq. Ft. (57.1389 Acres)

Excavation Volume (Cu. Yd.)	Fill Volume (Cu. Yd.)
100,342.9	1,394,833.6

Net Difference: 1,294,490.7 Cu. Yd. Borrow

APPENDIX G.5

MATERIAL QUANTITY ASSESSMENT SAMPLING AND ANALYSIS REPORT

Cumberland Fossil Plant
Material Quantity Assessment
Sampling and Analysis Report

TDEC Commissioner's Order:
Environmental Investigation Plan
Cumberland Fossil Plant
Cumberland City, Tennessee

December 17, 2021

Prepared for:

Tennessee Valley Authority
Chattanooga, Tennessee

Prepared by:

Stantec Consulting Services Inc.
Lexington, Kentucky

Revision Record

Revision	Description	Date
0	Submittal to TDEC	October 1, 2021
1	Addresses October 26, 2021 TDEC Review Comments and Issued for TDEC	November 8, 2021
2	Addresses November 23, 2021 TDEC Review Comments and Issued for TDEC	December 17, 2021

Sign-off Sheet

This document entitled Cumberland Fossil Plant Material Quantity Sampling and Analysis Report was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Tennessee Valley Authority (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule, and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by Vincent J. Severance ___________________________

Vincent J. Severance, PE, Senior Civil Engineer

Reviewed by Robert D. Fuller ___________________________

Robert D. Fuller, PE, Senior Principal

Approved by Carole M. Farr ___________________________

Carole M. Farr, Senior Principal Geologist

Table of Contents

Abbreviations

Civil 3D	AutoDesk® AutoCAD® Civil 3D software
CCR	Coal Combustion Residuals
EAR	Environmental Assessment Report
EI	Environmental Investigation
EXD	Exploratory Drilling
CUF Plant	Cumberland Fossil Plant
MQA	Material Quantity Assessment
NGVD29	National Geodetic Vertical Datum of 1929
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
Study Area	Gypsum Storage Area, Dry Ash Stack, Bottom Ash Pond, and Retention Pond including Stilling Pond
Stantec	Stantec Consulting Services Inc.
TDEC	Tennessee Department of Environment and Conservation
TDEC Order	Commissioner’s Order No. OGC15-0177
TER	Triennial Engineering Report
TriAD	TriAD Environmental Consultants, Inc.
TVA	Tennessee Valley Authority

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) has prepared this Sampling and Analysis Report (SAR) on behalf of the Tennessee Valley Authority (TVA) to document activities related to a Material Quantity Assessment (MQA) at TVA's Cumberland Fossil Plant (CUF Plant) located in Cumberland City, Tennessee, as shown on Exhibit A.1 (Appendix A).

The purpose of the MQA is to use historical data supplemented with information collected for other TDEC Order SARs to perform three-dimensional modeling of certain coal combustion residuals (CCR) units at the CUF Plant and estimate CCR material quantities and other properties in support of fulfilling the requirements for the Tennessee Department of Environment and Conservation (TDEC) issued Commissioner's Order No. OGC15-0177 (TDEC Order) to TVA (TDEC 2015). The TDEC Order sets forth a "process for the investigation, assessment, and remediation of unacceptable risks" at TVA's coal ash disposal sites in Tennessee.

The purpose of this SAR is to document the three-dimensional modeling work completed during the MQA. This SAR is not intended to provide conclusions or evaluations of results. The scope of the MQA activities represented herein was conducted pursuant to the Material Quantity Sampling and Analysis Plan (SAP) (Stantec 2018a) and is part of a larger Environmental Investigation (EI) at the CUF Plant. The data provided in this SAR are not inclusive of other programmatic data that exist for this site. The evaluation of the results will consider other aspects of the EI, including data collected under other State and/or CCR programs and be presented in the Environmental Assessment Report (EAR).

The MQA activities discussed herein were performed in general accordance with the following documents developed by TVA to support fulfilling the requirements of the TDEC Order at the CUF Plant:

- *Material Quantity SAP* (Stantec 2018a)
- *Environmental Investigation Plan* (EIP) (Stantec 2018b)
- *Exploratory Drilling (EXD) SAP* (Stantec 2018c)
- *Quality Assurance Project Plan* (Environmental Standards, Inc. 2018).

2.0 OBJECTIVE AND SCOPE

The objectives of the MQA, conducted pursuant to the Material Quantity SAP, are to describe CCR management unit geometry, CCR material quantity, phreatic elevations, and subsurface conditions for certain CCR management units at the CUF Plant in response to the TDEC Order. The Material Quantity SAP included evaluation of the following CCR management units: Gypsum Storage Area, Dry Ash Stack, Bottom Ash Pond, and Retention Pond including Stilling Pond (MQA Study Area).

The approach for the MQA SAR was to develop three-dimensional models of the MQA Study Area using data from existing borings installed under different environmental or geotechnical programs, as well as pre-construction topographic information for the MQA Study Area. The existing information was supplemented with data from borings drilled per the EXD SAP.

The scope of work consisted of the following tasks:

- Developing three-dimensional subsurface models from ground surface to bedrock using boring elevation data and pre-construction topographic information
- Developing a cross section location map and cross sections showing the modeled dikes and surfaces
- Identifying additional information needed to complete the objectives of the Material Quantity SAP.

Details of the completed MQA work are presented in the following sections. These activities were carried out following the completion of borings drilled per the EXD SAP. Details of the drilling activities are provided in the EXD SAR.

3.0 PHYSICAL SETTING AND SITE HISTORY

3.1 CCR MATERIAL PLACEMENT SITE HISTORY

As shown on Exhibit A.2 (Appendix A), an initial clay dike was constructed along the southern and western perimeter to an elevation of 380 feet (National Geodetic Vertical Datum of 1929 [NGVD29]) between 1969 and 1972 to develop the Ash Disposal Area. CUF Plant discharges were initially routed to the Ash Disposal Area, which discharged to the Cumberland River.

In 1976, a divider dike was constructed to divide the Ash Disposal Area into Ash Disposal Area No. 1 and Ash Disposal Area No. 2 (Exhibit A.2). In 1977, an additional divider dike was constructed in the northern portion of the Ash Disposal Area No. 2 to form the Stilling Pond (Exhibit A.2). The perimeter dike was raised approximately 15 feet in 1979 and extended around the full perimeter of the CCR management units (Exhibit A.2).

The following operational changes were implemented under a modification to Class II Solid Waste Disposal Permit number IDL 81-102-0086 issued by TDEC to TVA in 1996 (TDEC 1996).

- A divider dike was constructed to divide Ash Disposal Area No. 2 into the Retention Pond and Dry Ash Stack for the placement of dry ash as shown on Exhibit A.2
- TVA began dry ash stacking in the Dry Ash Stack
- Ash Disposal Area No. 1 was redeveloped as the Gypsum Storage Area for stacking wet gypsum as shown on Exhibit A.2
- The Bottom Ash Pond was constructed. Bottom ash was then sluiced to this pond and settled bottom ash was excavated and placed in the Dry Ash Stack (refer to Exhibit A.2).

Historical drawings of the dike constructions are presented as Attachments B.1, B.2, B.3, and B.5 (Appendix B) (TVA 1991a; 1991b; 2003a, 2003b respectively).

3.2 EXISTING CONDITIONS

CCR material is present at the CUF Plant in several individual areas including the Gypsum Storage Area, Dry Ash Stack, Bottom Ash Pond, and Stilling Pond (including Retention Pond). A site location map showing the physical setting of the CCR management units is provided as Exhibit A.1 (Appendix A). The Gypsum Storage Area and Dry Ash Stack are active CCR management units. The Bottom Ash Pond no longer receives CCR or non-CCR waste streams.

TVA currently operates a temporary lined basin located in the southeast corner of the Stilling Pond (including Retention Pond) to temporarily treat plant process flows and landfill stormwater flows during repurposing of the Stilling Pond (including Retention Pond). Free water was removed from the remaining Stilling Pond (including Retention Pond) areas by February 2021. Work to consolidate CCR and repurpose the remaining Stilling Pond (including Retention Pond) areas as a lined, process-water basin is in progress and scheduled to be completed in December 2022.

TVA provides Triennial Engineering Reports (TERs) to TDEC which include a current topographic survey of the permitted landfills and estimates of the current constructed capacity, total remaining volume (currently constructed), and total remaining volume (permitted capacity) in accordance with Tennessee Department of Environment and Conservation requirements, contained in subparagraph (t) of paragraph (2) of Rule 0400-11-01-.04 for Class II facilities, which became effective 30 December 2019. TVA provided the latest TER to TDEC on July 17, 2020. A copy of the latest TER is provided as Attachment B.1.

3.3 PRIOR MATERIAL QUANTITY ASSESSMENTS

Previous material quantity assessments were completed by TriAD Environmental Consultants, Inc. (TriAD) of Nashville, Tennessee as part of their Historical Ash Volume Calculations (TriAD 2017a). The Historical Ash Volume Calculations by TriAD were completed for the MQA Study Area. The results of their calculations will be compared with Stantec’s evaluation results in the EAR.

4.0 THREE-DIMENSIONAL MODEL METHODOLOGY

Three-dimensional models of the MQA Study Area were developed to depict subsurface conditions from the ground surface to bedrock using AutoDesk® AutoCAD® Civil 3D software (Civil 3D). Elevation data including contours and boring elevations were imported into Civil 3D to model the three-dimensional surface of specific layers that comprise the CCR management units within the MQA Study Area using a surface triangulation method. Refer to Autodesk (2021) for more information regarding Civil 3D surface triangulation. The approach used to model the CCR management units within the MQA Study Area is summarized below.

1. Pre-Construction Surface: The approach to modeling the ground surface prior to the construction of the dikes and placement of CCR was to identify and evaluate historic topographic drawings with pre-construction contours for use in the pre-construction surface. Topographic drawings that did not provide horizontal coordinates were deemed not usable since horizontal coordinates were required to georeference the drawing and spatially align it with other data sources. Boring elevation data was used to confirm the accuracy of the contours used in the pre-construction surface. If the elevation differences between the pre-construction contours from the drawing and the boring elevation data were considered negligible for the purposes of estimating CCR volumes, the borings were designated as confirmation borings and not imported into the surface to preserve the continuity of the pre-construction surface.

Topographic drawings with pre-construction contours evaluated for use in the pre-construction surface included the 1965 United States Geological Survey (USGS) *Cumberland City, Tennessee Topographic Quadrangle* (USGS 1965) and TVA Drawing 10N212R11 (TVA 1991a). Both drawings provided horizontal coordinates that could be used to georeferenced the drawing and spatially align it with other data sources; however, contour data from TVA Drawing 10N212R11 (provided as Attachment B.1) was used to model the pre-construction surface since it provided five-foot interval contours versus the 20-foot interval contours provided by USGS (1965).

TVA Drawing 10N212R11 was imported into Civil 3D as an image and georeferenced using the coordinates provided on the drawing. The contours shown on the drawing were digitized by tracing a three-dimensional polyline (3D polyline) over the contours and assigning an elevation coordinate to each 3D polyline which corresponded to the contour elevation shown on the drawing. The 3D polylines were used to model a three-dimensional surface of the pre-construction topography.

The pre-construction surface was then compared to the top of foundation soil elevation boring data from borings installed as part of the EI. For the purposes of the MQA, it was determined that the difference between the top of foundation soil elevation boring data and the contour data from TVA Drawing 10N212R11 was negligible; therefore, the top of foundation soil elevation boring data was not imported into the pre-construction surface and is designated in herein as confirmation data.

Model input data and confirmation data used to model and evaluate the pre-construction surface are summarized in Table C.1 (Appendix C). Exhibit A.3 shows the pre-construction topographic contours digitized from TVA Drawing 10N212R11 and the confirmation borings used to evaluate the pre-construction surface.

2. Starter Dike/Raised Dikes: The approximate locations of the starter dikes and raised dikes were digitized and modeled, using the design geometry and alignments presented on TVA Drawings 10N212R11 (TVA 1991a), 10N213R6 (TVA 1991b), and 10W302-13 (TVA 2003a), which are provided as Attachments B.1, B.2, and B.3 (Appendix B). The starter dike alignments and configurations were confirmed with historical boring information, topographic aerial surveys, and preliminary cross sections developed from all the modeled surfaces.

3. Bottom of CCR Surface: For the purposes of the MQA, it was assumed that the pre-construction surface is equivalent to the bottom of CCR surface within the interior of the modeled starter dikes. Model input data and confirmation data used to model and evaluate the bottom of CCR surface are summarized in Table C.1. Exhibit A.4 shows the bottom of CCR surface contours and confirmation borings.

4. Ground Surface: A final elevation surface was not available since the ground surface contours in the MQA Study Area are constantly changing due to operational and construction projects described herein, and final grading has not been performed. Contour data from the surveys summarized in Table C.2, including the 2021 CUF Plant aerial survey (RLS 2021a and b), 2017 CUF Plant aerial survey (Tuck 2017), as well as other surveys were used to develop a composite surface to model the ground surface. The 2021 CUF Plant aerial survey covers most of the footprint of the CCR management units; however, data from the 2017 CUF Plant aerial survey and other surveys was needed to model the ground surface and supplement the 2021 CUF Plant aerial survey at specific locations. Model input data used to model the ground surface are summarized in Table C.2. Exhibit A.5 shows contours from the modeled ground surface. The horizontal datum for the ground surface contours is Tennessee State Plane North American Datum (NAD) of 1927, and the vertical datum is NGVD29.

5. Top of CCR Surface: For the purposes of the MQA, it was assumed that the top of CCR surface is equivalent to the ground surface within the interior of the modeled dikes. No adjustments were made to the top of CCR surface to account for any temporary soil cover placed on the outer CCR slopes. Exhibit A.6 shows contours from the modeled top of CCR surface. Model input data used to model the top of CCR surface are summarized in Table C.2.

6. Top of Bedrock Surface**:** Bedrock elevation boring data was imported into Civil 3D and a surface triangulation method was used to model the top of bedrock surface. Break lines and contours were added to the top of bedrock surface along the original alignment of Wells Creek and along the perimeter of the alluvium deposits shown on the *Geologic Map of Wells Creek* (Tiedemann, et al 1968; Attachment B.4) to adjust the interpolation between bedrock elevations. Additional contours were added in the vicinity of the geologic units outside of the alluvium deposits to offset the original ground by observed soil thicknesses and maintain a top of rock surface below the original ground surface. The Kriging interpolation method in Civil 3D was then applied to refine and smooth the composite bedrock surface.

Logs for borings installed as part of the EI discussed in the EXD SAR and other environmental and geotechnical programs were evaluated to identify which provided bedrock elevation boring data. Bedrock elevation boring data was imported into Civil 3D as point data to model a three-dimensional surface of the top of bedrock and is referenced herein as model input data. Model input data used to model the top of bedrock surface are summarized in Table C.3. Exhibit A.7 shows the contours from the modeled top of bedrock surface over an excerpt of the *Geologic Map of Wells Creek* (Tiedemann, et al 1968; Attachment B.4).

5.0 CROSS SECTIONS

A cross section location exhibit and 12 representative cross sections are provided as Exhibits A.8 through A.14. The cross-section locations were intentionally selected to capture variations within each CCR management unit. The cross sections are on approximate 800 feet spacing with additional sections taken perpendicular the primary sections. The modeled dikes and surfaces discussed in Section 4.0 are shown on the cross sections. The composite surface summarized in Table C.4 and shown on Exhibit A.15 is also shown on the cross-sections to depict site conditions during the time of the EI; however, this composite surface will not be used to calculate volumes which will be provided in the EAR.

6.0 LIMITATIONS

The following items are limitations of the information presented herein:

- The site history discussed focuses on the dike construction history. A more detailed site history will be presented in the EAR.
- The pre-construction topography used to estimate the pre-construction and bottom of CCR material surfaces was generated by a georeferencing historical drawing and digitizing the contours and should be considered approximate. In general, the topography shown on TVA Drawing 10N212R11 correlated well with historical and recent boring data.
- Final grading has not been performed within the Dry Ash Stack, Gypsum Storage Area, and Bottom Ash Pond. Work to consolidate CCR and repurpose the remaining Stilling Pond (including Retention Pond) area as a lined, process-water basin is in progress. Therefore, a final elevation surface was not modeled.

7.0 SUMMARY

The information presented in this report is from the MQA at the CUF Plant. The scope of work for this MQA SAR included developing new three-dimensional models of the MQA Study Area using data from existing borings installed under different environmental or geotechnical programs and the EI, as well as pre-construction topographic information for the MQA Study Area. The existing information was supplemented with data from borings drilled per the EXD SAP. The scope of work included:

- Developing three-dimensional subsurface models from ground surface to bedrock using boring elevation data and pre-construction topographic information
- Developing a cross section location map and cross sections showing the modeled dikes and surfaces
- Identifying additional information needed to complete the objectives of the Material Quantity SAP.

Data and drawings used to develop the three-dimensional models are summarized in Section 4.0 and presented in Exhibits A.3 through A.7, and Tables C.1 through C.3. Cross sections are discussed in Section 5.0 and a cross section location map and cross sections are provided as Exhibits A.8 through A.14. Limitations of the three-dimensional models are presented in Section 6.0.

Stantec has completed development of three-dimensional models of the MQA Study Area for the MQA at the CUF Plant in Cumberland City, Tennessee, in accordance with the Material Quantity SAP as documented herein. The three-dimensional models are usable for reporting and evaluation in the EAR and meet the objectives of the TDEC Order EIP. The three-dimensional models will be evaluated along with data collected under other TDEC Order SAPs, as well as data collected under other State and CCR programs, and will be used to fulfill the requirements of the TDEC Order. This evaluation will be provided in the EAR.

8.0 REFERENCES

Autodesk. 2021. About Creating a TIN Surface. Located at: https://knowledge.autodesk.com/support/civil-3d/learn-explore/caas/CloudHelp/cloudhelp/2019/ENU/Civil3D-UserGuide/files/GUID-D0FCED34-D68F-42D2-A6FB-14C454CA57FA-htm.html. August 20, 2021.

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Tennessee Department of Environment and Conservation. 2015. Commissioner's Order No. OGC15-0177.

Tennessee Valley Authority (TVA). 1991a. *TVA Drawing 10N212R11: Ash Disposal Areas Sheet No. 1*. May 20.

TVA 1991b. *TVA Drawing 10N213R6: Ash Disposal Areas Sheet No. 2*. May 20.

TVA 2003a. *TVA Drawing 10W302-13: Prop. Waste Disposal Facility Construction Sequence Stage No. 5 and 6 – Sheet 2 of 2*. October 10.

TVA 2003b. T*VA Drawing 10W302-5: Proposed Waste Disposal Facility Existing Site Conditions – Sheet 4 of 4*. October 10.

TVA 2020. *Coal Combustion Residuals Triennial Engineering Report, Cumberland Fossil Plant Gypsum Disposal Area and Dry Ash Stack (IDL #81-0086), Cumberland City, Tennessee*. July 17.

Tiedemann, Herbert A., Charles W. Wilson, Jr., and Richard G. Stearns (Tiedemann, et al). 1968. *Geologic Map of Wells Creek Basin*. Tennessee Division of Geology, Bulletin 68, Plate 2.

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RLS Surveying (RLS). 2021a. *Aerial Survey, Cumberland Fossil Fuel Plant – Ash and Gypsum Stack, Cumberland City, Stewart County, Tennessee*. May 20.

RLS. 2021b. *Aerial Survey, Cumberland Fossil Fuel Plant – MAPR, Cumberland City, Stewart County, Tennessee*. May 21.

United States Geological Survey (USGS). 1965.

APPENDIX A - EXHIBITS

Exhibit No.

A.1

Title

Site Location Plan

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209
Prepared by MB on 2021-12-09
Technical Review by EM on 2021-12-09

0 300 600 900 1,200 Feet

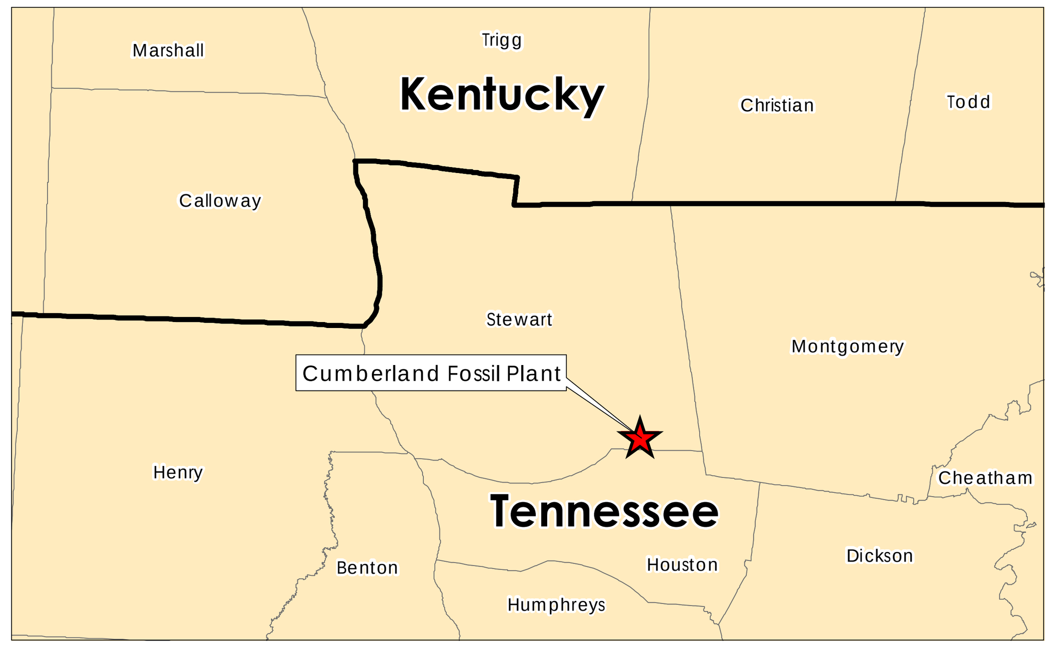
1:3,600 (At original document size of 22x34)

Legend

- 2019 Imagery Boundary
- 2020 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/9/2020)



Stantec TVA

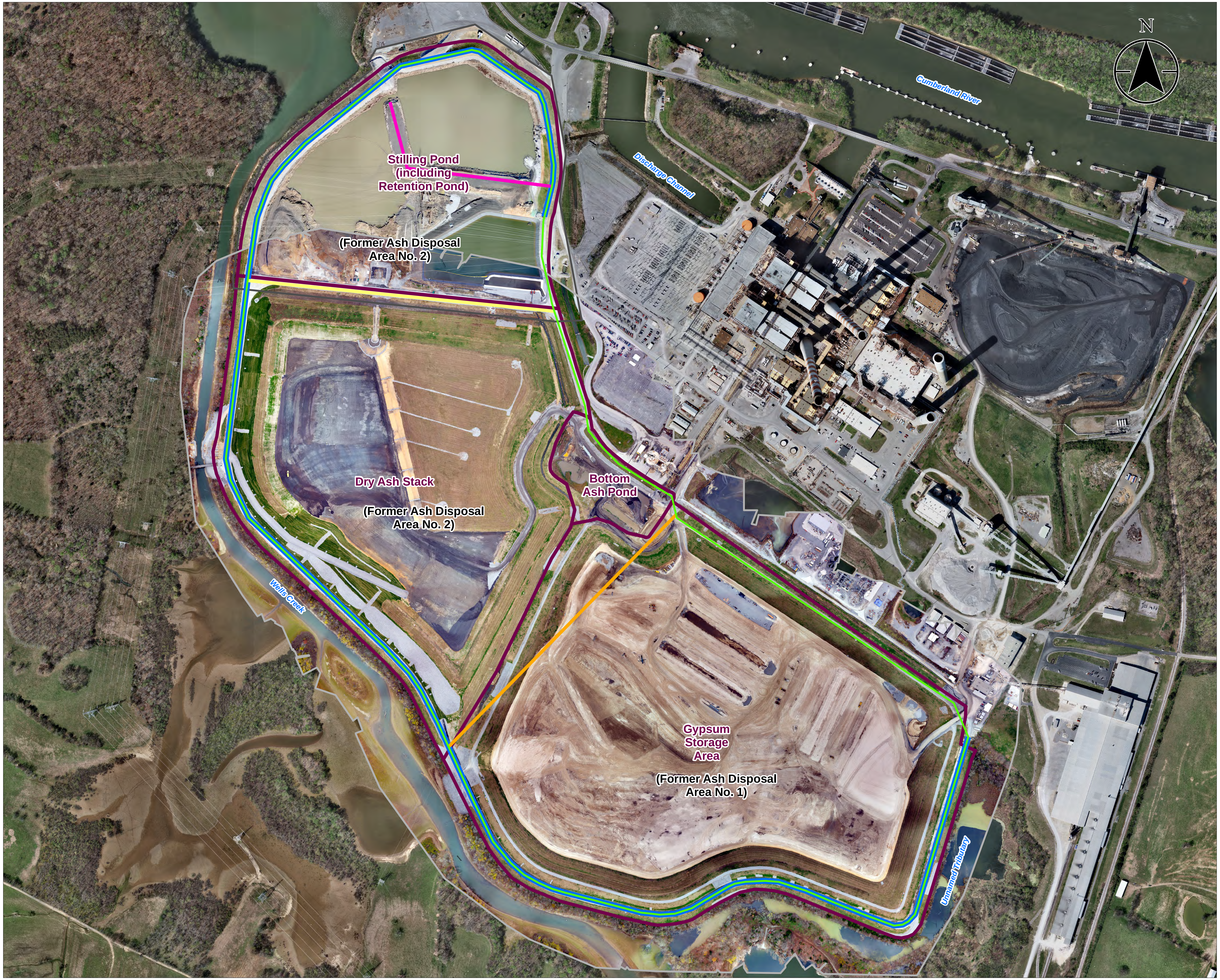


Exhibit No.

A.2

Title

Dike Construction History

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209
Prepared by MB on 2021-12-10
Technical Review by EM on 2021-12-10

0 300 600 900 1,200 Feet

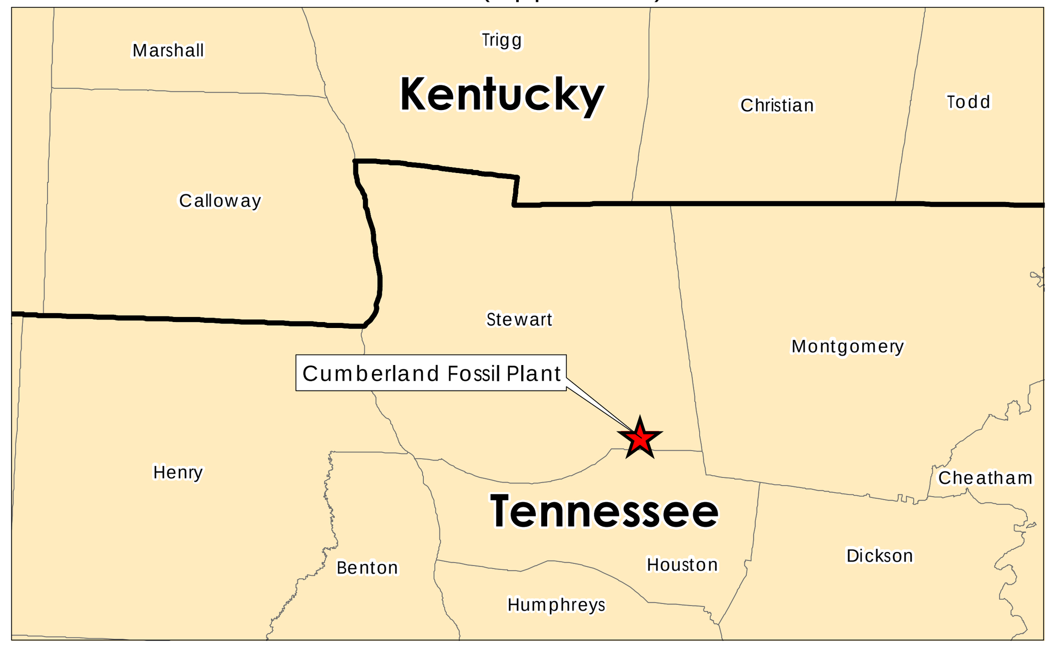
1:3,600 (At original document size of 22x34)

Legend

- 1969: Initial Dike (Approximate)
- 1976: Divider Dike (Approximate)
- 1977: Divider Dike (Approximate)
- 1979: Perimeter Dike Raise
- 1996: Divider Dike (Approximate)
- 2019 Imagery Boundary
- 2020 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/9/2020)
3. Approximate dike alignments shown herein were referenced from Attachments B.1, B.3, and B.5 (Appendix B).



Stantec TVA

Exhibit No.

A.3

Title

Pre-Construction Topography

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location 175568209

Stewart County, Tennessee

Prepared by MB on 2021-12-09
Technical Review by VS on 2021-12-09

0 325 650 975 1,300 Feet

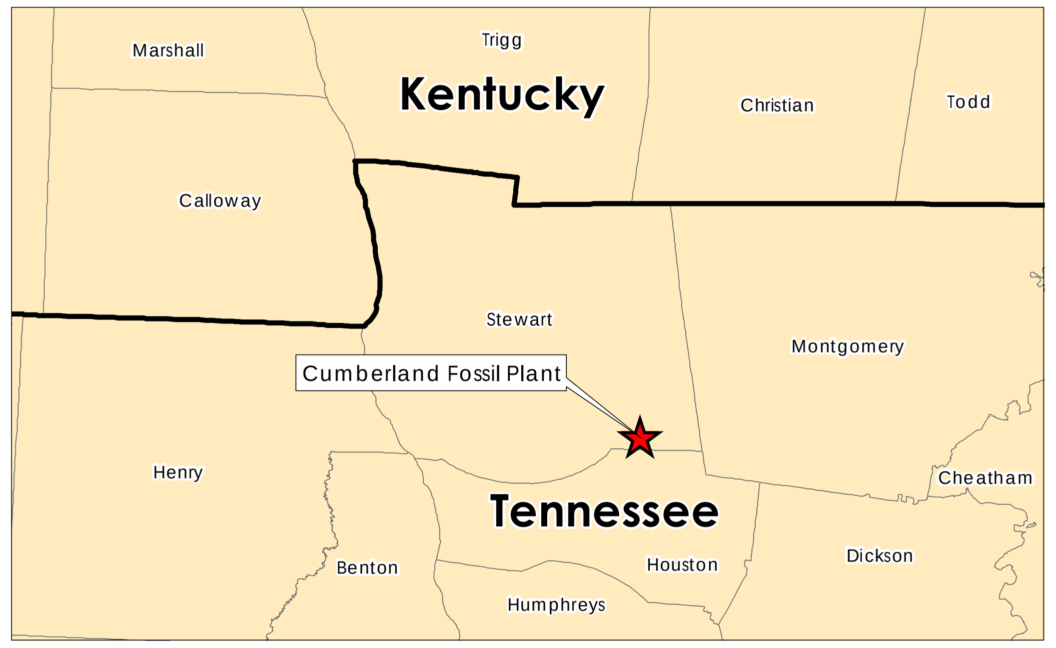
1:3,900 (At original document size of 22x34)

Legend

- Existing Boring with Top of Foundation Soil Elevation in feet (ft)
- Original Ground Topography Contour (2 ft interval)
- Original Ground Topography Contour (10 ft interval)
- CCR Unit Area (Approximate)
- 2019 Imagery Boundary
- 2020 Imagery Boundary

Notes

1. Coordinate System: NAD 1927 StatePlane Tennessee FIPS 4100
2. Vertical Datum: NGVD29
3. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/09/2020)
4. Model input data and confirmation data used to model and evaluate the pre-construction surface shown herein are summarized in Table C.1 (Appendix C).



Stantec TVA

Exhibit No.
A.4

Title

Bottom of CCR Material Elevations

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

175568209

Stewart County, Tennessee

Prepared by MB on 2021-12-09
Technical Review by VS on 2021-12-09

0 300 600 900 1,200 Feet

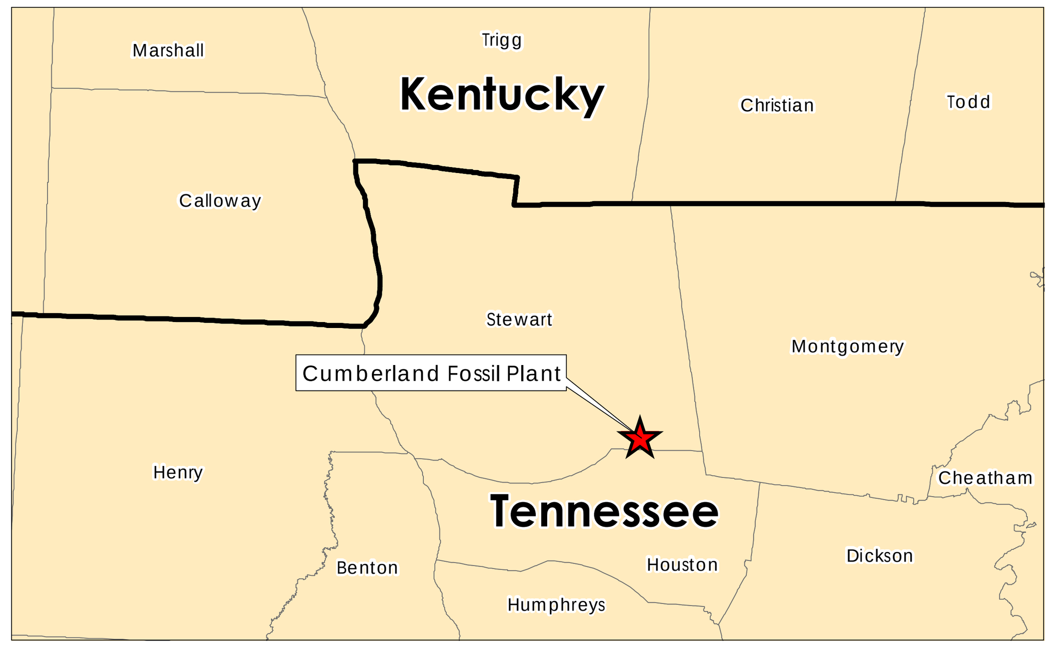
1:3,600 (At original document size of 22x34)

Legend

- Existing Boring with Bottom of CCR Material Elevation in feet (ft)
- Bottom of CCR Material Elevation Contour (2 ft interval)
- Bottom of CCR Material Elevation Contour (10 ft interval)
- CCR Unit Area (Approximate)
- 2019 Imagery Boundary
- 2020 Imagery Boundary

Notes

1. Coordinate System: NAD 1927 StatePlane Tennessee FIPS 4100
2. Vertical Datum: NGVD29
3. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/09/2020)
4. Model input data and confirmation data used to model and evaluate the pre-construction surface shown herein are summarized in Table C.1 (Appendix C).



Stantec

TVA

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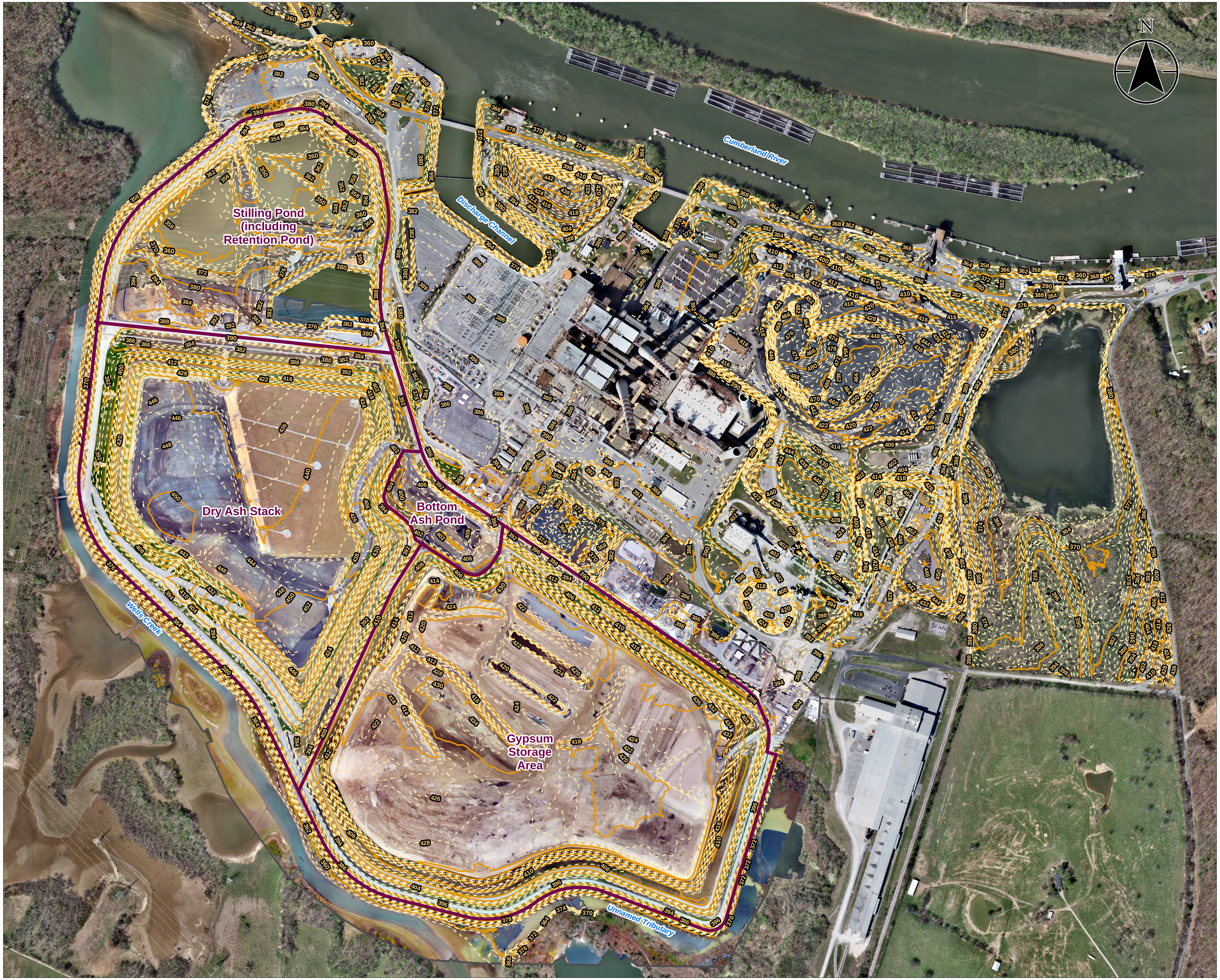


Exhibit No.

A.5

Title

Ground Surface Elevations of CCR Units 2017-2021 Composite Surface

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209
Prepared by MB on 2021-12-10
Technical Review by VS on 2021-12-10

0 325 650 975 1,300 Feet

1:3,900 (At original document size of 22x34)

Legend

- CCR Unit Ground Surface Elevation Contour (2 ft interval)
- CCR Unit Ground Surface Elevation Contour (10 ft interval)
- CCR Unit Area (Approximate)
- 2019 Imagery Boundary
- 2020 Imagery Boundary

Notes

1. Coordinate System: NAD 1927 StatePlane Tennessee FIPS 4100
2. Vertical Datum: NGVD29
3. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/09/2020)
4. Contours from the 2017 CUF Plant aerial survey (Tuck 2017), 2021 CUF Plant aerial survey (RLS 2021a and b), and supplemental as-built construction surveys summarized in Table C.2 (Appendix C) were used to model the composite ground surface shown herein.

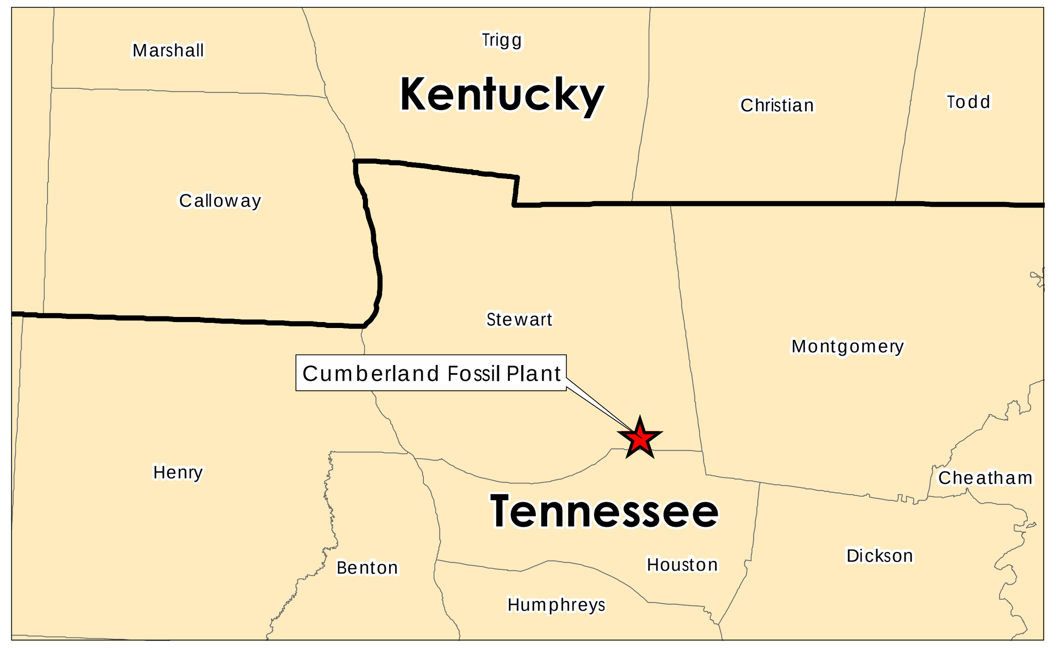


Exhibit No.

A.6

Title

Top of CCR Material Elevations

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209

Prepared by MB on 2021-12-11
Technical Review by VS on 2021-12-11

0 300 600 900 1,200 Feet

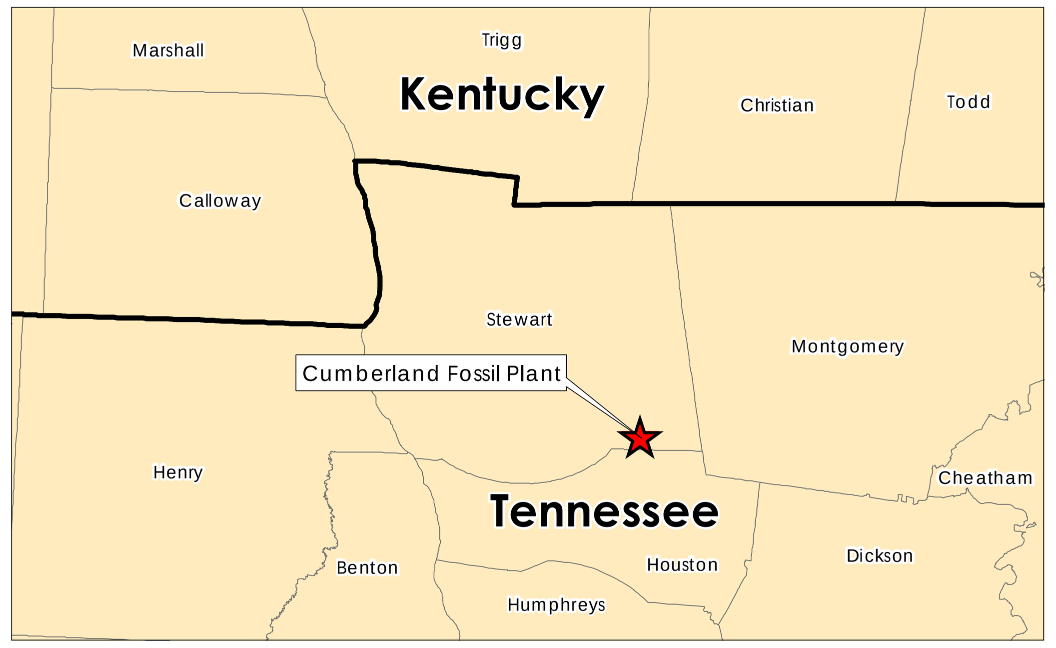
1:3,600 (At original document size of 22x34)

Legend

- CCR Unit Ground Surface Elevation Contour (2 ft interval)
- CCR Unit Ground Surface Elevation Contour (10 ft interval)
- CCR Unit Area (Approximate)
- 2019 Imagery Boundary
- 2020 Imagery Boundary

Notes

1. Coordinate System: NAD 1927 StatePlane Tennessee FIPS 4100
2. Vertical Datum: NGVD29
3. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/09/2020)
4. Contours from the 2017 CUF Plant aerial survey (Tuck 2017), 2021 CUF Plant aerial survey (RLS 2021a and b), and supplemental as-built construction surveys summarized in Table C.2 (Appendix C) were used to model the composite top of CCR surface shown herein.



Stantec

TVA

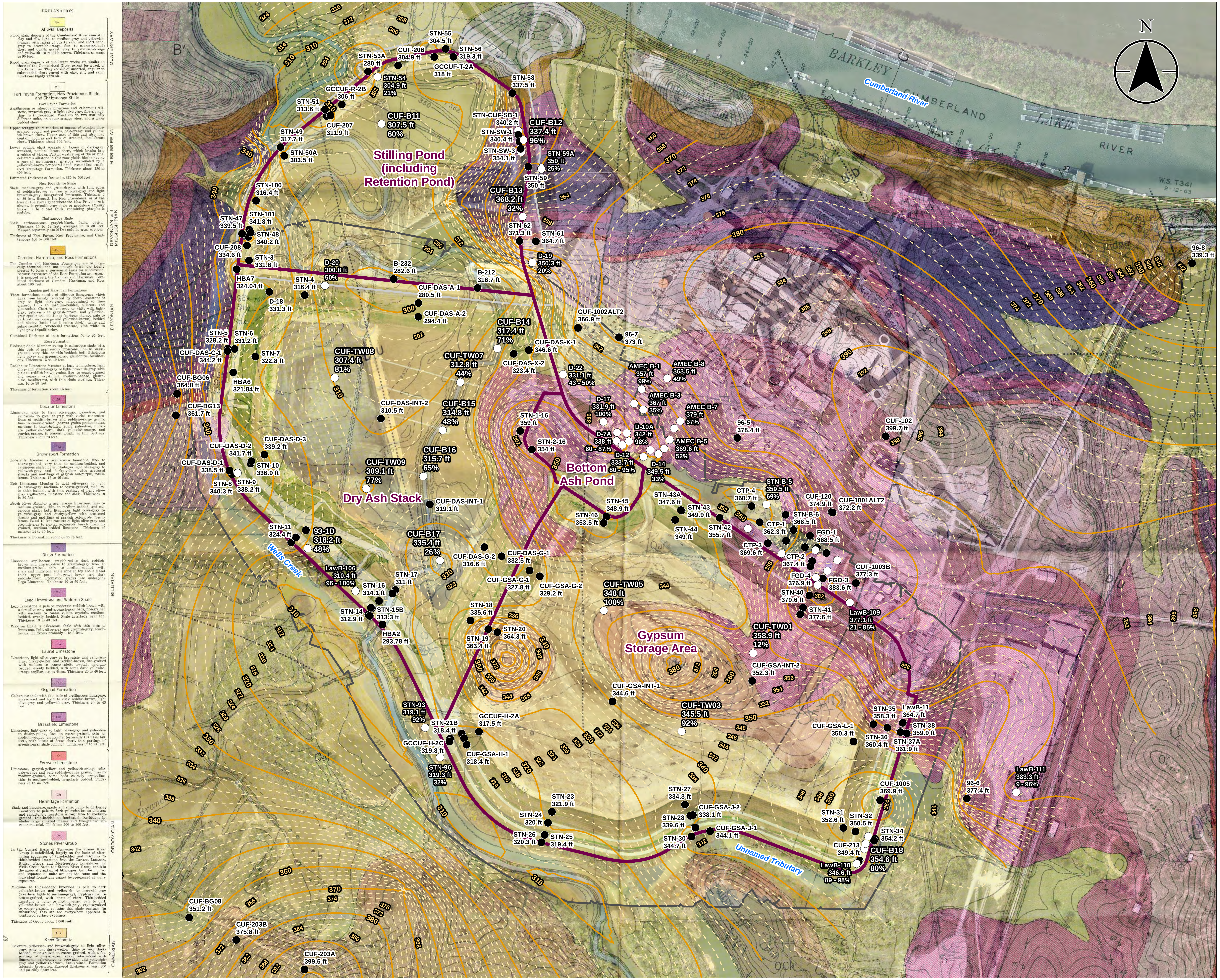


Exhibit No.

A.7

Title

Top of Bedrock Elevations

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209
Prepared by MB on 2021-12-09
Technical Review by VS on 2021-12-09

0 325 650 975 1,300 Feet

1:3,900 (At original document size of 22x34)

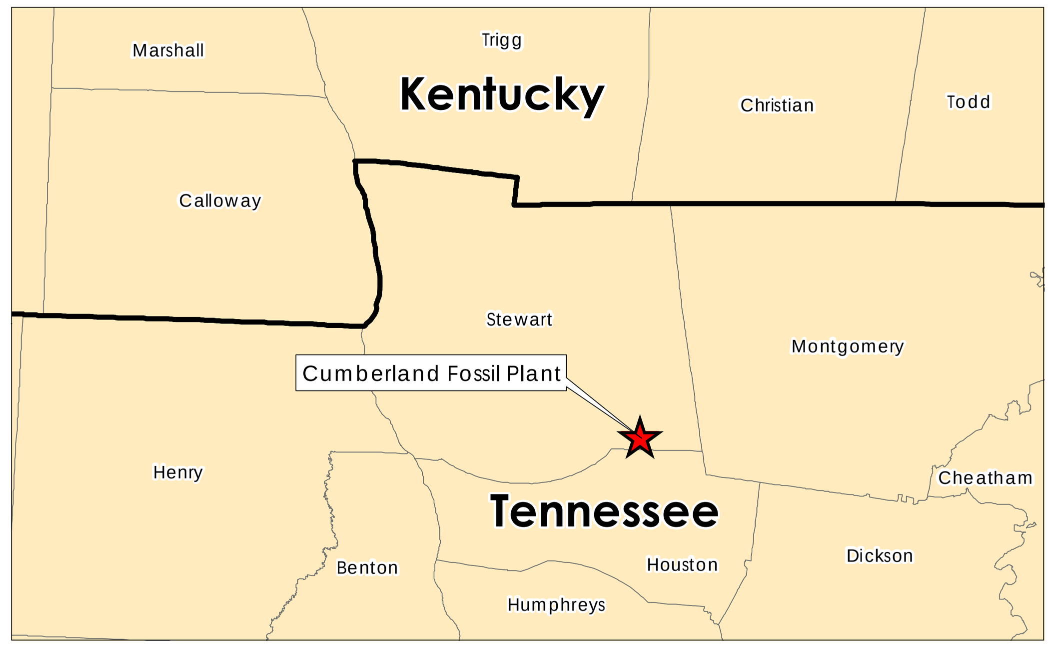
Legend

- Boring without Rock Core Data [ID, TOR Elevation in feet (ft)]
- Boring with Rock Core Data [ID, TOR Elevation RQD]
- CCR Unit Area (Approximate)
- Top of Bedrock Elevation Contour (2 ft interval)
- Top of Bedrock Elevation Contour (10 ft interval)
- 2019 Imagery Boundary
- 2020 Imagery Boundary

ID = identification
TOR = top of rock
RQD = Rock Quality Designation

Notes

1. Coordinate System: NAD 1927 StatePlane Tennessee FIPS 4100
2. Vertical Datum: NGVD29
3. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/09/2020)
4. RQD value corresponds to upper 20 feet of rock core
5. Geologic map corresponds to *The Geologic Map of Wells Creek Basin* (Tiedemann et al, 1968).
6. Model input data used to model the top of bedrock surface shown herein are summarized in Table C.3 (Appendix C).



Stantec

TVA

Exhibit No.

A.8

Title

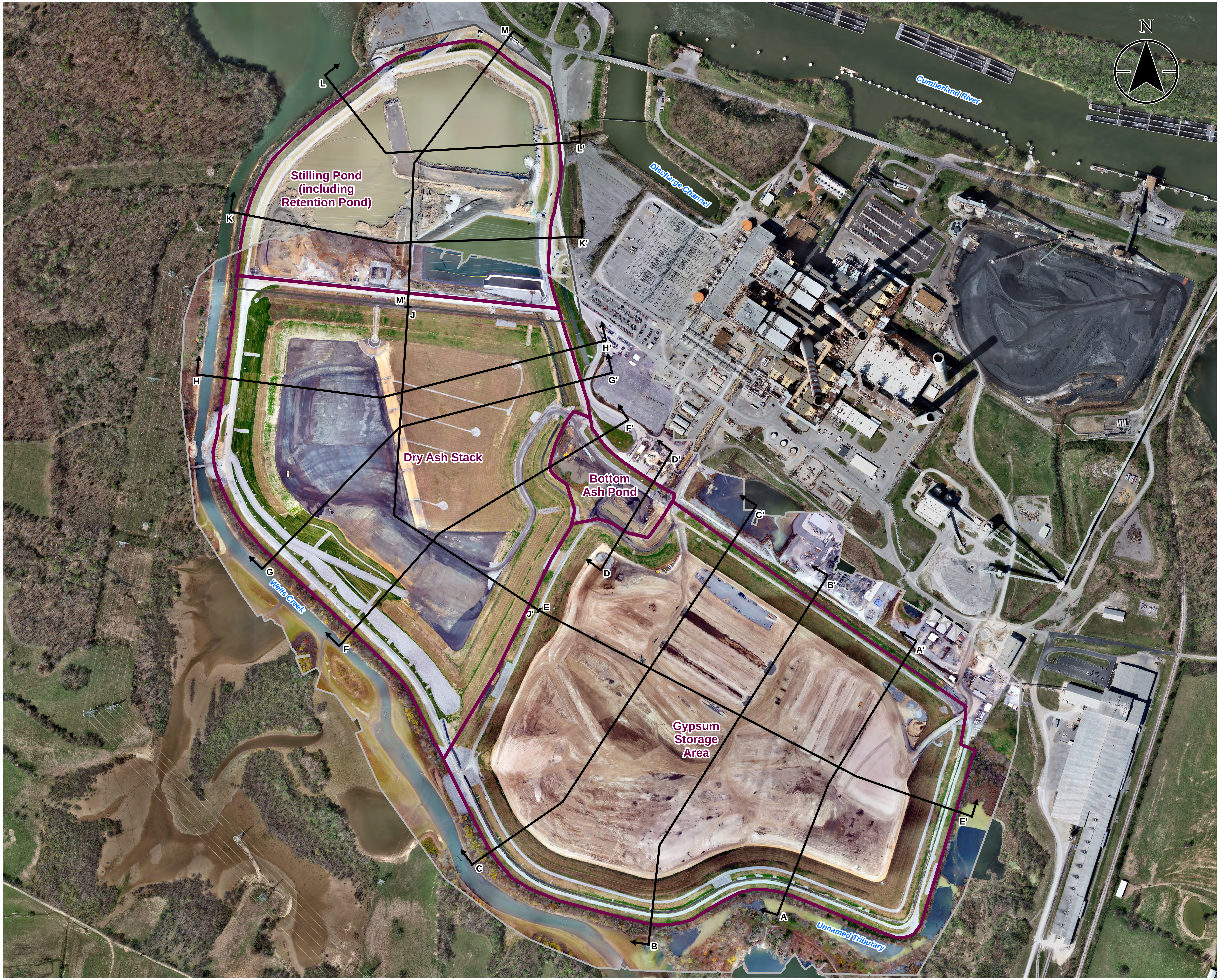
Cross Section Locations

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location: Stewart County, Tennessee

175568209
Prepared by MB on 2021-12-10
Technical Review by EM on 2021-12-10



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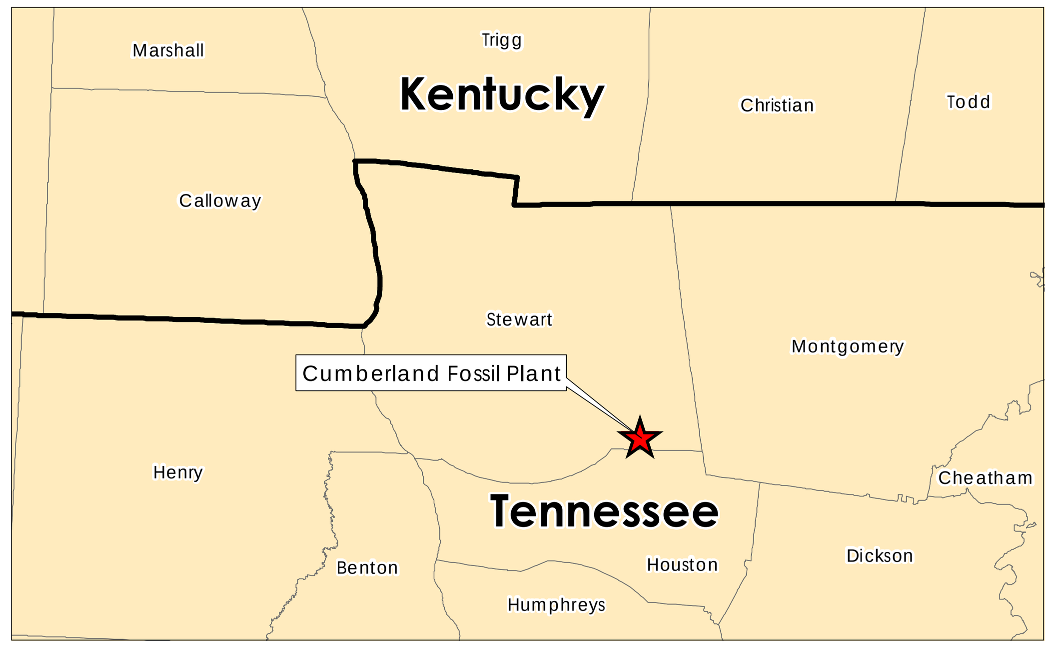
1:3,600 (At original document size of 22x34)

Legend

- Cross Section Location
- 2019 Imagery Boundary
- 2020 Imagery Boundary
- CCR Unit Area (Approximate)

Notes

1. Coordinate System: NAD 1983 StatePlane Tennessee FIPS 4100 Feet
2. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/9/2020)



Stantec TVA

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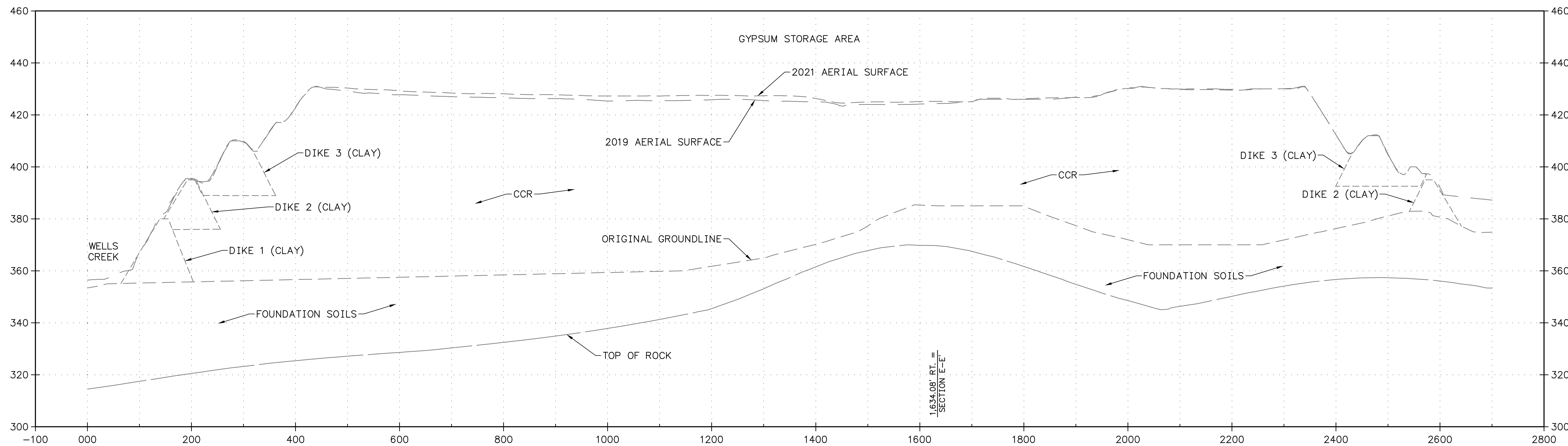
Exhibit No.
A.9

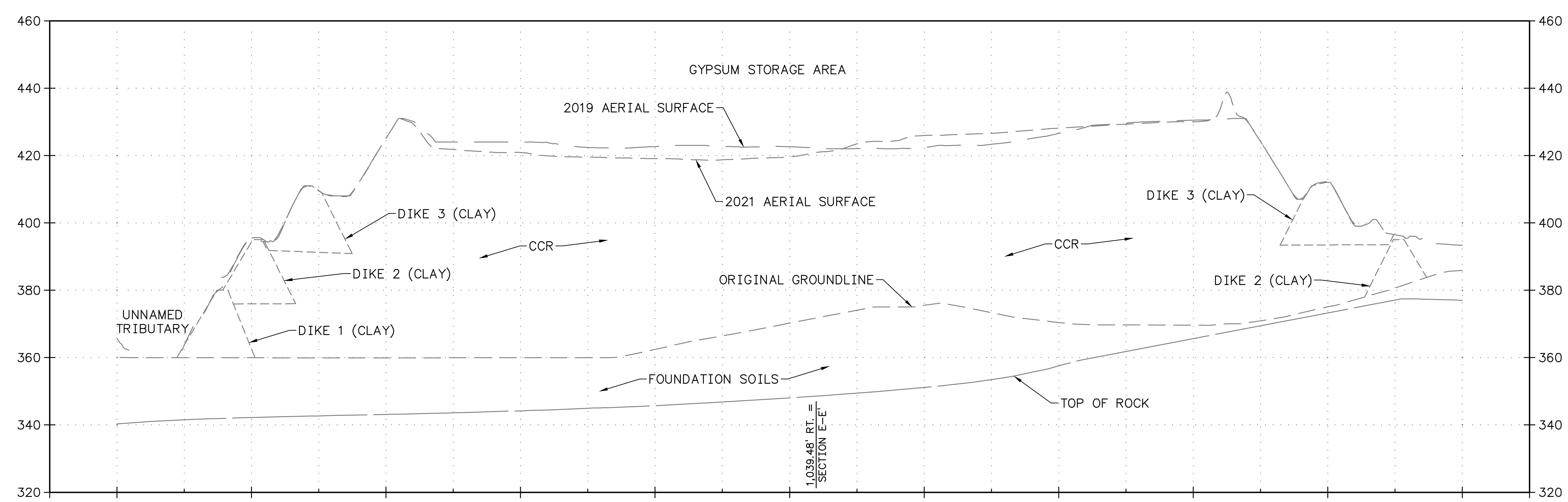
Title
CUF MATERIAL QUANTITY CROSS SECTIONS

Client/Project
Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location 175568209
Stewart County, Tennessee
Prepared by JM on 2021-08-18
Technical Review by VS on 2021-08-18



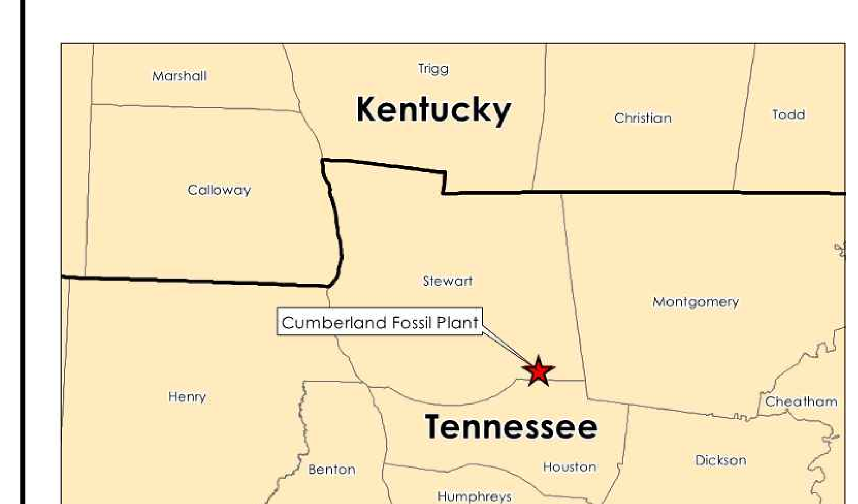
SECTION B–B'
SCALE: 1" = 100' HOR.
1" = 20' VER.



SECTION A–A'
SCALE: 1" = 100' HOR.
1" = 20' VER.

NOTES:

1. COORDINATE SYSTEM: NAD 1927 STATEPLANE TENNESSEE FIPS 4100.
2. VERTICAL DATUM: NGVD29.
3. SEE SECTION 4.0 OF THE MATERIAL QUANTITY SAMPLING AND ANALYSIS REPORT FOR DETAILS REGARDING THE METHODOLOGY AND SOURCE DATA USED TO DEVELOP THE THREE–DIMENSIONAL MODELS FROM WHICH THESE CROSS SECTIONS WERE EXTRACTED.
4. THE INFORMATION AND DATA SHOWN HEREIN ARE FURNISHED ONLY FOR PURPOSES OF THE TDEC ORDER AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. THE ENGINEER OR OWNER WILL NOT BE RESPONSIBLE FOR ANY INTERPRETATION OR CONCLUSION DRAWN BY OTHERS FOR PURPOSES OTHER THAN THE TDEC ORDER.



Stantec TVA

Exhibit No.
A.10

Title
CUF MATERIAL QUANTITY CROSS SECTIONS

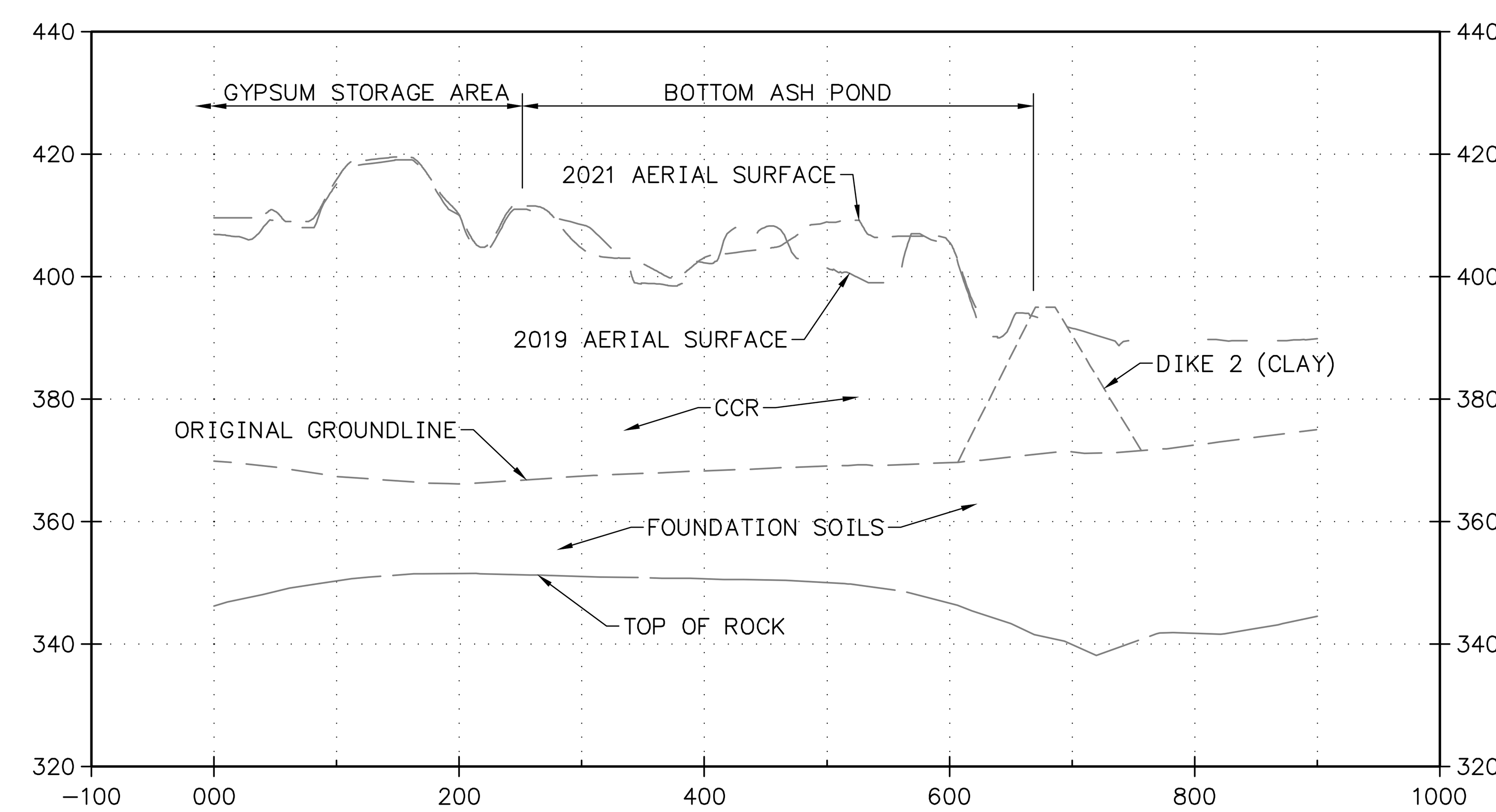
Client/Project
Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location
Stewart County, Tennessee

175568209
Prepared by JM on 2021-08-18
Technical Review by VS on 2021-08-18

NOTES:

1. COORDINATE SYSTEM: NAD 1927 STATEPLANE TENNESSEE FIPS 4100.
2. VERTICAL DATUM: NGVD29.
3. SEE SECTION 4.0 OF THE MATERIAL QUANTITY SAMPLING AND ANALYSIS REPORT FOR DETAILS REGARDING THE METHODOLOGY AND SOURCE DATA USED TO DEVELOP THE THREE-DIMENSIONAL MODELS FROM WHICH THESE CROSS SECTIONS WERE EXTRACTED.
4. THE INFORMATION AND DATA SHOWN HEREIN ARE FURNISHED ONLY FOR PURPOSES OF THE TDEC ORDER AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. THE ENGINEER OR OWNER WILL NOT BE RESPONSIBLE FOR ANY INTERPRETATION OR CONCLUSION DRAWN BY OTHERS FOR PURPOSES OTHER THAN THE TDEC ORDER.



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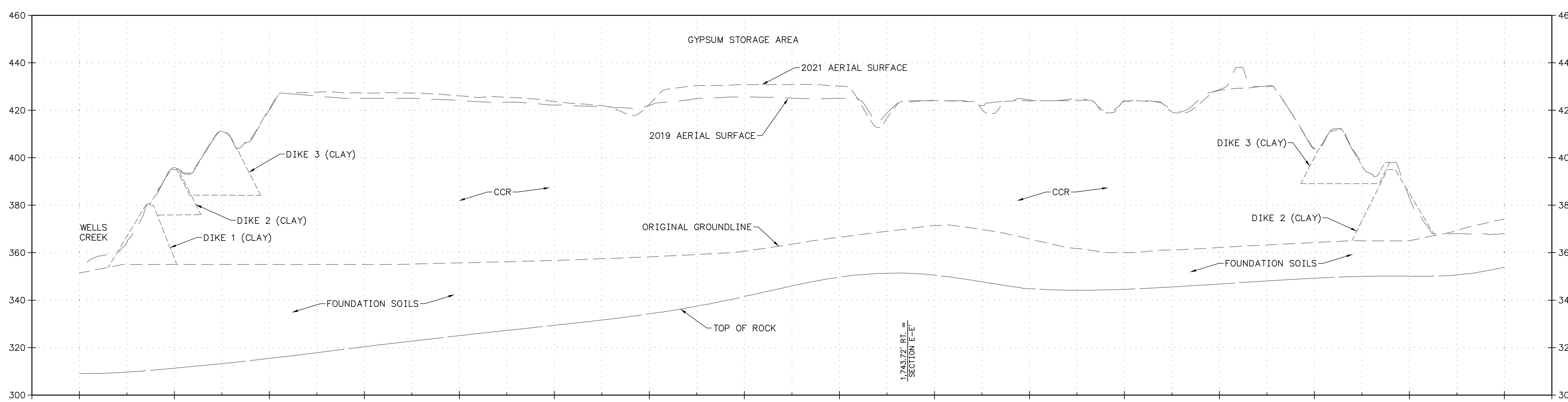


SECTION C–C'
SCALE: 1" = 100' HOR.
1" = 20' VER.

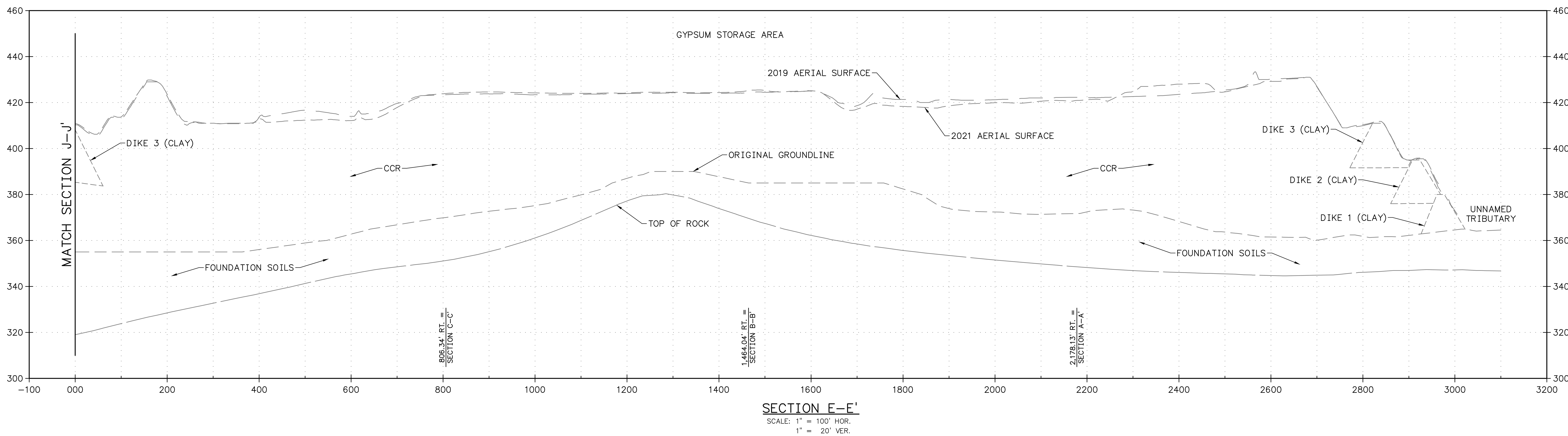
Exhibit No.
A.11

Title
CUF MATERIAL QUANTITY CROSS SECTIONS

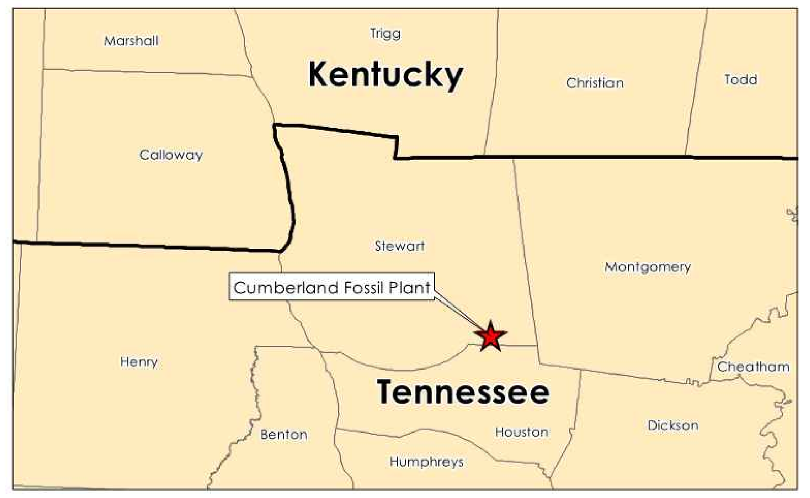
Client/Project
Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location 175568209
Stewart County, Tennessee
Prepared by JM on 2021-08-18
Technical Review by VS on 2021-08-18

NOTES:
1. COORDINATE SYSTEM: NAD 1927 STATEPLANE TENNESSEE FIPS 4100.
2. VERTICAL DATUM: NGVD29.
3. SEE SECTION 4.0 OF THE MATERIAL QUANTITY SAMPLING AND ANALYSIS REPORT FOR DETAILS REGARDING THE METHODOLOGY AND SOURCE DATA USED TO DEVELOP THE THREE-DIMENSIONAL MODELS FROM WHICH THESE CROSS SECTIONS WERE EXTRACTED.
4. THE INFORMATION AND DATA SHOWN HEREIN ARE FURNISHED ONLY FOR PURPOSES OF THE TDEC ORDER AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. THE ENGINEER OR OWNER WILL NOT BE RESPONSIBLE FOR ANY INTERPRETATION OR CONCLUSION DRAWN BY OTHERS FOR PURPOSES OTHER THAN THE TDEC ORDER.



SECTION E-E'
SCALE: 1" = 100' HOR.
1" = 20' VER.



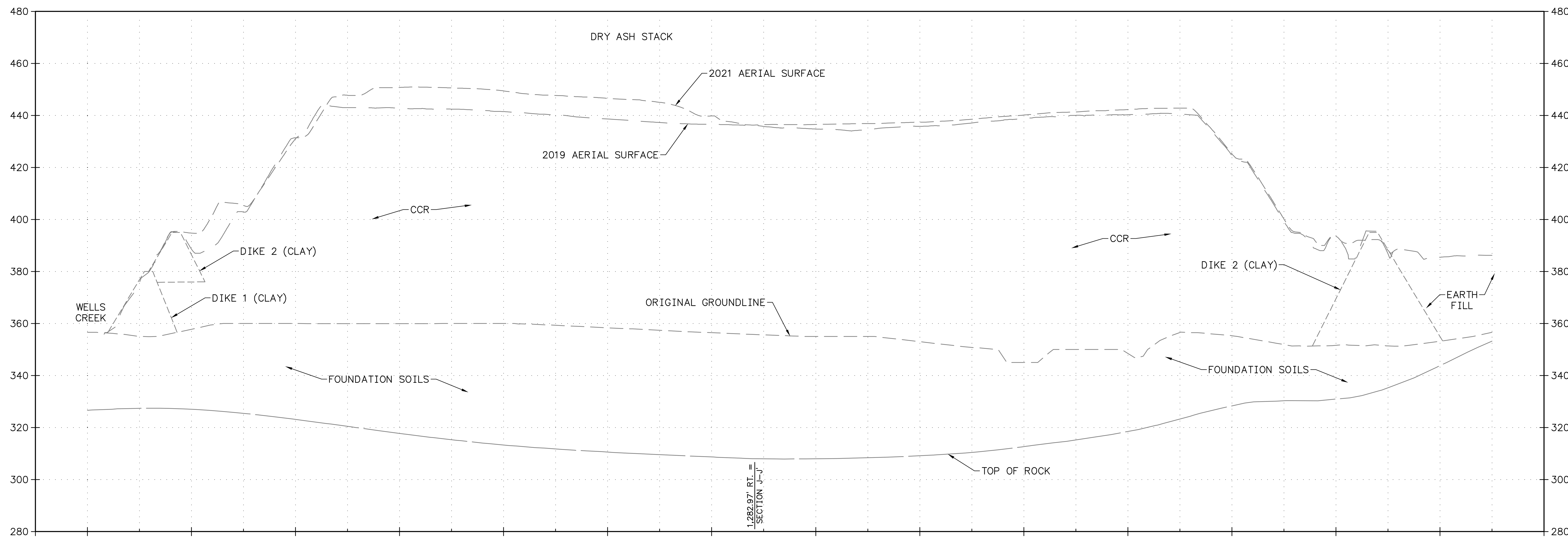
Stantec TVA

Exhibit No.
A.12

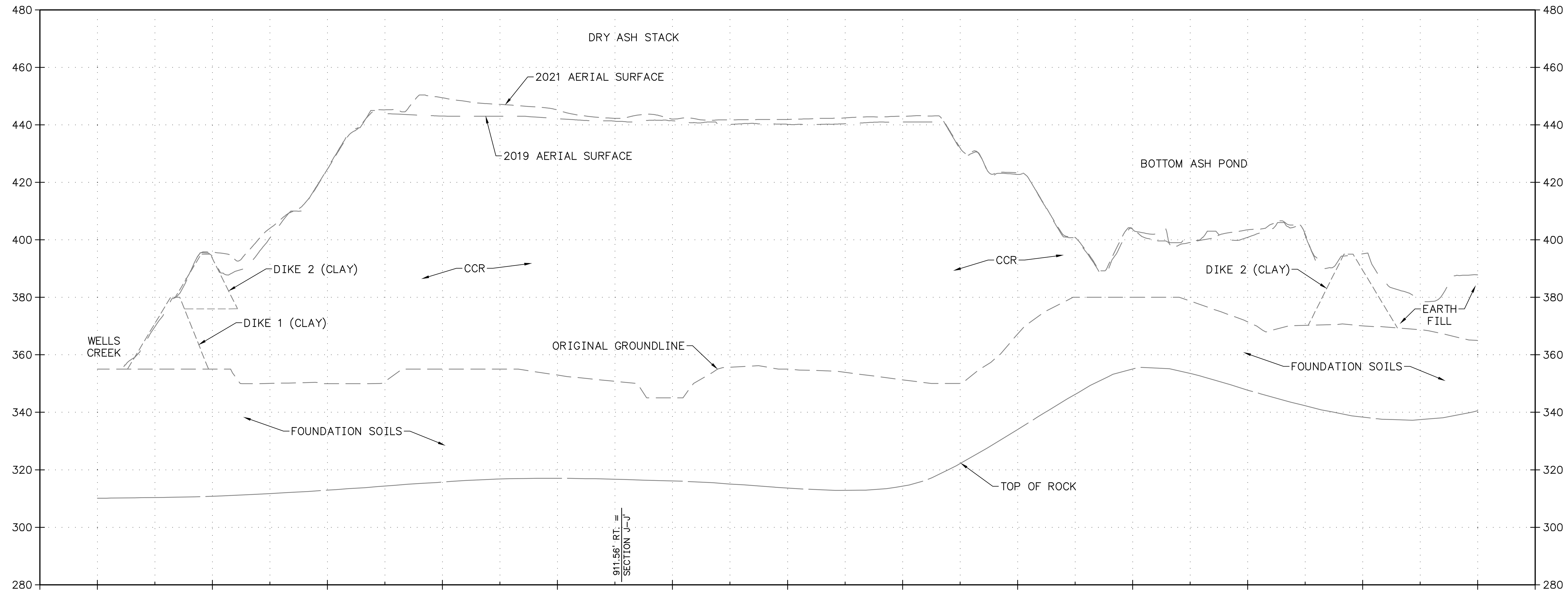
Title
CUF MATERIAL QUANTITY CROSS SECTIONS

Client/Project
Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location: Stewart County, Tennessee
175568209
Prepared by JM on 2021-08-18
Technical Review by VS on 2021-08-18



SECTION G–G'
SCALE: 1" = 100' HOR.
1" = 20' VER.



SECTION F–F'
SCALE: 1" = 100' HOR.
1" = 20' VER.

NOTES:
1. COORDINATE SYSTEM: NAD 1927 STATEPLANE TENNESSEE FIPS 4100.
2. VERTICAL DATUM: NGVD29.
3. SEE SECTION 4.0 OF THE MATERIAL QUANTITY SAMPLING AND ANALYSIS REPORT FOR DETAILS REGARDING THE METHODOLOGY AND SOURCE DATA USED TO DEVELOP THE THREE–DIMENSIONAL MODELS FROM WHICH THESE CROSS SECTIONS WERE EXTRACTED.
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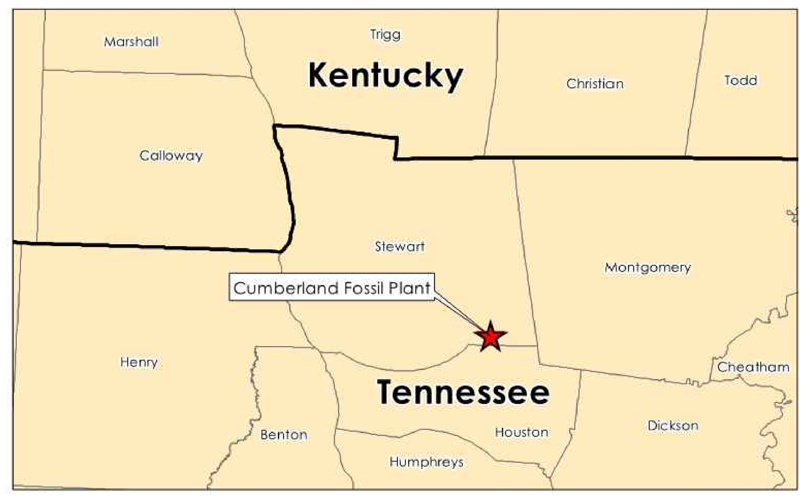


Stantec
TVA

Exhibit No.
A.13

Title
CUF MATERIAL QUANTITY CROSS SECTIONS

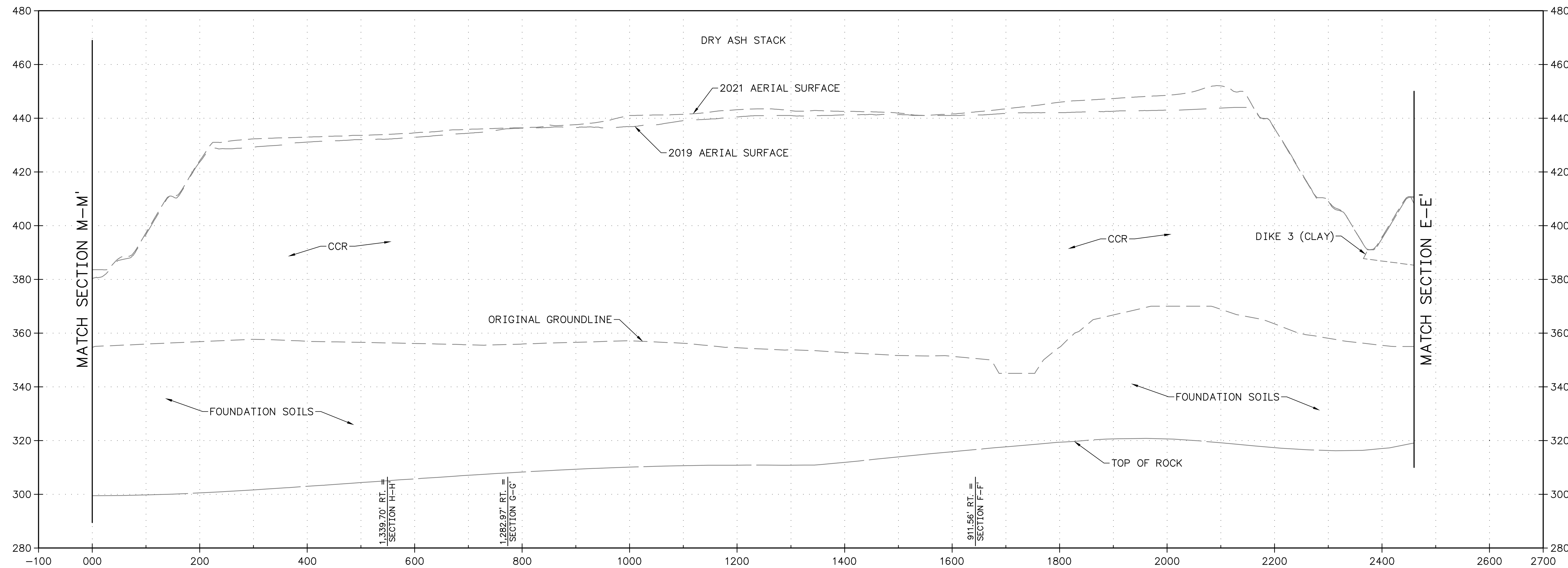
Client/Project
Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location
Stewart County, Tennessee

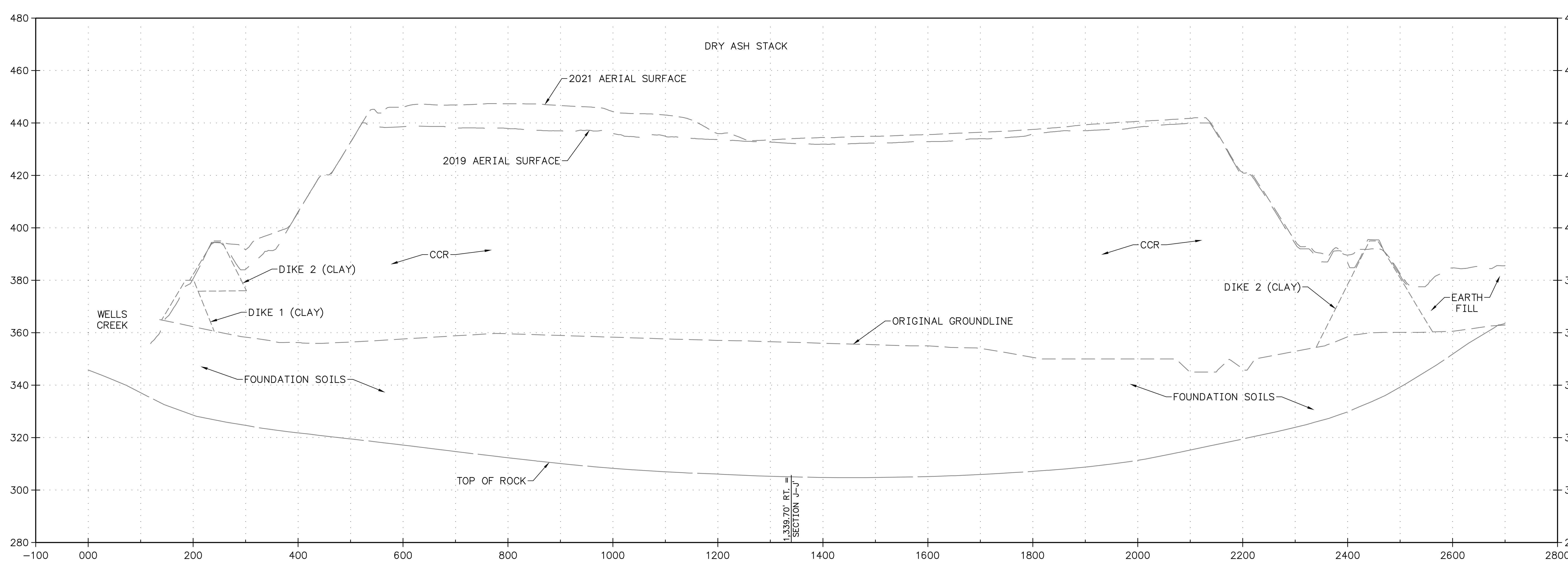
175568209
Prepared by JM on 2021-08-18
Technical Review by VS on 2021-08-18

NOTES:

1. COORDINATE SYSTEM: NAD 1927 STATEPLANE TENNESSEE FIPS 4100.
2. VERTICAL DATUM: NGVD29.
3. SEE SECTION 4.0 OF THE MATERIAL QUANTITY SAMPLING AND ANALYSIS REPORT FOR DETAILS REGARDING THE METHODOLOGY AND SOURCE DATA USED TO DEVELOP THE THREE-DIMENSIONAL MODELS FROM WHICH THESE CROSS SECTIONS WERE EXTRACTED.
4. THE INFORMATION AND DATA SHOWN HEREIN ARE FURNISHED ONLY FOR PURPOSES OF THE TDEC ORDER AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. THE ENGINEER OR OWNER WILL NOT BE RESPONSIBLE FOR ANY INTERPRETATION OR CONCLUSION DRAWN BY OTHERS FOR PURPOSES OTHER THAN THE TDEC ORDER.



SECTION J–J'
SCALE: 1" = 100' HOR.
1" = 20' VER.



SECTION H–H'
SCALE: 1" = 100' HOR.
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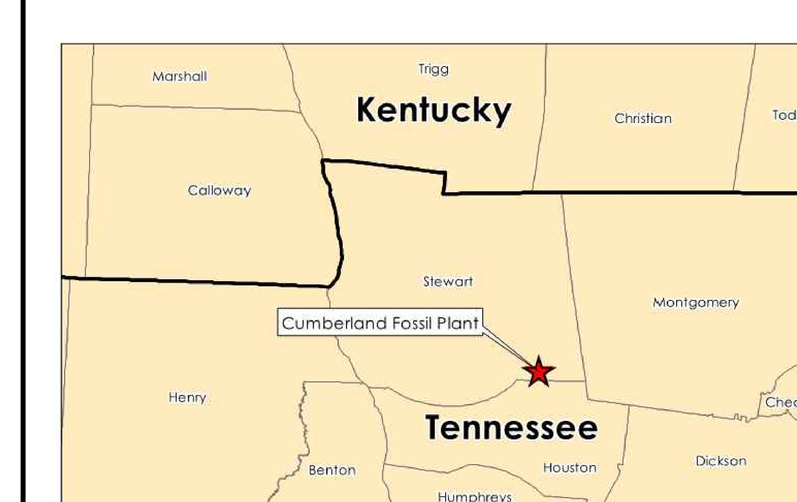
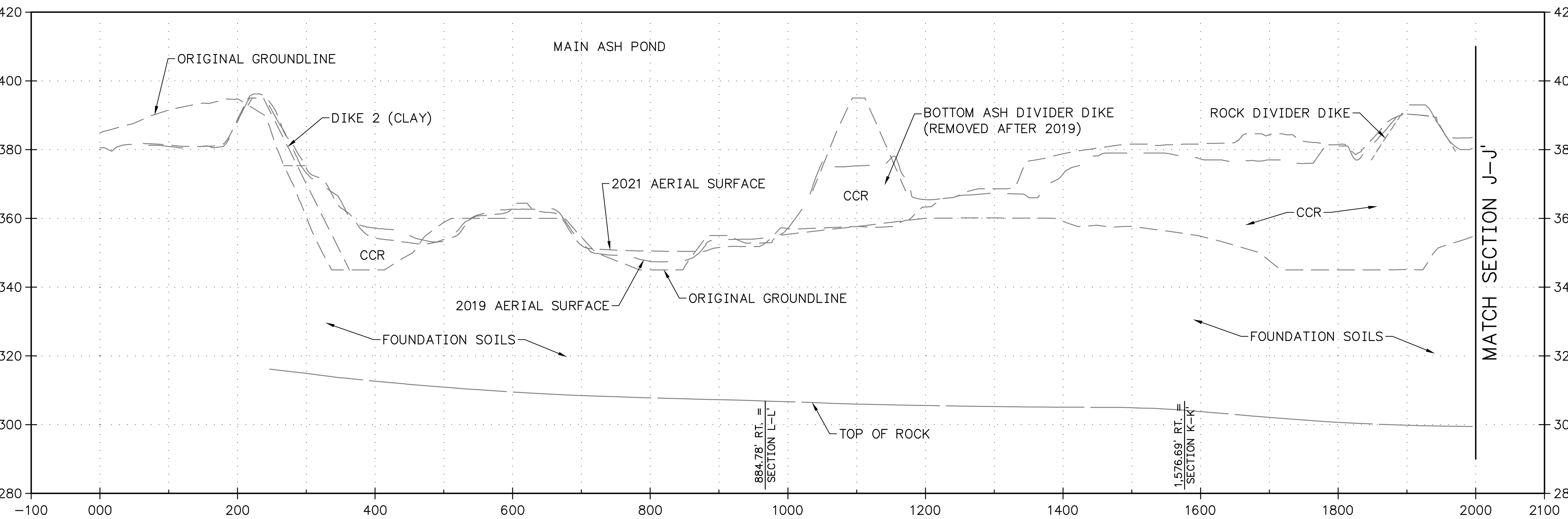


Stantec
TVA



SECTION M–M'

SCALE: 1" = 100' HOR.
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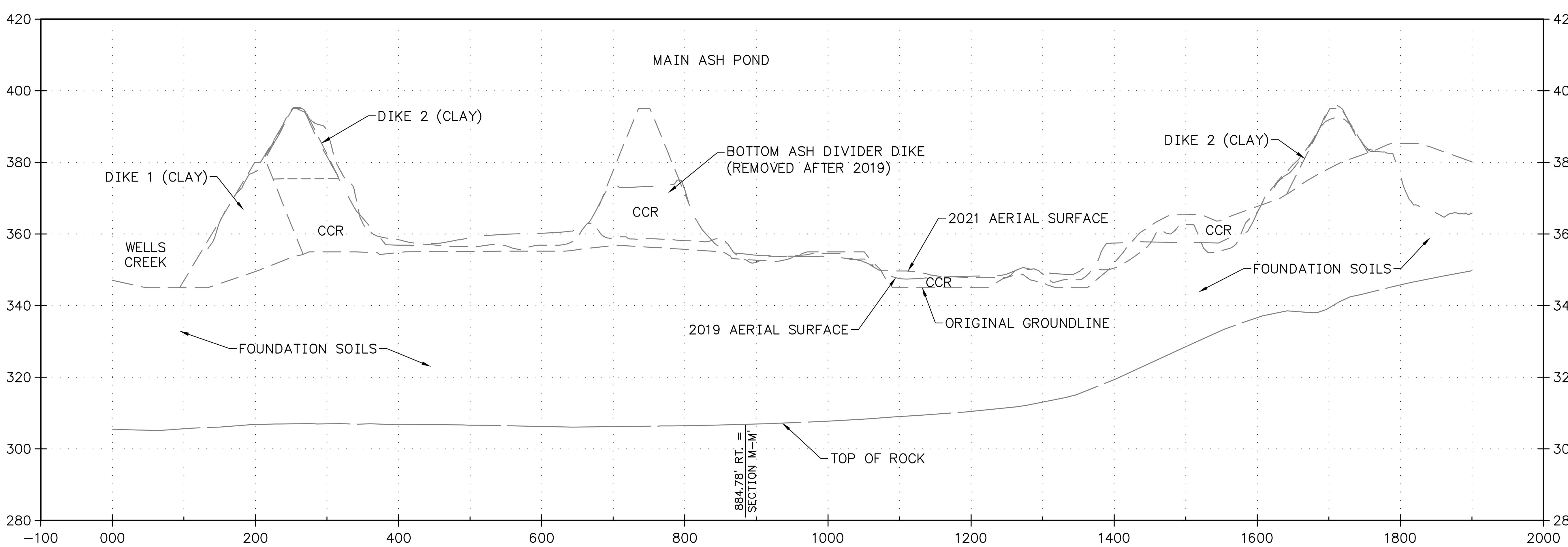
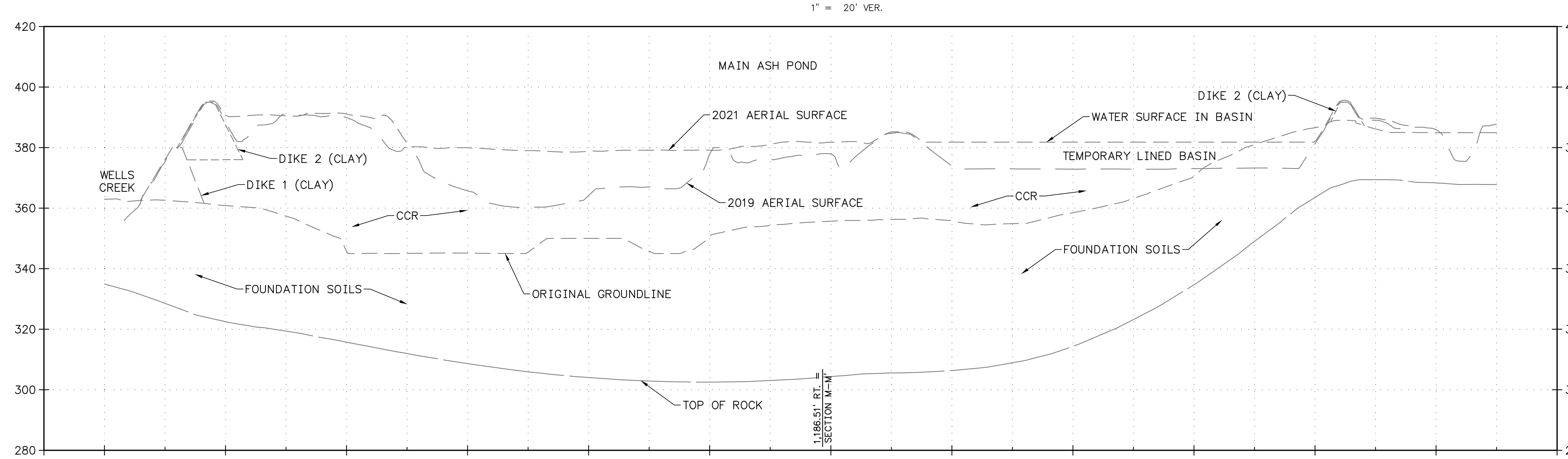


SECTION L–L'

SCALE: 1" = 100' HOR.
1" = 20' VER.



SECTION K–K'

SCALE: 1" = 100' HOR.
1" = 20' VER.

Exhibit No.
A.14

Title
CUF MATERIAL QUANTITY CROSS SECTIONS

Client/Project
Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location
Stewart County, Tennessee

175568209
Prepared by JM on 2021-08-18
Technical Review by VS on 2021-08-18

NOTES:

1. COORDINATE SYSTEM: NAD 1927 STATEPLANE TENNESSEE FIPS 4100.
2. VERTICAL DATUM: NGVD29.
3. SEE SECTION 4.0 OF THE MATERIAL QUANTITY SAMPLING AND ANALYSIS REPORT FOR DETAILS REGARDING THE METHODOLOGY AND SOURCE DATA USED TO DEVELOP THE THREE–DIMENSIONAL MODELS FROM WHICH THESE CROSS SECTIONS WERE EXTRACTED.
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Stantec
TVA

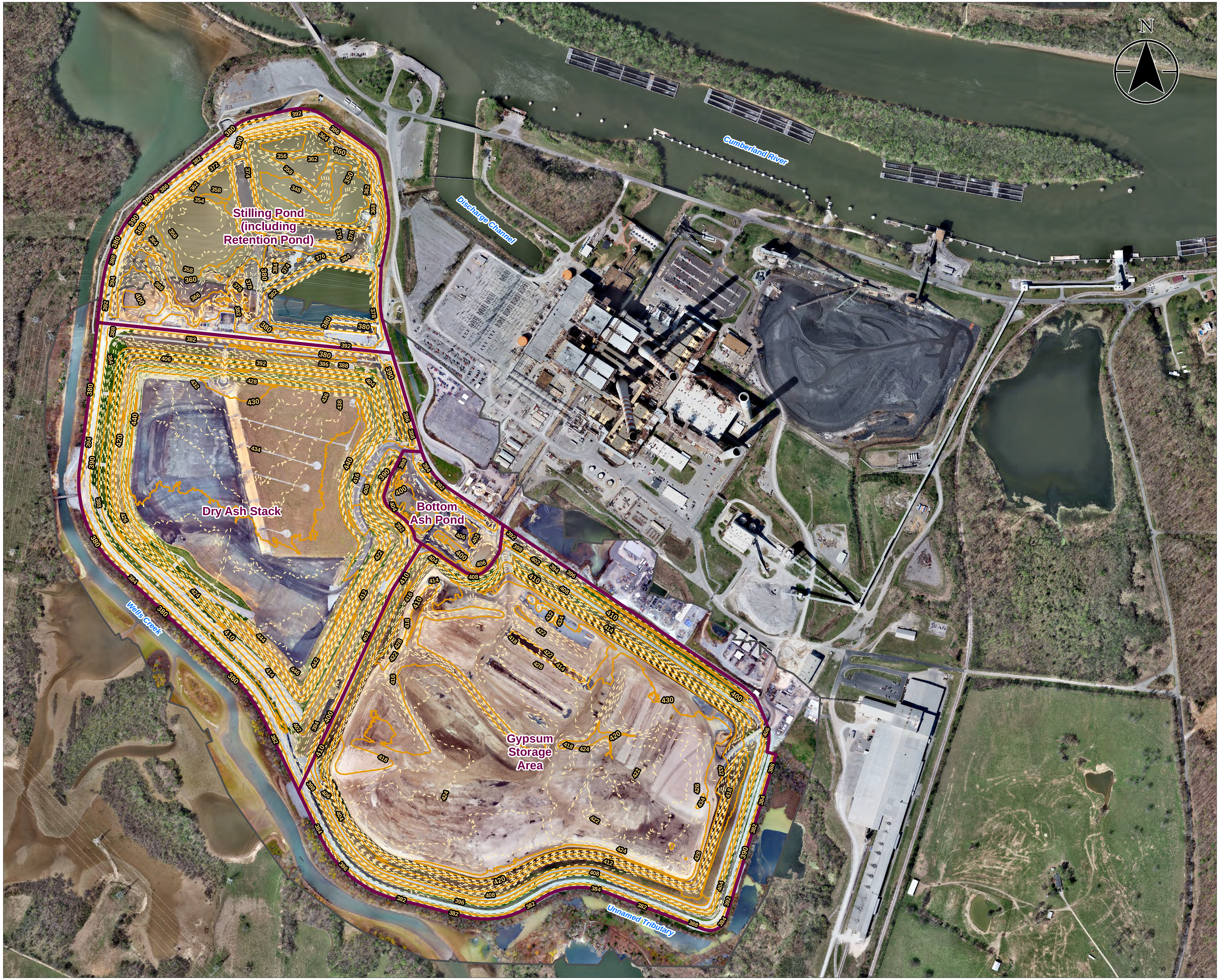


Exhibit No.

A.15

Title

Ground Surface Elevations of CCR Units 2015-2019 Composite Surface

Client/Project

Tennessee Valley Authority
Cumberland Fossil (CUF) Plant TDEC Order

Project Location

Stewart County, Tennessee

175568209
Prepared by MB on 2021-12-09
Technical Review by VS on 2021-12-09

N

0 325 650 975 1,300 Feet

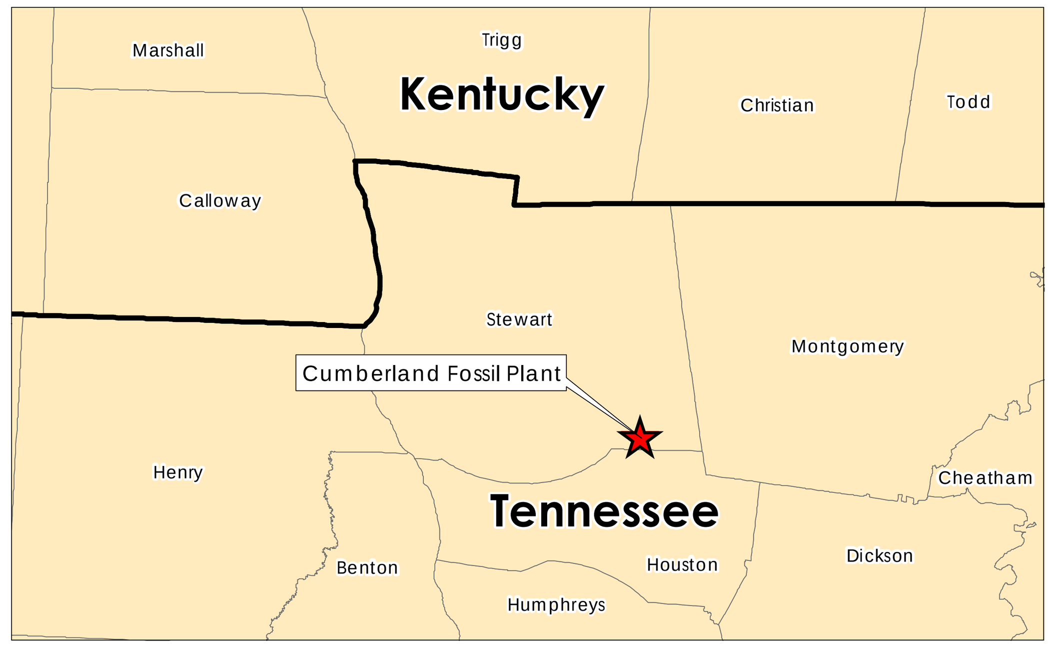
1:3,900 (At original document size of 22x34)

Legend

- CCR Unit Ground Surface Elevation Contour (2 ft interval)
- CCR Unit Ground Surface Elevation Contour (10 ft interval)
- CCR Unit Area (Approximate)
- 2019 Imagery Boundary
- 2020 Imagery Boundary

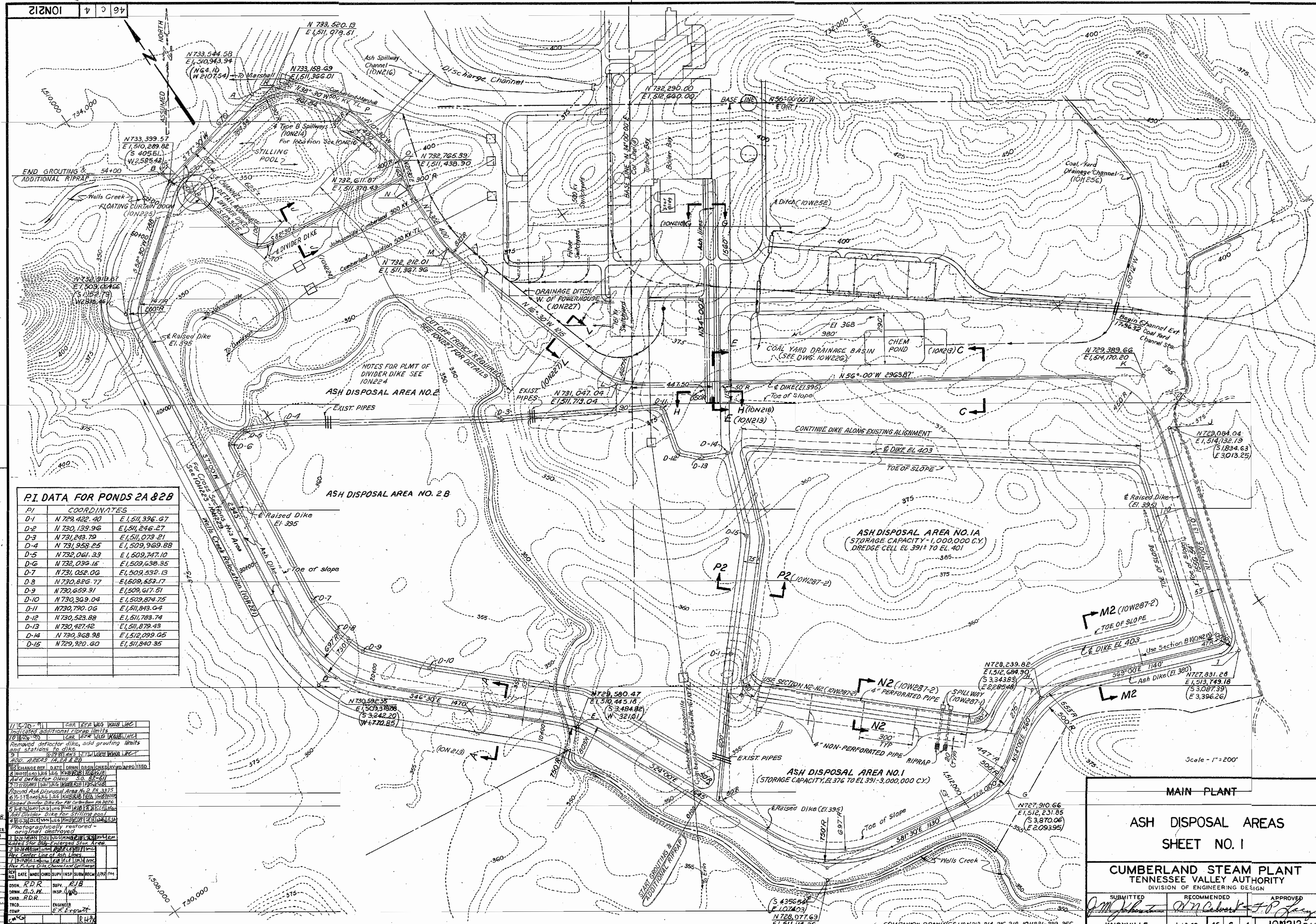
Notes

1. Coordinate System: NAD 1927 StatePlane Tennessee FIPS 4100
2. Vertical Datum: NGVD29
3. Imagery Provided by Tuck Mapping (c. 2017) and TVA (12/11/2019 and 11/09/2020)
4. Contours from the 2017 CUF Plant aerial (Tuck 2017) and supplemental as-built construction surveys summarized in Table C.3 (Appendix C) were used to model the composite ground surface shown herein.



Stantec TVA

APPENDIX B – HISTORICAL DRAWINGS AND INFORMATION



P.I. DATA FOR PONDS 2A & 2B

PI	COORDINATES	
D-1	N 729,422.40	E 1,511,396.67
D-2	N 730,133.96	E 1,511,246.27
D-3	N 731,243.79	E 1,511,073.21
D-4	N 731,958.25	E 1,509,969.88
D-5	N 732,061.33	E 1,509,747.10
D-6	N 732,036.15	E 1,509,638.35
D-7	N 731,052.06	E 1,509,532.13
D-8	N 730,826.77	E 1,509,553.17
D-9	N 730,659.31	E 1,509,617.51
D-10	N 730,369.04	E 1,509,874.75
D-11	N 730,790.06	E 1,511,843.64
D-12	N 730,523.88	E 1,511,783.74
D-13	N 730,427.42	E 1,511,879.43
D-14	N 730,368.98	E 1,512,099.65
D-15	N 729,920.60	E 1,511,840.35

MAIN PLANT

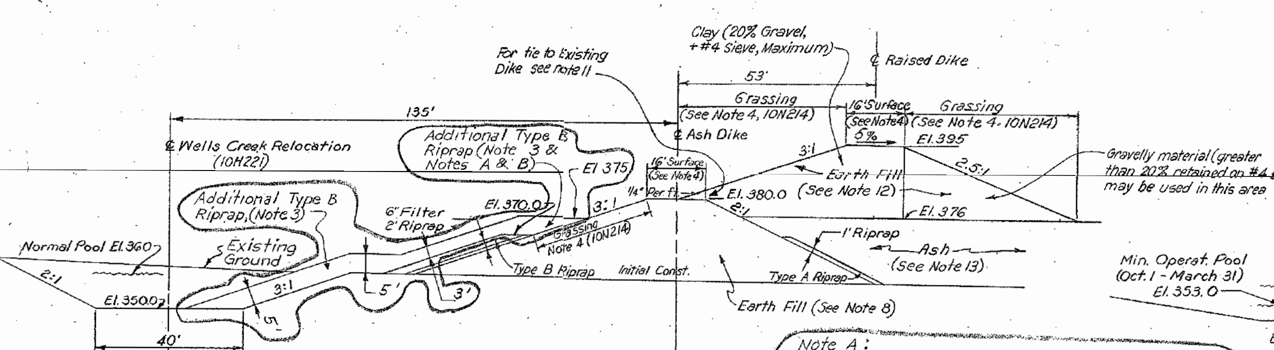
ASH DISPOSAL AREAS
SHEET NO. 1

CUMBERLAND STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED
KNOXVILLE	1-13-69	46 C 4 10N212 R11

RECORD DRAWING AS CONSTRUCTED 7-24-74

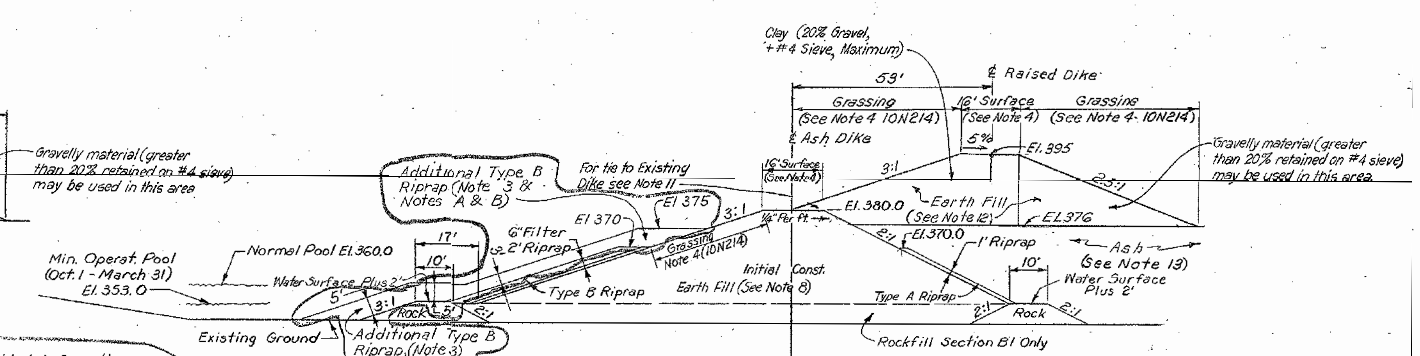
46 C 4 10N213



Note A: This additional riprap must be added before the ash pond water level is raised to El. 378.

Note B: This additional riprap is to be added only from Sta 0+00 to Sta 54+00 along Wells Creek as shown on dwg 10N212 R11

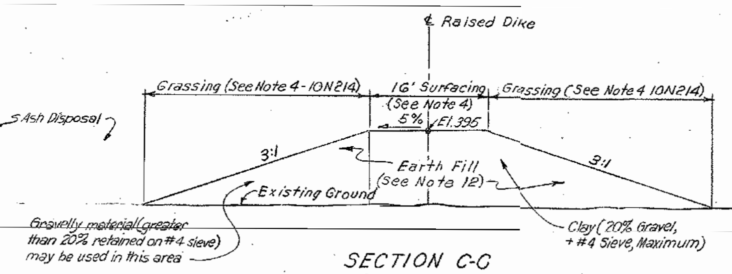
SECTION A
Dike where Exist Ground is above water surface.
Scale: 1" = 20'



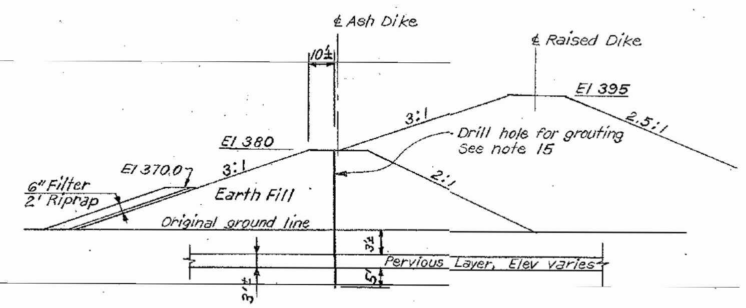
SECTION B & B1
Dike where Exist Ground is below water surface.
Scale: 1" = 20'

NOTES:

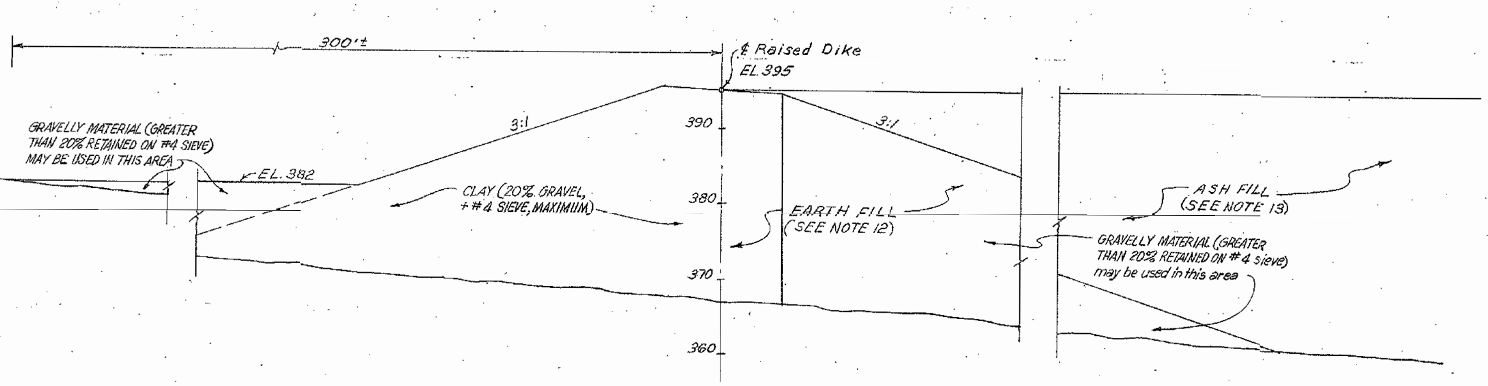
1. All work on the construction of these dikes shall be in accordance with the T-1 Specifications unless otherwise noted.
2. Embankments shall be compacted with sheepsfoot rollers. Two density tests per day shall be made to insure achivement of 95% of standard Proctor maximum density. Fill moisture shall be controlled to obtain optimum compaction (Initial const).
3. Riprap shall consist of sound, durable limestone, section 575 Filter shall be crushed stone conforming to section 570
   (a) Type A Riprap shall be 12 inches thick and at least 50 % of ~~the stone shall weigh 25 lb. or more. Riprap~~ laid without filter.
   (b) Type B Riprap shall be 24 inches thick and at least 50% of the stone shall weigh 150 lb. or more. Filter blanket shall be 6 inches thick.
4. Crushed stone surfacing, 4 inches thick, shall be applied for the full width of the top of the dike in accordance with section 305
5. Rockfill shall be sound, durable stone in accordance with section 124 and chocked with fines.
6. Where practical borrow shall be obtained from inside disposal areas.
7.
8. Initial ash dikes to be built by construction of earth to ~~elevation shown on sections.~~
9. The results of the soil investigation for the raising of the dikes at the ash disposal area no.2 are reported in a memorandum from Gene Farmer to G.L. Buchanan dated Nov. 20, 1978 Cumberland Steam Plant Ash Disposal Area Dikes Soils Investigation.
10. The minimum factor of safety for all loading conditions on ash disposal area dikes is 1.60.
11. When connecting the new dike to the old dike extreme care shall be used to insure an impervious and stable connection. The existing dikes shall be stripped of all vegetation, riprap, gravel, crushed stone, course ash and other pervious material on top of dike and above elevation 376 on inside slope. Benched and scarified to a minimum depth of 6 inches and compacted so as to form a bond with the new earth fill. The utmost caution shall be used in benching the existing dike slopes so as not to create an unstable condition. Small benches of minimum depth shall be used.
12. Earth fill for raised dikes shall be placed in accordance with all applicable sections of general construction specification G-9 for Rolled Earth Fill for Dams and Power Plants. Earth fill shall be obtained from designated borrow areas. The earth fill moisture content shall not exceed 3.0% above optimum ~~moisture content and shall be placed and~~ compacted to be at least 95% maximum dry density as determined by the TVA Materials Laboratory. At least one moisture-density assurance test shall be made on each 5000 cu. yd. of fill placed.
13. Placement of the underwater ash fill shall be by end dumping along the length of the dike. The top surface of the underwater dike just above the water shall be thoroughly compacted and scarified before placing the overlaying ash fill. Bottom ash for that portion of the divider dike above water shall be placed in not more than 9 inch layers, and well compacted with rubber tired hauling equipment.
14. Dike foundation shall have all weak surface soils removed to material that will easily bear the weight of loaded ~~rubber tired earth hauling equipment.~~
15. Refer to the memorandum J.H. Coulson to R.G. Haynes dated Nov. 20, 1990 (B65901120029), for specifications for grouting Ash Pond seep repair.



SECTION C-C
Scale: 1" = 10'-0"
(10N212)



TYP GROUTING SECTION
NTS



SECTION E-E
SCALE: 1" = 10'
(10N212)

SUMMARY OF QUANTITIES													
Area	Item No. / Location	Ash Fill Cu. Yd.	123 Earth Bor. Cu. Yd.	305 Surfacing Ton	580 Seeding Sq. Yd.	582 Mulching Sq. Yd.	600 Class III Reinf. Conc. Pipe - Lin. ft. 18"	36"	48"	570 Filter Blanket Ton	575 Riprap - Cu. Yd. Type A	Type B	Rock fill Cu. Yd.
Ash Disposal Dike (Initial Const)	A-B		54,900	910						520	600	1540	1060
	B-C		75,800	310						880	915	2600	4015
	C-D		149,500	920						2195	2340	6485	6280
	D-E		104,850	580						1425	1485	4215	4125
	E-F		140,150	640						2375	2480	7020	1690
	F-G		28,850	440						885	720	2625	345
	G-H		5,000	200							515		
	H-I		12,050	440							1235		
	I-J		40,450	840							615		
Ash Disposal Dikes (Raising to EL 395)		95,300	310,200	3000	47,300	47,300		272					
Total		95,300	921,750	8280	47,300	47,300		272		8280	10,905	24,485	17,515
Dike Stability												91,000	

CAPACITY OF DISPOSAL AREAS — ACCUMULATION OF UNIT YEARS			
AREA NO. 1 Elevations	AREA NO. 1 Unit Yrs.*	AREA NO. 2 Elevations	AREA NO. 2 Unit Yrs.*
345	0.2		
350	0.6		
355	1.5		
360	3.4	360	0.6
~~365~~	~~6.9~~	365	2.0
370	8.8	370	3.8
375	11.9	375	5.9
380	15.3	380	8.5
385	18.8	385	11.3
390	22.3	390	14.2

* Based on 1,300,000 KW unit. 80% Capacity.

COMPANION DRAWINGS: 10N212, 214
10N221-229, 256

Scale: As Noted

MAIN PLANT

ASH DISPOSAL AREAS
SHEET NO. 2

CUMBERLAND STEAM PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE 1-13-69 46 C 4 10N213 R6

Attachment B.3

SEE 10W302-1 FOR DRAWING INDEX/COMPANION DRAWING LIST

R										
R 0		JLG	MGH	JGA	HLP	REP		JGA		D
INITIAL ISSUE FOR DCN CUF-03-536										
REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST / REV CD

DISCIPLINE INTERFACE

SCALE: 1" = 100' EXCEPT AS NOTED

FGD RETROFIT PROJECT
UNITS 1 & 2

PROP. WASTE DISPOSAL FACILITY
CONSTRUCTION SEQUENCE
STAGE NO. 5 & 6 – SHEET 2 OF 2

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
J.L. GRAY	M.G. HRANEK	J.G. ALBRIGHT	H.L. PETTY	R.E. PURKEY		J.G. ADAIR

CUMBERLAND FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R2K | DATE | 46 | C | 10W302-13 | R 0

PLOT FACTOR:1:1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

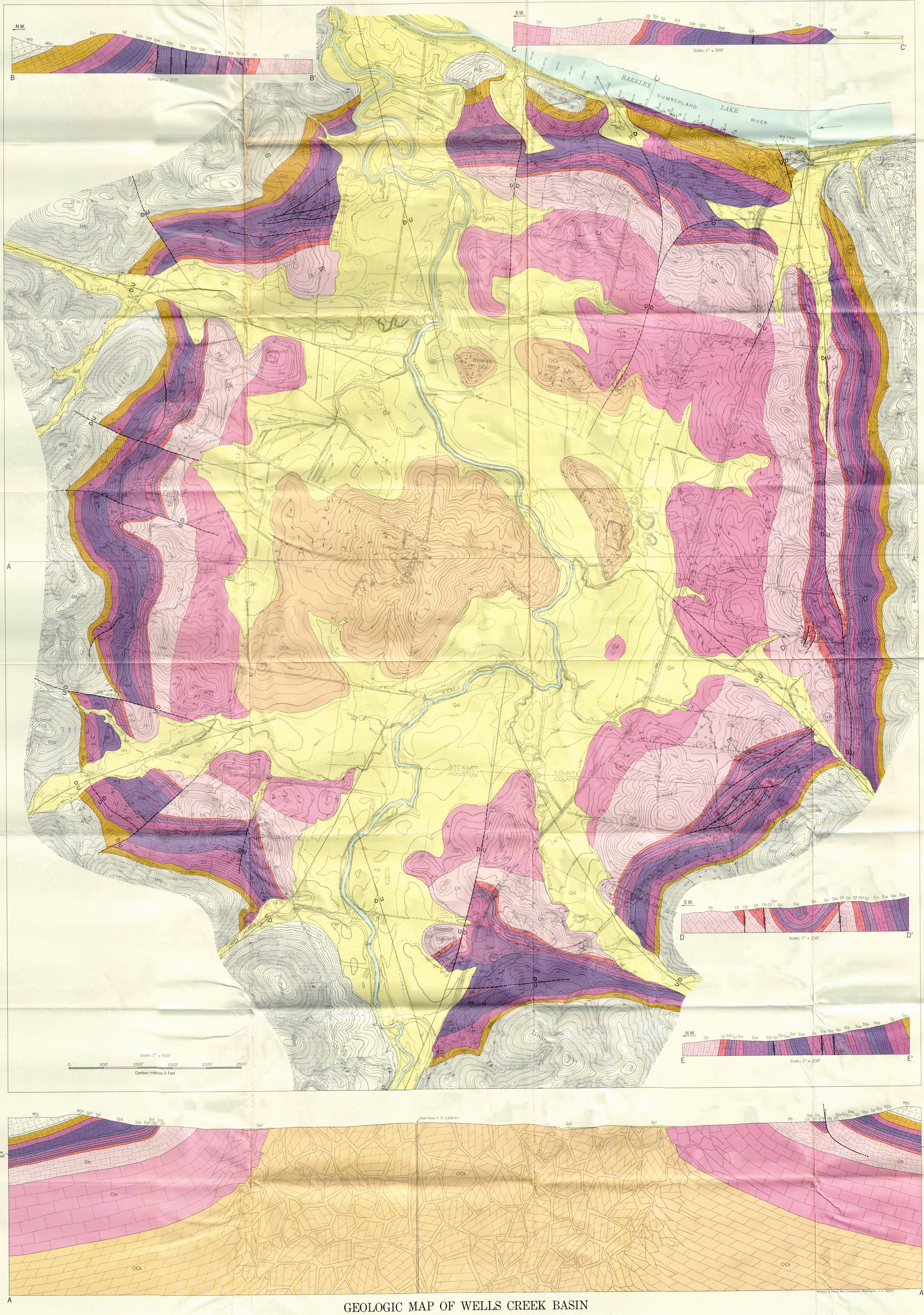
TASK COMPLETED BY: | REV NO.

HAROLD L. PETTY – REGISTERED ENGINEER – STATE OF TENNESSEE
10/10/03

46 C 10W302-13

TENNESSEE DIVISION OF GEOLOGY
BULLETIN 68
PLATE 2

ATTACHMENT B.4



EXPLANATION

Qal

Alluvial Deposits

QUATERNARY

Flood plain deposits of the Cumberland River consist of clay and silt, light- to medium-gray and yellowish-orange; with lenses of quartz sand and chert sand, gray to brownish-orange, fine- to coarse-grained; chert and quartz gravel, gray to yellowish-orange and yellowish- to reddish-brown. Thickness as much as 90 feet.

Flood plain deposits of the larger creeks are similar to those of the Cumberland River, except for a lack of quartz pebbles. They consist of unsorted, angular to subrounded chert gravel with clay, silt, and sand. Thickness highly variable.

Mfp

Fort Payne Formation, New Providence Shale, and Chattanooga Shale

MISSISSIPPIAN

Fort Payne Formation

Argillaceous or siliceous limestone and calcareous siltstone, brownish-gray to light olive gray, fine-grained, thin- to thick-bedded. Weathers to two markedly different units, an upper scraggy chert and a lower bedded chert.

Upper scraggy chert consists of masses of banded, fine-grained, rough and porous, pale-orange and yellowish-brown chert. Upper part of this unit also may contain nodules and beds of streaked, fossiliferous chert. Thickness about 100 feet.

Lower bedded chert consists of layers of dark-gray, streaked, nonfossiliferous chert, which breaks into a rubble of blocks. Partial weathering of the original calcareous siltstone in this zone yields blocks having a core of medium-gray siltstone surrounded by a yellowish-brown peripheral band, resembling weathered Hermitage Formation. Thickness about 280 to 400 feet.

Estimated thickness of formation 380 to 500 feet.

New Providence Shale

Shale, medium-gray and greenish-gray with thin zones of reddish-brown; at base is olive-gray and light brownish-gray, fine-grained limestone. Thickness 0 to 20 feet. Beneath the New Providence, or at the base of the Fort Payne where the New Providence is absent, is greenish-gray shale or mudstone (Maury Shale), 1 to 4 feet thick, containing phosphatic nodules.

DEVONIAN and MISSISSIPPIAN

Chattanooga Shale

Shale, carbonaceous, grayish-black, fissile, pyritic. Thickness 15 to 58 feet; averages 25 to 30 feet. Mapped separately (as MDc) only in cross sections.

Thickness of Fort Payne, New Providence, and Chattanooga 400 to 500 feet.

Dcr

Camden, Harriman, and Ross Formations

DEVONIAN

The Camden and Harriman Formations are lithologically identical, and not enough fossils are locally present to form a convenient basis for subdivision. Because exposures of the Ross Formation are scarce, it is mapped with the Camden and Harriman. Combined thickness of Camden, Harriman, and Ross about 100 feet.

Camden and Harriman Formations

These formations consist of siliceous limestones which have been largely replaced by chert. Limestone is gray to light olive-gray, micrograined to fine-grained, thin- to medium-bedded, siliceous and glauconitic. Chert is light-gray to white with light-gray, yellowish- to grayish-brown, and yellowish-gray specks and mottlings (surfaces stained pale to dark yellowish-orange and yellowish-brown), bedded and blocky (beds 2 to 6 inches thick), dense and subnovaculitic, conchoidal fracture, with white to light-gray tripolitic clay.

Combined thickness of both formations 50 to 95 feet.

Ross Formation

Birdsong Shale Member at top is calcareous shale with thin beds of argillaceous limestone, fine- to coarse-grained, very thin- to thin-bedded; both lithologies light olive- and greenish-gray, glauconitic, fossiliferous. Thickness 15 to 40 feet.

Rockhouse Limestone Member at base is limestone, light olive- and greenish-gray to light brownish-gray with pink to reddish-brown grains, fine- to coarse-grained and coarsely crystalline, medium-bedded, glauconitic, fossiliferous, with thin shale partings. Thickness 10 to 30 feet.

Thickness of formation about 45 feet.

SILURIAN

Sd

Decatur Limestone

Limestone, gray to light olive-gray, pale-olive, and yellowish- to greenish-gray with varied concentrations of reddish-brown and reddish-orange grains, fine- to coarse-grained (coarser grains predominate), medium- to thick-bedded. Shale, pale-olive, moderate yellowish-brown, dark yellowish-orange, and grayish-orange, is present locally as thin partings. Thickness about 70 feet.

Sbp

Brownsport Formation

Lobelville Member is argillaceous limestone, fine- to coarse-grained, very thin- to medium-bedded, and calcareous shale; both lithologies light olive-gray to yellowish-gray and dusky-yellow with scattered streaks and mottlings of grayish red-purple, fossiliferous. Thickness 15 to 46 feet.

Bob Limestone Member is light olive-gray to light yellowish-gray, medium- to coarse-grained, medium- to thick-bedded, with thin partings of light olive-gray argillaceous limestone and shale. Thickness 10 to 20 feet.

Beech River Member is argillaceous limestone, fine- to medium grained, thin- to medium-bedded, and calcareous shale; both lithologies light olive-gray to yellowish-gray and dusky-yellow with scattered streaks and mottlings of grayish red-purple, fossiliferous. Basal 10 feet consists of light olive-gray and greenish-gray to grayish red-purple, fine- to medium-grained, medium-bedded limestone. Thickness of member 14 to 35 feet.

Thickness of Formation about 55 to 75 feet.

Sdx

Dixon Formation

Limestone, argillaceous, grayish-red to dark reddish-brown and grayish-olive to greenish-gray, fine- to medium-grained, thin- to medium-bedded, with shale and mudstone; shale zone at top about 3 feet thick, upper part light-gray, lower part dark reddish-brown. Formation grades into underlying Lego Limestone. Thickness 40 to 50 feet.

Slw

Lego Limestone and Waldron Shale

Lego Limestone is pale to moderate reddish-brown with a few olive-gray and greenish-gray beds, fine-grained with medium to coarse calcite crystals, medium-bedded, evenly bedded. Shale interbeds near top. Thickness 16 to 40 feet.

Waldron Shale is calcareous shale with thin beds of limestone, light olive-gray and greenish-gray, fossiliferous. Thickness probably 2 to 3 feet.

Sla

Laurel Limestone

Limestone, light olive-gray to brownish- and yellowish-gray, dusky-yellow, and reddish-brown, fine-grained with medium to coarse calcite crystals, medium-bedded, evenly bedded, with some dark yellowish-orange argillaceous partings. Thickness 20 to 40 feet.

So

Osgood Formation

Calcareous shale with thin beds of argillaceous limestone, grayish-red and light to dark reddish-brown, light olive-gray and yellowish-gray. Thickness 20 to 43 feet.

Sbr

Brassfield Limestone

Limestone, light-gray to light olive-gray and pale-olive to dusky-yellow, fine- to coarse-grained, thin- to medium-bedded, glauconitic (especially the basal few feet), with lenses of dense chert, thin partings of greenish-gray shale common. Thickness 17 to 21 feet.

ORDOVICIAN

Of

Fernvale Limestone

Limestone, grayish-yellow and yellowish-orange with pale-orange and pale reddish-orange grains, fine- to medium-grained, some beds coarsely crystalline, thin- to medium-bedded, irregularly bedded. Thickness 25 to 44 feet.

Oh

Hermitage Formation

Shale and limestone, sandy and silty, light- to dark-gray (weathers to pale to dark yellowish-brown siltstone and sandstone); limestone is very fine- to medium-grained, thin-bedded to laminated. Residuum includes large silicified masses and fine-grained siliceous material. Thickness 200 to 300 feet.

Osr

Stones River Group

In the Central Basin of Tennessee the Stones River Group is subdivided, largely on the basis of alternating sequences of thin-bedded and medium- to thick-bedded limestone, into the Carters, Lebanon, Ridley, Pierce, and Murfreesboro Limestones. In Wells Creek Basin the Stones River Group exhibits the same alternation of lithologies, but the number and sequence of units are not the same and the individual formations cannot be recognized at many exposures.

Medium- to thick-bedded limestone is pale to dark yellowish-brown and yellowish- to brownish-gray (weathers light- to medium-gray), cryptograined to coarse-grained, with lenses of chert. Thin-bedded limestone is light- to medium-gray, pale to dark yellowish-brown and brownish-gray, cryptograined to coarse-grained, contains thin shale partings (in subsurface) that are not everywhere apparent in weathered surface exposures.

Thickness of Group about 1,000 feet.

CAMBRIAN

O€k

Knox Dolomite

Dolomite, yellowish- and brownish-gray to light olive-gray, gray and dusky-yellow, thin- to very thick-bedded, micrograined to coarse-grained, with a few partings of grayish-green shale; interbedded with limestone, pale-orange to brownish- and yellowish-gray and yellowish-brown, fine-grained. Formation intensely brecciated. Exposed thickness at least 600 and possibly 2,000 feet.

Contact, dashed where approximate

U / D — Fault, dashed where approximate, dotted where concealed; U upthrown side, D downthrown side

Fault, arrow indicates relative movement (shown in cross sections only)

Strike and dip of beds

45 — Normal

60 — Overturned

Vertical

Horizontal

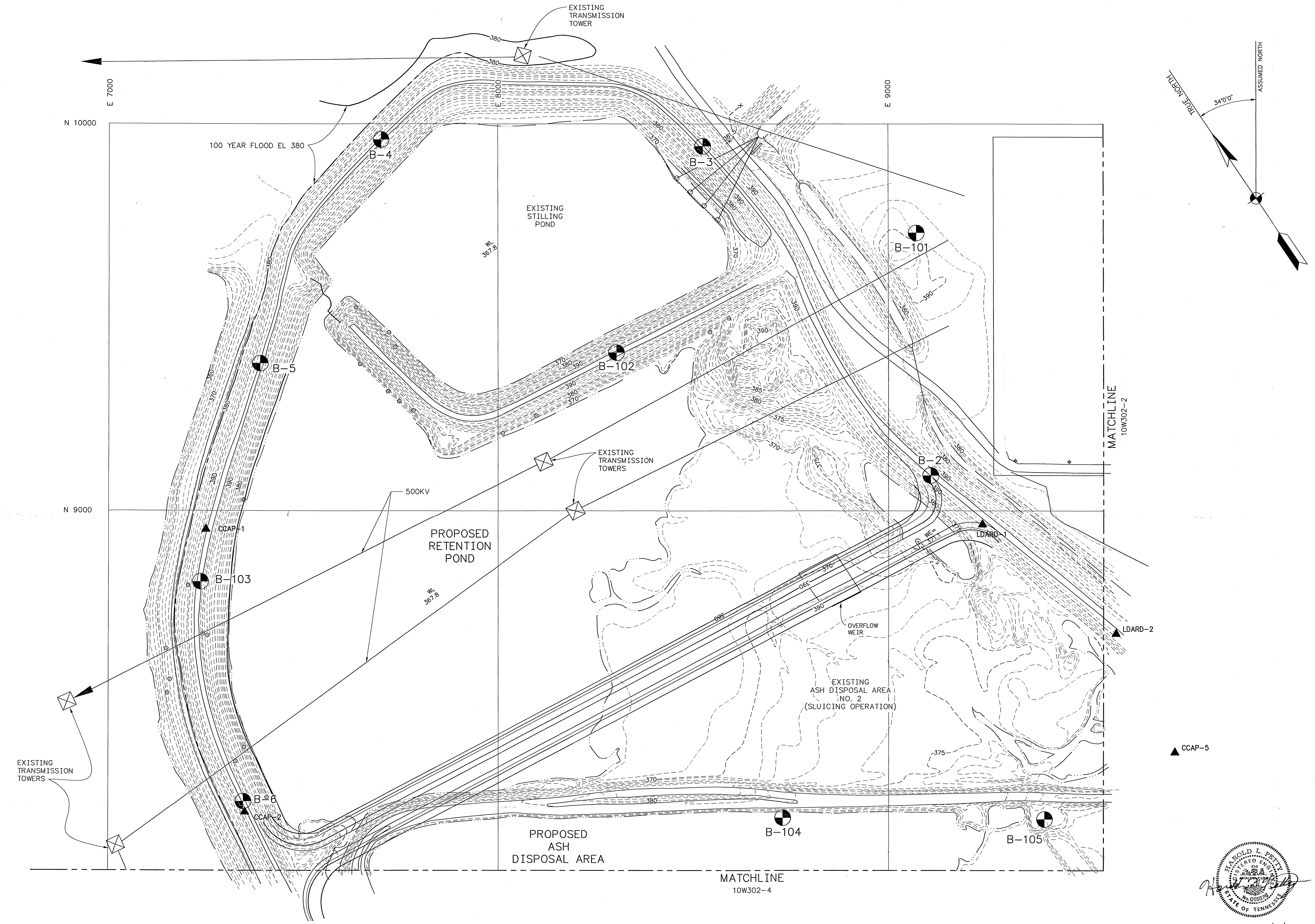
GEOLOGIC MAP OF WELLS CREEK BASIN

By

Herbert A. Tiedemann, Charles W. Wilson, Jr., and Richard G. Stearns

1968

ATTACHMENT B.5



LEGEND

- BORING LOCATION (B-102)
- 100-YR FLOOD PLAIN
- DISPOSAL AREA BOUNDARY
- PROPOSED GROUNDWATER MONITOR WELL (CUF 93-1)
- EXISTING CONTOUR
- BENCHMARK LOCATION

BORING COORDINATES

BORING NO.	TENNESSEE LAMBERT COORDINATES (FEET) NORTH	TENNESSEE LAMBERT COORDINATES (FEET) EAST	PLANT GRID * COORDINATES (FEET) NORTH	PLANT GRID * COORDINATES (FEET) EAST	ELEV. (FEET)
2	732035.90	1511415.10	9093.20	9110.00	394.70
3	733062.80	1511406.40	9939.60	8528.5	395.50
4	733539.90	1510732.50	9958.40	7703.10	395.40
5	733237.10	1510150.60	9382.00	7390.00	395.40
6	733237.10	1610160.60	8253.30	7346.40	396.40
101	732575.16	1511734.25	9718.74	9073.06	387.83
102	732750.06	1510926.12	9411.83	8305.29	394.96
103	732854.94	1509709.05	8818.21	7237.64	394.35
104	731516.81	1510607.21	8211.09	8730.52	383.53

* N10,000 PLANT COORDINATE COINCIDES WITH THE EXISTING E-W PLANT BASELINE (C OF EXISTING UNIT #1 CHIMNEY). E10,000 PLANT COORDINATE COINCIDES WITH THE EXISTING N-S PLANT BASELINE (EXISTING COLUMN LINE "A"). I.E. 10,000:10,000=TVA 0:0

** FOR BENCHMARK DATA SEE 10W302-2.

SEE 10W302-1 FOR DRAWING INDEX/COMPANION DRAWINGS LIST

HAROLD L. PETTY, REGISTERED ENGINEER, NO. 015578, STATE OF TENNESSEE

10/10/03

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R											
R 0		JLG	MGH	JGA	HLP	REP		JGA			D

INITIAL ISSUE; FOR DCN CUF-03-536

DISCIPLINE INTERFACE 1 2 3 4

SCALE: 1"=100' EXCEPT AS NOTED

FGD RETROFIT PROJECT
UNITS 1 & 2

PROPOSED WASTE DISPOSAL FACILITY EXISTING SITE CONDITIONS SHEET 4 OF 4

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
J.L. GRAY	M.G. HRANEK	J.G. ALBRIGHT	H.L. PETTY	R.E. PURKEY		J.G. ADAIR

CUMBERLAND FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R2K | DATE | 46 | C | 10W302-5 | R 0

PLOT FACTOR:1200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

TASK COMPLETED BY: | REV NO.

46 C 10W302-5

Tennessee Valley Authority
1101 Market Street, Chattanooga, TN 37402

17 July 2020

Tennessee Valley Authority
1101 Market Street
Chattanooga, TN 37402-2801

Subject: **Coal Combustion Residuals Triennial Engineering Report**
Cumberland Fossil Plant Gypsum Disposal Area and Dry Ash Stack
(IDL #81-0086)
Cumberland City, Tennessee

1. INTRODUCTION

The Tennessee Valley Authority (TVA) has prepared the following Coal Combustion Residuals (CCR) Triennial Engineering Report (TER) for the Cumberland Fossil Plant (CUF) Gypsum Disposal Area and Dry Ash Stack (Site or Facility) to meet the Tennessee Department of Environment and Conservation (TDEC) requirements, contained in subparagraph (t) of paragraph (2) of Rule 0400-11-01-.04 for Class II facilities, which became effective 30 December 2019.

In April 2020, TVA requested an extension from TDEC for this initial CUF TER because TVA's digital records library does not include records for CUF before 2009, and access to hard-copy records was restricted due to the COVID-19 pandemic. TDEC approved the extension request and established a new submittal date of 01 August 2020. This extension has enabled a complete review of permit modification records for CUF, which are summarized in Attachment A.

2. CCR DISPOSAL FACILITY DETAILS

The Site is located within the CUF reservation and currently accepts CCR materials generated as part of operations at CUF. TVA obtained a permit (Permit No. IDL 81-0082) to construct and operate the CCR disposal facility on 27 July 1993. A major permit modification for the entire CCR disposal facility was approved by TDEC on 18 September 1996 and resulted in the issuance of a new permit (Permit No. IDL 81-0086). The major modification proposed modifications to the following: (i) the Covering Program, including both intermediate and final cover design, (ii) Groundwater Protection Standards and Detection Monitoring, (iii) the Surface Water Management System, and (iv) the Geologic Buffer System.

The CCR disposal facility is divided into two distinct disposal units, the Gypsum Disposal Area and the Dry Ash Stack. Both disposal units constitute the active portion of the Site, with waste placement areas of approximately 115 and 155 acres, respectively. The facility is permitted to accept all types of CCR materials generated as a result of power generation operations at CUF. These CCR materials include those generated by the dry flue gas desulfurization (FGD) system (i.e., gypsum) and coal ash (e.g., bottom ash and fly ash); however, TVA made previous commitments to TDEC to dispose of individual types of CCR materials within specified disposal units (e.g., gypsum in the Gypsum Disposal Area and coal ash in the Dry Ash Stack).

3. SITE STORAGE CAPACITY

The current grades and permitted final grades at the Site are presented in Figure 1. The current grades were surveyed as of 27 February 2020 by the RLS Group, a qualified land surveyor authorized under Tennessee law to conduct such activities. The current constructed capacity of the Site was determined using existing site conditions and the relevant capacities reported in the Site permit. Calculations were completed by comparing the current grades and permitted top of waste grades at the Site, alongside existing information contained in the Site permit, to determine: (i) the total remaining volume within currently constructed cells to be filled, and (ii) the total remaining permitted capacity of the Site, all in cubic yards (CY). Please see the following table for a summary of these calculations.

Calculation[1]	**Volume (CY)[2]**
Current Constructed Capacity	32,600,000
Total Remaining Volume (Currently Constructed)	20,884,000
Total Remaining Volume (Permitted Capacity)	20,884,000

Notes:

1. Disposal capacities are estimated from the permit drawings with a reduction applied to account for the final cover system.
2. Volumes are rounded to the nearest 1,000 CY.

4. MINOR MODIFICATION SUMMARY

A summary of minor permit modifications to the Facility since the most recent permit issuance (i.e., the latest approved major permit modification) approved by TDEC on 18 September 1996 are summarized in Attachment A.

5. CLOSING STATEMENT

I, M. Scott Turnbow, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this report is true and accurate as of the date of my signature below, has been prepared in accordance with the accepted practice of engineering, and that the TER meets the TDEC requirements contained in subparagraph (t) of paragraph (2) of Rule 0400-11-01-.04 for Class II facilities, which became effective 30 December 2019.

M. Scott Turnbow
Vice President – Civil Projects, ESS & CCP Management

03/24/2020
DATE

Pam Blevins
Notary State/County of Certification

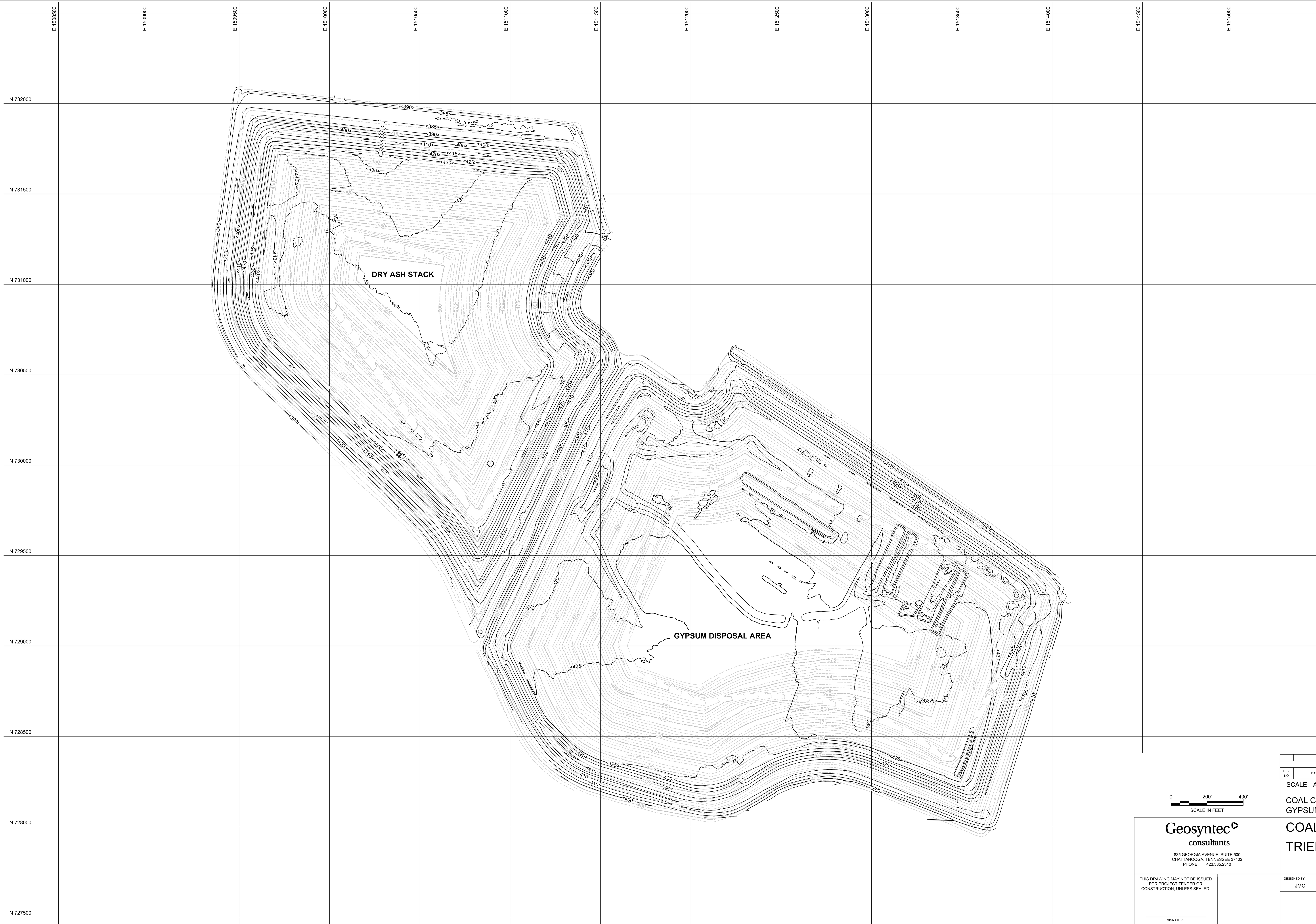
PAM BLEVINS
STATE OF TENNESSEE NOTARY PUBLIC
HAMILTON COUNTY
MY COMMISSION EXPIRES 5-23-2021

ATTACHMENTS

Figure 1. Current Facility Survey and Capacity Calculation

Attachment A. Minor Permit Modification Summary

Figure 1



LEGEND

<550>	CURRENT GRADES (NOTE 1)
440	PERMITTED FINAL GRADES (NOTES 2 AND 3)

NOTES:

1. THE CURRENT GRADES SHOWN ON THIS FIGURE WERE PROVIDED BY TVA AND ARE BASED ON A SURVEY CONDUCTED ON 27 FEBRUARY 2020 BY THE RLS GROUP. THE GRID COORDINATES CORRESPOND TO TENNESSEE STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM (NAD) 1927. ELEVATIONS ARE IN FEET ABOVE SEA LEVEL, NATIONAL GEODETIC VERTICAL DATUM (NGVD) 1929.
2. THE GYPSUM DISPOSAL AREA AND DRY ASH STACK CONSTITUTE THE ACTIVE PORTION OF THE DISPOSAL FACILITY. PERMITTED FINAL GRADES SHOWN ON THIS FIGURE REPRESENT THE TOP OF FINAL COVER GRADES APPROVED FOR PLACEMENT IN THE GYPSUM DISPOSAL AREA AND DRY ASH STACK.
3. THE PERMITTED FINAL GRADES DEPICTED ON THIS FIGURE ARE THE BASIS FOR THE GYPSUM DISPOSAL AREA AND DRY ASH STACK PERMIT VOLUMES AND REMAINING CAPACITY CALCULATIONS. THESE GRADES WERE PROVIDED BY TVA AND ARE BASED ON THE PERMIT DRAWINGS COMPLETED BY LAW ENGINEERING, INC. AND APPROVED IN 1994 (I.E., 6314-W-C110216 AND 6314-W-C110217 OF THE PERMIT DRAWINGS). THE VOLUME OF THE COMPACTED SOIL LAYER, PROTECTIVE COVER LAYER, AND VEGETATIVE COVER LAYER WERE ESTIMATED AND DEDUCTED FROM THE TOTAL VOLUME TO DETERMINE REMAINING CAPACITIES.

0 200' 400'
SCALE IN FEET

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD

DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

COAL COMBUSTION RESIDUALS DISPOSAL FACILITY
GYPSUM DISPOSAL AREA AND DRY ASH STACK

COAL COMBUSTION RESIDUALS TRIENNIAL ENGINEERING REPORT

Geosyntec consultants
835 GEORGIA AVENUE, SUITE 500
CHATTANOOGA, TENNESSEE 37402
PHONE: 423.385.2310

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
JMC	JJA	WMM	VJD	N/A	N/A	N/A

CUMBERLAND FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

CIVIL 3D 2020 | DATE JULY 2020 | C | FIGURE 1 | R

GEOSYNTEC CONSULTANTS | -
TASK COMPLETED BY: | REV NO.

PLOT FACTOR: 1:1
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

Attachment A

CUF Minor Permit Modification Summary

Minor Modification	Date of TDEC Approval
CUF Gypsum Disposal Area and Dry Ash Stack – Bottom Ash Pond Configuration (Addition of Two Rim Ditches, Work Platform, and Haul Road)	Oct. 2011
CUF Gypsum Disposal Area – Flexible Membrane Liner for Gypsum Setting Channels	Nov. 2012
CUF Gypsum Disposal Area and Dry Ash Stack – Addition of CCR Constituents to Groundwater Monitoring Parameters	Nov. 2016
CUF Gypsum Disposal Area and Dry Ash Stack – Addition of Instrumentation Data to Operating Record	Dec. 2018
CUF Gypsum Disposal Area and Dry Ash Stack – Installation of Two Standpipe Piezometers	Dec. 2018
CUF Gypsum Disposal Area and Dry Ash Stack – Addition of Temporary Wells to Existing Stack	Dec. 2018
CUF Gypsum Disposal Area – Addition of Two Temporary Laydown Areas	May 2019
CUF Gypsum Disposal Area – Modifications to Stormwater Conveyance Ditches	Sep. 2019
CUF Gypsum Disposal Area and Dry Ash Stack – Addition of Validated Intelligent Compaction Operations to Operating Record	Jan. 2020
CUF Gypsum Disposal Area – Operations Plan (Gypsum Harvesting and Beneficial Reuse)	Feb. 2020

APPENDIX C – TABLES

Table C.1. Model Input and Confirmation Data Used to Model and Evaluate the Pre-Construction and Bottom of CCR Surfaces

Data Type	Data Use	Boring ID	Reference
Pre-Construction Contours	Model Input	Not Applicable	TVA Drawing 10N212R11: Ash Disposal Areas Sheet No. 1.
Boring Elevation	Confirmation	CUF-B11	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-B14	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-B15	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-B16	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-B17	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-B18	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-B19	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-B21	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-B23	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-TW01	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-TW03	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-TW05	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-TW07	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-TW08	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.
Boring Elevation	Confirmation	CUF-TW09	Stantec. 2021. "Exploratory Drilling Sampling and Analysis Report". Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee. Prepared for Tennessee Valley Authority. April 16.

Table C.2. Model Input Data Used to Model the Ground and Top of CCR Surfaces (2017-2021 Composite Surface)

Data Type	Data Use	Boring ID	Reference
Survey/Contour	Model Input	Not Applicable	RLS Surveying (RLS). 2021a. Aerial Survey, Cumberland Fossil Fuel Plant – Ash and Gypsum Stack, Cumberland City, Stewart County, Tennessee. May 20.
Survey/Contour	Model Input	Not Applicable	RLS Surveying (RLS). 2021b. Aerial Survey, Cumberland Fossil Fuel Plant – MAPR, Cumberland City, Stewart County, Tennessee. May 21.
Survey/Contour	Model Input	Not Applicable	December 11, 2019 Aerial Drone Survey
Survey/Contour	Model Input	Not Applicable	October 14, 2019 Temporary Lined Basin As-Built Survey
Survey/Contour	Model Input	Not Applicable	Tuck Mapping Solutions (Tuck). 2017. Cumberland Fossil Plant Aerial Survey. April 8.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Alluvial and Residual Soil Depths	Model Input	NA	Geologic Map of Wells Creek
Boring Elevation	Model Input	96-5	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	96-6	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	96-7	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	96-8	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	AMEC B-1	Amec Foster Wheeler Environment & Infrastructure, Inc. (AMEC). 2017. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee." Prepared for Tennessee Valley Authority. Amec Foster Wheeler Project Number: 3043160015. April 13.
Boring Elevation	Model Input	AMEC B-2	Amec Foster Wheeler Environment & Infrastructure, Inc. (AMEC). 2017. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee." Prepared for Tennessee Valley Authority. Amec Foster Wheeler Project Number: 3043160015. April 13.
Boring Elevation	Model Input	AMEC B-3	Amec Foster Wheeler Environment & Infrastructure, Inc. (AMEC). 2017. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee." Prepared for Tennessee Valley Authority. Amec Foster Wheeler Project Number: 3043160015. April 13.
Boring Elevation	Model Input	AMEC B-4	Amec Foster Wheeler Environment & Infrastructure, Inc. (AMEC). 2017. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee." Prepared for Tennessee Valley Authority. Amec Foster Wheeler Project Number: 3043160015. April 13.
Boring Elevation	Model Input	AMEC B-5	Amec Foster Wheeler Environment & Infrastructure, Inc. (AMEC). 2017. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee." Prepared for Tennessee Valley Authority. Amec Foster Wheeler Project Number: 3043160015. April 13.
Boring Elevation	Model Input	AMEC B-6	Amec Foster Wheeler Environment & Infrastructure, Inc. (AMEC). 2017. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee." Prepared for Tennessee Valley Authority. Amec Foster Wheeler Project Number: 3043160015. April 13.
Boring Elevation	Model Input	AMEC B-7	Amec Foster Wheeler Environment & Infrastructure, Inc. (AMEC). 2017. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee." Prepared for Tennessee Valley Authority. Amec Foster Wheeler Project Number: 3043160015. April 13.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	AMEC B-8	Amec Foster Wheeler Environment & Infrastructure, Inc. (AMEC). 2017. "Report of Geotechnical Exploration, Bottom Ash Dewatering Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee." Prepared for Tennessee Valley Authority. Amec Foster Wheeler Project Number: 3043160015. April 13.
Boring Elevation	Model Input	B-212	Stantec Consulting Services Inc. (Stantec). 2019. "Data Report - 2018 Geotechnical Exploration (Rev. 2), Dry Ash Stack Divider Dike, TVA Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Letter from Stantec to TVA. March 18.
Boring Elevation	Model Input	B-232	Stantec Consulting Services Inc. (Stantec). 2019. "Data Report - 2018 Geotechnical Exploration (Rev. 2), Dry Ash Stack Divider Dike, TVA Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Letter from Stantec to TVA. March 18.
Boring Elevation	Model Input	CTP-1	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	CTP-2	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	CTP-3	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	CTP-4	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	CUF-102	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-120	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-202A	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-202B	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	CUF-203A	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-203B	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-204	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-204A	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-206	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-207	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-208	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-213	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-214	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-DAS-A-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	CUF-DAS-A-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-C-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-D-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-D-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-D-3	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-G-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-G-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-INT-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-INT-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-X-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-DAS-X-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-G-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-G-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	CUF-GSA-H-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-INT-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-INT-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-J-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-J-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-K-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-L-1	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	CUF-GSA-M-2	Stantec Consulting Services Inc. (Stantec). 2018. "Partial Closure Instrumentation - TVA Cumberland Fossil Plant, Dry Ash Stack & Gypsum Storage Area." Letter from Stantec to TVA. June 15.
Boring Elevation	Model Input	D-10A	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-12	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-13	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-14	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-15	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-16	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-17	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-18	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	D-19	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-20	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-22	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-7A	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	D-9	Tennessee Valley Authority (TVA). 1998. “Cumberland Fossil Plan Groundwater Assessment.” Prepared by TVA. August.
Boring Elevation	Model Input	FGD-1	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	FGD-2	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	FGD-3	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	FGD-4	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	GCCUF-F-2B	Geocomp Consulting, Inc. 2013. "Tennessee Valley Authority EPA Seismic Assessment Supplemental Site Exploration, Cumberland Fossil Plant." March 29.
Boring Elevation	Model Input	GCCUF-F-2C	Geocomp Consulting, Inc. 2013. "Tennessee Valley Authority EPA Seismic Assessment Supplemental Site Exploration, Cumberland Fossil Plant." March 29.
Boring Elevation	Model Input	GCCUF-H-2A	Geocomp Consulting, Inc. 2013. "Tennessee Valley Authority EPA Seismic Assessment Supplemental Site Exploration, Cumberland Fossil Plant." March 29.
Boring Elevation	Model Input	GCCUF-H-2B	Geocomp Consulting, Inc. 2013. "Tennessee Valley Authority EPA Seismic Assessment Supplemental Site Exploration, Cumberland Fossil Plant." March 29.
Boring Elevation	Model Input	GCCUF-H-2C	Geocomp Consulting, Inc. 2013. "Tennessee Valley Authority EPA Seismic Assessment Supplemental Site Exploration, Cumberland Fossil Plant." March 29.
Boring Elevation	Model Input	GCCUF-R-2B	Geocomp Consulting, Inc. 2013. "Tennessee Valley Authority EPA Seismic Assessment Supplemental Site Exploration, Cumberland Fossil Plant." March 29.
Boring Elevation	Model Input	GCCUF-T-2A	Geocomp Consulting, Inc. 2013. "Tennessee Valley Authority EPA Seismic Assessment Supplemental Site Exploration, Cumberland Fossil Plant." March 29.
Boring Elevation	Model Input	HBA2	Hall, Blake, and Associates (HBA). 1986. “Site Investigation, Proposed Cumberland Fossil Project Soils Investigation for Ash Pond Dike and Borrow Areas.” Prepared for Tennessee Valley Authority. October 3.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	HBA6	Hall, Blake, and Associates (HBA). 1986. “Site Investigation, Proposed Cumberland Fossil Project Soils Investigation for Ash Pond Dike and Borrow Areas.” Prepared for Tennessee Valley Authority. October 3.
Boring Elevation	Model Input	HBA7	Hall, Blake, and Associates (HBA). 1986. “Site Investigation, Proposed Cumberland Fossil Project Soils Investigation for Ash Pond Dike and Borrow Areas.” Prepared for Tennessee Valley Authority. October 3.
Boring Elevation	Model Input	LawB-106	Law Engineering, Inc. (Law). 1992. “Report of Hydrogeologic Evaluation, Proposed Dry Fly Ash and Gypsum Disposal Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee, Law Project No. 574-01442.04.” Prepared for Tennessee Valley Authority. July 3
Boring Elevation	Model Input	LawB-109	Law Engineering, Inc. (Law). 1992. “Report of Hydrogeologic Evaluation, Proposed Dry Fly Ash and Gypsum Disposal Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee, Law Project No. 574-01442.04.” Prepared for Tennessee Valley Authority. July 3
Boring Elevation	Model Input	LawB-11	Law Engineering, Inc. (Law). 1992. “Report of Subsurface Exploration and Stability Analyses, Proposed Fly Ash/Scrubber Sludge Disposal Facility, Cumberland Fossil Fuel Plant, Cumberland City, Tennessee, Law Project No. 57401442.01.” Prepared for Tennessee Valley Authority. January 27.
Boring Elevation	Model Input	LawB-110	Law Engineering, Inc. (Law). 1992. “Report of Hydrogeologic Evaluation, Proposed Dry Fly Ash and Gypsum Disposal Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee, Law Project No. 574-01442.04.” Prepared for Tennessee Valley Authority. July 3
Boring Elevation	Model Input	LawB-111	Law Engineering, Inc. (Law). 1992. “Report of Hydrogeologic Evaluation, Proposed Dry Fly Ash and Gypsum Disposal Facility, TVA Cumberland Fossil Plant, Cumberland City, Tennessee, Law Project No. 574-01442.04.” Prepared for Tennessee Valley Authority. July 3
Boring Elevation	Model Input	STN-1-16	Stantec Consulting Services Inc. (Stantec). 2016. “Report of Geotechnical Exploration, Cumberland Fossil Plant, Bottom Ash Pond, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. October 12.
Boring Elevation	Model Input	STN-10	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-100	Stantec Consulting Services Inc. (Stantec). 2013. “Instrumentation Installation and Updated Seepage Analyses, Ash Pond, Cumberland Fossil Plant.” Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-101	Stantec Consulting Services Inc. (Stantec). 2013. “Instrumentation Installation and Updated Seepage Analyses, Ash Pond, Cumberland Fossil Plant.” Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-102	Stantec Consulting Services Inc. (Stantec). 2013. “Instrumentation Installation and Updated Seepage Analyses, Ash Pond, Cumberland Fossil Plant.” Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-11	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	STN-12	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-13	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-14	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-15	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-15B	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-16	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-17	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-18	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-19	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-2-16	Stantec Consulting Services Inc. (Stantec). 2016. “Report of Geotechnical Exploration, Cumberland Fossil Plant, Bottom Ash Pond, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. October 12.
Boring Elevation	Model Input	STN-20	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-21B	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-22	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	STN-23	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-24	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-25	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-26	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-27	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-28	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-29	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-29A	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-3	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-30	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-31	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-32	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-33	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
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Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	STN-34	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-35	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-36	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-37	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-37A	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-38	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-39	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-4	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-40	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-41	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-42	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-43	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-43A	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
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Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	STN-44	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-45	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-46	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-47	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-48	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-49	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-5	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-50A	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-51	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-52	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-53A	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-54	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-55	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	STN-56	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-58	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-59	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-59A	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-59B	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-6	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-60	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-61	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-62	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration and Slope Stability Evaluation, Ash Pond, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. March.
Boring Elevation	Model Input	STN-7	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-8	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-9	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-93	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Slope Repair Project – Gypsum Stack Complex, Cumberland Fossil Plant, Cumberland City, Tennessee.” Prepared for Tennessee Valley Authority. November.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	STN-96	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Slope Repair Project – Gypsum Stack Complex, Cumberland Fossil Plant, Cumberland City, Tennessee.” Prepared for Tennessee Valley Authority. November.
Boring Elevation	Model Input	STN-9A	Stantec Consulting Services Inc. (Stantec). 2010. “Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Stewart County, Tennessee.” Prepared for Tennessee Valley Authority. June.
Boring Elevation	Model Input	STN-B-10	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-11	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-12	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-13	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-14	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-15	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-16	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-17	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-5	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-6	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-B-7	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	STN-B-8	Stantec Consulting Services Inc. (Stantec). 2019. "Geotechnical Field Investigation Report, CUF WWT StageA/B Phase 2 (TVA Project No. 604122), Cumberland Fossil Plant (CUF), Cumberland City, Stewart County, Tennessee." Prepared for Tennessee Valley Authority. January 9.
Boring Elevation	Model Input	STN-CUF-SB-1	Stantec Consulting Services Inc. (Stantec). 2010. "Basis of Design Report, Cumberland Fossil Plant Ash Stilling Pond Spillway Improvement Project Work Plan 7 (CUF-110311-WP-7), Stewart County Tennessee." Prepared for TVA. March 24.
Boring Elevation	Model Input	STN-CUF-SB-1A	Stantec Consulting Services Inc. (Stantec). 2010. "Basis of Design Report, Cumberland Fossil Plant Ash Stilling Pond Spillway Improvement Project Work Plan 7 (CUF-110311-WP-7), Stewart County Tennessee." Prepared for TVA. March 24.
Boring Elevation	Model Input	STN-CUF-SB-2	Stantec Consulting Services Inc. (Stantec). 2010. "Basis of Design Report, Cumberland Fossil Plant Ash Stilling Pond Spillway Improvement Project Work Plan 7 (CUF-110311-WP-7), Stewart County Tennessee." Prepared for TVA. March 24.
Boring Elevation	Model Input	STN-SW-1	Stantec Consulting Services Inc. (Stantec). 2018. "Results of Geotechnical Exploration, CCR Rule Location Restrictions (Seismic Impact Zones), Stilling Pond (including Retention Pond), TVA Cumberland Fossil Plant." Letter from Stantec to TVA. July 13.
Boring Elevation	Model Input	STN-SW-2	Stantec Consulting Services Inc. (Stantec). 2018. "Results of Geotechnical Exploration, CCR Rule Location Restrictions (Seismic Impact Zones), Stilling Pond (including Retention Pond), TVA Cumberland Fossil Plant." Letter from Stantec to TVA. July 13.
Boring Elevation	Model Input	STN-SW-3	Stantec Consulting Services Inc. (Stantec). 2018. "Results of Geotechnical Exploration, CCR Rule Location Restrictions (Seismic Impact Zones), Stilling Pond (including Retention Pond), TVA Cumberland Fossil Plant." Letter from Stantec to TVA. July 13.
Boring Elevation	Model Input	93-1D	Stantec Consulting Services Inc. (Stantec). 2018. "Geotechnical Field Services for Well Installations and Closures. Groundwater Monitoring Optimization - Phase 3, Cumberland Fossil Plant, Cumberland City, Stewart County, Tennessee." Prepared for Tenessee Valley Authority. February 1.
Boring Elevation	Model Input	CUF-B11	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-B12	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-B13	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-B14	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-B15	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	CUF-B16	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-B17	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-B18	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-B19	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-TW01	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-TW03	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-TW05	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-TW07	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-TW08	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-TW09	Stantec Consulting Services Inc. (Stantec). 2021. "Cumberland Fossil Plant Exploratory Drilling Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." April 16.
Boring Elevation	Model Input	CUF-1002ALT2	Stantec Consulting Services Inc. (Stantec). 2020. "Cumberland Fossil Plant Hydrogeological Investigation Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." September 1.
Boring Elevation	Model Input	CUF-1001ALT2	Stantec Consulting Services Inc. (Stantec). 2020. "Cumberland Fossil Plant Hydrogeological Investigation Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." September 1.
Boring Elevation	Model Input	CUF-1003B	Stantec Consulting Services Inc. (Stantec). 2020. "Cumberland Fossil Plant Hydrogeological Investigation Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." September 1.

Table C.3. Model Input Data Used to Model the Top of Bedrock Surface
Cumberland Fossil Plant

Data Type	Use	Boring ID	Reference
Boring Elevation	Model Input	CUF-1005	Stantec Consulting Services Inc. (Stantec). 2020. "Cumberland Fossil Plant Hydrogeological Investigation Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." September 1.
Boring Elevation	Model Input	CUF-BG13	Stantec Consulting Services Inc. (Stantec). 2020. "Cumberland Fossil Plant Background Soil Investigation Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." August 21.
Boring Elevation	Model Input	CUF-BG06	Stantec Consulting Services Inc. (Stantec). 2020. "Cumberland Fossil Plant Background Soil Investigation Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." August 21.
Boring Elevation	Model Input	CUF-BG08	Stantec Consulting Services Inc. (Stantec). 2020. "Cumberland Fossil Plant Background Soil Investigation Sampling and Analysis Report, TDEC Commissioner's Order: Environmental Investigation Plan, Cumberland Fossil Plant, Cumberland City, Tennessee." August 21.

Table C.4. Ground Surface Elevations of CCR Units 2015 - 2019 Composite Surface

Data Type	Data Use	Boring ID	Reference
Survey/Contour	Model Input	Not Applicable	Tuck Mapping Solutions (Tuck). 2017. Cumberland Fossil Plant Aerial Survey.
Survey/Contour	Model Input	Not Applicable	2015 Main Ash Pond Bathymetric Survey
Survey/Contour	Model Input	Not Applicable	June 2017 Main Ash Pond and Stilling Pond Bathymetric Survey
Survey/Contour	Model Input	Not Applicable	November 28, 2017 CUF 171925 Holistic Wastewater Treatment Program Survey
Survey/Contour	Model Input	Not Applicable	2018 Coal Yard Runoff Pond Dredge Survey
Survey/Contour	Model Input	Not Applicable	2018 TKS842 Scan
Survey/Contour	Model Input	Not Applicable	May 12, 2018 Coal Pile Inventory Survey
Survey/Contour	Model Input	Not Applicable	September 25, 2018 Outage Wash Pad
Survey/Contour	Model Input	Not Applicable	September 28, 2018 Coal Yard Conveyance Area
Survey/Contour	Model Input	Not Applicable	October 8, 2018 Coal Yard Runoff Pond and Chemical Pond Survey
Survey/Contour	Model Input	Not Applicable	December 21, 2018 Main Ash Pond Survey
Survey/Contour	Model Input	Not Applicable	March 06, 2019 Drone Survey of Stacks
Survey/Contour	Model Input	Not Applicable	March 11, 2019 Polymer Injection System As-Built Survey
Survey/Contour	Model Input	Not Applicable	April 22, 2019 Coal Yard Runoff Pond Improvements As-built Survey