

CPS Energy

Groundwater Monitoring System

Calaveras Power Station
San Antonio, Texas

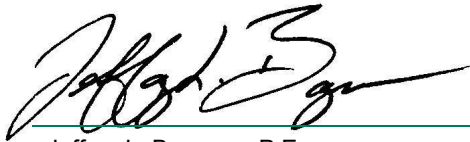
October 16, 2017
Amended August 18, 2023

Project No. 0681818

Groundwater Monitoring System

Calaveras Power Station
San Antonio, Texas

October 16, 2017
Amended August 18, 2023



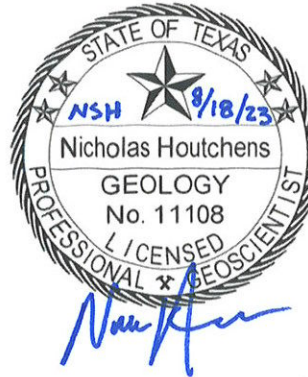
Jeffery L. Bauguss, P.E.
Partner



Walter "Wally" Zverina
Project Manager



Nicholas Houtchens, P.G. (TX)
Senior Geologist



Environmental Resources Management Southwest, Inc.

CityCentre Four
840 West Sam Houston Parkway North,
Suite 600
Houston, Texas 77024
281-600-1000 (T)

Texas Registered Engineering Firm F-2393
Texas Board of Professional Geoscientists Firm 50036

© Copyright 2023 by The ERM International Group Limited and/or its affiliates ('ERM').
All Rights Reserved. No part of this work may be reproduced or transmitted in any form
or by any means, without prior written permission of ERM.

CONTENTS

1.	INTRODUCTION	1
2.	BACKGROUND.....	2
2.1	Site Description.....	2
2.2	EPA and Texas CCR Rules	2
3.	SCOPE AND OBJECTIVES.....	3
4.	METHODOLOGY	5
4.1	Initial Evaluation.....	5
4.2	Hydrogeologic investigation	5
4.2.1	Soil Boring Installation and Monitor Well Completions.....	5
4.2.2	Geotechnical Testing	7
4.2.3	Surveying.....	8
5.	INVESTIGATION RESULTS	9
5.1	Site-Wide Geology	9
5.1.1	Northern CCR Units	9
5.1.2	Central CCR Unit	10
5.1.3	Southern CCR Units	10
5.2	Site-Wide Hydrogeology	11
5.2.1	Northern CCR Units	11
5.2.2	Central CCR Unit	11
5.2.3	Southern CCR Units	12
6.	CCR UNIT MONITOR WELL NETWORKS	13
6.1	EP Monitor Well Network Updates.....	16
6.2	SRH Pond Monitor Well Network Updates.....	16
6.3	BAPs Monitor Well Network Updates	16
7.	CONCLUSIONS	17

APPENDIX A	SOIL BORING LOGS, WELL COMPLETION LOGS, AND STATE WELL REPORTS
APPENDIX B	GEOTECHNICAL LABORATORY RESULTS
APPENDIX C	STRATIGRAPHIC CROSS-SECTIONS
APPENDIX D	RABA KISTNER GEOTECHNICAL ENGINEERING STUDIES
APPENDIX E	POTENTIOMETRIC SURFACE MAPS
APPENDIX F	ERM 2021 WATER LEVEL STUDY
APPENDIX G	GROUNDWATER ELEVATIONS SUMMARIES
APPENDIX H	GROUNDWATER MONITORING SYSTEM CERTIFICATION

List of Tables

Table 1: Geotechnical Testing Results Summary

Table 2: Well Survey Summary

List of Figures

Figure 1: General Site Location Map

Figure 2: CCR Unit Locations Map

Figure 3: CCR Well Network Location Map

1. INTRODUCTION

On behalf of CPS Energy, Environmental Resource Management Southwest, Inc. (ERM) conducted a characterization of the subsurface hydrogeology around existing Coal Combustible Residuals (CCR) Units associated with the Calaveras Power Station located southeast of San Antonio, in Bexar County, Texas. The hydrogeologic investigation was conducted to obtain site-specific technical data necessary to assess compliance with Title 40, Code of Federal Regulations, Part 257 (40 CFR Part 257), Subpart D (a.k.a. CCR Rule) and Title 30, Texas Administrative Code, Chapter 352 (30 TAC 352) (a.k.a. Texas CCR Rule), collectively referred to as the CCR Rules.

2. BACKGROUND

2.1 Site Description

CPS Energy owns and operates the Calaveras Power Station which consists of three power plants of which two plants (J.T. Deely and J.K. Spruce) are subject to the CCR Rules. The Calaveras Power Station is located in unincorporated Bexar County, Texas, approximately 13 miles southeast of San Antonio. The JT Deely Power Plant ceased operation at the end of December 2018. The JK Spruce Power Plant and CCR units associated with both power plants that receive or historically received CCR are subject to the CCR Rules. A general site location map is provided as **Figure 1**.

2.2 EPA and Texas CCR Rules

The EPA and State of Texas have published rules for the management of CCR generated from electric utilities. The CCR Rules specify requirements for active and inactive surface impoundments and landfills that manage CCR.

CPS Energy has identified six CCR Units at the Calaveras Power Station:

- Fly Ash Landfill (FAL);
- Evaporation Pond (EP);
- Plant Drains Pond (PDP);
- Sludge Recycle Holding (SRH) Pond;
- North Bottom Ash Pond (BAP); and
- South BAP.

For the purposes of this investigation, the FAL and the EP are collectively termed the Northern CCR Units, the PDP is termed the Central CCR Unit, and the SRH Pond and BAPs are collectively termed the Southern CCR Units. A CCR Unit locations map is provided as **Figure 2**.

This report presents site-specific data obtained by ERM that is intended to address the requirements of the following CCR Rules in the vicinity of the CCR Units:

40 CFR §257.91 Groundwater monitoring systems.

“(a) Performance standard. The owner or operator of a CCR unit must install a groundwater monitoring system that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer...”

“(b) The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information ...”

30 TAC §352.911 Groundwater Monitoring Systems.

(a) The commission adopts by reference 40 Code of Federal Regulations §257.91 (Groundwater monitoring systems) as amended through the April 17, 2015, issue of the Federal Register (80 FR 21301), subject to the additions in this section.”

3. SCOPE AND OBJECTIVES

ERM conducted a phased investigation of the hydrogeology at the Calaveras Power Station to identify the uppermost groundwater-bearing unit (i.e., aquifer, as described by the CCR Rules), characterize the subsurface hydrogeology near the CCR Units which are subject to the CCR Rules, and installation of CCR Unit groundwater monitoring systems. Specifically, the hydrogeologic investigation included:

Initial Evaluation

- Measure groundwater elevations from existing monitor wells located in the vicinity of the Northern CCR Units to evaluate preliminary groundwater flow direction;
- Inspect existing wells located in the vicinity of the Northern CCR Units for potential future use in CCR monitor well networks; and
- Evaluate placement and construction requirements for future well installation activities to take place during Phase I activities.

Phase I: Hydrogeological Investigation (Northern and Southern CCR Units)

- Advance soil borings to obtain lithologic and stratigraphic information about the underlying soil and the underlying groundwater-bearing unit;
- Install monitor wells and measuring groundwater elevations to determine the apparent groundwater flow direction; and
- Collect geotechnical information to assess the confining and/or semi-confining units above and below the uppermost groundwater-bearing unit.

Phase II: Hydrogeological Investigation and Installation of Groundwater Monitor Well Network (Northern and Southern CCR Units)

- Confirm and further characterize the hydrogeologic information obtained during the Phase I hydrogeologic investigation;
- Confirm the extent of the lower confining unit in the vicinity of the Northern CCR Units and the presence/extent of the semi-confining unit in the vicinity of the Southern CCR Units;
- Measure additional site-wide groundwater flow direction data at each CCR Unit; and
- Complete installation of groundwater monitor well networks at the Northern and Southern CCR Units.

Phase III: Hydrogeological Investigation (Central CCR Unit)

- Advance soil borings to obtain lithologic and stratigraphic information about the underlying soil and the underlying groundwater-bearing unit; and
- Install monitor wells and measuring groundwater elevations to determine the apparent groundwater flow direction.

Phase IV: Hydrogeological Investigation and Installation of Groundwater Monitor Well Network (Central CCR Unit), and Supplemental Well Installation (Northern and Southern CCR Units)

- Confirm and further characterize the hydrogeologic information obtained during the Phase III hydrogeologic investigation in the vicinity of the PDP;
- Complete installation of groundwater monitor well network at the PDP;
- Collect geotechnical information to assess the confining and/or semi-confining units above and below the uppermost groundwater-bearing unit in the vicinity of the PDP; and
- Installation of supplemental soil bores and/or wells at the FAL and Southern CCR Units.

4. METHODOLOGY

4.1 Initial Evaluation

An initial evaluation was conducted which included 1) collecting water level measurements to determine the depth to water and groundwater flow direction in proximity to the Northern CCR units; 2) inspecting selected wells to determine their viability/usability in a future groundwater monitoring network; and 3) evaluating the placement of the monitor well filter packs and screens relative to encountered groundwater-bearing zones.

The water levels in seven existing monitor wells in proximity to the Northern CCR units would suggest that the wells are screened in the same groundwater-bearing unit. As there is no detailed lithologic/hydrogeologic information from the previous well installations, it is unclear whether these water levels indicate confined or semi-confined conditions, or if there is a shallow water bearing unit that is not currently being monitored.

Three existing monitor wells (JKS-31, JKS-33, and JKS-36) were identified as potentially viable/useable in a future groundwater monitoring network (**Figure 3**). The screen lengths in all three monitor wells were 10 feet, which is an industry recognized standard length. The filter pack length in JKS-31 and JKS-33 is approximately 10 to 12 feet in length, which is consistent with industry standards. The filter pack in JKS-36 is reported to be approximately 45 to 50 feet in length.

4.2 Hydrogeologic Investigation

4.2.1 Soil Boring Installation and Monitor Well Completions

Prior to initiating any subsurface disturbance activities, proposed boring locations were evaluated for the presence of any features (i.e., buried utilities/piping) in the subsurface. This subsurface clearance process included:

- A review of available site drawings showing the location of buried utilities;
- A site-walk of each boring location with CPS personal knowledgeable of known and potential subsurface assets;
- Geophysical clearance using a third-party line locator. Geophysical clearance was performed by Ground Penetrating Radar Systems, Inc. for Phases I through III and by Local Locators LLC for Phase IV; and
- Manual clearance of each boring location to visually confirm that no subsurface utilities were present by using a high-pressure water sprayer and an air vacuum (hydro-excavation) to remove soil to a depth of 5 feet below ground surface (bgs). Hydro-excavation activities were conducted by Best Drilling Services, Inc. for Phases I and II, by Vortex Drilling Partners, LP (Vortex) for Phase III, and by Envirotech Drilling Services, LLC (Envirotech) for Phase IV.

ERM subcontracted Strata Core Services, LLC (Strata Core), Vortex, and Envirotech to advance soil borings and install groundwater monitor wells using a hollow-stem auger (HSA) drilling method. The drilling and well installation were completed under the supervision of an ERM geologist by Strata Core for Phase I and II, by Vortex for Phase III, and by Envirotech for Phase IV. An ERM geologist visually classified the stratigraphic column at each soil boring location. ERM boring logs, based on visual field-classification of geologic materials, are provided in **Appendix A**.

Phase I - April 2016

The investigation included the advancement of three (3) soil borings within a 100- to 200-foot distance from the Northern CCR Units and the advancement of four (4) soil borings within a 100-to 200-foot distance from the Southern CCR Units (**Figure 3**). The seven (7) soil borings were installed to address the lack of lithologic/hydrogeologic information in the vicinity of the Northern and Southern CCR Units.

Around the Northern CCR Units, three soil borings (JKS-45, JKS-46, and JKS-47) were initially advanced to depths corresponding to water levels measured in existing monitor wells during the initial evaluation in August 2015 (approximately 25 to 35 feet bgs). Groundwater was encountered in JKS-46 and JKS-47 at similar depths; however, groundwater was encountered in JKS-45 at a deeper depth (approximately 45 feet bgs). At the initial soil boring in the northern area (JKS-45), the top of the uppermost aquifer and an underlying confining/semi-confining unit were identified, then a monitor well was installed. In subsequent soil borings, a monitor well was installed once the top of the uppermost aquifer was identified.

Around the Southern CCR Units, four soil borings (JKS-48, JKS-49, JKS-50, and JKS-51) were advanced until a groundwater-bearing unit was encountered. An underlying confining/semi-confining unit was not encountered in the southern area. Each soil boring was terminated when bedrock was encountered.

Phase II - September 2016

The investigation included the advancement of eight (8) soil borings within a 100- to 200-foot distance from the Northern CCR Units and the advancement of six (6) soil borings within a 100-to 200-foot distance from the Southern CCR Units (**Figure 3**). The fourteen (14) additional soil borings were installed to confirm and further characterize the lithologic/hydrogeologic information obtained during Phase I of the hydrogeologic investigation, and to supplement the monitoring well networks in the Northern and Southern CCR Units.

Around the Northern CCR Units, eight soil borings (JKS-57, JKS-58, JKS-59, JKS-60, JKS-61, JKS-62, JKS-63¹, JKS-64) were initially advanced to depths corresponding to water levels measured in existing monitor wells during an August 2016 groundwater gauging event (approximately 15-30 feet bgs for the Fly Ash Landfill, and approximately 25-30 feet bgs for the Evaporation Pond). Groundwater was encountered at similar depths in all borings, with the exception of JKS-57 where groundwater was not initially observed during well installation, and JKS-63 where groundwater was encountered at 38 feet bgs (due to its higher topographic elevation). After JKS-57 was allowed to equilibrate, groundwater was observed at a similar depth as the other monitor wells.

Around the Southern CCR Units, six soil borings (JKS-50R, JKS-52, JKS-53, JKS-54, JKS-55, JKS-56) were initially advanced to depths corresponding either to where bedrock was encountered during Phase I activities (20-30 feet bgs) or the presence of groundwater. JKS-50, installed during the initial investigation, was plugged, and abandoned and JKS-50R was re-installed in its place.

Phase III – August 2020

The investigation included the advancement of three (3) soil borings within a 100- to 200-foot distance from the proposed placement of the Central CCR Unit (**Figure 3**). The soil borings were installed to address the lack of lithologic/ hydrogeologic information in the vicinity of the Central CCR Unit.

Three soil borings (JKS-65, JKS-66, and JKS-67) were advanced until a groundwater-bearing unit was encountered. An underlying confining/semi-confining unit was not encountered in the central area, and each soil boring was terminated at a depth of 40 feet bgs.

¹ JKS-63 was later plugged and abandoned and replaced with monitor well JKS-63R on May 2, 2019, due to a blockage within the well annulus (tree roots).

Phase IV – July 2022

The investigation included the advancement of two (2) soil borings within a 100- to 200-foot distance from the Fly Ash Landfill, the advancement of two (2) soil borings within a 100- to 200-foot distance from the Central CCR Unit, and the advancement of one (1) soil boring within a 100-to 200-foot distance from the Southern CCR Units (**Figure 3**). The five (5) soil borings were installed to confirm and further characterize the lithologic/hydrogeologic information obtained during Phase III, and to complete the monitoring well networks for the FAL and Southern CCR Units.

Around the FAL, two soil borings (SB-20220713-01 and SB-20220713-02) were initially advanced to depths corresponding to water levels measured in existing monitor wells during an April 2022 gauging event (approximately 35-45 feet bgs). Groundwater was not observed at either soil boring location during initial installation, and each boring was further advanced into the underlying confining unit and allowed to remain open to observe for presence of groundwater. Both soil borings were plugged and abandoned, as no measurable amount of groundwater was detected.

Around the Central CCR Unit, two soil borings (JKS-68 and JKS-69) were initially advanced to depths corresponding to where groundwater was encountered during Phase III (10-25 feet bgs). JKS-68 was advanced deeper in an attempt to identify an underlying confining/semi-confining unit. No confining unit was encountered, and the boring was terminated when bedrock was encountered.

Around the Southern CCR Units, one soil boring (JKS-70) was installed to a depth corresponding to where bedrock was encountered during Phase I and II (20-30 feet bgs).

Well Construction

Monitor wells were constructed of 2-inch diameter PVC casing with 0.010-inch slotted well-screen. Screen lengths were installed based on the thickness of the encountered groundwater-bearing unit and ranged from 7.5 feet to 15 feet during Phase I and 10 feet to 20 feet during Phases II through IV. The borehole annulus around the well screen was backfilled one to two feet above the top of the well-screen with 20/40 or 16/30 silica sand filter pack, and the remaining borehole annulus was backfilled with 3/8-inch bentonite pellets up to the ground surface. Soil boring logs, well completion logs, and state well reports are provided in **Appendix A**.

Phase I through IV wells were completed with a concrete pad at ground surface. With the exception of JKS-52, all wells were completed above ground surface with a protective steel casing, extending several feet above grade. JKS-52, which was drilled in the middle of a berm roadway, was completed as flush mount well in a sub-grade steel vault.

4.2.2 Geotechnical Testing

Once an underlying confining/semi-confining unit had been encountered in the Northern and Southern CCR Units, undisturbed samples were collected by advancing Shelby tubes into the underlying units (i.e., clay and clayey units) to document the bulk density, hydraulic conductivity, specific gravity, Atterberg limits, and grain size distribution of the materials in these units. The geotechnical results will aid in the evaluation of whether these confining/semi-confining units can affect the downward vertical migration of CCR. As an underlying confining/semi-confining unit was not encountered in the Central CCR Unit, no undisturbed samples were collected for geotechnical analysis. In addition, grab samples were collected in the Northern, Central, and Southern CCR Units from representative materials overlying the confining/semi-confining unit or bedrock to document the Atterberg limits and grain size distribution. Samples were containerized, labeled, and transported to the HTS, Inc. Consultants (HTS) laboratory in Houston, Texas. A summary of the geotechnical testing results is provided in **Table 1**. HTS laboratory test results are provided in **Appendix B**.

4.2.3 Surveying

To better define the water levels and the groundwater flow direction in the vicinity of the Northern CCR Units, the top of casing and ground surface of three monitor wells (JKS-31, JKS-33, and JKS-36) within the existing groundwater monitoring network were surveyed. In addition, the top of casing and ground surface elevations of the 28 installed monitor wells, and ground surface elevations for the two soil borings installed in the vicinity of the FAL were surveyed by a land surveyor. Monitor well survey data are summarized in **Table 2**.

5. INVESTIGATION RESULTS

5.1 Site-Wide Geology

According to the Bureau of Economic Geology (BEG) Geologic Atlas of Texas San Antonio Sheet², the geology in the area of Calaveras Power Station consists of the Carizzo Sand and the Wilcox Group. According to the United States Geological Survey, the Carizzo Sand consists of medium to coarse grained sandstone, with finer grained material towards the top of the formation³. The Wilcox Group consists mostly of mudstone, with various amounts of sandstone, lignite, ironstone concretions, and is glauconitic⁴. The surface topography of Calaveras Power Station slopes in multiple directions towards Calaveras Lake. Generally, the topography in the northern and southern area slopes towards the southeast.

ERM constructed cross sections (**Appendix C**) of the subsurface lithology/ stratigraphy in the vicinities of the Northern, the Central, and the Southern CCR Units using data from the installed borings. In addition, the cross sections for the Central CCR Unit incorporated geologic data collected by Raba Kistner, Inc. for two geotechnical engineering studies conducted in the vicinity of the PDP (**Appendix D**).

- Cross sections A-A', B-B', and C-C' reflect subsurface lithology/ stratigraphy in the vicinity of the Northern CCR Units;
- Cross sections H-H' and I-I' reflect the subsurface lithology/stratigraphy in the vicinity of the Central CCR Unit; and
- Cross sections D-D', E-E', F-F', and G-G' reflect subsurface lithology/ stratigraphy in the vicinity of the Southern CCR Units.

5.1.1 Northern CCR Units

The stratigraphic sequence is generally characterized by approximately 8 feet to 41 feet of unconsolidated material (sands, silts, and low to medium plasticity clays), underlain by a clayey/silty to well-sorted sand (groundwater-bearing unit) approximately 5 to over 25 feet thick (where observed), underlain by grey to brown, high plasticity clay (lower confining unit). The ground water bearing unit is at its greatest observed thickness near the southwest corner of the EP and thins towards the northwest (northwest of the FAL). The groundwater-bearing sand unit was not observed during installation of soil borings SB-20220713-01 and SB-20220713-02, indicating that this unit pinches out near the western extent of the FAL. The lower confining unit, generally observed at a depth between approximately 471 feet to 478 feet above mean sea level, was not observed at monitor wells JKS-47 and JKS-60 (drilled to depths of 462 feet and 466 feet above mean sea level, respectively). This possibly suggests the presence of erosional channels or gradational changes in lithology between JKS-45 and JKS-47, and JKS-46 and JKS-60. Interbedded sands and clays were observed within both the unconsolidated material and ground water bearing unit in monitor wells JKS-57, JKS-58, and JKS-61 through JKS-64. High plasticity clay intervals were observed in the upper portion of the unconsolidated material at soil boring SB-20220713-01 and immediately above the groundwater-bearing unit at monitor well JKS-45. However, these clay units appear to be discontinuous as they were not encountered during the installation of any additional soil borings or monitor wells in the vicinity of the Northern CCR Units. Drilling refusal was encountered at

² Bureau of Economic Geology. 1974, revised 1982. *Geologic Atlas of Texas, San Antonio Sheet*. Bureau of Economic Geology, University of Texas at Austin.

³ Eargle, D.H. 1968. *Nomenclature of Formations of Claiborne Group, Middle Eocene, Coastal Plain of Texas*. U.S. Geological Survey Bulletin 1251-D.

⁴ United States Geological Survey. 2016. *Wilcox Group, undivided*. U.S. Geological Survey Mineral Resources On-line Spatial Data. July 25, 2016. <http://mrdata.usgs.gov/geology/state/sgmc-unit.php?unit=TXEOPNwi:0>.

soil boring SB-20220713-02 at approximately 47 feet below ground surface, possibly indicating bedrock was encountered (sandstone fragments observed in soil cuttings).

Visual classifications of the geologic materials described above are consistent with results from the soil materials testing analysis conducted by HTS for samples collected at JKS-45, JKS-58, JKS-62, and JKS-64. The laboratory USCS results classify the high plasticity clay unit (above the groundwater-bearing unit) and the lower confining unit as fat clay (CH). Sandy lean clay (CL) and clayey sand (SC) USCS results from JKS-58 and JKS-62, respectively, suggest that the contact between the groundwater bearing unit and lower confining unit is gradational in some areas. The laboratory USCS results classify the groundwater-bearing unit from a silty sand (SM) at JKS-45 to a clayey sand (SC) at JKS-64. Hydraulic conductivities from cohesive samples collected from the lower confining unit were reported on the order of 10^{-7} to 10^{-8} centimeters per second (cm/sec), which is within the range of values for clay⁵. A summary of the geotechnical testing results is provided in **Table 1**. HTS laboratory test results are provided in **Appendix B**.

5.1.2 Central CCR Unit

The stratigraphic sequence is generally characterized by approximately 5 feet to 15 feet of consolidated material (sands, silts, and low to medium plasticity clays), underlain by a clayey/silty sand to poorly sorted sand (groundwater-bearing unit) that is at least 22 feet thick, but may be greater than 40 feet thick. Discontinuous silt and clay material were observed within the groundwater-bearing unit in monitor well JKS-65 (west of the unit), Raba Kistner geotechnical soil boring B-4 (north of the unit), monitor well JKS-68 (northeast of the unit), and in monitoring well JKS-67 and Raba Kistner geotechnical soil borings B-10 and B-11 (south of the unit). Bedrock (sandstone) was encountered below the groundwater-bearing unit at monitor well JKS-68 at a depth of 27 feet below ground surface but was not observed at any other soil boring or monitor well. However, it is anticipated that the bedrock encountered is acting as a confining layer for the Central CCR Unit and is present at deeper intervals west of JKS-68 and Calaveras Lake.

Visual classifications of the geologic material described above are consistent with results from the soil materials testing analysis conducted by ERM and Raba Kistner. The laboratory USCS results classify the groundwater bearing-unit as silty sand (SM) at Raba Kistner geotechnical soil borings B-3 and B-13. The discontinuous clay lenses observed within the groundwater-bearing unit at monitor well JKS-68 and Raba Kistner geotechnical soil borings B-10 and B-11 were classified as sand lean clays (CL). A summary of the ERM geotechnical testing results is provided in **Table 1**. HTS laboratory test results are provided in **Appendix B**. Geologic and geotechnical data collected by Raba Kistner are provided in **Appendix D**.

5.1.3 Southern CCR Units

The stratigraphic sequence is generally characterized by approximately 6 feet to 18 feet of unconsolidated material (sands, silts, and low to medium plasticity clays), underlain by clayey/silty sand to moderately sorted sand (groundwater-bearing unit) approximately 9.5 to 21.5 feet thick, underlain by bedrock (sandstone). Discontinuous silts and interbedded clay material were observed within the groundwater-bearing unit in monitor wells JKS-48, JKS-49, and JKS-51 through JKS-55.

Visual classifications of the geologic materials described above are consistent with results from the soil materials testing analysis conducted by HTS for samples collected at JKS-48, JKS-53, and JKS-54. The laboratory USCS results classify the groundwater-bearing unit from a silty clayey sand (SC-SM) at JKS-54 to a clayey sand (SC) at JKS-48 and JKS-53. Hydraulic conductivities from cohesive samples collected from the semi-confining unit were reported on the order of 10^{-6} to 10^{-8} (cm/sec). A summary of

⁵ Freeze, R. A., and J. A. Cherry. 1979. *Groundwater*. Prentice-Hall, Inc. Englewood Cliffs, N.J.

the geotechnical testing results is provided in **Table 1**. HTS laboratory test results are provided in **Appendix B**.

5.2 Site-Wide Hydrogeology

Based on water level measurements collected from 2016 to 2022, ERM constructed potentiometric surface maps in the vicinities of the Northern, the Central, and the Southern CCR Units (**Appendix E**). In addition, ERM conducted a comprehensive Water Level Study of the Northern CCR Units and Southern CCR Units, comprised of groundwater elevation data and Calaveras Lake level information collected from 2016 to 2021 (**Appendix F**). Based on this information and stratigraphic information collected during the advancement of the soil borings, ERM has provided an interpretation of the confining nature of the underlying stratigraphy.

5.2.1 Northern CCR Units

Based on recent water elevation data collected in 2022, groundwater in the vicinity of the FAL appears to flow radially to the northeast and east from a potentiometric high located at JKS-45. Groundwater upgradient of the Evaporation Pond appears to flow southeast from a potential groundwater divide (located west of the CCR unit) and northeast from the Closed Landfills (located south of the CCR unit). Downgradient of the EP, groundwater appears to flow generally east to northeast. Interpretations of groundwater flow for the Northern CCR Units has evolved over the course of the program as a more holistic review of groundwater data from additional site wells have been incorporated. Groundwater elevation data is summarized in **Appendix G**.

The groundwater-bearing unit in the vicinity of the Northern CCR Units appears to exhibit unconfined conditions based on the potentiometric surface of groundwater in relation to the first encountered water during drilling and the lack of continuous confining units (i.e., clay, sandy clay, or silty clay). As shown on Cross Sections A-A' through C-C' (**Appendix C**) and indicated on the boring logs (**Appendix A**), the potentiometric surface is within approximately three feet of the first water encountered during drilling, and no continuous confining units are observed. The minimal change in elevation and the stratigraphic information indicates that a significant, laterally continuous confining layer is not present above the groundwater-bearing unit in the northern area. However, a laterally continuous lower confining unit was observed in multiple borings below the groundwater bearing unit.

5.2.2 Central CCR Unit

Based on recent water elevation data collected in 2022, groundwater in the vicinity of the Central CCR Unit appears to flow towards the Southern CCR Units and Lake Calaveras (south to southeast). Groundwater elevation data is summarized in **Appendix G**.

The groundwater-bearing unit in the vicinity of the Central CCR Unit appears to exhibit unconfined conditions based on the potentiometric surface of the groundwater in relation to the first encountered water during drilling for the temporary wells installed by Raba Kistner (**Appendix D**), the permanently installed wells installed by ERM, and the lack of continuous upper confining units. As shown on Cross Sections H-H' and I-I' (**Appendix C**) and indicated on the boring logs (**Appendix A**), the potentiometric surface is within approximately one-half foot to five feet of the first water encountered during drilling. The minimal change in elevation and the stratigraphic information indicates that a significant, laterally continuous confining layer is not present above the groundwater-bearing unit in the central area.

5.2.3 Southern CCR Units

Based on recent water elevation data collected in 2022 (and historically since approximately October 2019), groundwater flow in the vicinity of the Southern CCR Units has shown evidence of temporal variation. As measured during the April 2022 monitoring event, groundwater appears to flow south to southeast towards the northern portion of the CCR unit. Groundwater in the vicinity of the southern and western extent of the CCR unit appears to flow east to northeast towards Calaveras Lake. Groundwater elevations measured during the October 2022 monitoring event appear to display a southeastern groundwater flow towards the northern extent of the CCR unit, which converges with groundwater flow from the southwest towards a potentiometric low near monitor well JKS-49. Prior to October 2019, groundwater appeared to flow radially towards Calaveras Lake and the adjacent channel (southeast and east) from a groundwater high located near JKS-49. Groundwater elevation data is summarized in **Appendix G**.

The groundwater-bearing unit in the vicinity of the Southern CCR Units appears to exhibit semi-confined conditions with confining units (i.e., clay, sandy clay, or silty clay) present in all the wells except JKS-49 and JKS-56. As shown on Cross Sections D-D' through G-G' (**Appendix C**) and indicated on the boring logs (**Appendix A**), the potentiometric surface is within approximately 4 feet to 11 feet of where water was first encountered during drilling for all wells except JKS-56, indicative of groundwater under hydraulic head pressure with semi-confined conditions. JKS-56 appears to demonstrate unconfined conditions, due to the approximately 0.5-foot difference between the first encountered water during drilling and the potentiometric surface. As shown on Cross Sections D-D', E-E', and G-G' (**Appendix C**), and indicated on the boring logs (**Appendix A**), there is a bedrock unit underlying the groundwater-bearing unit in the southern area.

6. CCR UNIT MONITOR WELL NETWORKS

According to the CCR Rules, the groundwater monitoring system requires that wells be installed both upgradient from each CCR Unit (to establish background concentrations of the constituents listed in Appendix III and IV of the CCR Rule), and downgradient from each CCR Unit to detect potential releases. Due to the horizontal distance between the FAL and the EP, and the differing groundwater flow directions, the two Northern CCR Units require separate monitor well networks. Even though the SRH Pond and the BAPs are in close proximity, two separate monitors well networks will be used to monitor the groundwater in the vicinity of these two Southern CCR Units. ERM developed the monitor well networks utilizing one to two upgradient wells and at least three or more downgradient wells.

The locations for groundwater monitor well networks at the Northern, the Central, and the Southern CCR Units are shown in **Figure 3**, and the respective well functions are as follows:

FAL Monitor Well Network

Well ID	Well Function	Comment
JKS-45	Background Monitoring	Collect sample and measure water elevation
JKS-57	Background Monitoring	Collect sample and measure water elevation
JKS-31	Downgradient Monitoring	Collect sample and measure water elevation
JKS-33	Downgradient Monitoring	Collect sample and measure water elevation
JKS-46	Downgradient Monitoring	Collect sample and measure water elevation
JKS-60	Downgradient Monitoring	Collect sample and measure water elevation
JKS-58	Groundwater Observation	Measure water elevation only
JKS-59	Groundwater Observation	Measure water elevation only

EP Monitor Well Network

Well ID	Well Function	Comment
JKS-47	Background Monitoring	Collect sample and measure water elevation
JKS-63	Former Background Monitoring	Plugged and abandoned on May 2, 2019, due to a blockage within the well annulus (tree roots)
JKS-63R	Background Monitoring	Collect sample and measure water elevation
JKS-36	Downgradient Monitoring	Collect sample and measure water elevation
JKS-61	Downgradient Monitoring	Collect sample and measure water elevation
JKS-62	Downgradient Monitoring	Collect sample and measure water elevation
JKS-64	Downgradient Monitoring	Collect sample and measure water elevation

PDP Monitor Well Network

Well ID	Well Function	Comment
JKS-66	Background Monitoring	Collect sample and measure water elevation
JKS-65	Downgradient Monitoring	Collect sample and measure water elevation
JKS-67	Downgradient Monitoring	Collect sample and measure water elevation
JKS-68	Downgradient Monitoring	Collect sample and measure water elevation
JKS-69	Downgradient Monitoring	Collect sample and measure water elevation

SRH Pond Monitor Well Network

Well ID	Well Function	Comment
JKS-51	Background Monitoring	Collect sample and measure water elevation
JKS-70	Background Monitoring	Collect sample and measure water elevation
JKS-52	Downgradient Monitoring	Collect sample and measure water elevation
JKS-53	Downgradient Monitoring	Collect sample and measure water elevation
JKS-54	Downgradient Monitoring	Collect sample and measure water elevation

BAPs Monitor Well Network

Well ID	Well Function	Comment
JKS-51	Background Monitoring	Collect sample and measure water elevation
JKS-70	Background Monitoring	Collect sample and measure water elevation
JKS-48	Downgradient Monitoring	Collect sample and measure water elevation
JKS-49	Downgradient Monitoring	Collect sample and measure water elevation
JKS-50R	Downgradient Monitoring	Collect sample and measure water elevation
JKS-52	Downgradient Monitoring	Collect sample and measure water elevation
JKS-55	Downgradient Monitoring	Collect sample and measure water elevation
JKS-56	Downgradient Monitoring	Collect sample and measure water elevation

6.1 EP Monitor Well Network Updates

Historically, the groundwater monitoring well network consisted of three upgradient monitor wells (JKS-47, JKS-63R, and JKS-64) and three downgradient monitor wells (JKS-36, JKS-61, and JKS-62). Non-proportional changes in water levels were observed during the 2020 monitoring events and a site-wide water level study (Study) was recommended to understand temporal changes in hydrogeology. ERM completed this Study by collecting five rounds of water level measurements at each CCR Unit, which included observations from other on-site monitor wells, from February to October 2021. The Study is provided in **Appendix F**.

As documented in the Study, JKS-64 no longer appeared to be a viable background well. Therefore, ERM recommended that JKS-64 be re-designated as a downgrade well for monitoring and statistical analysis. As such, the revised groundwater monitoring well network consists of two upgradient monitor wells (JKS-47 and JKS-63R) and four downgradient monitor wells (JKS-36, JKS-61, JKS-62, and JKS-64).

6.2 SRH Pond Monitor Well Network Updates

Historically, the groundwater monitoring well network consisted of two upgradient monitor wells (JKS-49 and JKS-51) and three downgradient monitor wells (JKS-52, JKS-53, and JKS-54). Non-proportional changes in water levels observed during the 2020 monitoring events were investigated as part of the Study discussed further in Section 6.1.

As documented in the Study, JKS-49 and JKS-51 no longer appeared to be viable background wells and ERM recommended the installation of one or two new monitor wells located north of the SRH Pond. One monitor well (JKS-70) was installed in July 2022 and was designated as a background well for the SRH Pond and JKS-51 was reassessed as a background well. As such, the revised groundwater monitoring well network consists of two upgradient monitor wells (JKS-70 and JKS-51) and three downgradient monitor wells (JKS-52, JKS-53, and JKS-54).

6.3 BAPs Monitor Well Network Updates

Historically, the groundwater monitoring well network consisted of two upgradient monitor wells (JKS-51 and JKS-70) and five downgradient monitor wells (JKS-48, JKS-50R, JKS-52, JKS-55, and JKS-56). Non-proportional changes in water levels observed during the 2020 monitoring events were investigated as part of the Study discussed further in Section 6.1.

As documented in the Study, JKS-49 and JKS-51 no longer appeared to be viable background wells and ERM recommended the installation of one or two new monitor wells located northwest of the BAPs. One monitor well (JKS-70) was installed in July 2022 and was designated as a background well for the BAPs and JKS-51 was reassessed as a background well. As such, the revised groundwater monitoring well network consists of two upgradient monitor wells (JKS-51 and JKS-70) and six downgradient monitor wells (JKS-48, JKS-49, JKS-50R, JKS-52, JKS-55, and JKS-56).

7. CONCLUSIONS

- Based on recent water elevation data, groundwater flow in the vicinity of the FAL is generally northeast to east from a potentiometric high at JKS-45.
- Based on recent water elevation data, groundwater upgradient of the EP appears to flow southeast from a potential groundwater divide and northeast from the Closed Landfills. Downgradient of the CCR Unit, groundwater appears to flow generally northeast to east.
- The groundwater-bearing unit in the vicinity of the Northern CCR Units appears to exhibit unconfined conditions and is underlain by a lower confining unit.
- Based on recent water elevation data, groundwater flow in the vicinity of the Central CCR Unit appears to flow south to southeast towards the Southern CCR Units and Lake Calaveras.
- The groundwater-bearing unit in the vicinity of the Central CCR Unit appears to exhibit unconfined conditions and is underlain by bedrock (sandstone).
- The groundwater flow in the vicinity of the Southern CCR Units has shown temporal variation since October 2019.
 - During the April 2022 monitoring event, groundwater appears to flow south to southeast towards the northern portion the CCR unit, and in the vicinity of the southern and western extent of the CCR unit appears to flow east to northeast towards Calaveras Lake.
 - During the October 2022 monitoring event, groundwater appears to display a southeastern groundwater flow towards the northern extent of the CCR unit, which converges with groundwater flow from the southwest towards a potentiometric low near monitor well JKS-49.
- The groundwater-bearing unit in the vicinity of the Southern CCR Units appears to exhibit semi-confined conditions and is underlain by bedrock (sandstone).
- The following groundwater monitoring systems, installed for each CCR Unit at the Calaveras Power Station, meets the groundwater monitoring system requirements specified in the CCR Rule:
 - FAL: 2 background wells; 4 downgradient wells; 2 observation wells
 - EP: 2 background wells; 4 downgradient wells
 - PDP: 1 background well; 4 downgradient wells
 - SRH Pond: 2 background wells; 3 downgradient wells
 - BAPs: 2 background wells; 6 downgradient wells
- Certification from a qualified professional engineer stating that the groundwater monitoring system has been designed and constructed to meet the requirements of 40 C.F.R. Part 257.91 and 30 TAC §352.911 is provided in **Appendix H**.

TABLES

TABLE 1
Geotechnical Testing Results Summary
CPS Energy
Calaveras Power Station

Well ID	Depth (feet bgs)	USCS Description	Moisture (%)	Density (pcf)	Atterberg Liquid Limit (%)	Atterberg Plastic Limit (%)	Atterberg Plastic Index (%)	Particle Size	Hydraulic Conductivity (cm/sec)	Specific Gravity
		ASTM D2487	ASTM D2216	ASTM D2937	ASTM D4318	ASTM D4318	ASTM D4318	ASTM D421/D422	ASTM D5084	ASTM D854
JKS-45	28-30	Fat Clay (CH)	24.3	--	61	22	39	91.6	-	-
JKS-45	36-38	Fat Clay (CH)	19.0	--	67	24	43	90.5	-	-
JKS-45	50-52	Silty Sand (SM)	18.0	--	Non Plastic	Non Plastic	Non Plastic	12.6	-	-
JKS-45	55-57	Fat Clay (CH)	27.9	--	75	28	47	97.0	-	-
JKS-45	60-62	Fat Clay (CH)	22.6	120.9	75	26	49	86.4	1.82E-08	2.696
JKS-48	10-12.5	Clayey Sand (SC)	20.5	--	35	16	19	44.6	-	-
JKS-48	15-16.5	Sandy Lean Clay (CL)	19.1	--	48	19	29	58.9	-	-
JKS-48	19-20	Clayey Sand (SC)	25.2	--	26	16	10	48.7	-	-
JKS-53	10-12.5	Clayey Sand (SC)	24.2	101.8	30	14	16	35.9	5.34E-06	2.68
JKS-53	12.5-15	Clayey Sand (SC)	23.6	97.1	29	15	14	48.8	4.13E-08	2.68
JKS-53	20-21	Clayey Sand (SC)	29.5	--	27	14	13	37.6	--	--
JKS-54	13-14	Silty Clayey Sand (SC-SM)	25.5	--	22	15	7	33.5	--	--
JKS-58	26-27	Sandy Lean Clay (CL)	22.7	--	38	18	20	50.9	--	--
JKS-58	30-32.5	Fat Clay (CH)	20.3	100.0	57	20	37	89.1	1.53E-07	2.72
JKS-62	35-37	Clayey Sand (SC)	18.4	93.8	38	17	21	32.3	6.63E-07	2.68
JKS-64	20-30	Clayey Sand (SC)	28.6	--	29	14	15	30.1	--	--
JKS-68	23-25	Sandy Lean Clay (CL)	24.8	--	30	16	14	68.3	--	--

NOTES:

feet bgs = feet below ground surface
USCS = Unified Soil Classification System
pcf = pounds per cubic foot
cm/sec = centimeters per second
-- = Not analyzed for this parameter
All analyses performed by HTS, Inc. Consultants.

TABLE 2
Well Survey Summary
CPS Energy
Calaveras Power Station

Monitor Well Survey Data															
Well ID	Hydrogeologic Unit Monitored	Type	Up or Down Gradient	Casing Diameter and Material	Screen Diameter (inches) and Material	Screen Slot Size (inches)	Northing (US Survey Feet)	Easting (US Survey Feet)	TOC Elevation (feet MSL)	Ground Surface Elevation (feet MSL)	Casing Height (feet)	Well Depth (feet BGS)	Well Depth (feet BTOC)	Screen Interval (feet BGS)	Screen Interval (feet BTOC)
<u>Fly Ash Landfill</u>															
JKS-31	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13669119.58	2187983.62	507.79	505.76	2.03	65.0	67.2	55.0 - 65.0	57.0 - 67.0
JKS-33	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13669102.42	2188839.03	498.96	497.59	1.37	29.0	30.0	19.0 - 29.0	20.4 - 30.4
JKS-45	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13667132.78	2186615.40	531.46	528.31	3.15	55.0	58.2	40.0 - 55.0	43.2 - 58.2
JKS-46	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13667810.11	2187972.31	499.08	495.75	3.33	25.0	28.3	15.0 - 25.0	18.3 - 28.3
JKS-57	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13668235.72	2187486.38	506.91	503.83	3.08	27.0	30.1	12.0 - 27.0	15.1 - 30.1
JKS-58	Uppermost	Observation	Downgradient	2-inch PVC	2-inch PVC	0.01	13667994.99	2187797.39	504.45	500.94	3.51	30.0	33.5	20.0 - 30.0	23.5 - 33.5
JKS-59	Uppermost	Observation	Downgradient	2-inch PVC	2-inch PVC	0.01	13667779.88	2188352.07	496.45	493.53	2.92	27.0	29.9	12.0 - 27.0	14.9 - 29.9
JKS-60	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13667357.02	2188465.44	495.70	492.68	3.02	25.0	28.0	10.0 - 25.0	13.0 - 28.0
<u>Evaporation Pond</u>															
JKS-36	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13668612.14	2187599.34	508.51	507.06	1.45	50.0	51.5	40.0 - 50.0	41.5 - 51.5
JKS-47	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13665709.79	2186503.87	513.63	510.28	3.35	40.0	43.4	25.0 - 40.0	28.4 - 43.4
JKS-61	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13665721.04	2187196.65	505.51	502.52	2.99	33.0	36.0	18.0 - 33.0	21.0 - 36.0
JKS-62	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13666020.13	2187153.88	509.84	506.71	3.13	30.0	33.1	20.0 - 30.0	23.1 - 33.1
JKS-63 - P&A	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13666230.86	2186553.38	526.86	523.55	3.31	50.0	53.3	30.0 - 50.0	33.3 - 53.3
JKS-63R	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13668452.91	2186879.12	522.27	519.15	3.12	50.0	53.1	35.0 - 50.0	38.1 - 53.1
JKS-64	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13665627.14	2186778.76	507.84	504.38	3.46	30.0	33.5	15.0 - 30.0	18.5 - 33.5
<u>Plant Drains Pond</u>															
JKS-65	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13664675.83	2186405.30	518.53	515.82	2.71	40.0	42.7	20.0 - 40.0	22.7 - 42.7
JKS-66	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13664900.45	2186752.50	517.65	514.35	3.30	40.0	43.3	20.0 - 40.0	23.3 - 43.3
JKS-67	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13664200.80	2186869.58	503.29	500.48	2.81	25.0	27.8	10.0 - 25.0	12.8 - 27.8
JKS-68	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13664629.59	2186983.08	506.34	503.41	2.93	27.0	29.9	12.0 - 27.0	14.9 - 29.9
JSK-69	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13664320.12	2186428.47	515.82	513.01	2.81	40.0	42.8	25.0 - 40.0	27.8 - 42.8
<u>SRH Pond</u>															
JKS-51	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13660243.53	2185630.39	496.92	494.04	2.88	22.0	24.9	7.0 - 22.0	9.9 - 24.9
JKS-52	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13659683.26	2186139.05	493.15	493.56	-0.41	29.0	28.6	19.0 - 29.0	18.6 - 28.6
JKS-53	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13659757.34	2185892.80	494.74	491.33	3.41	25.0	28.4	15.0 - 25.0	18.4 - 28.4
JKS-54	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13659753.34	2185641.96	496.40	492.69	3.71	22.0	25.7	12.0 - 22.0	15.7 - 25.7
JKS-70	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13663092.09	2186316.21	496.29	493.51	2.78	27.0	29.8	12.0 - 27.0	14.8 - 29.8
<u>Bottom Ash Ponds</u>															
JKS-48	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13659658.78	2186490.78	497.19	493.71	3.48	28.5	32.0	18.5 - 28.5	22.0 - 32.0
JKS-49	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13660519.40	2186229.15	498.63	495.17	3.46	17.0	20.5	7.0 - 17.0	10.5 - 20.5
JKS-50 - P&A	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13660122.87	2186836.72	498.20	494.87	3.33	10.0	13.3	2.5 - 10.0	5.8 - 13.3
JKS-50R	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13660149.90	2186841.92	498.48	494.96	3.52	19.5	23.0	9.5 - 19.5	13.0 - 23.0
JKS-51	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13660243.53	2185630.39	496.92	494.04	2.88	22.0	24.9	7.0 - 22.0	9.9 - 24.9
JKS-52	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13659683.26	2186139.05	493.15	493.56	-0.41	29.0	28.6	19.0 - 29.0	18.6 - 28.6
JKS-55	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13659749.76	2186840.46	493.81	490.13	3.68	25.0	28.7	15.0 - 25.0	18.7 - 28.7
JKS-56	Uppermost	Point of Compliance	Downgradient	2-inch PVC	2-inch PVC	0.01	13660382.47	2186847.61	496.66	493.07	3.59	25.0	28.6	10.0 - 25.0	13.6 - 28.6
JKS-70	Uppermost	Background	Upgradient	2-inch PVC	2-inch PVC	0.01	13663092.09	2186316.21	496.29	493.51	2.78	27.0	29.8	12.0 - 27.0	14.8 - 29.8

NOTES:

TOC = top of casing

feet MSL = feet above mean sea level

feet BLS = feet below ground surface

feet BTOC = feet below top of casing

P&A = JKS-50 was plugged and abandoned on 09/09/16, and JKS-63 was plugged and abandoned on 5/2/2019.

Surveying performed by Pape-Dawson Engineers, Inc. using NAD 83 State Plane Coordinates 4204 Texas South Central (NAVD88 computed using GEOID 03).

FIGURES



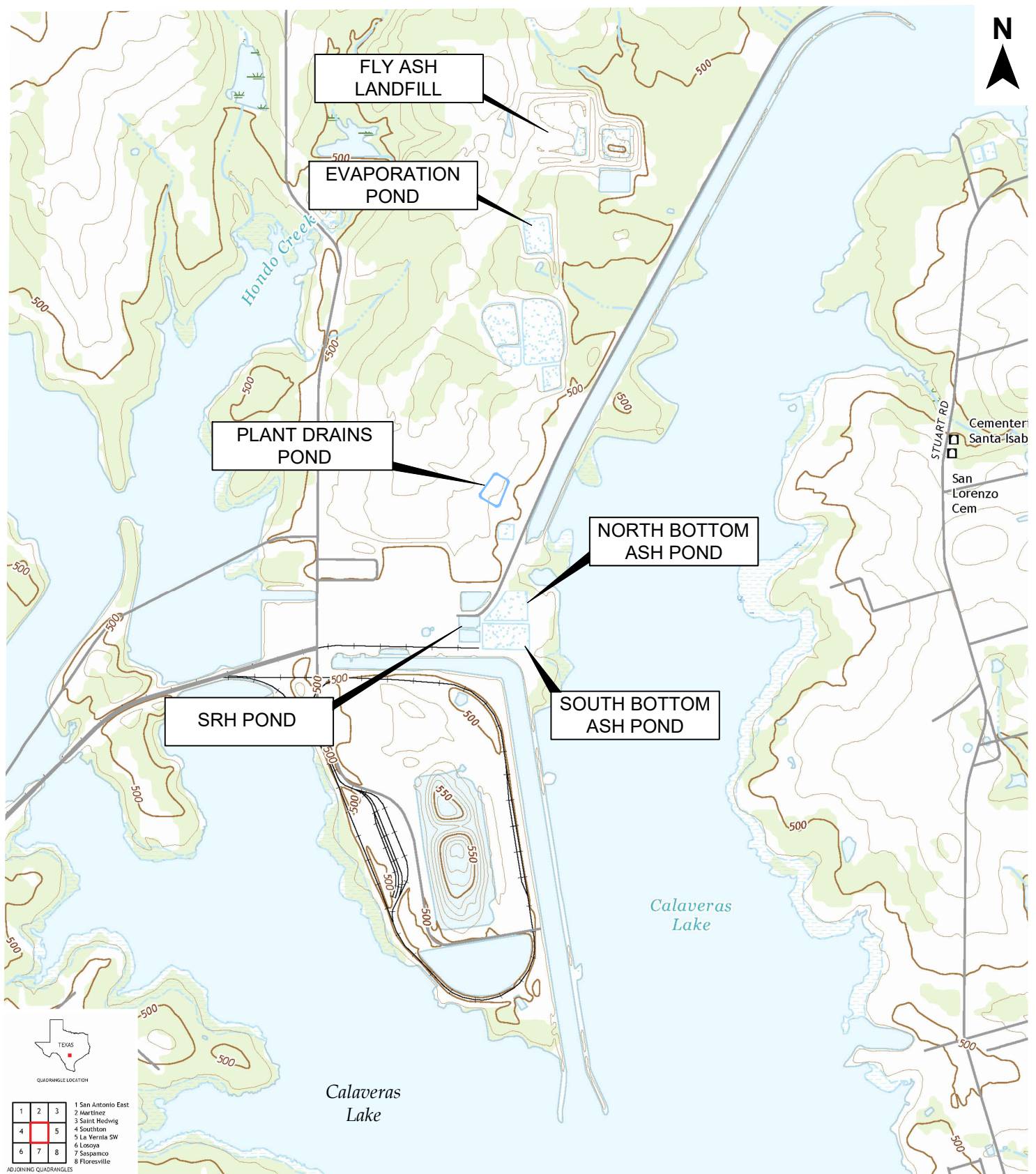
Environmental Resources Management

DESIGN:	NH	DRAWN:	EFC	CHKD.:	WZ
DATE:	7/25/2016	SCALE:	AS SHOWN	REVISION:	1
W.O.NO.:	K:\GIS\CPS\Calaveras\MXD\0337367_CPSCalaveras_SiteLoc.mxd				

FIGURE 1
GENERAL SITE LOCATION MAP

CPS Energy - Calaveras Power Station
San Antonio, Texas










SOURCE: USGS 7.5-MINUTE QUADRANGLE, TOPOGRAPHIC SERIES, ELMENDORF, TX, 2022.

Figure 2
CCR Unit Locations
 CPS Energy
 Calaveras Power Station
 San Antonio, Texas

0 2000 4000
 SCALE FEET

Legend

-  Background Monitor Well
-  Downgradient Monitor Well
-  Groundwater Elevation Observation Well
-  Soil Boring
-  CCR Unit



Environmental Resources Management

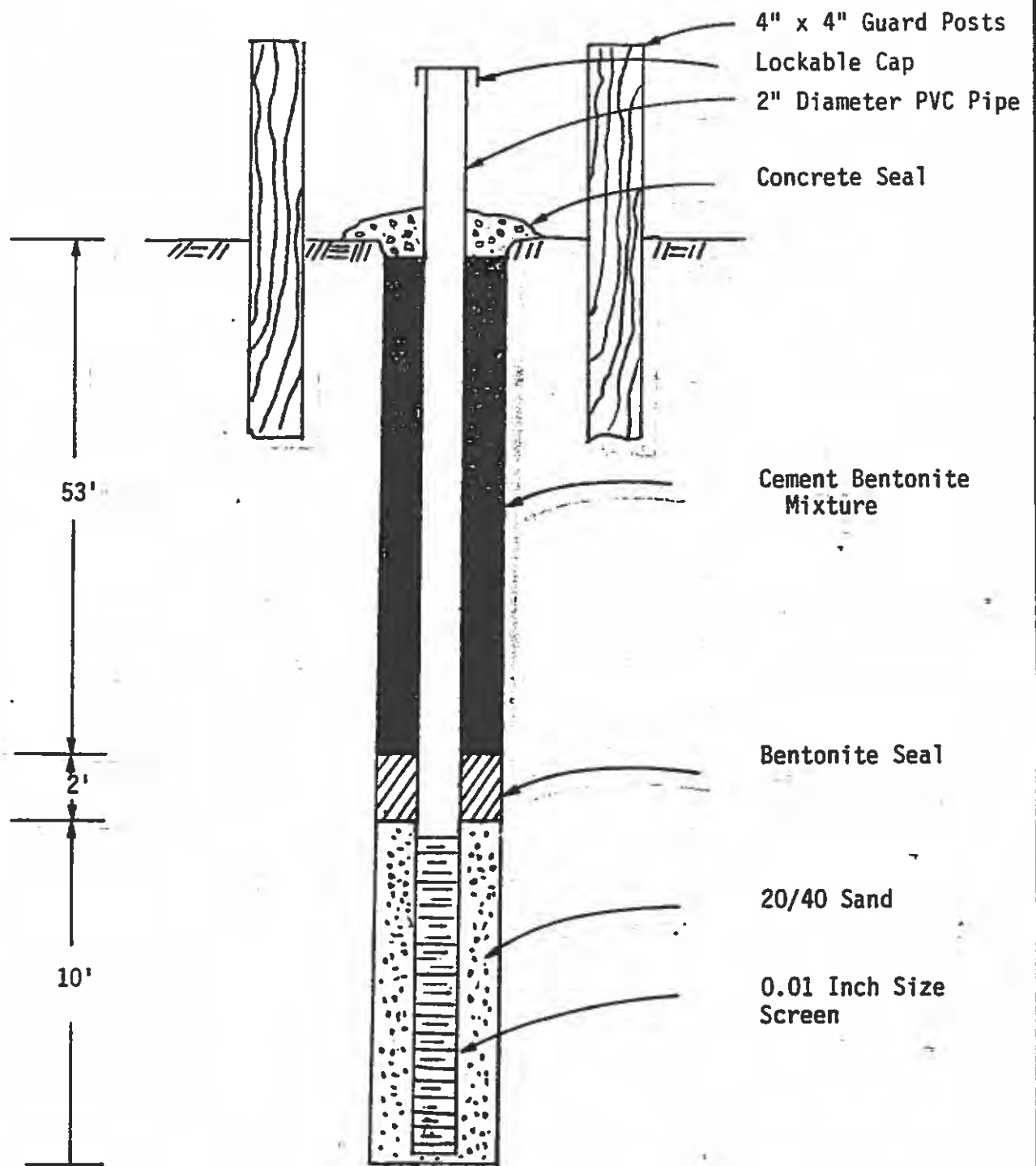
DESIGN: WZ	DRAWN: EFC	CHKD.: WZ
DATE: 7/3/2023	SCALE: AS SHOWN	REVISION: 0

M:\US\Projects\A-C\PS_Energy\SanAntonio_TX\APRX\CPS_Energy_SanAntonio_2022\CPS_Energy_SanAntonio_2022.APRX

FIGURE 3
CCR WELL NETWORK LOCATION MAP
CPS Energy - Calaveras Power Station
San Antonio, Texas



APPENDIX A SOIL BORING LOGS, WELL COMPLETION LOGS, AND STATE WELL REPORTS



PROJECT NAME

CALAVERAS PLANT - UNITS 5 AND 6
LANDFILL AREA EXPLORATION
San Antonio, Texas

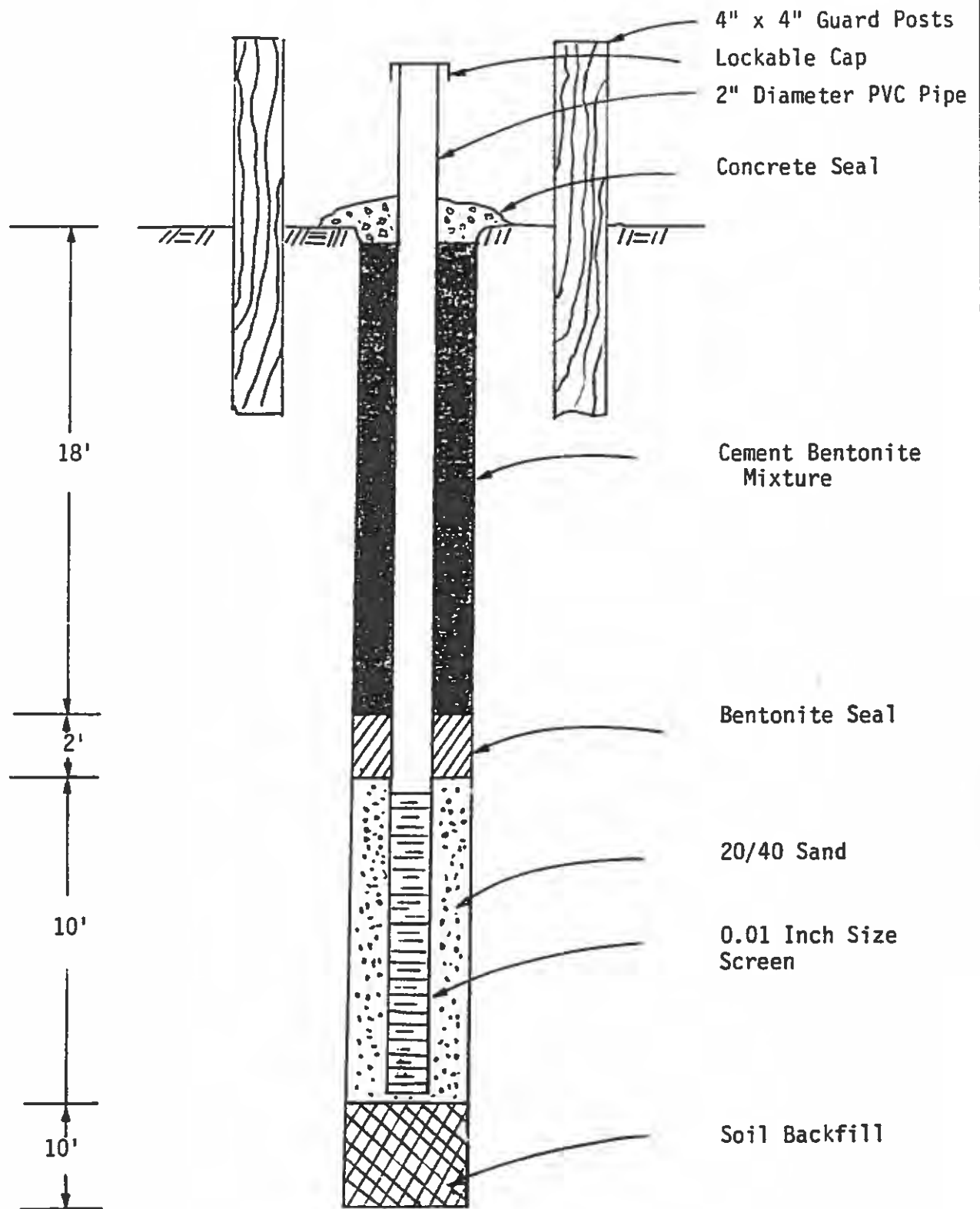
Monitor Well No. B-31

PROJECT NO.

312-75036

DATE

7-9-87



PROJECT NAME

CALAVERAS PLANT - UNITS 5 AND 6
LANDFILL AREA EXPLORATION
San Antonio, Texas

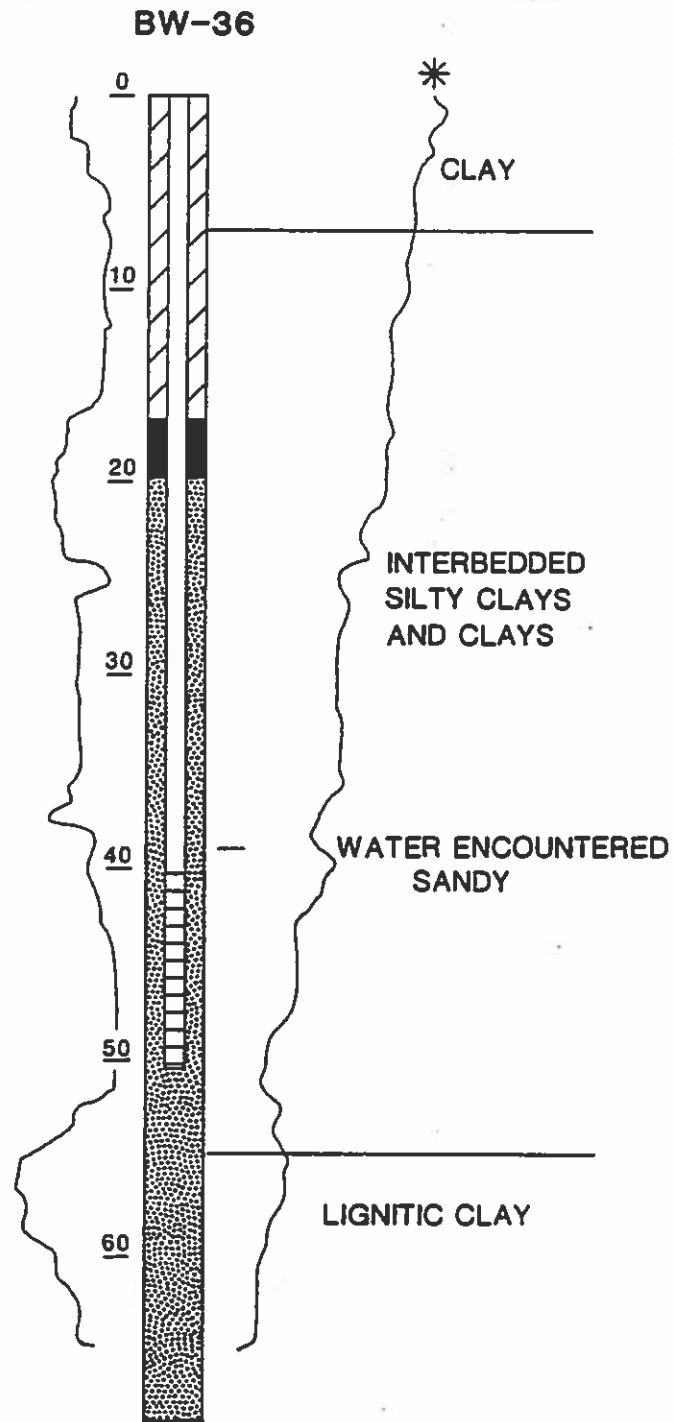
Monitor Well No. B-33

PROJECT NO

312-75036

DATE

7-9-87



ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

FIGURE A-2
MONITORING WELL BW-36
GEOPHYSICAL/LITHOLOGIC LOGS



ERM Environmental Resources Management

JKS-45 DRILLING LOG

Proj. No. 0337367 Boring/Well ID JKS-45 Date Drilled 2016-04-04
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 62.00' Boring Diam. 8.25"
 N. Coord. 13667132.78' E. Coord. 2186615.40' Surface Elevation 528.31' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 40.00' Sump Length 0'
 Top of Casing Elevation 531.46' Stickup 3.15'
 Depth to Water: 1. Ft. btoc 47.19 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP

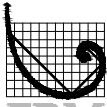


NOTES

Coordinates in Texas South Central State Plane 4204.
 Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
528.31	0			0		0-5	NO RECOVERY: Previously excavated by hydrovac truck.
525	5			100		5-7	SILTY CLAY: Brown; dry to damp; medium stiff; medium plasticity; some white calcareous concretions present. At 5.5' bgs: Slight orange mottling.
520	10			50		7-10	CLAY: Grey; dry to damp; stiff; medium to high plasticity; minor silt content at depth; white calcareous concretions throughout. At 7.5' bgs: Orange mottling. At 9' bgs: Yellowish orange silt lens.
515	15			75		10-12.5	SILT: Alternating light grey and yellowish brown, stratified with orange, yellow, and red; damp; loose.
510	20					12.5-15	NO RECOVERY.
						15-22	SILT: Brownish light grey; damp; loose to medium dense; some yellow stringers. At 16' bgs: Alternating pinkish brown stratifications (2" thick). At 16.5' bgs: Orange band (2" thick). At 17.5' bgs: Orange band (1" thick). At 19' bgs: Light grey and pinkish brown laminations; minor clay content; occasional orange silt stringers.





ERM Environmental Resources Management

JKS-45 DRILLING LOG

Proj. No. 0337367 Boring/Well ID JKS-45 Date Drilled 2016-04-04
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 62.00' Boring Diam. 8.25"
 N. Coord. 13667132.78' E. Coord. 2186615.40' Surface Elevation 528.31' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 40.00' Sump Length 0'
 Top of Casing Elevation 531.46' Stickup 3.15'
 Depth to Water: 1. Ft. btoc 47.19 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

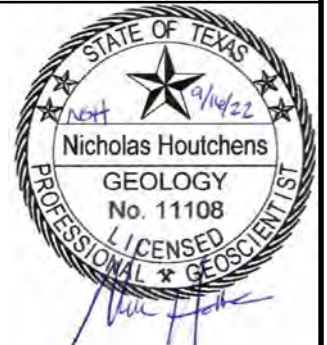
SKETCH MAP

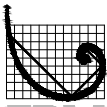


NOTES

Coordinates in Texas South Central State Plane 4204. Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
505	20			75		22-25	CLAYEY SILT: Pinkish brown laminated with light grey; dry to damp; medium dense to dense; slight plasticity; trace yellow and orange silt stringers.
500	25			100	JKS-45 28-30 USCS: Fat Clay (CH) AL: 61 / 22 / 39 -200 Sieve: 91.6	25-34.5	SILTY CLAY: Dark reddish brown; dry to damp; medium stiff; high plasticity; fractures along planar surfaces. At 25.5' bgs: Light grey silt lens (2" thick). At 28' bgs: Light grey silt stringers; yellow silt stringers and minor gypsum crystals from 28' to 30' bgs. Non-cohesive grab sample collected from 28'-30' bgs. At 31.5' bgs: Dry; yellow silt stringers; abundant yellowish orange silt stringers to 32' bgs. At 33.5' bgs: Trace gypsum crystals.
495	30			100		34.5-35	SILT: Dark pinkish brown laminated with greyish brown; dry; dense; some clay content.
490	35			100	JKS-45 36-38 USCS: Fat Clay (CH) AL: 67 / 24 / 43 -200 Sieve: 90.5	35-36	SILTY CLAY: Very dark reddish brown; damp to moist; medium stiff; high plasticity; trace yellow silt; minor gypsum crystals; brownish black band (2" thick) at 35' bgs.
490	36			100		36-38	CLAY: Pinkish grey; dry; very stiff to hard; very high plasticity (fat). Non-cohesive grab sample collected from 36'-38' bgs.
490	37			100		38-43	At 36.5' bgs: Yellow and orange silt stringers to 37.5' bgs. SILT: Orangish brown; dry to damp; medium dense to dense; slight plasticity; slight clay content.
490	40			100			





ERM Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-45 Date Drilled 2016-04-04
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 62.00' Boring Diam. 8.25"
 N. Coord. 13667132.78' E. Coord. 2186615.40' Surface Elevation 528.31' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 40.00' Sump Length 0'
 Top of Casing Elevation 531.46' Stickup 3.15'
 Depth to Water: 1. Ft. btoc 47.19 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-45 DRILLING LOG

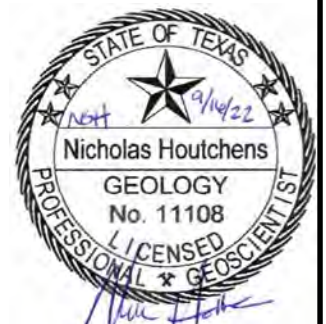
SKETCH MAP

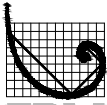


NOTES

Coordinates in Texas South Central State Plane 4204.
 Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
485	40			80		43-45	At 38.75' bgs: Brownish black band (1.5" thick). At 39.25' bgs: Yellow silt stringers. At 39.5' bgs: Color change to brownish grey; very dense; increased clay content. At 40' bgs: Yellow and orange silt stringers to 43' bgs; some compacted silt pieces to 43' bgs. CLAYEY SILT: Dark reddish brown; damp; medium dense; slight plasticity; orange silt stringers throughout.
480	45			50		45-55	At 44.5' bgs: Trace fine-grained sand content. SAND: Light grey to grey stratified with yellow, orange and red; wet to saturated; fine-grained to medium grained with depth; sub-rounded; well sorted; loose; minor clay lenses (1/16" to 1/8" thick).
475	50			50	JKS-45 50-52 USCS: Silty Sand (SM) AL: Non-plastic -200 Sieve: 12.6		At 48' bgs: Color change to orangish brown with orange laminations; no clay content. At 49.5' bgs: Intermixed red color to 50' bgs. At 50' bgs: Color change to pinkish brown. Non-cohesive grab sample collected from 50'-52' bgs.
470	55			100	JKS-45 55-57 USCS: Fat Clay (CH) AL: 75 / 28 / 47 -200 Sieve: 97	55-62	At 54.5' bgs: Brownish orange band (2" thick). CLAY: Dark grey; damp; stiff to very stiff; very high plasticity (fat); occasional light grey silt stringers; fractures along silt stringers. Non-cohesive sample collected from 55'-57' bgs.
60							





ERM Environmental Resources Management

JKS-45 DRILLING LOG

Proj. No. 0337367 Boring/Well ID JKS-45 Date Drilled 2016-04-04
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 62.00' Boring Diam. 8.25"
 N. Coord. 13667132.78' E. Coord. 2186615.40' Surface Elevation 528.31' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 40.00' Sump Length 0'
 Top of Casing Elevation 531.46' Stickup 3.15'
 Depth to Water: 1. Ft. btoc 47.19 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

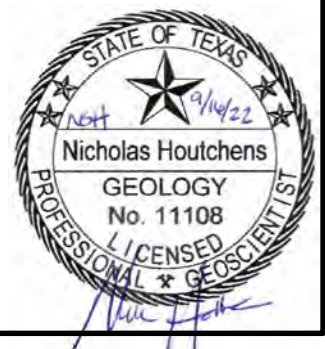
SKETCH MAP



NOTES

Coordinates in Texas South Central State Plane 4204.
 Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
465	60			100	JKS-45_60-62 USCS: Fat Clay (CH) AL: 75 / 26 / 49 -200 Sieve: 86.4 k: 1.82x10 ⁻⁸		Cohesive sample (Shelby tube) collected from 60'-62' bgs. Boring terminated at 62' bgs.
460	65						
455	70						
450	75						
80							



STATE OF TEXAS WELL REPORT for Tracking #424209

Owner: CPS Energy	Owner Well #: JKS-45
Address: PO Box 2906 San Antonio, TX 78299	Grid #: 68-46-5
Well Location: Calaveras Power Station San Antonio, TX	Latitude: 29° 19' 01" N
Well County: Bexar	Longitude: 098° 18' 08" W
	Elevation: 528 ft. above sea level

Type of Work: New Well	Proposed Use: Monitor
-------------------------------	------------------------------

Drilling Start Date: **4/4/2016** Drilling End Date: **4/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	62

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	38	56	Sand	20/40

Annular Seal Data: **No Data**

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	Bentonite	52	62

Water Quality: *Strata Depth (ft.)* *Water Type*
 No Data **No Data**

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
 contained injurious constituents?: **No**

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**
 112 S. Norwood Drive
 Hurst, TX 76053

Driller Name: **Joseph Ray** License Number: **58794**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

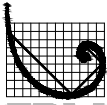
<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>	<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
0	5	Ash						
5	8	Lt brn sandy clay	2	Riser	New Plastic (PVC)	40	0	40
8	14	Lt gry sandy clay	2	Screen	New Plastic (PVC)	40 10	40	55
14	20	Lt gray sand						
20	40	Brn silty clay						
40	45	Lt gray sand						
45	55	yellow/org silty sand						
55	62	Green/gray clay						

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880**



ERM Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-46 Date Drilled 2016-04-05
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 30.00' Boring Diam. 8.25"
 N. Coord. 13667810.11' E. Coord. 2187972.31' Surface Elevation 495.75' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Sump Length 0'
 Top of Casing Elevation 499.08' Stickup 3.33'
 Depth to Water: 1. Ft. btoc 19.38 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-46 DRILLING LOG

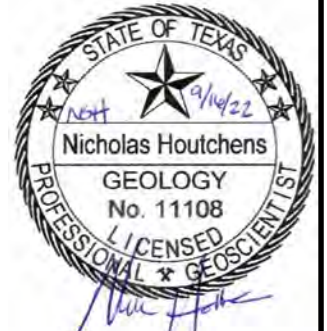
SKETCH MAP

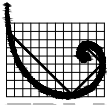


NOTES

Coordinates in Texas South
 Central State Plane 4204.
 Elevations in NAVD88
 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
495.75	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
495				0			
	5					5-8	CLAYEY SAND: Reddish orange; damp to moist; fine-grained; sub-round; well-sorted; medium dense; slight to low plasticity; some silt content.
490				100		8-10	At 7.5' bgs: Dense grey clay lenses (1/2" thick). SANDY CLAY: Reddish orange; medium stiff; slight to low plasticity; minor silt content; dense grey clay lenses (1/2" thick); yellow and yellowish orange silt stringers.
	10					10-11	At 9.5' bgs: Increased silt content. CLAY: Grey; dry; stiff; medium plasticity; minor silt content; fractures along tan silt to fine-grained sand stringers.
485				75		11-15	SAND: Tan; damp; fine-grained; sub-round, well sorted; loose.
							At 13' bgs: Striated with pink and orange.
	15					15-19.5	At 14' bgs: Color change to reddish orange; some silt content; occasional clay lenses. At 14.75' bgs: Orange silt lens. SILT: Red with orange; damp to dry; loose; slight plasticity. At 15.5' bgs: Color change to grey. At 15.75' bgs: Color change to red. At 16' bgs: Color change to tan with yellow; fractures along planar surfaces. At 17' bgs: Moist.
480				85			At 18.75' bgs: Color change to red and orange.
	20					19.5-25	SAND: Tan; moist; fine-grained, coarsens with depth; sub-round; well sorted; loose; minor silt and trace clay; orange and yellow silt stringers.





ERM Environmental Resources Management

JKS-46 DRILLING LOG

Proj. No. 0337367 Boring/Well ID JKS-46 Date Drilled 2016-04-05
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 30.00' Boring Diam. 8.25"
 N. Coord. 13667810.11' E. Coord. 2187972.31' Surface Elevation 495.75' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Sump Length 0'
 Top of Casing Elevation 499.08' Stickup 3.33'
 Depth to Water: 1. Ft. btoc 19.38 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP



NOTES

Coordinates in Texas South Central State Plane 4204.
 Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
475	20			75	No Samples Collected	25-30	At 20' bgs: Color change to brownish tan with orange band (2" thick) at 20.25' bgs. At 21.5' bgs: Color change to tannish grey with yellowish orange band (2" thick). At 22.5' bgs: Color change to tan stratified with pinkish orange and orange. CLAY: Dark greyish brown; damp to dry; very stiff; high to very high plasticity (fat); fractures along planar surfaces; Light grey and yellowish orange silt lenses throughout. At 29.75' bgs: Dark grey silt lenses; some very small gypsum crystals. Boring terminated at 30' bgs.
470	25			100			
465	30						
460	35						
40							



STATE OF TEXAS WELL REPORT for Tracking #424210

Owner:	CPS ENERGY	Owner Well #:	JKS-46
Address:	PO BOX 2906 SAN ANTONIO, TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station SAN ANTONIO, TX	Latitude:	29° 19' 01" N
		Longitude:	098° 18' 08" W
Well County:	Bexar	Elevation:	496 ft. above sea level
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **4/4/2016** Drilling End Date: **4/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	30

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	13	25	Sand	20/40

Annular Seal Data: **No Data**

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed**

Surface Completion by Driller

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	Bentonite	26	30

Water Quality: Strata Depth (ft.) No Data Water Type No Data

Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: Strata Core Services, LLC
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: Joseph Ray License Number: 58794

Comments: No Data

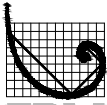
Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)	
0	5	ASH							
5	8	LT BRN SANDY CLAY	2	Riser	New Plastic (PVC)	40	0	15	
8	14	LT GRY CLAY	2	Screen	New Plastic (PVC)	40 10	15	25	
14	28	LT GRY SAND							
28	30	BRN CLAY							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



ERM Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-47 Date Drilled 2016-04-05
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 48.00' Boring Diam. 8.25"
 N. Coord. 13665709.79' E. Coord. 2186503.87' Surface Elevation 510.28' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 25.00' Sump Length 0'
 Top of Casing Elevation 513.63' Stickup 3.35'
 Depth to Water: 1. Ft. btoc 31.37 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-47 DRILLING LOG

SKETCH MAP

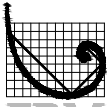


NOTES

Coordinates in Texas South Central State Plane 4204.
 Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
510.28 510	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
	5			0		5-9.5	CLAYEY SILT: Pinkish brown with grey; damp to moist; loose; slight to low plasticity; occasional yellow and orange silt lenses. At 5.5' bgs: Clay lens (2" thick).
	10			50		9.5-20	At 9.25' bgs: Clay lens (2" thick). SILT: Light grey; damp; medium dense; slight plasticity; minor clay content, decreases with depth; abundant yellow and orange silt stringers; fractures along planar surfaces. At 10' bgs: Striated with pinkish brown to 12' bgs.
	15			90			At 12.5' bgs: No clay content. At 13' bgs: Color change to tan; dry; yellow and orange silt stringers.
495	20			50			





ERM Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-47 Date Drilled 2016-04-05
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 48.00' Boring Diam. 8.25"
 N. Coord. 13665709.79' E. Coord. 2186503.87' Surface Elevation 510.28' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 25.00' Sump Length 0'
 Top of Casing Elevation 513.63' Stickup 3.35'
 Depth to Water: 1. Ft. btoc 31.37 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-47 DRILLING LOG

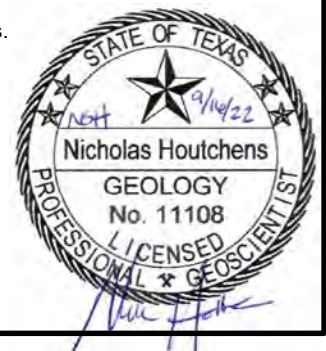
SKETCH MAP

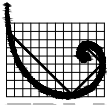


NOTES

Coordinates in Texas South Central State Plane 4204.
 Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
490	20			75	No Samples Collected	20-23	At 20' bgs: Whitish tan striated with yellow; minor fine-grained sand content. SANDY SILT: Whitish tan; dry; loose; occasional yellow and orange silt stringers, occurrence increases with depth.
485	25			50		23-48	SAND: Whitish tan; dry to moist with depth; fine-grained; sub-round; well sorted; minor yellow and orange silt stringers; thin clay pinkish brown to brown clay laminations to 23.25' bgs. At 25' bgs: Color change to tannish brown; very moist.
480	30			100			At 30' bgs: Saturated; Orange band (1" thick) at 30.25' bgs.
475	35			50			At 34' bgs: Orange striations to 35' bgs. At 35' bgs: Trace orange silt stringers.
470	40						





ERM Environmental Resources Management

JKS-47 DRILLING LOG

Proj. No. 0337367 Boring/Well ID JKS-47 Date Drilled 2016-04-05
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 48.00' Boring Diam. 8.25"
 N. Coord. 13665709.79' E. Coord. 2186503.87' Surface Elevation 510.28' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 25.00' Sump Length 0'
 Top of Casing Elevation 513.63' Stickup 3.35'
 Depth to Water: 1. Ft. btoc 31.37 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP



NOTES

Coordinates in Texas South Central State Plane 4204.
 Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	40				No Samples Collected		At 40' bgs: Clayey sand lens (2" thick). At 40.5' bgs: Occasional pinkish brown silt stringers to 41' bgs. At 14.5' bgs: Abundant yellowish orange silt stringers to 42.5' bgs.
				75			At 41.5' bgs: Orange and brown laminated silt stringers to 43' bgs. At 44' bgs: Medium-grained; no silt content.
465	45						At 46' bgs: Orangish brown silt layer (1/2" thick). At 46.5' bgs: Color change to greyish tan; fine to medium-grained with decreasing grain size with depth.
				100			Boring terminated at 48' bgs.
460	50						
455	55						
60							



STATE OF TEXAS WELL REPORT for Tracking #424211

Owner:	CPS ENERGY	Owner Well #:	JKS-47
Address:	PO BOX 2906 SAN ANTONIO, TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station SAN ANTONIO, TX	Latitude:	29° 18' 01" N
		Longitude:	098° 18' 08" W
Well County:	Bexar	Elevation:	510 ft. above sea level

Type of Work:	New Well	Proposed Use:	Monitor
---------------	-----------------	---------------	----------------

Drilling Start Date: **4/4/2016** Drilling End Date: **4/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	48

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	23	41	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	2	23	Bentonite 15 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **No Data**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	Bentonite	41	48

Water Quality: Strata Depth (ft.) No Data Water Type No Data
Chemical Analysis Made: No
Did the driller knowingly penetrate any strata which contained injurious constituents?: No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: Strata Core Services, LLC
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: Joseph Ray License Number: 58794

Comments: No Data

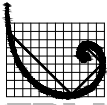
Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)	
0	5	ASH							
5	8	LT BRN SANDY CLAY	2	Riser	New Plastic (PVC)	40	0	25	
8	14	LT GRAY SANDY CLAY	2	Screen	New Plastic (PVC)	40 10	25	40	
14	20	LT GRAY SAND							
20	40	BRN SILTY CLAY							
40	48	LT GRAY SAND							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



ERM Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-48 Date Drilled 2016-04-06
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 30.00' Boring Diam. 8.25"
 N. Coord. 13659658.78' E. Coord. 2186490.78' Surface Elevation 493.71' Ft MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 18.50' Sump Length 0'
 Top of Casing Elevation 497.19' Stickup 3.48'
 Depth to Water: 1. Ft. btoc 11.28 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-48 DRILLING LOG

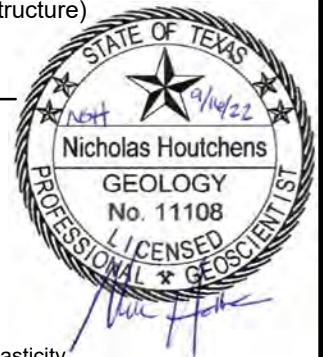
SKETCH MAP

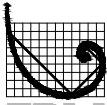


NOTES

Coordinates in Texas South Central State Plane 4204. Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
493.71	0			0		0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490	5			100		5-6	CLAYEY SILT: Orangish brown; damp; medium dense to dense; slight to low plasticity. At 5.5' bgs: Brown band (2" thick). At 5.75' bgs: Color change to brown; damp to dry; minor clay content; fractures along planar surfaces.
485	10			75	JKS-48_10-12.5 USCS: Clayey Sand (SC) AL: 35 / 16 / 19 -200 Sieve: 44.6	6-6.5 6.5-7 7-7.5 7.5-12.5	SILTY CLAY: Orangish brown heavily mottled with grey and orange; damp; stiff; medium plasticity; occasional grey and orange silt stringers. SILT: Brownish tan with grey and orange; damp; medium dense; slight plasticity; trace clay. SILTY CLAY: Orangish brown heavily mottled with grey and orange; damp; stiff; medium plasticity; occasional grey and orange silt stringers. CLAYEY SILT: Brown; damp to moist; medium dense; low plasticity; light grey and orange silt stringers. At 9' bgs: Dense silty clay layer (2" thick). At 9.25' bgs: Dense silty clay layer (2" thick). Non-cohesive grab sample collected from 10'-12.5' bgs. At 10.5' bgs: Dense silty clay layer (2" thick).
480	15			80	JKS-48_15-16.5 USCS: Sandy Lean Clay (CL) AL: 48 / 19 / 29 -200 Sieve: 58.9	12.5-15 15-16.5 16.5-19	SAND: Brownish grey; damp to moist; fine-grained; sub-angular; moderately sorted; loose; minor silt content. At 13.5' bgs: Dense clay lens (1" thick). At 14.5' bgs: Color change to dark brown. CLAY: Brownish orange heavily mottled with dark brown, orange, and orangish red; moist; stiff; high plasticity; trace silt content, increases with depth; orange silt stringers. Non-cohesive grab sample collected from 15'-16.5' bgs. CLAYEY SILTY SAND: Brownish tan; very moist; loose to medium dense; slight plasticity; decreasing clay content with depth; occasional orange silt stringers. At 16.5' bgs: Wet.
475	20				JKS-48_19-20 USCS: Clayey Sand (SC) AL: 26 / 16 / 10 -200 Sieve: 48.7	19-20	SAND: Orangish brown; very moist to wet; fine-grained; sub-angular; moderately sorted; loose; minor silt content, decreases with depth; laminated with light grey clay to 19.25' bgs. Non-cohesive grab sample collected from 19'-20' bgs.





ERM Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-48 Date Drilled 2016-04-06
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 30.00' Boring Diam. 8.25"
 N. Coord. 13659658.78' E. Coord. 2186490.78' Surface Elevation 493.71' Ft MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 18.50' Sump Length 0'
 Top of Casing Elevation 497.19' Stickup 3.48'
 Depth to Water: 1. Ft. btoc 11.28 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-48 DRILLING LOG

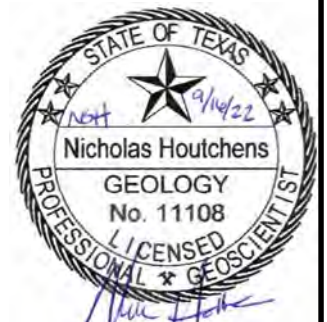
SKETCH MAP



NOTES

Coordinates in Texas South Central State Plane 4204.
 Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			50		20-22.5	SILTY SAND: Orangish brown; saturated; fine to very-fine grained; sub-angular, poorly sorted; loose; minor clay content. At 20.25' bgs: Thin grey clay laminations.
						22.5-25	SAND: Tannish brown with grey; saturated; fine-grained; sub-angular; moderately sorted; loose; some silt content; orange silt stringers.
	25			50		25-27.5	At 24.5' bgs: Orange silt lens to 24.75' bgs. INTERBEDDED SILTY SAND AND CLAY: Tannish grey; saturated; medium dense; laminated silty fine-grained sand with pinkish brown clay; clay laminations fracture along planar surfaces; yellow and orange silt stringers throughout.
465						27.5-30	CLAYEY SILTY SAND: Tannish grey; saturated; loose; slight plasticity; orange 1/16" thick silt laminations throughout.
	30						At 29.5' bgs: Pinkish brown (1/16" thick) clay laminations to 30' bgs. Refusal (bedrock) encountered at 30' bgs.
460	35						
455							
40							



STATE OF TEXAS WELL REPORT for Tracking #424212

Owner:	CPS ENERGY	Owner Well #:	JKS-48
Address:	PO BOX 2906 SAN ANTONIO, TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station SAN ANTONIO, TX	Latitude:	29° 19' 01" N
		Longitude:	098° 18' 08" W
Well County:	Bexar	Elevation:	494 ft. above sea level

Type of Work:	New Well	Proposed Use:	Monitor
---------------	-----------------	---------------	----------------

Drilling Start Date: **4/4/2016** Drilling End Date: **4/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	30

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	16.5	20.5	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	2	16.5	Bentonite 15 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion:	Surface Slab Installed	Surface Completion by Driller
---------------------	-------------------------------	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

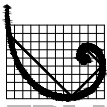
	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	Bentonite	29.5	30

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Comments: No Data

Lithology:			Casing:					
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA					
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
0	5	ASH	2	Riser	New Plastic (PVC)	40	0	18.5
5	8	LT BRN CLAY		2	Screen	New Plastic (PVC)	40 10	18.5
8	14	LT GRAY CLAY						
14	20	LT GRAY SAND						
20	30	BRN SILTY CLAY						

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-49 Date Drilled 2016-04-06
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 19.00' Boring Diam. 8.25"
 N. Coord. 13660519.40' E. Coord. 2186229.15' Surface Elevation 495.17' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 7.00' Sump Length 0'
 Top of Casing Elevation 498.63' Stickup 3.46'
 Depth to Water: 1. Ft. btoc 9.32 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-49 DRILLING LOG

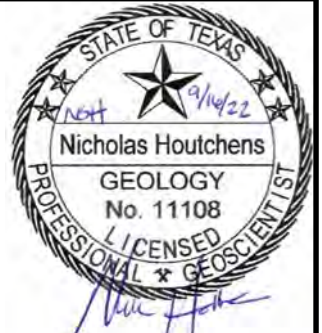
SKETCH MAP



NOTES

Coordinates in Texas South Central State Plane 4204. Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
495.17 495	0			0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490	5			50		5-6	SAND: Greyish tan; very moist; fine-grained; sub-angular; moderately sorted; loose; orange silt stringers.
						6-10	SILT: Greyish tan; very moist; loose; minor fine-grained sand; occasional yellow silt stringers.
485	10			100		10-15	At 9.5' bgs: Color change to light brown; wet; orange silt stringers. SAND: Light brown; wet; fine-grained; sub-angular; moderately sorted; loose to medium dense; minor silt content; abundant orange silt stringers. At 11.75' bgs: Orange silt lens (2" thick); trace silt stringers. At 12' bgs: Decreasing silt content.
480	15			100		15-16.5	At 14' bgs: Color change to greyish tan. SANDY SILT: Light brown; wet to saturated; loose; occasional orange silt stringers.
						16.5-19	At 16.5' bgs: Pinkish brown clay lens (3/16" thick). SILT: Brownish orange; wet to saturated; loose; non-plastic; minor fine-grained sand content. At 17.5' bgs: Color change to light brown. At 18.25' bgs: Color change to orange; pinkish brown clay lens (1/16" thick). At 18.5' bgs: Minor orange and red sandstone pieces, occurrence increases at depth. Refusal (bedrock) encountered at 19' bgs.
475	20						



STATE OF TEXAS WELL REPORT for Tracking #424213

Owner:	CPS ENERGY	Owner Well #:	JKS-49
Address:	PO BOX 2906 SAN ANTONIO, TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station SAN ANTONIO, TX	Latitude:	29° 19' 01" N
		Longitude:	098° 18' 08" W
Well County:	Bexar	Elevation:	495 ft. above sea level

Type of Work:	New Well	Proposed Use:	Monitor
---------------	-----------------	---------------	----------------

Drilling Start Date: **4/4/2016** Drilling End Date: **4/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	19

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	7	17	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	2	7	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion:	Surface Slab Installed	Surface Completion by Driller
---------------------	-------------------------------	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

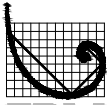
	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	Bentonite	18	19

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Comments: No Data

Lithology: DESCRIPTION & COLOR OF FORMATION MATERIAL			Casing: BLANK PIPE & WELL SCREEN DATA					
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
0	5	ASH	2	Riser	New Plastic (PVC)	40	0	7
5	8	LT BRN CLAY		2	Screen	New Plastic (PVC)	40 10	7
8	14	LT GRAY CLAY						
14	19	LT GRAY SAND						

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



ERM Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-50 Date Drilled 2016-04-06
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 14.00' Boring Diam. 8.25"
 N. Coord. 13660122.87' E. Coord. 2186836.72' Surface Elevation 494.87' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 7.50' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 2.50' Sump Length 0'
 Top of Casing Elevation 498.20' Stickup 3.33'
 Depth to Water: 1. Ft. btoc 11.76 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-50 DRILLING LOG

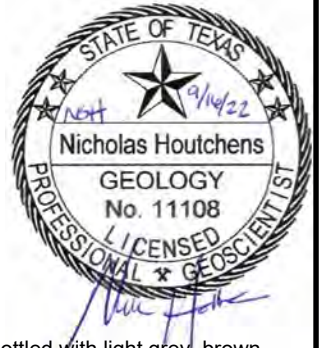
SKETCH MAP



NOTES

Coordinates in Texas South Central State Plane 4204.
Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
494.87	0			0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490	5			80		5-7.75	SILTY CLAY: Orangish brown heavily mottled with light grey, brown, and tan; damp; stiff; medium to high plasticity; increasing silt content with depth; orange silt stringers. At 6' bgs: Tan silt lens (2" thick).
						7.75-8.25	At 7.5' bgs: Color change to brownish orange; minor fine-grained sand content.
						8.25-9.25	SAND: Tan; damp; fine-grained, sub-angular; moderately sorted; dense; minor silt content; occasional orange silt stringers.
485	10			25		9.25-10	SILTY CLAY: Orangish brown mottled with grey, brown, red and occasional yellow; damp; stiff; medium plasticity; orange silt stringers throughout.
						10-13	SILT: Tan; moist; loose; trace orange silt stringers. At 9.75' bgs: Soft clay lens (3/16" thick). NO RECOVERY.
						13-13.75	SILTY CLAY: Brown; saturated; loose; low plasticity; orange silt stringers; sandstone pieces (3/8" thick) near 13.75' bgs.
480	15					13.75-14	SANDSTONE: Brownish orange laminated with orange, tan, and dark brown. Refusal (bedrock) encountered at 14' bgs.
475	20						



STATE OF TEXAS WELL REPORT for Tracking #424216

Owner:	CPS ENERGY	Owner Well #:	JKS-50
Address:	PO BOX 2906 SAN ANTONIO, TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station SAN ANTONIO, TX	Latitude:	29° 19' 01" N
		Longitude:	098° 18' 08" W
Well County:	Bexar	Elevation:	489 ft. above sea level
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **4/4/2016** Drilling End Date: **4/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	14

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	1.5	10	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0.5	1.5	Bentonite 1 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	Bentonite	10	14

Water Quality: Strata Depth (ft.) No Data Water Type No Data

Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: **Joseph Ray** License Number: **58794**

Comments: **No Data**

Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)	
0	5	ASH	2	Riser	New Plastic (PVC)	40	0	2.5	
5	8	LT BRN CLAY	2	Screen	New Plastic (PVC)	40 10	2.5	10	
8	14	LT GRAY CLAY							
14	15	LT GRAY SAND							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



Environmental Resources Management

JKS-50R DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-50R Date Drilled 2016-10-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 22.50' Boring Diam. 8.25"
 N. Coord. 13660149.90' E. Coord. 2186841.92' Surface Elevation 494.96' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 9.50' Sump Length 0'
 Top of Casing Elevation 498.48' Stickup 3.52'
 Depth to Water: 1. Ft. btoc 12.67 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

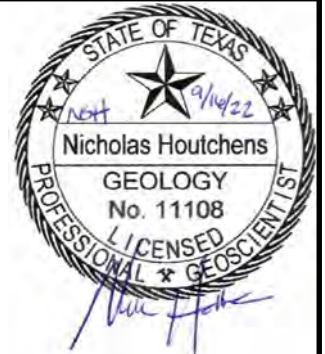
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft. MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
494.96	0			0	No Samples Collected	0-15	See boring log JKS-50 from 4/6/16.
490	5			0			
485	10			0			
480	15			50		15-17.5	CLAYEY SAND: Light brown; wet; loose; trace dark gray sandy clay content; very coarse gravel (2" diam.) present.
475	20					17.5-22.0	CLAYEY SILTY SAND: Light brown; saturated; loose; light gray pieces of clay; few large (2" diam.) very coarse (2" diam.) angular rocks present.





Environmental Resources Management

JKS-50R DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-50R Date Drilled 2016-10-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 22.50' Boring Diam. 8.25"
 N. Coord. 13660149.90' E. Coord. 2186841.92' Surface Elevation 494.96' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 9.50' Sump Length 0'
 Top of Casing Elevation 498.48' Stickup 3.52'
 Depth to Water: 1. Ft. btoc 12.67 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			50		22-22.5	CLAYEY SAND: Brownish gray; dry to damp; loose. Boring terminated at 22.5' bgs.
465	25						
460	30						
455	35						
450	40						



STATE OF TEXAS WELL REPORT for Tracking #443567

Owner:	Calaveras Power Station	Owner Well #:	JKS-50R
Address:	12940 US 181 San Antonio, TX 78223	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78223	Latitude:	29° 18' 28.4" N
		Longitude:	098° 19' 01.91" W
Well County:	Bexar	Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **10/7/2016** Drilling End Date: **10/7/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	19.5

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	7.5	19.5	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	7.5	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Slab Installed** **Surface Completion by Driller**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
Water Quality:	No Data	No Data
		Chemical Analysis Made: No
	Did the driller knowingly penetrate any strata which contained injurious constituents?: No	

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: **William Fields** License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

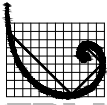
Lithology:			Casing:					
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA					
<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>	<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
0	17.5	Clayey sand -light brown	2	Riser	New Plastic (PVC)	40	0	9.5
17.5	19.5	Clayey silty sand - light brown	2	Screen	New Plastic (PVC)	40 10	9.5	19.5

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



ERM Environmental Resources Management

JKS-51 DRILLING LOG

Proj. No. 0337367 Boring/Well ID JKS-51 Date Drilled 2016-04-07
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 29.50' Boring Diam. 8.25"
 N. Coord. 13660243.53' E. Coord. 2185630.39' Surface Elevation 494.04' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 7.00' Sump Length 0'
 Top of Casing Elevation 496.92' Stickup 2.88'
 Depth to Water: 1. Ft. btoc 10.56 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

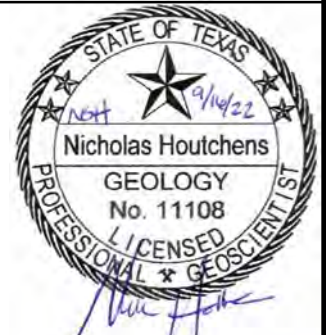
SKETCH MAP



NOTES

Coordinates in Texas South Central State Plane 4204. Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
494.04	0			0	No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490	5			60		5-6.5	SILTY CLAY: Light brown with occasional orange mottling; wet; soft; low plasticity; occasional gravel (1/16" thick).
						6.5-10	SAND: Light brown; very moist; fine-grained; sub-angular; moderately sorted; medium dense; slight plasticity; minor silt and clay content. At 7.5' bgs: Clay lenses (up to 3/4" thick) to 8.5' bgs. At 8.5' bgs: Occasional orange silt stringers to 9.5' bgs. At 9' bgs: Clay lamina (1/16" thick) to 10' bgs. At 9.5' bgs: Wet.
485	10			100		10-15	SILT: Light brown; wet; medium dense; low plasticity; laminated with grey clay (1/16" to 3/16" thick) throughout; minor fine-grained sand; orange silt stringers throughout. At 12.5' bgs: Sand lens (2" thick). At 13.5' bgs: Sand lens (2" thick); fractures in planar surfaces to 14.5' bgs. At 14' bgs: Occasional thin clay lamina to 15' bgs. At 14.5' bgs: Color change to light grey.
480	15			100		15-17.75	CLAY: Pinkish grey; moist; medium stiff; low to medium plasticity; laminated with orange and grey silt (up to 3/4" thick) throughout. CLAY: Grey; moist; medium stiff; low plasticity; trace silt content; abundant orange silt stringers.
						17.75-18.25	SILTY SAND: Light brown; wet to saturated; very fine to fine-grained; sub-angular; poorly sorted; loose.
475						18.25-19.75	At 19.25' bgs: Pinkish grey clay lens (2" thick); thin red silt lens below clay; occasional orange silt stringers.
	20					19.75-26.5	SAND: Light grey; wet; fine-grained; sub-angular; moderately sorted; loose; occasional orange silt stringers.





ERM Environmental Resources Management

Proj. No. 0337367 Boring/Well ID JKS-51 Date Drilled 2016-04-07
 Project Groundwater Investigation Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 29.50' Boring Diam. 8.25"
 N. Coord. 13660243.53' E. Coord. 2185630.39' Surface Elevation 494.04' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 7.00' Sump Length 0'
 Top of Casing Elevation 496.92' Stickup 2.88'
 Depth to Water: 1. Ft. btoc 10.56 (2016-05-31) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Joseph Ray
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

JKS-51 DRILLING LOG

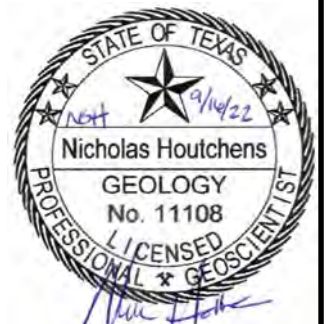
SKETCH MAP



NOTES

Coordinates in Texas South Central State Plane 4204. Elevations in NAVD88 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			100	No Samples Collected		At 21.25' bgs: Red silt lens (1/16" thick); abundant orange silt stringers.
	25			100		26.5-27.75	At 24' bgs: Minor silt and trace clay content.
465	30					27.75-28	At 26.25' bgs: Reddish orange silt lens (1/16" thick). SANDY SILT: Tannish light grey; wet; loose; slight plasticity; occasional yellow and orange silt stringers.
460	35					28-29.5	At 27.5' bgs: Trace clay content. CLAY: Dark brown mottled with tannish brown; moist; stiff; very high plasticity (fat); brown silt stringers throughout. SAND: Tannish light grey; wet; fine-grained; sub-angular; moderately sorted; loose; trace silt, occurrence decreases with depth; abundant orange silt stringers.
455							At 29.25' bgs: Color change to light brown; occasional orange silt stringers. Refusal (bedrock) encountered at 29.5' bgs.
450							
445							
440							
435							
430							
425							
420							
415							
410							
405							
400							



STATE OF TEXAS WELL REPORT for Tracking #424218

Owner:	CPS ENERGY	Owner Well #:	JKS-51
Address:	PO BOX 2906 SAN ANTONIO, TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station SAN ANTONIO, TX	Latitude:	29° 19' 01" N
		Longitude:	098° 18' 08" W
Well County:	Bexar	Elevation:	491 ft. above sea level

Type of Work:	New Well	Proposed Use:	Monitor
---------------	-----------------	---------------	----------------

Drilling Start Date: **4/4/2016** Drilling End Date: **4/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	29.5

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	5	23	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	2	5	Bentonite 3 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion:	Surface Slab Installed	Surface Completion by Driller
---------------------	-------------------------------	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Description (number of sacks & material)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Plug Information:	Bentonite	23	29.5

Water Quality: Strata Depth (ft.) No Data Water Type No Data

Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: **Joseph Ray** License Number: **58794**

Comments: **No Data**

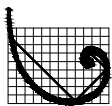
Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)	
0	5	ASH							
5	8	LT BRN CLAY	2	Riser	New Plastic (PVC)	40	0	7	
8	14	LT GRAY CLAY	2	Screen	New Plastic (PVC)	40 10	7	22	
14	20	LT GRAY SAND							
20	24	BRN SITY CLAY							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



JKS-52 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-52 Date Drilled 2016-09-01
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 32.50' Boring Diam. 8.25"
 N. Coord. 13659683.26' E. Coord. 2186139.05' Surface Elevation 493.56' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 19.00' Sump Length 0'
 Top of Casing Elevation 493.15' Stickup -0.41'
 Depth to Water: 1. Ft. btoc 7.30 (2016-05-21) 2. Ft. _____ (_____)
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

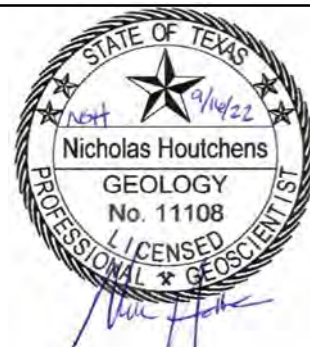
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
493.56	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490	5			0		5-7	CLAYEY SILT: Orangish brown with red and light gray; damp; loose; slight plasticity; red nodules throughout. no odor. At 5' bgs: Red clay lens (1" thick).
				100		7-8	At 5.8' bgs: Light gray clay lens. SILTY CLAY: Tan; damp.
485	10					8-10	CLAYEY SILT: Gray with light gray and tan streaks; damp.
				100		10-12	CLAY: Dark gray to brownish gray, mottled with light gray and bluish gray; damp; medium dense; slight plasticity.
480	15					12-12.5	SILTY CLAY: Dark gray.
				100		12.5-13.5	SAND: Tan with light brownish gray; damp; loose; layered with iron-oxide staining, (1/4" thick).
						13.5-15	CLAYEY SILT: Tan with light brownish gray; damp; medium dense; non-plastic.
				100		15-19	SAND: Tan with gray clay stringers; damp; loose.
475	20					19-20	SAND: Light tan; saturated; loose.





Environmental Resources Management

JKS-52 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-52 Date Drilled 2016-09-01
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 32.50' Boring Diam. 8.25"
 N. Coord. 13659683.26' E. Coord. 2186139.05' Surface Elevation 493.56' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 19.00' Sump Length 0'
 Top of Casing Elevation 493.15' Stickup -0.41'
 Depth to Water: 1. Ft. btoc 7.30 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			100		20-24	SAND: Light orange and tan; damp; medium dense; no odor. At 21' bgs: Color change to tan with gray striations. At 22' bgs: Color change to tan; damp; and loose; At 22.5' bgs: Two gray striations layered within iron-oxide staining.
465	25			100		24-25 25-30	CLAYEY SAND: Tan; saturated; medium dense. INTERBEDDED CLAY AND SAND: Gray and tan; damp; loose. At 27.5' bgs: Intermittent pinkish gray coloration of clay content to 30' bgs.
460	30			100		30-31 31-32.5	SAND: Gray; damp; loose. INTERBEDDED CLAY AND SAND: Orange with pinkish gray; damp; loose; medium plasticity. Boring terminated at 32.5' bgs.
455	35						
450							
445							
440							
435							
430							
425							
420							
415							
410							
405							
400							



STATE OF TEXAS WELL REPORT for Tracking #443571

Owner: Calaveras Power Station	Owner Well #: JKS-52
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
	Longitude: 098° 19' 01.91" W
Well County: Bexar	Elevation: No Data

Type of Work: New Well	Proposed Use: Monitor
-------------------------------	------------------------------

Drilling Start Date: **9/1/2016** Drilling End Date: **9/1/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	29

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	7.5	19.5	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	17	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

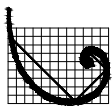
Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**



JKS-53 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-53 Date Drilled 2016-09-02
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 27.00' Boring Diam. 8.25"
 N. Coord. 13659757.34' E. Coord. 2185892.80' Surface Elevation 491.33' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Sump Length 0'
 Top of Casing Elevation 494.74' Stickup 3.41'
 Depth to Water: 1. Ft. btoc 8.50 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

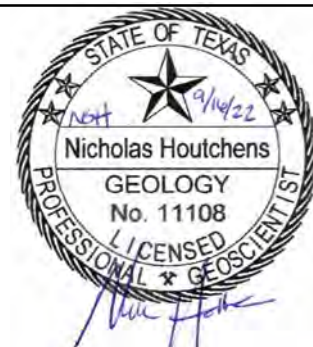
SKETCH MAP

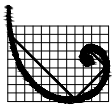


NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
491.33	0					0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490				0			
	5					5-7.5	SANDY SILTY CLAY: Tan to reddish gray; wet; low plasticity; no odor. At 6' bgs: Pockets of orange colored sand.
485				100		7.5-10	SANDY CLAY: Orangish brown and gray; moist; low plasticity. At 9' bgs: Pockets of orange colored sand.
	10				JKS-53_10-12.5 USCS: Clayey Sand (SC) AL: 30 / 14 / 16 - #200: 35.9 k: 5.34x10 ⁻⁶	10-15	NO RECOVERY Cohesive sample (Shelby tube) collected from 10'-12' bgs. Cohesive sample (Shelby tube) collected from 12.5'-15' bgs.
480				0	JKS-53_12.5-15 USCS: Clayey Sand (SC) AL: 29 / 15 / 14 - #200: 48.8 k: 4.13x10 ⁻⁸		
	15					15-16	CLAYEY SAND: Tan; wet; loose; no odor.
475						16-17.5	INTERBEDDED CLAY AND SAND: Orangish light brown sand interbedded with pinkish gray clay.
				100		17.5-19.5	At 16.5 - 17' bgs: Tan sand; damp. CLAYEY SAND: Light brown and tannish gray; saturated; loose; slight plasticity. At 18.5-19' bgs: Tan sand.
	20					19.5-20	INTERBEDDED CLAY AND SAND: Tan sand interbedded with pinkish gray clay; layered with iron-oxide staining; damp; loose.





JKS-53 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-53 Date Drilled 2016-09-02
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 27.00' Boring Diam. 8.25"
 N. Coord. 13659757.34' E. Coord. 2185892.80' Surface Elevation 491.33' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Sump Length 0'
 Top of Casing Elevation 494.74' Stickup 3.41'
 Depth to Water: 1. Ft. btoc 8.50 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			100	JKS-53_20-21 USCS: Clayey Sand (SC) AL: 27 / 14 / 13 - #200: 37.6	20-25	CLAYEY SAND: Gray with tannish orange staining; saturated; loose. Non-cohesive grab sample collected from 20'-21' bgs. At 22-22.5' bgs: Color change to orangish light brown; moist. At 22.5-25' bgs: Saturated.
465	25			100		25-27	SAND: Reddish brown mixed with light gray; damp; medium dense; dry and crumbly with depth. Boring terminated at 27' bgs.
460	30						
455	35						
450	40						



STATE OF TEXAS WELL REPORT for Tracking #443589

Owner:	Calaveras Power Station	Owner Well #:	JKS-53
Address:	12940 US 181 San Antonio, TX 78223	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78223	Latitude:	29° 18' 28.4" N
Well County:	Bexar	Longitude:	098° 19' 01.91" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: 9/2/2016 Drilling End Date: 9/2/2016

	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
Borehole:	8.25	0	25

Drilling Method: Hollow Stem Auger

Borehole Completion: Filter Packed

	Top Depth (ft.)	Bottom Depth (ft.)	Filter Material	Size
Filter Pack Intervals:	17	25	Sand	20/40

	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	17	Bentonite 2 Bags/Sacks

Seal Method: Hand Mixed

Sealed By: Driller

Distance to Property Line (ft.): No Data

Distance to Septic Field or other
concentrated contamination (ft.): No Data

Distance to Septic Tank (ft.): No Data

Method of Verification: No Data

Surface Completion: Surface Slab Installed

Surface Completion by Driller

Water Level: No Data

Packers: No Data

Type of Pump: No Data

Well Tests: No Test Data Specified

	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
Water Quality:	No Data	No Data
		Chemical Analysis Made: No
	Did the driller knowingly penetrate any strata which contained injurious constituents?:	No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**

**112 S. Norwood Drive
Hurst, TX 76053**

Driller Name: **William Fields**

License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

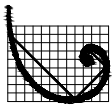
<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>	<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	15
7	15	Clayey silty - gray to brown	2	Screen	New Plastic (PVC)	40 10	15	25
15	19	Sand - tan with gray						
19	23	Sand - light orange and tan						
23	25	Sand - reddish brown						

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880**



JKS-54 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-54 Date Drilled 2016-09-02
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 27.50' Boring Diam. 8.25"
 N. Coord. 13659753.34' E. Coord. 2185641.96' Surface Elevation 492.69' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0'
 Top of Casing Elevation 496.40' Stickup 3.71'
 Depth to Water: 1. Ft. btoc 10.79 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

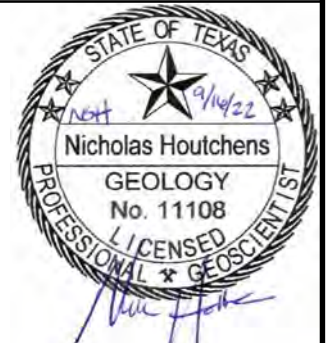
SKETCH MAP

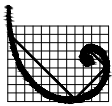


NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
492.69	0					0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490				0			
	5					5-5.8	CLAYEY SILT: Orangish brown with red; damp; loose; non-plastic; no odor.
						5.8-7.2	At 5.8' bgs: White chalky material.
						7.2-8	CLAYEY SAND: Light brown to tan; damp.
485				100		8-11.5	INTERBEDDED CLAY AND SAND: Gray clay laminations (1" thick). CLAYEY SAND: Orangish brown; medium dense.
	10						At 10.8' bgs: Tan; saturated; and loose.
						11.5-12.5	INTERBEDDED CLAY AND SAND: Tan sand interbedded with light pinkish gray clay; damp; clay laminations are 1/4"-1/2" thick.
480				100	JKS-54_13-14 USCS: Silty Clayey Sand (SC-SM) AL: 22 / 15 / 7 - #200: 33.5	12.5-15	CLAYEY SAND: Tan; wet to saturated; loose. Non-cohesive grab sample collected from 13'-14' bgs. At 13.2-14.2' bgs: Saturated.
	15						At 14.9' bgs: Single thin (1" thick) clay layer.
						15-27.5	INTERBEDDED CLAY AND SAND: Tan fine grained sand and light pinkish gray clay; damp.
475				100			
	20						





JKS-54 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-54 Date Drilled 2016-09-02
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 27.50' Boring Diam. 8.25"
 N. Coord. 13659753.34' E. Coord. 2185641.96' Surface Elevation 492.69' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0'
 Top of Casing Elevation 496.40' Stickup 3.71'
 Depth to Water: 1. Ft. btoc 10.79 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

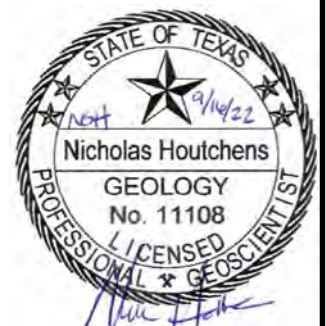
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			100			
	25			100			At 25-28' bgs: Iron-oxide stained layers between sand and clay; clay content has slight to low plasticity; clay layers are 1/2" thick.
465							Refusal encountered at 28' bgs.
	30						
460							
	35						
455							
40							



STATE OF TEXAS WELL REPORT for Tracking #443590

Owner: Calaveras Power Station	Owner Well #: JKS-54
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
Well County: Bexar	Longitude: 098° 19' 01.91" W
	Elevation: No Data
Type of Work: New Well	
Proposed Use: Monitor	

Drilling Start Date: **9/2/2016** Drilling End Date: **9/2/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	22

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	10	22	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	10	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level:	No Data
Packers:	No Data
Type of Pump:	No Data
Well Tests:	No Test Data Specified

	Strata Depth (ft.)	Water Type
Water Quality:	No Data	No Data
		Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: **William Fields** License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

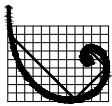
Lithology:			Casing:					
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA					
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	12
7	15	Clayey silty - gray to brown	2	Screen	New Plastic (PVC)	40 10	12	22
15	19	Sand - tan with gray						
19	22	Sand - light orange and tan						

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



JKS-55 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-55 Date Drilled 2016-09-06
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 25.00' Boring Diam. 8.25"
 N. Coord. 13659749.76' E. Coord. 2186840.46' Surface Elevation 490.13' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Sump Length 0'
 Top of Casing Elevation 493.81' Stickup 3.68'
 Depth to Water: 1. Ft. btoc 8.36 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

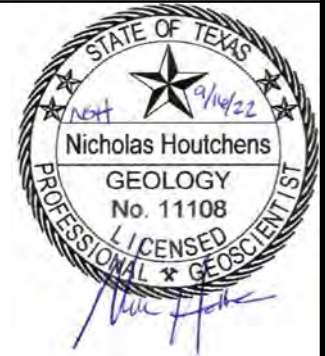
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
490.13	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
485	5			0		5-11.5	NO RECOVERY
480	10			0		11.5-12.5	NO RECOVERY: Cuttings are saturated; clayey silt material.
				0		12.5-13.5	SANDY CLAY: Dark olive gray; damp; soft; non-plastic.
				0		13.5-18.5	CLAYEY SAND: Tannish gray with trace iron-oxide staining; damp; loose. At 15' bgs: White chalky material (1" thick); wet. At 15.5-17.5' bgs: Clayey sand mixed with some gravel. At 16.5' bgs: White chalky layer (1/2" thick). At 17.5' bgs: White chalky layer (1/2" thick). At 17.5-18.5' bgs: Saturated; tan clayey sand with trace gravel.
475	15			100		18.5-19.8	SAND: Gray; wet; fine grained.
	20					19.8-20	SAND: Gray; very dense; moderately to highly cemented.





Environmental Resources Management

JKS-55 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-55 Date Drilled 2016-09-06
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 25.00' Boring Diam. 8.25"
 N. Coord. 13659749.76' E. Coord. 2186840.46' Surface Elevation 490.13' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Sump Length 0'
 Top of Casing Elevation 493.81' Stickup 3.68'
 Depth to Water: 1. Ft. btoc 8.36 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

SKETCH MAP



NOTES

Coordinates in Texas South
 Central State Plane 4204.
 Elevations in NAVD88
 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			100		20-21	SANDY CLAY: Gray; damp; soft; slight plasticity.
						21-22.5	INTERBEDDED CLAY AND SAND: Fine grained tan sand interbedded with pinkish gray clay; damp.
						22.5-23.5	CLAYEY SAND: Tan; trace gravel; one large piece of sandstone (>1" thick).
						23.5-25	SAND: Pinkish gray; fine grained; damp; very thin layers of iron-oxide staining.
465	25						Boring terminated at 25' bgs.
460	30						
455	35						
450	40						



STATE OF TEXAS WELL REPORT for Tracking #443591

Owner: Calaveras Power Station	Owner Well #: JKS-55
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
Well County: Bexar	Longitude: 098° 19' 01.91" W
	Elevation: No Data

Type of Work: New Well	Proposed Use: Monitor
-------------------------------	------------------------------

Drilling Start Date: **9/6/2016** Drilling End Date: **9/6/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	25

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	12	25	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	12	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level:	No Data
Packers:	No Data
Type of Pump:	No Data
Well Tests:	No Test Data Specified

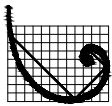
Strata Depth (ft.)	Water Type
No Data	No Data
Chemical Analysis Made: No	
Did the driller knowingly penetrate any strata which contained injurious constituents?: No	
<p>The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.</p>	

Company Information: **Strata Core Services, LLC**
112 S. Norwood Drive
Hurst, TX 76053

Lithology:			Casing:					
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA					
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	15
7	15	Clayey silty - gray to brown		2	Screen	New Plastic (PVC)	40 10	15
15	19	Sand - tan with gray						
19	23	Sand - light orange and tan						
23	25	Sand - reddish brown						

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



JKS-56 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-56 Date Drilled 2016-09-06
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 25.00' Boring Diam. 8.25"
 N. Coord. 13660382.47' E. Coord. 2186847.61' Surface Elevation 493.07' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Sump Length 0'
 Top of Casing Elevation 496.66' Stickup 3.59'
 Depth to Water: 1. Ft. btoc 11.20 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

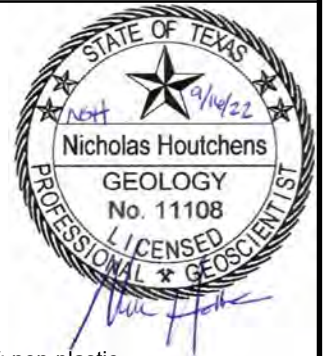
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
493.07	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490	5			0		5-5.5 5.5-7	SANDY CLAY: Reddish gray; damp; stiff; non-plastic. At 5.5' bgs: Gray sandstone piece (>1" thick).
485	10			100		7-7.5 7.5-9.5	SAND: Light orangish brown; fine grained; damp; loose. At 6.25' bgs: Color changes to tannish gray with some orangish brown. SANDY CLAY: Orange; damp; stiff to very stiff; non-plastic. CLAYEY SILT: Orangish tan; saturated; loose; non-plastic; mixed with some gravel and trace pockets of gray, fine grained sand.
480	15			15		9.5-10 10-13	CLAYEY SILTY SAND: Orangish tan; saturated; loose. NO RECOVERY
475	20			50		13-22.5	CLAYEY SAND: Tan; fine grained; saturated; loose. At 15' bgs: Small pocket of gray, fine grained, loose sand (1" thick). At 16' bgs: Coarse, angular gravel layer (~1-2" thick)





Environmental Resources Management

JKS-56 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-56 Date Drilled 2016-09-06
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 25.00' Boring Diam. 8.25"
 N. Coord. 13660382.47' E. Coord. 2186847.61' Surface Elevation 493.07' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Sump Length 0'
 Top of Casing Elevation 496.66' Stickup 3.59'
 Depth to Water: 1. Ft. btoc 11.20 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

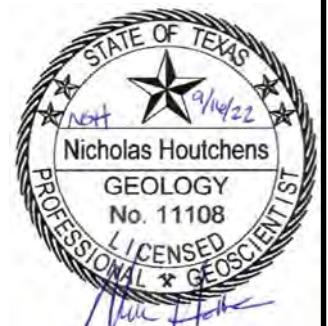
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			50		22.5-24.9	SAND: Brownish gray; fine grained; saturated; trace clay content.
465	25					24.9-25	SANDY CLAY: Reddish brown; saturated; very soft. Boring terminated at 25' bgs.
460	30						
455	35						
450	40						



STATE OF TEXAS WELL REPORT for Tracking #443592

Owner: Calaveras Power Station	Owner Well #: JKS-56
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
Well County: Bexar	Longitude: 098° 19' 01.91" W
	Elevation: No Data
Type of Work: New Well	Proposed Use: Monitor

Drilling Start Date: **9/6/2016** Drilling End Date: **9/6/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	25

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	8	25	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	8	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
Water Quality:	No Data	No Data
		Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**

**112 S. Norwood Drive
Hurst, TX 76053**

Driller Name: **William Fields**

License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

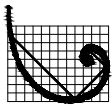
Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>	<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	10	
7	15	Clayey silty - gray to brown	2	Screen	New Plastic (PVC)	40 10	10	25	
15	19	Sand - tan with gray							
19	23	Sand - light orange and tan							
23	25	Sand - reddish brown							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880**



JKS-57 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-57 Date Drilled 2016-09-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 27.50' Boring Diam. 0.00"
 N. Coord. 13668235.72' E. Coord. 2187486.38' Surface Elevation 503.83' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0'
 Top of Casing Elevation 506.91' Stickup 3.08'
 Depth to Water: 1. Ft. btoc 20.07 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

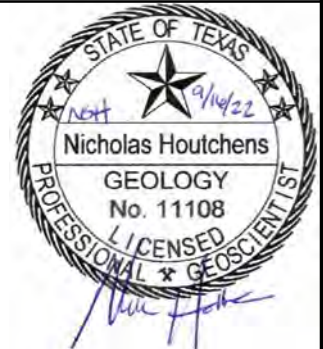
SKETCH MAP

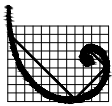


NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
503.83	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
				0			
500	5					5-8	CLAYEY SILT: Dark brown; damp; loose to medium dense; very slight plasticity; rootlets present.
				100			
495	10					8-12.2	CLAYEY SAND: Orangish brown with trace gray and iron-oxide staining; damp; loose to medium dense; slight plasticity; rootlets present. At 10' bgs: Color becomes grayish tan mottled with yellow iron-oxide staining.
				100			
490	15					12.2-14	SANDSTONE: Magenta red with orangish yellow and gray; damp; several pieces of reddish brown nodules (>1" thick) surrounded by yellow sandy clay.
				100			
485	20					14-15	SANDY CLAY: Orangish yellow and gray; damp; slight plasticity; gray and orangish yellow striations of sandy clay; white crystalline structures with medium grained sand throughout.
				100		15-25	INTERBEDDED CLAY AND SAND: Gray with yellow and iron-oxide staining; dry; soft; medium plasticity. At 15-16' bgs: Mostly sand and iron-oxide staining. At 16-17.5' bgs: Mostly gray clay. At 17.5-18.5' bgs: Mostly sand with some yellow and trace iron-oxide staining. At 18.5-20' bgs: Mostly sand with some iron-oxide staining.





ERM Environmental Resources Management

JKS-57 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-57 Date Drilled 2016-09-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 27.50' Boring Diam. 0.00"
 N. Coord. 13668235.72' E. Coord. 2187486.38' Surface Elevation 503.83' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0'
 Top of Casing Elevation 506.91' Stickup 3.08'
 Depth to Water: 1. Ft. btoc 20.07 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

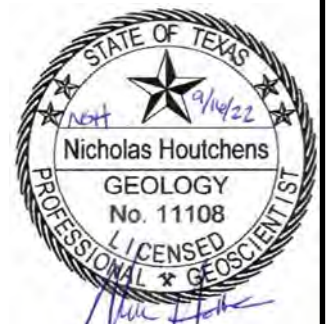
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
480	20			100			At 20-21' bgs: Mostly sand with yellow and trace iron-oxide staining.
							At 21-21.5' bgs: 2" thick layer of reddish brown, hard-packed sand; 4" thick layer of tan, very fine grained, loose sand.
							At 21.5-25' bgs: Mostly dark gray clay;
							At 22.5' bgs: Reddish brown coloration;
	25			100			At 24-25' bgs: Color is brownish gray with redox stippling.
						25-25.5	SAND: Gray; fine grained; dry; medium dense; low plasticity.
						25.5-27	At 25.5' bgs: Very thin (1/8" thick) brownish red coloration.
							INTERBEDDED CLAY AND SAND: Brownish gray clay interbedded with fine grained sand; dense; hard-packed.
						27-27.5	At 26.6' bgs: Thin, tan, dry, very fine grained, sand.
							SAND: Highly cemented; reddish brown nodules present.
							Refusal encountered at 27.5' bgs.
475	30						
470	35						
465							
460							
455							
450							
445							
440							
435							
430							
425							
420							
415							
410							
405							
400							



STATE OF TEXAS WELL REPORT for Tracking #443593

Owner: Calaveras Power Station	Owner Well #: JKS-57
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
Well County: Bexar	Longitude: 098° 19' 01.91" W
	Elevation: No Data
Type of Work: New Well	Proposed Use: Monitor

Drilling Start Date: **9/7/2016** Drilling End Date: **9/7/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	27

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	10	27	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	10	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
Water Quality:	No Data	No Data
		Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**

**112 S. Norwood Drive
Hurst, TX 76053**

Driller Name: **William Fields**

License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>	<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	12	
7	15	Clayey silty - gray to brown							
15	19	Sand - tan with gray	2	Screen	New Plastic (PVC)	40 10	12	27	
19	23	Sand - light orange and tan							
23	27	Sand - reddish brown							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880**



Environmental Resources Management

JKS-58 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-58 Date Drilled 2016-09-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 32.00' Boring Diam. 8.25"
 N. Coord. 13667994.99' E. Coord. 2187797.39' Surface Elevation 500.94' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length 0'
 Top of Casing Elevation 504.45' Stickup 3.51'
 Depth to Water: 1. Ft. btoc 21.09 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

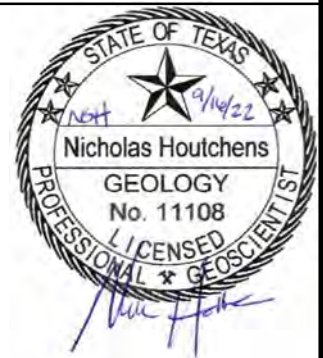
SKETCH MAP

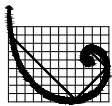


NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
500.94	0					0-5	NO RECOVERY: Previously excavated by hydrovac truck.
500				0			
	5					5-6	SAND: Brown; fine grained; moist; very loose.
495						6-7	CLAYEY SAND: Grayish brown with red; fine grained; damp; loose.
				100		7-10	SAND: Red, orange, and gray; damp medium grained; very loose to medium dense; slight gray, soft to medium dense, sandy clay; (clay content increases with depth).
	10					10-17	At 9.8' bgs: Color change to dark gray. At 10' bgs: Hard, sandstone, iron ore piece (>1" thick) SILTY CLAY: Gray with alternating yellow and orange layers; dry; dense; slight plasticity.
490							At 12.2' bgs: Brown sand seam (3" thick).
				100			
	15						At 16-16.5' bgs: Brownish tan sandy clay. At 16.5-17' bgs: Gray clay has fractured texture.
485						17-17.5	CLAY: Gray; damp; mixed with coarse grained sand.
				100		17.5-19.5	SAND: Tan; moist to wet. At 18-19.5' bgs: Color change to gray with black staining; no odor; white, crystalline, coarse grained structures present.
						19.5-20	CLAYEY SILTY SAND: Orangish brown; dry; gravel and some small sandstone pieces present.
	20						





ERM Environmental Resources Management

JKS-58 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-58 Date Drilled 2016-09-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 32.00' Boring Diam. 8.25"
 N. Coord. 13667994.99' E. Coord. 2187797.39' Surface Elevation 500.94' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length 0'
 Top of Casing Elevation 504.45' Stickup 3.51'
 Depth to Water: 1. Ft. btoc 21.09 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

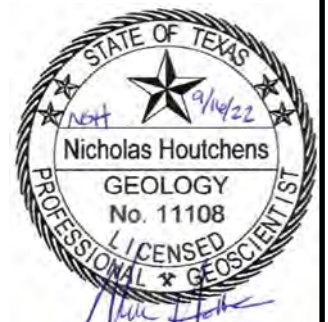
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
480	20			100		20-21	CLAY: Gray; dry; stiff; small, tan sandy clay pockets present.
						21-22.5	INTERBEDDED CLAY AND SAND: Gray and orangish tan; damp; clay is pinkish gray interbedded with thin orange sand layers.
						22.5-25.5	CLAY: Dark pinkish gray; dry; stiff; several very thin, light gray, silty sand layers. At 24.5-24.7' bgs: Tan, dry, silty clay.
475	25			100	JKS-58_26-27 USCS: Sandy Lean Clay (CL) AL: 38 / 18 / 20 - #200: 50.9	25.5-30	CLAYEY SAND: Tan; moist to saturated. At 25.5-27.5' bgs: No distinct layers. Non-cohesive grab sample collected from 26'-27' bgs. At 27.5' bgs: Thin saturated seam. At 27.5-30' bgs: Yellow and orange layering.
470	30				JKS-58_30-32.5 USCS: Fat Clay (CH) AL: 57 / 20 / 37 - #200: 89.1 k: 1.53x10 ⁻⁷	30-32.5	NO RECOVERY: Cohesive sample (Shelby tune) collected from 30'-32' bgs. Boring terminated at 32.5' bgs.
465	35						
460							
455							
450							
445							
440							
435							
430							
425							
420							
415							
410							
405							
400							



STATE OF TEXAS WELL REPORT for Tracking #443594

Owner: Calaveras Power Station	Owner Well #: JKS-58
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
Well County: Bexar	Longitude: 098° 19' 01.91" W
	Elevation: No Data
Type of Work: New Well	Proposed Use: Monitor

Drilling Start Date: **9/7/2016** Drilling End Date: **9/7/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	30

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	18	30	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	18	Bentonite 4 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
Water Quality:	No Data	No Data
		Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which
contained injurious constituents?: No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: **William Fields** License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

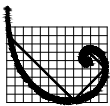
Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>	<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	20	
7	15	Clayey silty - gray to brown	2	Screen	New Plastic (PVC)	40 10	20	30	
15	19	Sand - tan with gray							
19	23	Sand - light orange and tan							
23	30	Sand - reddish brown							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



JKS-59 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-59 Date Drilled 2016-09-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 27.00' Boring Diam. 8.25"
 N. Coord. 13667779.88' E. Coord. 2188352.07' Surface Elevation 493.53' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0'
 Top of Casing Elevation 496.45' Stickup 2.92'
 Depth to Water: 1. Ft. btoc 15.49 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

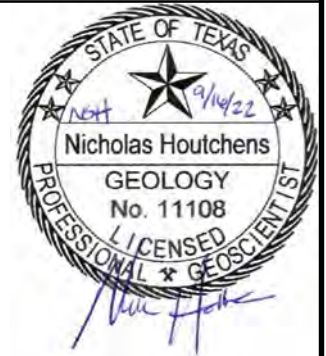
SKETCH MAP

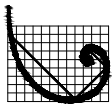


NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
493.53	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
490	5			0		5-6.5	SILTY SAND: Brown; damp; loose.
						6.5-7 7-10	SAND: Tan; damp; loose. SILTY CLAY: Dark brown; damp; soft; slight plasticity.
485	10			100		10-11	At 9-10' bgs: Decreasing silt content; increasing stiffness; some iron-oxide stained nodules observed. CLAY: Dark brown; damp; medium stiff; low to medium plasticity.
						11-15	SILTY CLAY: Dark orangish brown to orangish brown; damp; soft; increasing silt content with depth; increasing gray streaks/fissures with depth.
480	15			100		15-15.5 15.5-18	CLAY: Dark brown to brown; damp; medium stiff to stiff; low plasticity. SILTY SAND: Tan; saturated; loose. At 16' bgs: Wet; crumbly; trace clay content.
475	20			100		18-20	At 17.5' bgs: Saturated. SANDY CLAY: Light bluish gray mottled with orange iron-oxide and black staining; moist; medium stiff; slight plasticity.





ERM Environmental Resources Management

JKS-59 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-59 Date Drilled 2016-09-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 27.00' Boring Diam. 8.25"
 N. Coord. 13667779.88' E. Coord. 2188352.07' Surface Elevation 493.53' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0'
 Top of Casing Elevation 496.45' Stickup 2.92'
 Depth to Water: 1. Ft. btoc 15.49 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			100		20-20.5 20.5-21 21-22.5	CLAY: Brown to light brown; damp; medium stiff to stiff; low plasticity.
						22.5-22.8 22.8-25	SANDY CLAY: Light gray mottled with orangish iron-oxide staining; moist; medium stiff; slight plasticity. CLAY: Dark pinkish gray; moist; soft; layered with very thin orange/iron-oxide stained silty sand.
	25			100		25-26	SILT: Tan; saturated; very loose. CLAY: Dark pinkish gray; soft; layered with very thin orange/iron-oxide stained silty sand.
						26-27	SAND: Gray with orange staining; fine grained; saturated; loose. CLAY: Gray; saturated; very soft; high plasticity.
							Boring terminated at 27' bgs.
465	30						
460	35						
455							
40							



STATE OF TEXAS WELL REPORT for Tracking #443595

Owner:	Calaveras Power Station	Owner Well #:	JKS-59
Address:	12940 US 181 San Antonio, TX 78223	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78223	Latitude:	29° 18' 28.4" N
Well County:	Bexar	Longitude:	098° 19' 01.91" W
		Elevation:	No Data
Type of Work: New Well		Proposed Use: Monitor	

Drilling Start Date: 9/7/2016 Drilling End Date: 9/7/2016

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	27

Drilling Method: Hollow Stem Auger

Borehole Completion: Filter Packed

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	10	27	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	10	Bentonite 2 Bags/Sacks

Seal Method: Hand Mixed

Sealed By: Driller

Distance to Property Line (ft.): No Data

Distance to Septic Field or other
concentrated contamination (ft.): No Data

Distance to Septic Tank (ft.): No Data

Method of Verification: No Data

Surface Completion: Surface Slab Installed

Surface Completion by Driller

Water Level: No Data

Packers: No Data

Type of Pump: No Data

Well Tests: No Test Data Specified

Did the driller knowingly penetrate any strata which contained injurious constituents? **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Driller Name:	William Fields	License Number:	56033
Apprentice Name:	Ryan Spaust		
Comments:	No Data		

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



Environmental Resources Management

JKS-60 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-60 Date Drilled 2016-09-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 26.00' Boring Diam. 8.25"
 N. Coord. 13667357.02 E. Coord. 2188465.44 Surface Elevation 492.68' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Sump Length 0'
 Top of Casing Elevation 495.70' Stickup 3.02'
 Depth to Water: 1. Ft. btoc 17.40 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

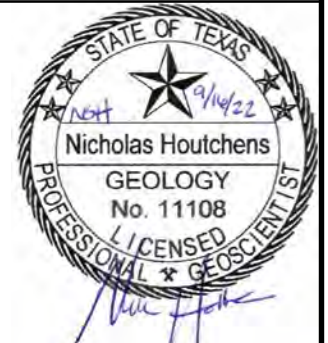
SKETCH MAP



NOTES

Coordinates in Texas South
 Central State Plane 4204.
 Elevations in NAVD88
 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
492.68	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated with hydrovac truck.
490	5			0		5-10	SAND: Grayish tan with orange and yellow; very fine grained; damp; loose; no odor. At 6' bgs: Color change to light pinkish orange. At 7.5' bgs: Color change to light gray with trace orange and yellow.
485	10			100		10-10.8 10.8-16	CLAY: Dark gray; moist; soft; slight plasticity. SAND: White with yellow; very fine grained; damp; loose. At 11.6-13' bgs: Color change to pale yellow. At 13-16' bgs: Color change to light orangish yellow.
480	15			100		16-23.5	At 15' bgs: Thin reddish orange stringer. At 15-16' bgs: Moist. SAND: Light orange; very fine grained; damp; very dense; unable to collect soil core, soil descriptions based on observation of auger cuttings. At 18-23.5' bgs: Color change to pale yellow.
475	20			0			





Environmental Resources Management

JKS-60 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-60 Date Drilled 2016-09-07
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 26.00' Boring Diam. 8.25"
 N. Coord. 13667357.02 E. Coord. 2188465.44 Surface Elevation 492.68' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Sump Length 0'
 Top of Casing Elevation 495.70' Stickup 3.02'
 Depth to Water: 1. Ft. btoc 17.40 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
470	20			0			At 22' bgs: Moisture content increases to wet.
						23.5-25.7	SAND: Tan; fine grained; saturated; loose.
25				100		25.7-25.9	At 25.5' bgs: Color change to white with brown; medium grained.
						25.9-26	SILTY SAND: Dark reddish staining; saturated. CLAY-SHALE: Shaley clay; tan; wet; dense. Boring terminated at 26' bgs.
465							
	30						
460							
	35						
455							
	40						



STATE OF TEXAS WELL REPORT for Tracking #443596

Owner:	Calaveras Power Station	Owner Well #:	JKS-60
Address:	12940 US 181 San Antonio, TX 78223	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78223	Latitude:	29° 18' 28.4" N
Well County:	Bexar	Longitude:	098° 19' 01.91" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: 9/7/2016 Drilling End Date: 9/7/2016

	Diameter (in.)	Top Depth (ft.)	Bottom Depth (ft.)
Borehole:	8.25	0	25

Drilling Method: Hollow Stem Auger

Borehole Completion: Filter Packed

	Top Depth (ft.)	Bottom Depth (ft.)	Filter Material	Size
Filter Pack Intervals:	8	25	Sand	20/40

	Top Depth (ft.)	Bottom Depth (ft.)	Description (number of sacks & material)
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	8	Bentonite 2 Bags/Sacks

Seal Method: Hand Mixed

Sealed By: Driller

Distance to Property Line (ft.): No Data

Distance to Septic Field or other
concentrated contamination (ft.): No Data

Distance to Septic Tank (ft.): No Data

Method of Verification: No Data

Surface Completion: Surface Slab Installed

Surface Completion by Driller

Water Level: No Data

Packers: No Data

Type of Pump: No Data

Well Tests: No Test Data Specified

	Strata Depth (ft.)	Water Type
Water Quality:	No Data	No Data

Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: **William Fields** License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

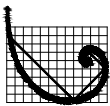
Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)	
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	10	
7	15	Clayey silty - gray to brown	2	Screen	New Plastic (PVC)	40 10	10	25	
15	19	Sand - tan with gray							
19	23	Sand - light orange and tan							
23	25	Sand - reddish brown							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



JKS-61 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-61 Date Drilled 2016-09-08
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 35.00' Boring Diam. 8.25"
 N. Coord. 13665721.04' E. Coord. 2187196.65' Surface Elevation 502.52' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 18.00' Sump Length 0'
 Top of Casing Elevation 505.51' Stickup 2.99'
 Depth to Water: 1. Ft. btoc 24.46 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

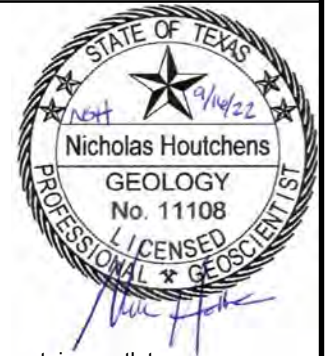
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
502.52	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated with hydrovac truck.
500				0		5-5.2 5.2-10.5	SANDY SILT: Dark brown; damp; loose; contains rootlets. SAND: Light tannish orange; damp; fine grained; loose.
495	5			100			At 7.8' bgs: Thin (1/4"), dark gray, sandy clay layer. At 8.2' bgs: Thin (1/4"), dark gray, sandy clay layer.
	10					10.5-12.5	INTERBEDDED CLAY AND SAND: Light gray to white; very fine grained; very hard packed; very thin (1/10") pinkish gray clay stringers throughout.
490				100		12.5-20	At 10.5' bgs: Pinkish gray clay layer (1" thick). SAND: Light gray to white with trace yellow and orange colorations; dry; very fine grained; very hard packed. At 12.5-15' bgs: Sand is cemented.
	15						At 16.5-19' bgs: Three clay stringers (1/4" thick).
485				100			
	20						





Environmental Resources Management

JKS-61 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-61 Date Drilled 2016-09-08
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 35.00' Boring Diam. 8.25"
 N. Coord. 13665721.04' E. Coord. 2187196.65' Surface Elevation 502.52' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 18.00' Sump Length 0'
 Top of Casing Elevation 505.51' Stickup 2.99'
 Depth to Water: 1. Ft. btoc 24.46 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

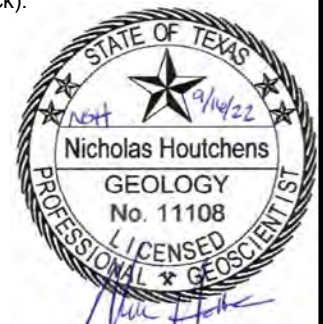
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
480	20			100		20-22.5	CLAYEY SAND: Gray with trace orange; damp; fine grained; loose; trace clay content present. At 21' bgs: Color change to tan with orange and gray; moisture content becomes wet. At 21.8' bgs: Thin pinkish gray clay seam (1/4" thick).
						22.5-25	SAND: Gray with orange, tan, and yellow; fine grained; wet; loose.
475	25			100		25-31.5	CLAYEY SAND: Gray; fine grained; wet to saturated; loose. At 25-25.8' bgs: Saturated. At 27.5-28.5' bgs: Saturated. At 30-31' bgs: Saturated. At 31-32.5' bgs: Wet.
470	30			100		31.5-32.5	SANDY CLAY: Pinkish gray; damp; medium dense; slightly plastic; very thin sand stringers throughout (1/10" thick).
						32.5-33	CLAYEY SILTY SAND: Gray; saturated; loose.
						33-35	SANDY CLAY: Pinkish gray; damp; medium dense; slightly plastic; very thin sand stringers throughout (1/10" thick).
	35						Boring terminated at 35' bgs.
465							
40							



STATE OF TEXAS WELL REPORT for Tracking #443597

Owner: Calaveras Power Station	Owner Well #: JKS-61
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
Well County: Bexar	Longitude: 098° 19' 01.91" W
	Elevation: No Data

Type of Work: New Well	Proposed Use: Monitor
-------------------------------	------------------------------

Drilling Start Date: **9/8/2016** Drilling End Date: **9/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	33

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	15	33	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	15	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	Strata Depth (ft.)	Water Type
Water Quality:	No Data	No Data
		Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: No

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: Strata Core Services, LLC

112 S. Norwood Drive
Hurst, TX 76053

Driller Name: William Fields

License Number: 56033

Apprentice Name: Ryan Spaust

Comments: No Data

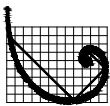
Lithology:			Casing:						
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA						
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)	
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	18	
7	15	Clayey silty - gray to brown	2	Screen	New Plastic (PVC)	40 10	18	33	
15	19	Sand - tan with gray							
19	23	Sand - light orange and tan							
23	33	Sand - reddish brown							

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

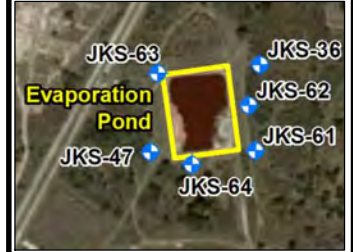
Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



JKS-62 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-62 Date Drilled 2016-09-08
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 37.00' Boring Diam. 8.25"
 N. Coord. 13666020.13' E. Coord. 2187153.88' Surface Elevation 506.71' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length 0'
 Top of Casing Elevation 509.84' Stickup 3.13'
 Depth to Water: 1. Ft. btoc 28.90 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

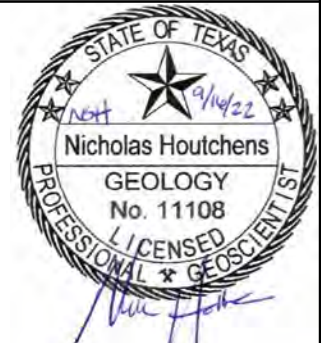
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
506.71	0					0-5	NO RECOVERY: Previously excavated with hydrovac truck.
505				0		5-6	SANDY SILT: Dark brown; damp; very loose; slight to low plasticity; trace rootlets.
	5					6-9	INTERBEDDED CLAY AND SAND: Light gray; dry; sand content fine grained, loose; clay content is pinkish gray with slight to low plasticity.
500				100			
	10					9-15	CLAYEY SAND: Light gray with yellowish orange and pale yellow; very fine grained; dry; trace clay content. At 10' bgs: Color change to light pinkish brown and yellowish orange; moisture content increases to damp; sand is loose; clay is soft. At 11' bgs: Color change to white/light gray and tan, clay is darker gray; moisture content decreases to dry; very dense; crumbles easily.
495				100			
	15					15-20	SAND: White; dry; dense but crumbles easily.
490				50			
	20						





Environmental Resources Management

JKS-62 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-62 Date Drilled 2016-09-08
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 37.00' Boring Diam. 8.25"
 N. Coord. 13666020.13' E. Coord. 2187153.88' Surface Elevation 506.71' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 10.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length 0'
 Top of Casing Elevation 509.84' Stickup 3.13'
 Depth to Water: 1. Ft. btoc 28.90 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

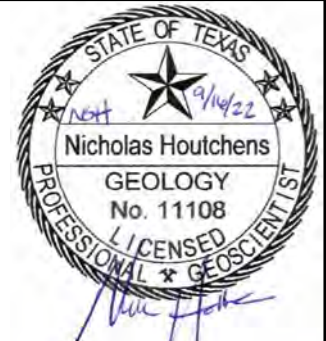
SKETCH MAP



NOTES

Coordinates in Texas South
 Central State Plane 4204.
 Elevations in NAVD88
 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
485	20			50		20-25	SAND: Light gray to tannish gray; fine grained; dry to damp; loose. At 21.2' bgs: Moisture content increases to damp. At 21.4' bgs: Yellow and iron-oxide staining.
480	25			100		25-27.5	INTERBEDDED CLAY AND SAND: Gray; fine grained; wet; loose. At 25.5' bgs: Iron-oxide staining and thin (1/4" thick) pinkish gray clay layer. At 27.5' bgs: Iron-oxide staining and thin (1/4" thick) pinkish gray clay layer.
475	30			0		27.5-29.5	CLAYEY SAND: Gray with iron-oxide staining; saturated; loose; trace clay content. At 29' bgs: Increased iron-oxide staining with clay layers.
470	35			0	JKS-62_35-37 USCS: Clayey Sand (SC) AL: 38 / 17 / 21 - #200: 32.3 k: 6.63x10 ⁻⁷	29.5-30 30-30.5 30.5-31 31-31.5 31.5-35	INTERBEDDED CLAY AND SAND: Pinkish gray; damp; medium dense; slight plasticity. SAND: Gray; fine grained; damp. INTERBEDDED CLAY AND SAND: Orange, fine grained, moist sand; gray, low plasticity clay; loose to medium dense. CLAY: Brown; moist; loose to medium dense. At 31.5 bgs: Thin reddish brown nodule layer (1/4" thick). CLAY: Brown; damp; soft; high plasticity; unable to collect soil core; descriptions based on observation of auger cuttings.
470	35			0		35-37	NO RECOVERY: Cohesive sample (Shelby tube) collected from 35'-37' bgs. Boring terminated at 35' bgs.
470	40						



STATE OF TEXAS WELL REPORT for Tracking #443598

Owner: Calaveras Power Station	Owner Well #: JKS-62
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
	Longitude: 098° 19' 01.91" W
Well County: Bexar	Elevation: No Data

Type of Work: New Well	Proposed Use: Monitor
-------------------------------	------------------------------

Drilling Start Date: **9/8/2016** Drilling End Date: **9/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	30

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	18	30	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	18	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
Water Quality:	No Data	No Data
		Chemical Analysis Made: No
	Did the driller knowingly penetrate any strata which contained injurious constituents?: No	

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**

**112 S. Norwood Drive
Hurst, TX 76053**

Driller Name: **William Fields**

License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

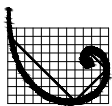
Lithology:			Casing:					
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA					
Top (ft.)	Bottom (ft.)	Description	Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	20
7	15	Clayey silty - gray to brown						
15	19	Sand - tan with gray	2	Screen	New Plastic (PVC)	40 10	20	30
19	23	Sand - light orange and tan						
23	30	Sand - reddish brown						

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

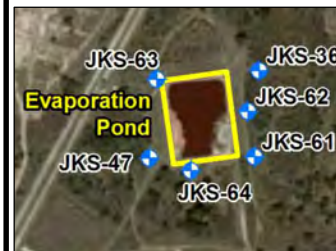
**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880**



JKS-63 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-63 Date Drilled 2016-09-08
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 50.00' Boring Diam. 8.25"
 N. Coord. 13666230.86' E. Coord. 2186553.38' Surface Elevation 523.55' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 30.00' Sump Length 0'
 Top of Casing Elevation 526.86' Stickup 3.31'
 Depth to Water: 1. Ft. btoc 44.70 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

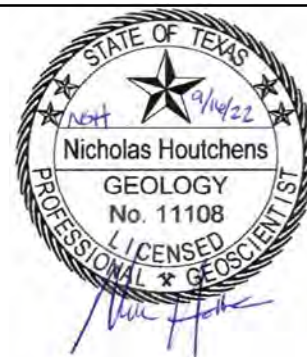
SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
523.55	0				No Samples Collected	0-5	NO RECOVERY: Previously excavated by hydrovac truck.
520	5			0		5-5.5 5.5-6 6-7.8	SAND: Brown; fine-grained; moist; loose. CLAYEY SAND: Tan; moist; single piece of gray. SILTY SAND: Brown lense; fine grained; moist; loose; trace rootlets.
515	10			100		7.8-10.2	SANDY CLAY: Reddish brown to dark gray with red; dry to damp; very stiff; hard-packed; non-plastic.
510	15			100		10.2-12.2	CLAYEY SAND: Orange to pinkish orange; dry to damp; very dense.
505	20			75		12.2-18	INTERBEDDED CLAY AND SAND: Tan; very fine-grained; very dense/hard-packed; layered with thin gray sandy clay seams. At 15' bgs: Sand color changes to very light gray to white; pinkish gray sandy clay seams throughout; layered with pale yellow colorations.
						18-20	SAND: Gray to brownish orange; dry; very fine-grained; medium dense; crumbles easily.





Environmental Resources Management

JKS-63 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-63 Date Drilled 2016-09-08
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 50.00' Boring Diam. 8.25"
 N. Coord. 13666230.86' E. Coord. 2186553.38' Surface Elevation 523.55' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 30.00' Sump Length 0'
 Top of Casing Elevation 526.86' Stickup 3.31'
 Depth to Water: 1. Ft. btoc 44.70 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

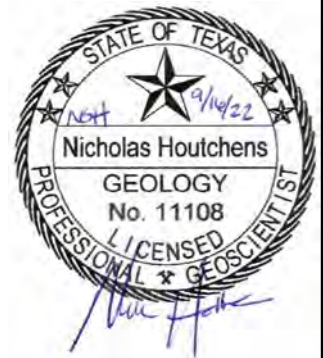
SKETCH MAP



NOTES

Coordinates in Texas South
 Central State Plane 4204.
 Elevations in NAVD88
 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
500	20			80		20-30	INTERBEDDED CLAY AND SAND: Light gray; very fine-grained; dry to damp; dense/hard-packed; layered with thin pinkish gray clay seams and iron-oxide staining.
495	25			80			
490	30			80		30-39	SAND: Gray; dry to saturated; fine-grained; very hard packed; crumbles easily. At 32.5' bgs: Medium-grained.
485	35			80			
480	39					39-39.5	CLAYEY SAND: Dark reddish brown; wet; loose.
475	40					39.5-50	SAND: Gray; wet; fine-grained; loose.





Environmental Resources Management

JKS-63 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-63 Date Drilled 2016-09-08
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras Power Station - San Antonio Boring T.D. 50.00' Boring Diam. 8.25"
 N. Coord. 13666230.86' E. Coord. 2186553.38' Surface Elevation 523.55' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 30.00' Sump Length 0'
 Top of Casing Elevation 526.86' Stickup 3.31'
 Depth to Water: 1. Ft. btoc 44.70 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
480	40			80			
475	45			80			At 45' bgs: Moisture content increases to saturated; trace iron-oxide staining.
50	50						Boring terminated at 50' bgs.
470	55						
465							
60							



STATE OF TEXAS WELL REPORT for Tracking #443599

Owner: Calaveras Power Station	Owner Well #: JKS-63
Address: 12940 US 181 San Antonio, TX 78223	Grid #: 68-46-5
Well Location: 12940 US 181 San Antonio, TX 78223	Latitude: 29° 18' 28.4" N
	Longitude: 098° 19' 01.91" W
Well County: Bexar	Elevation: No Data

Type of Work: New Well	Proposed Use: Monitor
-------------------------------	------------------------------

Drilling Start Date: **9/8/2016** Drilling End Date: **9/8/2016**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	50

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	28	50	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	28	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: Surface Slab Installed	Surface Completion by Driller
---	--------------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
Water Quality:	No Data	No Data
		Chemical Analysis Made: No

Did the driller knowingly penetrate any strata which contained injurious constituents?: **No**

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**

**112 S. Norwood Drive
Hurst, TX 76053**

Driller Name: **William Fields**

License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>	<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	30
7	15	Clayey silty - gray to brown	2	Screen	New Plastic (PVC)	40 10	30	50
15	19	Sand - tan with gray						
19	23	Sand - light orange and tan						
23	50	Sand - reddish brown						

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880**

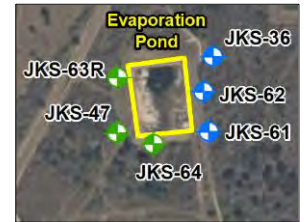


Environmental Resources Management

JKS-63R DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-63R Date Drilled 2019-05-02
 Project Evaporation Pond Well Re-Install Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 24.00' Boring Diam. 8.00"
 N. Coord. 13668452.91 E. Coord. 2186879.12 Surface Elevation 519.15' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 35.00' Sump Length 0'
 Top of Casing Elevation 522.27' Stickup 3.12'
 Depth to Water: 1. Ft. 36.00 (SB Installation) 2. Ft. 39.27 (2019-08-20)
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

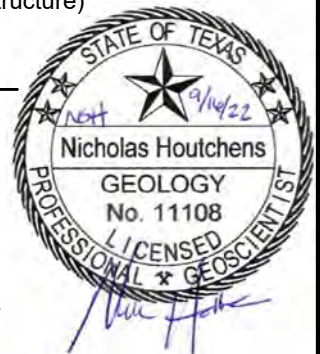
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011).
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
519.15	0			100	No Samples Collected	0-3.5	SAND: Brown; dry to damp; very-fine grained; sub-angular; poorly sorted; loose; minor silt and trace clay content; no odor. Ground surface to 5 ft. bgs logged via post hole digger soil cuttings.
	5			100		3.5-7.5	SANDY CLAY: Brown with occasional red and black mottling; damp; medium stiff; low plasticity; trace silt content; no odor. At 4' bgs: Color change to reddish brown. At 5' bgs: Stiff; medium plasticity.
	10			90		7.5-8.5	At 6' bgs: Occasional thin, light brown, very-fine grained sand seams. At 6.5' bgs: Interbedded clay and sand seam (6" thick); dry; clay content dark brown, stiff; sand content very-fine grained, sub-angular; occasional light brown and yellow silt stringers.
510.00	10			100		8.5-10	CLAYEY SAND: Reddish brown; damp; medium dense; non-plastic to slightly plastic; very-fine grained; sub-angular; minor yellow silt stringers; no odor.
	15			100		10-17.5	SILT: Light grey; dry; loose to medium dense; non-plastic; minor to occasional very-fine grained sand content, with increasing sand content with depth; minor yellow silt stringers; no odor. SAND: Light grey; dry; loose to medium dense; very-fine grained; sub-angular; poorly to moderately sorted; trace clay content; occasional yellow silt stringers; no odor. At 12.5' bgs: Medium dense.
	20			100			At 15' bgs: Medium dense to loose.
500.00	20			100		17.5-24	INTERBEDDED CLAY AND SAND: Light grey (sand content) and light brown (clay content); dry to damp; clay content medium stiff, slight to low plasticity; sand content medium dense, very-fine grained, sub-angular; occasional yellow silt stringers; no odor. At 19' bgs: Decreasing clay content; sand content fine grained.



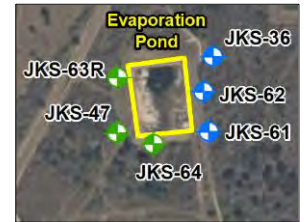


Environmental Resources Management

JKS-63R DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-63R Date Drilled 2019-05-02
 Project Evaporation Pond Well Re-Install Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 24.00' Boring Diam. 8.00"
 N. Coord. 13668452.91 E. Coord. 2186879.12 Surface Elevation 519.15' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 35.00' Sump Length 0'
 Top of Casing Elevation 522.27' Stickup 3.12'
 Depth to Water: 1. Ft. 36.00 (SB Installation) 2. Ft. 39.27 (2019-08-20)
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

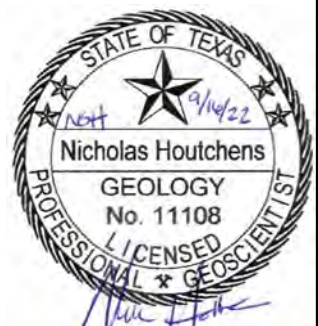
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011).
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
499.0	20			100	No Samples Collected		At 22' bgs: Sand seam (3" thick); light grey; fine grained; no clay content. At 22.5' bgs: Increasing clay content; medium stiff to stiff.
				100		24-50	SAND: Light brownish grey; damp; medium dense to loose; fine grained; sub-angular; poorly sorted; minor yellow silt stringers; no odor. At 25' bgs: Trace red silty clay content; medium plasticity.
	25			60			At 27.5' bgs: No clay content.
490.0				100			At 30' bgs: Minor clay content to 31' bgs.
	30			80			At 31.5' bgs: Moist. At 32' bgs: Occasional to abundant yellow and orange silt stringers. At 32.5' bgs: Very moist; minor to occasional yellow and orange silt stringers.
	35			100			At 35' bgs: Fine to very-fine grained; trace yellow and orange silt stringers. At 36' bgs: Wet.
				80			At 37.5' bgs: Saturated; fine grained; no clay content.
480.0				60			
	40						



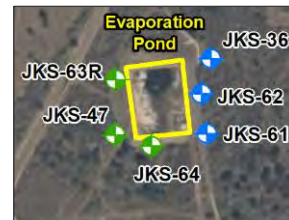


Environmental Resources Management

JKS-63R DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-63R Date Drilled 2019-05-02
 Project Evaporation Pond Well Re-Install Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 24.00' Boring Diam. 8.00"
 N. Coord. 13668452.91 E. Coord. 2186879.12 Surface Elevation 519.15' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 35.00' Sump Length 0'
 Top of Casing Elevation 522.27' Stickup 3.12'
 Depth to Water: 1. Ft. 36.00 (SB Installation) 2. Ft. 39.27 (2019-08-20)
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011).
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
479.0	40				No Samples Collected		At 40' bgs: Abundant orange silt stringers.
				80			At 42.5' bgs: Fine to medium grained; occasional orange silt stringers.
				80			At 45' bgs: Fine grained;
	45			60			At 47.5' bgs: Trace orange silt stringers.
470.0	50			60			Boring terminated at 50' bgs.
	55						
460.0	60						



STATE OF TEXAS WELL REPORT for Tracking #511515

Owner:	CPS Energy	Owner Well #:	JKS-63R
Address:	P.O. Box 2906 San Antonio , TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station 12940 US 181 San Antonio, TX 78263	Latitude:	29° 19' 27.98" N
		Longitude:	098° 18' 56.77" W
Well County:	Bexar	Elevation:	516 ft. above sea level

Type of Work:	New Well	Proposed Use:	Monitor
---------------	-----------------	---------------	----------------

Drilling Start Date: **5/2/2019** Drilling End Date: **5/2/2019**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	50

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	33	50	Sand	12/20

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Concrete 1.16 Bags/Sacks
	2	33	Bentonite 15.08 Bags/Sacks

Seal Method: **Hand Mixed**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion:	Surface Sleeve Installed	Surface Completion by Driller
---------------------	---------------------------------	--------------------------------------

Water Level: **36 ft. below land surface on 2019-05-02**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Vortex Drilling**
4412 Bluemel Road
San Antonio, TX 78240

Driller Name: **James E. Neal**

License Number: **4868**

Apprentice Name: **Tony Elmendorf**

Comments: **No Data**

Report Amended on 7/12/2019 by Request #28256

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	3.5	Sand
3.5	7.5	Sandy Clay
7.5	8.5	Clayey Sand
8.5	10	Silt
10	17.5	Sand
17.5	24	Interbedded Clay and Sand
24	50	Sand

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
2	Top Cap (Locking)	New Plastic (PVC)	40		
2	Bottom Cap	New Plastic (PVC)	40		
2	Riser	New Plastic (PVC)	40	-3	35
2	Screen	New Plastic (PVC)	40 0.010	35	50

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540



Environmental Resources Management

JKS-64 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-64 Date Drilled 2016-09-09
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras power Station - San Antonio Boring T.D. 32.00' Boring Diam. 8.25"
 N. Coord. 13665627.14' E. Coord. 2186778.76' Surface Elevation 504.38' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Sump Length 0'
 Top of Casing Elevation 507.84' Stickup 3.46'
 Depth to Water: 1. Ft. btoc 25.06 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

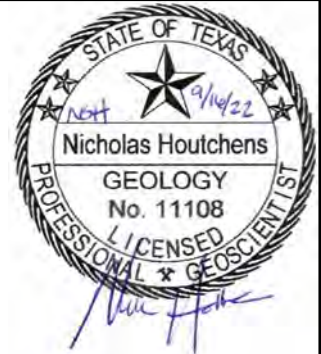
SKETCH MAP

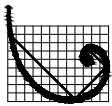


NOTES

Coordinates in Texas South
 Central State Plane 4204.
 Elevations in NAVD88
 computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
504.38	0					0-5	NO RECOVERY: Previously excavated with hydrovac truck.
	5			0		5-6.5	SILTY SAND: Brown; moist; loose.
	10			100		6.5-8	INTERBEDDED CLAY AND SAND: Pinkish gray and orange; fine grained, orange sand; pinkish gray clay layered with iron-oxide staining; damp; non-plastic.
495	15			100		8-13	SAND: Light gray and pale yellow; dry; very fine-grained; dense; very hard-packed; trace clay content; layered appearance.
490	20			100		13-22.5	INTERBEDDED CLAY AND SAND: Light gray and pale yellow, fine-grained sand; dark gray, slightly plastic, clay is medium stiff.
485							At 17' bgs: Thickness of clay layers increases (1-2" thick); low plasticity.



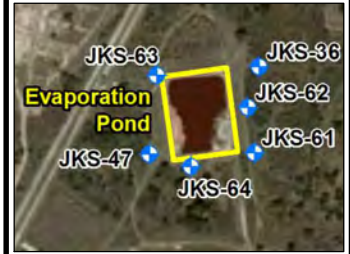


ERM Environmental Resources Management

JKS-64 DRILLING LOG

Proj. No. 0366643 Boring/Well ID JKS-64 Date Drilled 2016-09-09
 Project Ground Water Investigation - Phase II Owner CPS Energy
 Location Calaveras power Station - San Antonio Boring T.D. 32.00' Boring Diam. 8.25"
 N. Coord. 13665627.14' E. Coord. 2186778.76' Surface Elevation 504.38' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Sump Length 0'
 Top of Casing Elevation 507.84' Stickup 3.46'
 Depth to Water: 1. Ft. btoc 25.06 (2016-05-21) 2. Ft. ()
 Drilling Company Strata Core Services, LLC Driller Ryan Spaust
 Drilling Method Hollow-Stem Auger Log By Andrew Henry

SKETCH MAP



NOTES

Coordinates in Texas South
Central State Plane 4204.
Elevations in NAVD88
computed using Geoid03.

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
480	20			100	JKS-64_20-30 USCS: Clayey Sand (SC) AL: 29 / 14 / 15 - #200: 30.1	22.5-25	At 20' bgs: Saturated; clay color changes to pinkish gray. Non-cohesive grab sample collected from 20'-30' bgs. SAND: Gray with bluish gray and orange; fine-grained; loose.
475	25			100		25-30	At 23.8' bgs: Bluish gray, low plasticity clay (1/2" thick); sand color changes to greenish blue. INTERBEDDED CLAY AND SAND: Tannish gray; wet to saturated; fine-grained; wet to saturated; loose; clay layers are pinkish gray with iron-oxide staining. At 26.8' bgs: Wet. At 27.5' bgs: Saturated. At 28.3' bgs: Wet.
470	30					30-32	At 30' bgs: Gray clay; dense/stiff; low plasticity; 1" thick. NO RECOVERY: Geotechnical sample collected, but not analyzed. Boring terminated at 32' bgs.
465	35						
460	40						



STATE OF TEXAS WELL REPORT for Tracking #443600

Owner:	Calaveras Power Station	Owner Well #:	JKS-64
Address:	12940 US 181 San Antonio, TX 78223	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78223	Latitude:	29° 18' 28.4" N
Well County:	Bexar	Longitude:	098° 19' 01.91" W
		Elevation:	No Data

Type of Work:	New Well	Proposed Use:	Monitor
---------------	----------	---------------	---------

Drilling Start Date: 9/9/2016 Drilling End Date: 9/9/2016

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	30

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	12	30	Sand	20/40

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Cement 1 Bags/Sacks
	2	12	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion:	Surface Slab Installed	Surface Completion by Driller
---------------------	------------------------	-------------------------------

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

	<i>Strata Depth (ft.)</i>	<i>Water Type</i>
Water Quality:	No Data	No Data
		Chemical Analysis Made: No
	Did the driller knowingly penetrate any strata which contained injurious constituents?: No	

The driller did certify that while drilling, deepening or otherwise altering the above described well, injurious water or constituents was encountered and the landowner or person having the well drilled was informed that such well must be completed or plugged in such a manner as to avoid injury or pollution.

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Strata Core Services, LLC**
112 S. Norwood Drive
Hurst, TX 76053

Driller Name: **William Fields** License Number: **56033**

Apprentice Name: **Ryan Spaust**

Comments: **No Data**

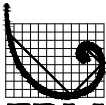
Lithology:			Casing:					
DESCRIPTION & COLOR OF FORMATION MATERIAL			BLANK PIPE & WELL SCREEN DATA					
<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>	<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
0	7	Clayey silt - orangish brown	2	Riser	New Plastic (PVC)	40	0	15
7	15	Clayey silty - gray to brown	2	Screen	New Plastic (PVC)	40 10	15	30
15	19	Sand - tan with gray						
19	23	Sand - light orange and tan						
23	30	Sand - reddish brown						

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 463-7880



Environmental Resources Management

JKS-65 DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-65 Date Drilled 2020-08-19
 Project Plant Drains Pond CCR Unit Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 40.00' Boring Diam. 8.25"
 N. Coord. 13664675.83 E. Coord. 2186405.30 Surface Elevation 515.82' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length "0.00"
 Top of Casing Elevation 518.53' Stickup 2.71'
 Depth to Water: 1. Ft. 22.50' (SB Installation) 2. Ft. ()
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
515.82	0			0	No Samples Collected	0-5.0	NO RECOVERY: Soil removed by hydro-excavation.
510.82	5			100		5.0-6.5	SANDY SILTY CLAY: Light brown to light yellowish brown, damp, stiff, low plasticity, sand content very fine grained, black and red silt stringers, abundant wood fragments, no odor.
				100		6.5-9.5	SILTY SAND: Light yellowish brown, dry, medium dense, very fine grained, minor clay and trace aggregate content, no odor. At 9' bgs: Light grey clay lens (2" thick).
505.82	10			90		9.5-11.3	CLAYEY SILT: Light brownish grey, damp to moist, loose, slight plasticity, occasional very fine grained sand content, occasional yellow silt stringers, no odor. At 10' bgs: Increasing clay content, decreasing sand content.
				100		11.3-12.5	CLAY: Light grey, moist, medium stiff to stiff, low to medium plasticity, minor to occasional silt content, some orange/yellow/dark reddish brown silt stringers, no odor.
500.82	15			100		12.5-30.0	SAND: Light grey, damp, medium dense to loose (with depth), very fine grained, poorly sorted, sub-angular, minor silt content, no odor. At 13.5' bgs: Abundant orange silt lenses (0.3" thick). At 13.8' bgs: Minor yellow silt stringers. At 17' bgs: Moist, trace dark brown silt stringers. At 17.5' bgs: Occasional yellow/orange silt stringers. At 18' bgs: Minor clay content. At 19' bgs: No clay and decreasing silt content. At 20' bgs: Increasing silt content, occasional yellow silt stringers.
495.82	20			100			





ERM Environmental Resources Management

JKS-65 DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-65 Date Drilled 2020-08-19
 Project Plant Drains Pond CCR Unit Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 40.00' Boring Diam. 8.25"
 N. Coord. 13664675.83 E. Coord. 2186405.30 Surface Elevation 515.82' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length "0.00"
 Top of Casing Elevation 518.53' Stickup 2.71'
 Depth to Water: 1. Ft. 22.50' (SB Installation) 2. Ft. ()
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

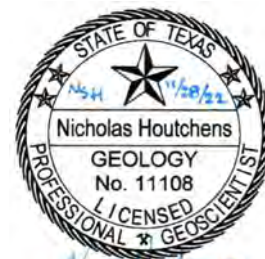
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
495.82	20			100	No Samples Collected		At 21.8' bgs: Trace to minor clay content, occasional yellow/orange silt stringers.
				75			At 22.5' bgs: Color change to light brown, very moist to wet, orange silt stringers.
490.82	25			60			At 25' bgs: Wet.
				100			At 27.5' bgs: Light grey coloring present.
485.82	30			60		30.0-39.5	At 29' bgs: Dark red/orange silt lenses (1" thick). SILTY SAND: Light brown with minor light grey, wet, loose, very fine grained, minor clay content, occasional red/orange silt stringers, no odor.
				60			At 32.5' bgs: Saturated.
480.82	35			100			At 36' bgs: Increasing clay content.
				80		39.5-40.0	At 37.4' bgs: light grey and orange silty clay lens (1" thick). SANDY CLAY: Light orangish brown with minor light grey mottling, wet, soft to medium stiff, low plasticity, sand content very fine grained, occasional silt, minor orange/yellow silt stringers, no odor. Color change to light grey at 39.9' bgs.
475.82	40						At 40' bgs: Boring terminated



STATE OF TEXAS WELL REPORT for Tracking #551889

Owner:	CPS Energy	Owner Well #:	JKS-65
Address:	P.O. Box 2906 San Antonio , TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station 12940 US 181 San Antonio, TX 78263	Latitude:	29° 18' 50.56" N
		Longitude:	098° 19' 02.52" W
Well County:	Bexar	Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **8/17/2020** Drilling End Date: **8/19/2020**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	40

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	18	40	Sand	12/20

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Concrete 1.16 Bags/Sacks
	2	18	Bentonite 8 Bags/Sacks

Seal Method: **Hand Mixed**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **22.5 ft. below land surface on 2020-08-17**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Vortex Drilling Partners, LP**
4412 Bluemel Road
San Antonio, TX 78240

Driller Name: **James E. Neal**

License Number: **4868**

Apprentice Name: **Joe Lopez**

Comments: **No Data**

Report Amended on 8/28/2020 by Request #32573

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	5	No recovery
5	6.5	Sandy Silty Clay
6.5	9.5	Silty Sand
9.5	11.3	Clayey Silt
11.3	12	Clay
12	30	Sand
30	39.5	Silty Sand
39.5	40	Sandy Clay

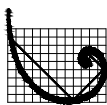
Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	Top Cap (Locking)	New Plastic (PVC)	40		
2	Bottom Cap	New Plastic (PVC)	40		
2	Riser	New Plastic (PVC)	40	-3	20
2	Screen	New Plastic (PVC)	40 0.010	20	40

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540**



ERM Environmental Resources Management

JKS-66 DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-66 Date Drilled 2020-08-18
 Project Plant Drains Pond CCR Unit Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 40.00' Boring Diam. 8.25"
 N. Coord. 13664900.45 E. Coord. 2186752.50 Surface Elevation 514.35' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length 0.00'
 Top of Casing Elevation 517.65' Stickup 3.30'
 Depth to Water: 1. Ft. 22.50' (SB Installation) 2. Ft. ()
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

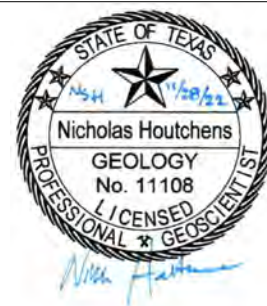
SKETCH MAP

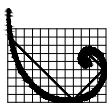


NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
514.35	0			0	No Samples Collected	0-5.0	NO RECOVERY: Soil removed by hydro-excavation.
509.35	5			100		5.0-7.5	SANDY CLAY: Orangish brown with trace orange and red mottling, damp to moist, medium stiff, low plasticity, sand content very fine grained, occasional silt content, no odor. At 7' bgs: Occasional light grey clay lenses.
				75		7.5-12.5	CLAYEY SAND: Orangish brown, moist, loose, slight plasticity, very fine to fine grained, trace light grey clay lenses (abundant at 9.8' bgs), no odor. At 9.5' bgs: Yellowish brown sand lens, fine grained, well sorted (1" thick). At 10' bgs: Minor orange/red/dark brown silt stringers. At 10.3' bgs: Sand lens (similar to above - 1" thick).
504.35	10			90		12.5-23.3	At 11.5' bgs: Light grey clay lens (1" thick; also observed at 12.3' bgs). SAND: Light brownish grey, damp, loose, very fine to fine grained, well sorted, sub-angular, occasional red/orange silt stringers, no odor.
				60			At 14.5' bgs: Red silt clay lens. At 15' bgs: Minor yellow silt stringers.
499.35	15			60			At 17.5' bgs: Minor dark brown silt stringers. At 17.8' bgs: Trace red silty clay lens (0.5" thick). At 19' bgs: Thin, horizontally layered orange/yellow/dark brown silt stringers. At 20' bgs: Occasional yellow/orange silt stringers.
494.35	20			80			





ERM Environmental Resources Management

JKS-66 DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-66 Date Drilled 2020-08-18
 Project Plant Drains Pond CCR Unit Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 40.00' Boring Diam. 8.25"
 N. Coord. 13664900.45 E. Coord. 2186752.50 Surface Elevation 514.35' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length 0.00'
 Top of Casing Elevation 517.65' Stickup 3.30'
 Depth to Water: 1. Ft. 22.50' (SB Installation) 2. Ft. ()
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

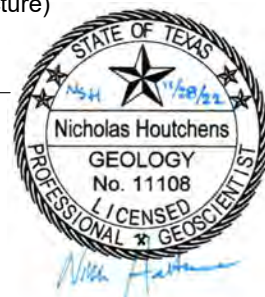
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
494.35	20			60	No Samples Collected	23.3-27.5	At 22.5' bgs: Very moist to wet, abundant orange/yellow silt stringers. CLAYEY SAND: Light brown with abundant orange coloring, moist, loose, non-plastic to slightly plastic, very fine grained, minor silt content, no odor.
				80			
489.35	25			60		27.5-40.0	At 25' bgs: Wet to 25.5' bgs, orange/light brown sandy clay lens. At 25.5' bgs: No orange coloring. SAND: Light brown, wet, loose, very fine grained, poorly sorted, sub-angular, minor silt content, trace orange silt stringers, no odor.
				80			
484.35	30			90			At 30' bgs: Saturated. At 31.8' bgs: Orange silty clay lens (1-2" thick).
				100			At 32.5' bgs: Trace orange silt stringers.
479.35	35			100			At 34.3' bgs: Light brown clay lens, medium plasticity (2" thick). At 35' bgs: Trace to minor orange silt stringers.
				100			At 37.5' bgs: Wet, minor clay content, abundant orange silt stringers.
							At 39' bgs: Some red silt stringers.
474.35	40						At 40' bgs: Boring Terminated.



STATE OF TEXAS WELL REPORT for Tracking #551899

Owner:	CPS Energy	Owner Well #:	JKS-66
Address:	P.O. Box 2906 San Antonio , TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station 12940 US 181 San Antonio, TX 78263	Latitude:	29° 18' 52.65" N
		Longitude:	098° 18' 58.53" W
Well County:	Bexar	Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **8/17/2020** Drilling End Date: **8/19/2020**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	40

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	18	40	Sand	12/20

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Concrete 1.16 Bags/Sacks
	2	18	Bentonite 7 Bags/Sacks

Seal Method: **Hand Mixed**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **22.5 ft. below land surface on 2020-08-18**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Vortex Drilling Partners, LP**
4412 Bluemel Road
San Antonio, TX 78240

Driller Name: **James E. Neal**

License Number: **4868**

Apprentice Name: **Joe Lopez**

Comments: **No Data**

Report Amended on 8/28/2020 by Request #32574

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	5	No recovery
5	7.5	Sandy Clay
7.5	12.5	Clayey Sand
12.5	23.3	Sand
23.3	27.5	Clayey Sand
27.5	40	Sand

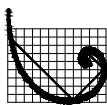
Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	Top Cap (Locking)	New Plastic (PVC)	40		
2	Bottom Cap	New Plastic (PVC)	40		
2	Riser	New Plastic (PVC)	40	-3	20
2	Screen	New Plastic (PVC)	40 0.010	20	40

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540



ERM Environmental Resources Management

JKS-67 DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-67 Date Drilled 2020-08-18
 Project Plant Drains Pond CCR Unit Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 25.00' Boring Diam. 8.25"
 N. Coord. 13664200.80 E. Coord. 2186869.58 Surface Elevation 500.48' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length 0.00'
 Top of Casing Elevation 503.29' Stickup 2.81'
 Depth to Water: 1. Ft. 12.00' (SB Installation) 2. Ft. ()
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

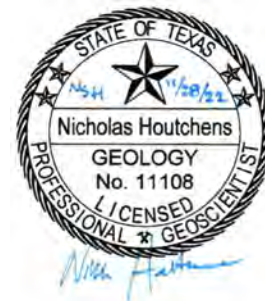
SKETCH MAP

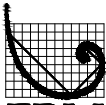


NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
500.48	0			0	No Samples Collected	0-5.0	NO RECOVERY: Soil removed by hydro-excavation
495.48	5			80		5.0- 7.5	SILTY SAND: Dark brown, dry, loose, very fine grained, abundant gravel content (up to 1") and root material, no odor.
				100		7.5-9.5	SILTY CLAYEY SAND: Brown, damp, dense to very dense (very compact), very fine grained, minor gravel content, abundant dark brown and occasional orange silt stringers, no odor
490.48	10			100		9.5-10.0	CLAYEY SAND: Brown, damp to moist, loose to medium dense, slight plasticity, very fine grained, heavily layered with dark brown/orange silt stringers, no odor.
				100		10.0-11.0	
				60		11.0-12.5	SAND: Light brown, very moist, loose, very fine grained, poorly sorted, sub-angular, trace dark brown silt stringers, no odor.
				60		12.5-15.0	CLAYEY SILTY SAND: Light brown with some dark brown and orange coloring, very moist, loose, slight plasticity, very fine grained, no odor. At 12' bgs: Wet.
485.48	15			60		15.0-20.3	SANDY CLAY: Light grey with some orange mottling, wet, soft, slight to low plasticity, sand content very fine grained, no odor.
				60			SILTY CLAYEY SAND: Light brown, wet, loose, very fine grained, minor to occasional dark brown/brown silt stringers, no odor.
				100			At 17.5' bgs: Saturated.
480.48	20						





Environmental Resources Management

JKS-67 DRILLING LOG

Proj. No. 0503422 Boring/Well ID JKS-67 Date Drilled 2020-08-18
 Project Plant Drains Pond CCR Unit Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 25.00' Boring Diam. 8.25"
 N. Coord. 13664200.80 E. Coord. 2186869.58 Surface Elevation 500.48' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 20.00' Sump Length 0.00'
 Top of Casing Elevation 503.29' Stickup 2.81'
 Depth to Water: 1. Ft. 12.00' (SB Installation) 2. Ft. ()
 Drilling Company Vortex Drilling Partners, LP Driller James E. Neal
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

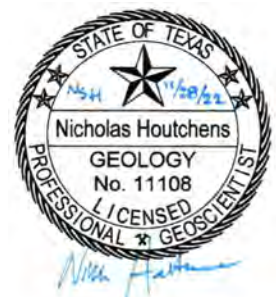
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Recovery (%)	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
480.48	20			100	No Samples Collected	20.3-25.0	SAND: Brown, saturated, loose, very fine grained, poorly sorted, sub-angular, minor silt content, abundant orange fine grained sand stringers and trace dark brown silt stringers, no odor.
				100			At 24.5' bgs: Sand very fine to fine grained, light brown colored layer (2" thick).
475.48	25			60			At 25' bgs: Boring Terminated.
				80			
470.48	30			90			
				100			
465.48	35			100			
				100			
460.48	40						



STATE OF TEXAS WELL REPORT for Tracking #551902

Owner:	CPS Energy	Owner Well #:	JKS-67
Address:	P.O. Box 2906 San Antonio , TX 78299	Grid #:	68-46-5
Well Location:	Calaveras Power Station 12940 US 181 San Antonio, TX 78263	Latitude:	29° 18' 45.98" N
		Longitude:	098° 18' 57.53" W
Well County:	Bexar	Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **8/17/2020** Drilling End Date: **8/19/2020**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	8.25	0	25

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	18	25	Sand	12/20

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Concrete 1.16 Bags/Sacks
	2	8	Bentonite 4.5 Bags/Sacks

Seal Method: **Hand Mixed**

Distance to Property Line (ft.): **No Data**

Sealed By: **Driller**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **10 ft. below land surface on 2020-08-17**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Vortex Drilling Partners, LP**
4412 Bluemel Road
San Antonio, TX 78240

Driller Name: **James E. Neal**

License Number: **4868**

Apprentice Name: **Joe Lopez**

Comments: **No Data**

Report Amended on 8/28/2020 by Request #32575

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	5	No recovery
5	7.5	Silty Sand
7.5	9.5	Silty Clayey Sand
9.5	10	Clayey Sand
10	11	Sand
11	12.5	Clayey Silty Sand
12.5	15	Sandy Clay
15	20.3	Silty Clayey Sand
20.3	25	Sand

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
2	Top Cap (Locking)	New Plastic (PVC)	40		
2	Bottom Cap	New Plastic (PVC)	40		
2	Riser	New Plastic (PVC)	40	-3	10
2	Screen	New Plastic (PVC)	40 0.010	10	25

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540



ERM Environmental Resources Management

JKS-68 DRILLING LOG

Proj. No. 0636109 Boring/Well ID JKS-68 Date Drilled 2022-07-12
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 27.00' Boring Diam. 7.25"
 N. Coord. 13664629.59 E. Coord. 2186983.08 Surface Elevation 503.41' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0.00'
 Top of Casing Elevation 506.34' Stickup 2.93'
 Depth to Water: 1. Ft. 15.00' (Installation) 2. Ft. _____ (_____)
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

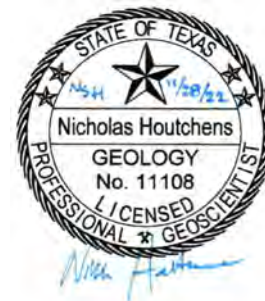
SKETCH MAP

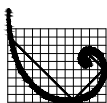


NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
503.41	0				0-5.0	NO RECOVERY: Soil removed by hydro-excavation.
498.41	5				5.0- 9.9	SILTY SAND: Light greyish brown, damp, loose, very fine grained, sub-angular, decreasing silt content with depth, occasional dark brown and minor orange silt stringers, no odor.
493.41	10				9.9-16.0	SAND: Light orangish brown, moist, loose, very fine grained, poorly sorted, sub-angular, occasional silt content, abundant orange silt stringers, no odor. At 12.0' bgs: Very moist. At 13.7' bgs: Color change to light brown At 14.2' bgs: Horizontally layered orange silt lenses. At 15.0' bgs: Very moist to wet.
488.41	15				16.0-27.0	SILTY SAND: Light greyish brown, very moist to wet, loose, very fine grained, sub-angular, abundant orange silt stringers, no odor. At 19.0' bgs: Color change to light brown. At 20.0' bgs: Wet.
483.41	20					





ERM Environmental Resources Management

JKS-68 DRILLING LOG

Proj. No. 0636109 Boring/Well ID JKS-68 Date Drilled 2022-07-12
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 27.00' Boring Diam. 7.25"
 N. Coord. 13664629.59 E. Coord. 2186983.08 Surface Elevation 503.41' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0.00'
 Top of Casing Elevation 506.34' Stickup 2.93'
 Depth to Water: 1. Ft. 15.00' (Installation) 2. Ft. _____ (_____)
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

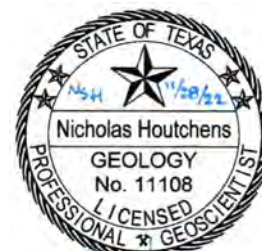
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
483.41	20					At 21.0' bgs: No silt content.
478.41	25			JKS-68_23-25 USCS: Sandy Lean Clay (CL) AL: 30 / 16 / 40 -200 Sieve: 68.3		At 23.0' bgs: Sandy clay lens to 25' bgs. Non-cohesive grab sample collected from 23'-25' bgs.
476.41						At 26.0' bgs: Refusal with split-spoon, switch to solid core bit (soil logged via cuttings). At 27.0' bgs: Drilling refusal (possible bedrock).
	30					
	35					
	40					



STATE OF TEXAS WELL REPORT for Tracking #612892

Owner:	CPS Energy	Owner Well #:	JKS-68
Address:	P.O. Box 2906 San Antonio, TX 78299	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78263	Latitude:	29° 18' 50.01" N
Well County:	Bexar	Longitude:	098° 18' 56.05" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **7/12/2022** Drilling End Date: **7/12/2022**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	7.25	0	27

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	10	27	Sand	16/30

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Concrete 1 Bags/Sacks
	2	10	Bentonite 2 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **15 ft. below land surface on 2022-07-12**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Envirotech Drilling Services LLC**

**PO BOX 19064
Houston, TX 77224**

Driller Name: **Jaime Vasquez**

License Number: **58171**

Comments: **No Data**

Report Amended on 8/24/2022 by Request #37320

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	5	No recovery
5	9.9	Silty Sand (light greyish brown)
9.9	16	Sand (light orangish brown)
16	27	Silty Sand (light greyish brown)

<i>Dia (in.)</i>	<i>Type</i>	<i>Material</i>	<i>Sch./Gage</i>	<i>Top (ft.)</i>	<i>Bottom (ft.)</i>
2	Riser	New Plastic (PVC)	40	-3	12
2	Screen	New Plastic (PVC)	40 0.010	12	27

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540**



Environmental Resources Management

JKS-69 DRILLING LOG

Proj. No. 0636109 Boring/Well ID JKS-69 Date Drilled 2022-07-12
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 40.00' Boring Diam. 7.25"
 N. Coord. 13664320.12 E. Coord. 2186428.47 Surface Elevation 513.01' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00 " Length 15.00 ' Slot Size 0.01 "
 Casing: Type Sch. 40 PVC Diam. 2.00 " Length 25.00 ' Sump Length 0.00'
 Top of Casing Elevation 515.82' Stickup 2.81'
 Depth to Water: 1. Ft. 25.00' (Installation) 2. Ft. _____ (_____)
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

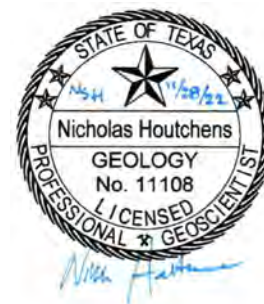
SKETCH MAP

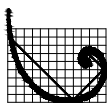


NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
513.01	0			No samples collected	0-5.0	NO RECOVERY: Soil removed by hydro-excavation.
508.01	5				5.0- 8.6	SILTY CLAY: Light orangish brown, moist, medium stiff to stiff, low plasticity, occasional very fine grained sand content, no odor. At 6.5' bgs: Occasional light grey and orange silt stringers to 7.3' bgs.
503.01	10				8.6-10.5	SILTY SAND: Light orangish brown, moist, loose, very fine grained, sub-angular, minor clay content, no odor.
					10.5-11.4	At 10.0' bgs: Color change to orange, increasing clay content. SILTY CLAY: Light grey, moist, soft, low plasticity, abundant orange silt stringers, no odor. Orange sandy clay lens (1" thick) at 10.7' bgs.
					11.4-22.0	At 11.1' bgs: Gradational contact with sand unit below, orange silty sandy clay lens to 11.4' bgs. SAND: Light orangish brown, moist to very moist, medium dense, very fine grained, well sorted, sub-angular, trace silt, minor to occasional orange silt stringers, no odor. At 12.2' bgs: Color Change to light brown.
498.01	15					At 18.5' bgs: Decreasing orange silt stringers.
493.01	20					





ERM Environmental Resources Management

JKS-69 DRILLING LOG

Proj. No. 0636109 Boring/Well ID JKS-69 Date Drilled 2022-07-12
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 40.00' Boring Diam. 7.25"
 N. Coord. 13664320.12 E. Coord. 2186428.47 Surface Elevation 513.01' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 25.00' Sump Length 0.00'
 Top of Casing Elevation 515.82' Stickup 2.81'
 Depth to Water: 1. Ft. 25.00' (Installation) 2. Ft. _____ (_____)
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

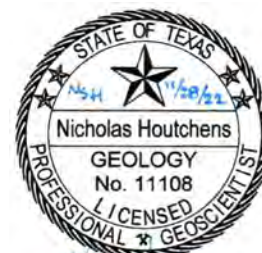
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
493.01	20				22.0-40.0	<p>At 20.5' bgs: Color change to light orangish brown, abundant orange silt stringers.</p> <p>At 21.5' bgs: Minor clay content.</p> <p>SILTY SAND: Light orangish brown, very moist, loose, very fine grained, sub-angular, occasional orange silt stringers (occurrence increases with depth), no odor.</p> <p>At 23.0' bgs: Color change to light brown.</p> <p>At 24.0' bgs: Intermixed pinkish brown color.</p> <p>At 25.0' bgs: Very moist to wet, no silt stringers.</p> <p>At 27.6' bgs: Horizontal dark brown banding (2" or less).</p> <p>At 32.0' bgs: Wet to saturated. Refusal with split-spoon, switch to solid core bit (soil logged via cuttings).</p> <p>At 40.0' bgs: Boring terminated.</p>
488.01	25					
483.01	30					
478.01	35					
473.01	40					



STATE OF TEXAS WELL REPORT for Tracking #612893

Owner:	CPS Energy	Owner Well #:	JKS-69
Address:	P.O. Box 2906 San Antonio, TX 78299	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78263	Latitude:	29° 18' 46.99" N
Well County:	Bexar	Longitude:	098° 19' 02.31" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **7/12/2022** Drilling End Date: **7/12/2022**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	7.25	0	40

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	23	40	Sand	16/30

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Concrete 1 Bags/Sacks
	2	23	Bentonite 6 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed** **Surface Completion by Driller**

Water Level: **25 ft. below land surface on 2022-07-12**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Envirotech Drilling Services LLC**

**PO BOX 19064
Houston, TX 77224**

Driller Name: **Jaime Vasquez**

License Number: **58171**

Comments: **No Data**

Report Amended on 8/24/2022 by Request #37321

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	5	No recovery
5	8.6	Silty clay (light orangish brown)
8.6	10.5	Silty sand (light orangish brown)
10.5	11.4	Silty clay (light grey)
11.4	22	Sand (light orangish brown)
22	40	Silty sand (light orangish brown)

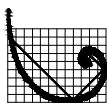
Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	Riser	New Plastic (PVC)	40	-3	25
2	Screen	New Plastic (PVC)	40 0.010	25	40

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540**



Environmental Resources Management

JKS-70 DRILLING LOG

Proj. No. 0636109 Boring/Well ID JKS-70 Date Drilled 2022-07-12
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 27.00' Boring Diam. 7.25"
 N. Coord. 13663092.09 E. Coord. 2186316.21 Surface Elevation 493.51' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0.00'
 Top of Casing Elevation 496.29' Stickup 2.78'
 Depth to Water: 1. Ft. 15.00' (Installation) 2. Ft. _____ (_____)
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

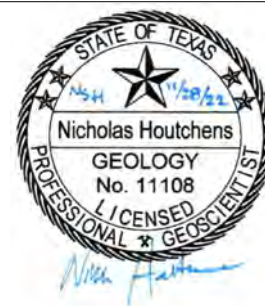
SKETCH MAP

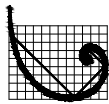


NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
493.51	0			No samples collected	0-5.0	NO RECOVERY: Soil removed by hydro-excavation.
488.51	5				5.0-8.5	SILTY SAND: Brown, moist, loose to medium dense, very fine grained, sub-angular, interbedded with low plasticity clay (light grey), abundant orange and minor yellow silt stringers, no odor.
483.51	10				8.5-11.5	SILTY CLAY: Brown, moist with increasing moisture content with depth, medium stiff, low plasticity, abundant very fine grained sand stringers, occasional orange silt stringers, no odor. At 10.0' bgs: Decreasing moisture content, increasing plasticity, abundant orange silt stringers.
					11.5-13.5	SILT: Brown to orangish brown, damp, medium dense, trace clay and minor very fine grained sand content, occasional clay lenses (light grey, low to medium plasticity), abundant orange and occasional dark brown silt stringers, no odor.
					13.5-15.0	At 12.8' bgs: Color change to orangish brown and dark brown.
478.51	15				15.0-20.8	SILTY SAND: Orangish brown, damp, medium dense, very fine grained, sub-angular, minor clay content (decreases with depth), no odor. At 13.9' bgs: Light grey, low plasticity clay lens (1" thick). SAND: Light grey to light brown, very moist to wet, medium dense (increasing density with depth), very fine grained, poorly sorted, sub-angular, abundant orange silt stringers, no odor.
						At 18.5' bgs: Trace clay content.
473.51	20					At 20.0' bgs: Wet, abundant red silt stringers to 20.3' bgs.





ERM Environmental Resources Management

JKS-70 DRILLING LOG

Proj. No. 0636109 Boring/Well ID JKS-70 Date Drilled 2022-07-12
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 27.00' Boring Diam. 7.25"
 N. Coord. 13663092.09 E. Coord. 2186316.21 Surface Elevation 493.51' Ft. MSL Datum
 Screen: Type Sch. 40 PVC Diam. 2.00" Length 15.00' Slot Size 0.01"
 Casing: Type Sch. 40 PVC Diam. 2.00" Length 12.00' Sump Length 0.00'
 Top of Casing Elevation 496.29' Stickup 2.78'
 Depth to Water: 1. Ft. 15.00' (Installation) 2. Ft. _____ (_____)
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
473.51	20				20.8-22.0	At 20.4' bgs: Abundant orange silt stringers. SILTY CLAYEY SAND: Brown, wet, loose, very fine grained, sub-angular, abundant dark brown silt stringers, no odor.
					22.0-27.0	SAND: Light greyish brown, wet, very dense, very fine grained, well sorted, sub-angular, trace dark brown silt stringers, no odor.
468.51	25					At 25.0' bgs: Saturated.
466.51						At 27.0' bgs: Drilling refusal (possible bedrock).
	30					
	35					
	40					



STATE OF TEXAS WELL REPORT for Tracking #612894

Owner:	CPS Energy	Owner Well #:	JKS-70
Address:	P.O. Box 2906 San Antonio, TX 78299	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78263	Latitude:	29° 18' 34.83" N
Well County:	Bexar	Longitude:	098° 19' 03.65" W
		Elevation:	No Data
Type of Work:	New Well	Proposed Use:	Monitor

Drilling Start Date: **7/12/2022** Drilling End Date: **7/12/2022**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	7.25	0	27

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Filter Packed**

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Filter Material</i>	<i>Size</i>
Filter Pack Intervals:	10	27	Sand	16/30

	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>	<i>Description (number of sacks & material)</i>
Annular Seal Data:	0	2	Concrete 1 Bags/Sacks
	2	10	Bentonite 2.5 Bags/Sacks

Seal Method: **Hand Mixed**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **Surface Sleeve Installed**

Surface Completion by Driller

Water Level: **15 ft. below land surface on 2022-07-12**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Envirotech Drilling Services LLC**

**PO BOX 19064
Houston, TX 77224**

Driller Name: **Jaime Vasquez**

License Number: **58171**

Comments: **No Data**

Report Amended on 9/1/2022 by Request #37418

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	5	0 - 5 ft: No recovery
5	8.5	5 - 8.5 ft: Silty sand (light grey & brown)
8.5	11.5	8.5 - 11.5 ft: Silty clay (brown)
11.5	13.5	11.5 - 13.5 ft: Silt (brown to orangish brown)
13.5	15	13.5 - 15 ft: Silty sand (orangish brown)
15	20.8	15 - 20.8 ft: Sand (light grey to light brown)
20.8	22	20.8 - 22 ft: Silty clayey sand (brown with dark brown)
22	27	22 - 27 ft: Sand (light greyish brown)

Dia (in.)	Type	Material	Sch./Gage	Top (ft.)	Bottom (ft.)
2	Riser	New Plastic (PVC)	40	-3	12
2	Screen	New Plastic (PVC)	40 0.010	12	27

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540**



Environmental Resources Management

SB-20220713-01 DRILLING LOG

Proj. No. 0636109 Boring/Well ID SB-20220713-01 Date Drilled 2022-07-13
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 60.00' Boring Diam. 7.25"
 N. Coord. 13670069.04 E. Coord. 2186901.25 Surface Elevation 533.24' Ft. MSL Datum
 Screen: Type N/A Diam. N/A Length N/A Slot Size N/A
 Casing: Type N/A Diam. N/A Length N/A Sump Length N/A
 Top of Casing Elevation N/A Stickup N/A
 Depth to Water: 1. Ft. 0.00) 2. Ft. 0.00 (
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

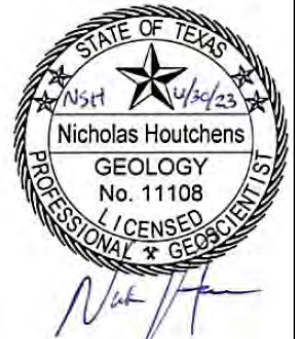
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
533.24	0			No samples collected	0-5.0	NO RECOVERY: Soil removed by hydro-excavation.
528.24	5				5.0-9.0	SILT: Orange, dry, very dense, minor fine grained sand content, occasional red and yellow silt stringers, no odor.
523.24	10				9.0-14.0	At 7.0' bgs: Color change to light greyish brown, abundant silt stringers (red, yellow, orange, and dark brown). At 8.5' bgs: Increasing sand content. CLAY: Brownish grey, damp, very stiff, high plasticity, occasional red, yellow, orange silt stringers, no odor.
518.24	15				14.0-15.0	At 13.7' bgs: Dark brown, medium plasticity, blocky, silty clay lens (3" thick). SAND: Light brown, dry to damp, loose, fine grained, well sorted, sub-angular, minor orange silt stringers, minor clay lenses (grey, high plasticity, 2" or less thickness), no odor.
					15.0-18.7	SILTY CLAY: Grey, dry to damp, stiff to very stiff, medium plasticity, abundant red, yellow, and orange silt stringers (up to 1" thick) to 17' bgs, no odor. At 17.0' bgs: Increasing silt content, minor yellow silt stringers.
					18.7-21.0	At 17.8' bgs: Fine grained, sub-angular, poorly sorted sand lens (2" thick). SILTY SAND: Light brown, dry, loose to medium dense, fine grained, sub-angular, abundant orange and red silt/fine grained sand stringers, minor clay content (at depth), no odor. At 19.0' bgs: Refusal with split-spoon, switch to solid core bit to 20' bgs (soil logged via cuttings).
513.24	20					





Environmental Resources Management

SB-20220713-01 DRILLING LOG

Proj. No. 0636109 Boring/Well ID SB-20220713-01 Date Drilled 2022-07-13
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 60.00' Boring Diam. 7.25"
 N. Coord. 13670069.04 E. Coord. 2186901.25 Surface Elevation 533.24' Ft. MSL Datum
 Screen: Type N/A Diam. N/A Length N/A Slot Size N/A
 Casing: Type N/A Diam. N/A Length N/A Sump Length N/A
 Top of Casing Elevation N/A Stickup N/A
 Depth to Water: 1. Ft. 0.00) 2. Ft. 0.00 (
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

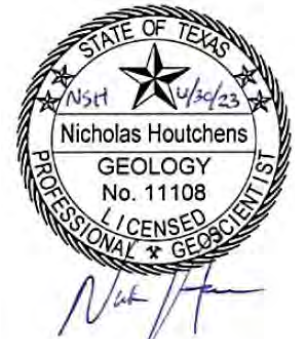
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
513.24	20				21.0-31.7	SILTY CLAY: Brownish grey, damp, very stiff, medium plasticity, abundant orange silt stringers to 22' bgs, no odor. At 22.0' bgs: Slight decrease in silt content with depth, occasional yellow silt stringers. At 24.0' bgs: Horizontally oriented light grey silt stringers. At 25.0' bgs: Damp to moist, slight increase in plasticity, slight decrease in silt content, occasional orange and yellow silt stringers.
508.24	25					
503.24	30					At 30.0' bgs: Silty clay interbedded with horizontally oriented grey, orange, and yellow silt lamina (<1" thick).
					31.7-33.0	CLAYEY SAND: Light greyish brown, damp, loose, slightly plastic, occasional silt content, decreasing clay content with depth, abundant orange and yellow silt stringers, no odor.
					33.0-35.0	CLAY: Brownish grey to dark grey, damp, very stiff, high plasticity, trace silt content (decreases with depth), abundant light grey, orange, and yellow silt stringers, no odor.
498.24	35				35.0-38.7	CLAYEY SILT: Light greyish brown, damp, slight plasticity, abundant alternating lenses of yellow silt and dark brown clay, no odor.
						At 37.5' bgs: Decreasing clay content to 38' bgs, orange silt stringers at 37.9' bgs.
493.24	40				38.7-41.0	SILTY CLAY: Light grey, damp, medium stiff to stiff, slight to low plasticity, abundant light grey and minor yellow silt stringers, occasional intermixed dark brown clay lenses, no odor.





Environmental Resources Management

SB-20220713-01 DRILLING LOG

Proj. No. 0636109 Boring/Well ID SB-20220713-01 Date Drilled 2022-07-13
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 60.00' Boring Diam. 7.25"
 N. Coord. 13670069.04 E. Coord. 2186901.25 Surface Elevation 533.24' Ft. MSL Datum
 Screen: Type N/A Diam. N/A Length N/A Slot Size N/A
 Casing: Type N/A Diam. N/A Length N/A Sump Length N/A
 Top of Casing Elevation N/A Stickup N/A
 Depth to Water: 1. Ft. 0.00) 2. Ft. 0.00 (
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

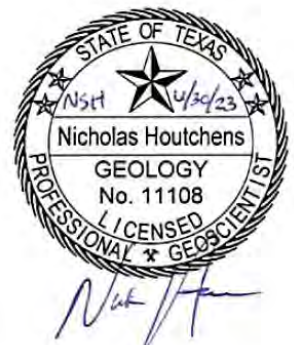
SKETCH MAP



NOTES

Texas Coordinate System - South
 Central Zone from North American
 datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
493.24	40				41.0-60.0	<p>CLAY: Very dark grey, dry to damp, very stiff, high plasticity, blocky texture (soil breaks along silt stringer seams), abundant light grey and orange silt stringers to 41.5' bgs.</p> <p>At 43.0' bgs: Refusal with split-spoon, switch to solid core bit to 45' bgs (soil logged via cuttings).</p> <p>At 45.0' bgs: Clay interbedded with light grey, very fine grained silty sand.</p> <p>At 46.7' bgs: Light grey silt lens (2-3" thick).</p> <p>At 47.0' bgs: Refusal with split-spoon, switch to solid core bit to 50' bgs (soil logged via cuttings).</p> <p>At 51.5' bgs: Grey silt lens (0.5' thick).</p> <p>At 60.0' bgs: Boring terminated.</p>



STATE OF TEXAS WELL REPORT for Tracking #612895

Owner:	CPS Energy	Owner Well #:	SB-20220713-01
Address:	P.O. Box 2906 San Antonio, TX 78299	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78263	Latitude:	29° 19' 43.87" N
Well County:	Bexar	Longitude:	098° 18' 56.58" W
		Elevation:	No Data
			Plugged Within 48 Hours

****This well has been plugged****

Plugging Report Tracking #221710

Type of Work:	New Well	Proposed Use:	Environmental Soil Boring
---------------	-----------------	---------------	----------------------------------

Drilling Start Date: **7/13/2022** Drilling End Date: **7/13/2022**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	7.25	0	60

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Open Hole**

Annular Seal Data: **No Data**

Seal Method: **Not Applicable**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **No Data**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

Strata Depth (ft.)	Water Type
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Envirotech Drilling Services LLC**

**PO BOX 19064
Houston, TX 77224**

Driller Name: **Jaime Vasquez**

License Number: **58171**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

Top (ft.)	Bottom (ft.)	Description
0	5	No recovery
5	9	Silt (orange)
9	14	Clay (brownish grey)
14	15	Sand (light brown)
15	18.7	Silty clay (grey)
18.7	21	Silty sand (light grey)
21	31.7	Silty clay (brownish grey)
31.7	33	Clayey sand (light greyish brown)
33	35	Clay (brownish grey to dark grey)
35	38.7	Clayey silt (light greyish brown)
38.7	41	Silty clay (light grey)
41	60	Clay (very dark grey)

Dia. (in.)	New/Used	Type	Setting From/To (ft.)
No Data			

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

**Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540**

STATE OF TEXAS PLUGGING REPORT for Tracking #221710

Owner:	CPS Energy	Owner Well #:	SB-20220713-01
Address:	P.O. Box 2906 San Antonio, TX 78299	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78263	Latitude:	29° 19' 43.87" N
Well County:	Bexar	Longitude:	098° 18' 56.58" W
		Elevation:	No Data

Well Type: **Environmental Soil Boring**

Drilling Information

Company:	Envirotech Drilling Services LLC	Date Drilled:	7/13/2022
Driller:	Jaime Vasquez	License Number:	58171

Well Report Tracking #612895

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	7.25	0	60

Plugging Information

Date Plugged: **7/13/2022** Plugger:

Plug Method: **Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet**

Casing Left in Well:

Plug(s) Placed in Well:

No Data

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description (number of sacks & material)</i>
0	60	Bentonite 21 Bags/Sacks

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Envirotech Drilling Services LLC**
PO BOX 19064
Houston, TX 77224

Driller Name: **Jaime Vasquez** License Number: **58171**

Comments: **No Data**



Environmental Resources Management

SB-20220713-02 DRILLING LOG

Proj. No. 0636109 Boring/Well ID SB-20220713-02 Date Drilled 2022-07-14
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 47.0' Boring Diam. 7.25"
 N. Coord. 13670423.23 E. Coord. 2186925.41 Surface Elevation 527.62' Ft. MSL Datum
 Screen: Type N/A Diam. N/A Length N/A Slot Size N/A
 Casing: Type N/A Diam. N/A Length N/A Sump Length N/A
 Top of Casing Elevation N/A Stickup N/A
 Depth to Water: 1. Ft. 0.00) 2. Ft. 0.00 ()
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

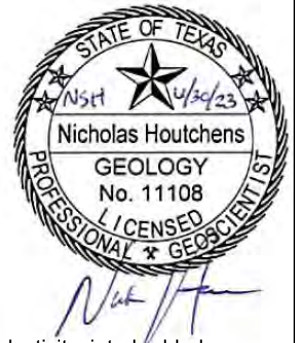
SKETCH MAP



NOTES

Texas Coordinate System - South
 Central Zone from North American
 datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
527.62	0			No samples collected	0-5.0	NO RECOVERY: Soil removed by hydro-excavation.
522.62	5				5.0-7.1	SILTY CLAY: Greyish brown, dry, stiff, medium plasticity, interbedded with light brown silt (lamina up to 0.5" thick), occasional orange silt stringers, no odor.
					7.1-10.0	SILTY SAND: Light brown, dry, dense, very fine grained, sub-angular, minor orange silt stringers to 8.5' bgs. At 8.5' bgs: Greyish brown, medium plasticity clay lens (4" thick), minor yellow silt stringers.
517.62	10				10.0-15.0	SILT: Light grey, dense to very dense, interbedded with dark brown, medium plasticity clay, minor very fine grained sand content, abundant orange and yellow silt stringers, no odor. At 12.2' bgs: Orange silt lens (2' thick). At 13.0' bgs: Orange silt lens (2' thick). At 13.3' bgs: Increasing occurrence of clay lenses, clay content very dark brown. At 14.5 bgs: Color change to orange, very dense, trace dark brown clay content (no longer interbedded).
512.62	15				15.0-20.5	SILTY CLAY: Dark brown, dry, very stiff, medium plasticity, interbedded with abundant light grey, orange, and yellow silt lamina, no odor. At 18.6' bgs: Light greyish brown silt lens (2" thick). At 18.8' bgs: Slightly decreasing occurrence of silt lamina.
507.62	20					





Environmental Resources Management

SB-20220713-02 DRILLING LOG

Proj. No. 0636109 Boring/Well ID SB-20220713-02 Date Drilled 2022-07-14
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 47.0' Boring Diam. 7.25"
 N. Coord. 13670423.23 E. Coord. 2186925.41 Surface Elevation 527.62' Ft. MSL Datum
 Screen: Type N/A Diam. N/A Length N/A Slot Size N/A
 Casing: Type N/A Diam. N/A Length N/A Sump Length N/A
 Top of Casing Elevation N/A Stickup N/A
 Depth to Water: 1. Ft. 0.00) 2. Ft. 0.00 (
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

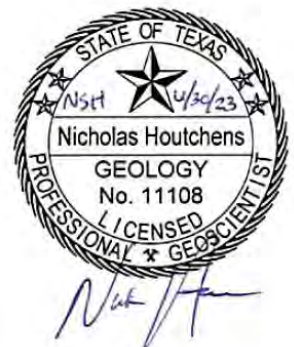
SKETCH MAP



NOTES

Texas Coordinate System - South Central Zone from North American datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
507.62	20				20.5-25.0	NO RECOVERY: Refusal with split-spoon, switch to solid core bit to 25' bgs (very hard layer encountered); rock fragments observed within drill cuttings.
502.62	25				25.0-29.5	SILTY CLAY: Dark brown, dry, very stiff, medium plasticity, interbedded with abundant light grey, orange, and yellow silt lamina, no odor. At 26.4' bgs: Light grey silt lens (1" thick). At 27.1' bgs: Color change to very dark brown.
497.62	30				29.5-47.0	CLAY: Very dark grey, dry, very stiff, high plasticity, occasional light grey and orange silt stringers. At 30.0' bgs: Blocky texture, minor light grey silt and no orange silt stringers.
492.62	35					At 36.0': Refusal with split-spoon, switch to solid core bit to 40' bgs (soil logged via cuttings).
487.62	40					At 40.0' bgs: Increasing silt content to 43' bgs.





Environmental Resources Management

SB-20220713-02 DRILLING LOG

Proj. No. 0636109 Boring/Well ID SB-20220713-02 Date Drilled 2022-07-14
 Project 2022 Well Installation Owner CPS Energy
 Location Calaveras Power Station Boring T.D. 47.0' Boring Diam. 7.25"
 N. Coord. 13670423.23 E. Coord. 2186925.41 Surface Elevation 527.62' Ft. MSL Datum
 Screen: Type N/A Diam. N/A Length N/A Slot Size N/A
 Casing: Type N/A Diam. N/A Length N/A Sump Length N/A
 Top of Casing Elevation N/A Stickup N/A
 Depth to Water: 1. Ft. 0.00) 2. Ft. 0.00 ()
 Drilling Company Envirotech Drilling Services, LLC Driller Juan Martinez
 Drilling Method Hollow-Stem Auger Log By Nick Houtchens

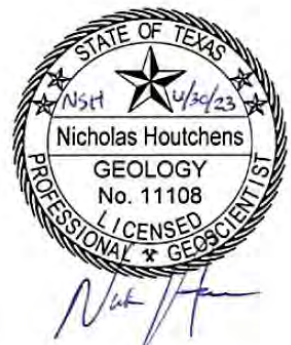
SKETCH MAP



NOTES

Texas Coordinate System - South
 Central Zone from North American
 datum of NAD 83 (NA2011)
 Elevations in NAVD88 (Geoid03).

Elevation (Ft MSL)	Depth (Feet)	Graphic Log	Well Construction	Lab Sample Data	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
487.62	40					
482.62	45					At 43.0' bgs: Trace silt stringers.
						At 46.0' bgs: Refusal with split-spoon, switch to solid core bit to 47' bgs (soil logged via cuttings).
						At 47.0' bgs: Drilling refusal (possible bedrock).
	50					
	50					
	60					



STATE OF TEXAS WELL REPORT for Tracking #612896

Owner:	CPS Energy	Owner Well #:	SB-20220713-02
Address:	P.O. Box 2906 San Antonio, TX 78299	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78263	Latitude:	29° 19' 47.37" N
Well County:	Bexar	Longitude:	098° 18' 56.27" W
		Elevation:	No Data
			Plugged Within 48 Hours

****This well has been plugged****

Plugging Report Tracking #221711

Type of Work:	New Well	Proposed Use:	Environmental Soil Boring
---------------	-----------------	---------------	----------------------------------

Drilling Start Date: **7/13/2022** Drilling End Date: **7/14/2022**

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	7.25	0	47

Drilling Method: **Hollow Stem Auger**

Borehole Completion: **Open Hole**

Annular Seal Data: **No Data**

Seal Method: **Not Applicable**

Sealed By: **Driller**

Distance to Property Line (ft.): **No Data**

Distance to Septic Field or other
concentrated contamination (ft.): **No Data**

Distance to Septic Tank (ft.): **No Data**

Method of Verification: **No Data**

Surface Completion: **No Data**

Water Level: **No Data**

Packers: **No Data**

Type of Pump: **No Data**

Well Tests: **No Test Data Specified**

Water Quality:

<i>Strata Depth (ft.)</i>	<i>Water Type</i>
No Data	No Data

Chemical Analysis Made: **No**

Did the driller knowingly penetrate any strata which
contained injurious constituents?: **No**

Certification Data: The driller certified that the driller drilled this well (or the well was drilled under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the report(s) being returned for completion and resubmittal.

Company Information: **Envirotech Drilling Services LLC**
PO BOX 19064
Houston, TX 77224

Driller Name: **Jaime Vasquez** License Number: **58171**

Comments: **No Data**

Lithology:
DESCRIPTION & COLOR OF FORMATION MATERIAL

Casing:
BLANK PIPE & WELL SCREEN DATA

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description</i>
0	5	No recovery
5	7.1	Silty clay (greyish brown)
7.1	10	Silty sand (light brown)
10	14.5	Silt interbedded with clay (light grey with dark brown)
14.5	15	Silt (orange)
15	20.5	Silty clay (dark brown)
20.5	25	No recovery
25	29.5	Silty clay (dark brown)
29.5	47	Clay (very dark grey)

<i>Dia. (in.)</i>	<i>New/Used</i>	<i>Type</i>	<i>Setting From/To (ft.)</i>
No Data			

IMPORTANT NOTICE FOR PERSONS HAVING WELLS DRILLED CONCERNING CONFIDENTIALITY

TEX. OCC. CODE Title 12, Chapter 1901.251, authorizes the owner (owner or the person for whom the well was drilled) to keep information in Well Reports confidential. The Department shall hold the contents of the well log confidential and not a matter of public record if it receives, by certified mail, a written request to do so from the owner.

Please include the report's Tracking Number on your written request.

Texas Department of Licensing and Regulation
P.O. Box 12157
Austin, TX 78711
(512) 334-5540

STATE OF TEXAS PLUGGING REPORT for Tracking #221711

Owner:	CPS Energy	Owner Well #:	SB-20220713-02
Address:	P.O. Box 2906 San Antonio, TX 78299	Grid #:	68-46-5
Well Location:	12940 US 181 San Antonio, TX 78263	Latitude:	29° 19' 47.37" N
Well County:	Bexar	Longitude:	098° 18' 56.27" W
		Elevation:	No Data

Well Type: **Environmental Soil Boring**

Drilling Information

Company:	Envirotech Drilling Services LLC	Date Drilled:	7/14/2022
Driller:	Jaime Vasquez	License Number:	58171

Well Report Tracking #612896

	<i>Diameter (in.)</i>	<i>Top Depth (ft.)</i>	<i>Bottom Depth (ft.)</i>
Borehole:	7.25	0	47

Plugging Information

Date Plugged: **7/14/2022** Plugger:

Plug Method: **Pour in 3/8 bentonite chips when standing water in well is less than 100 feet depth, cement top 2 feet**

Casing Left in Well:

Plug(s) Placed in Well:

No Data

<i>Top (ft.)</i>	<i>Bottom (ft.)</i>	<i>Description (number of sacks & material)</i>
0	47	Bentonite 16 Bags/Sacks

Certification Data: The driller certified that the driller plugged this well (or the well was plugged under the driller's direct supervision) and that each and all of the statements herein are true and correct. The driller understood that failure to complete the required items will result in the reports(s) being returned for completion and resubmittal.

Company Information: **Envirotech Drilling Services LLC**
PO BOX 19064
Houston, TX 77224

Driller Name: **Jaime Vasquez** License Number: **58171**

Comments: **No Data**

APPENDIX B GEOTECHNICAL LABORATORY RESULTS



TABLE 1

LABORATORY TEST SUMMARY

PAGE 1 OF 1

PROJECT: GW Investigation / CPS Calaveras Station

HTS PROJECT NO.: 16-S-217

LOCATION: San Antonio, Texas

CLIENT: ERM

ERM PROJECT #: 0337367

Sample ID	Sample Depth (feet)	Type of Material	Moisture Content (%)	Bulk Density (pcf)	Atterberg Limits (%)			-200 Sieve (%)	Coefficient of Permeability, k (cm/sec)	Solids Specific Gravity	Remarks
					LL	PL	PI				
JKS-45	28-30	Fat Clay (CH)	24.3	120.9	61	22	39	91.6*	1.82 ⁻⁰⁸	2.696	28'-30': Particle Size Analysis (ASTM D422)
	36-38	Fat Clay (CH)	19.0		67	24	43	90.5*			36'-38': Particle Size Analysis (ASTM D422)
	50-52	Silty Sand (SM)	18.0		Non Plastic			12.6*			50'-52': Particle Size Analysis (ASTM D422)
	55-57	Fat Clay (CH)	27.9		75	28	47	97.0*			55'-57': Particle Size Analysis (ASTM D422)
	60-62	Fat Clay (CH)	22.6		75	26	49	86.4*			60'-62': Particle Size Analysis (ASTM D421) (no hydrometer)
JKS-48	10-12.5	Clayey Sand (SC)	20.5		35	16	19	44.6*			10'-12.5': Particle Size Analysis (ASTM D422)
	15-16.5	Sandy Lean Clay (CL)	19.1		48	19	29	58.9*			15'-16.5': Particle Size Analysis (ASTM D422)
	19-20	Clayey Sand (SC)	25.2		26	16	10	48.7*			19'-20': Particle Size Analysis (ASTM D422)
* From Particle Size Analysis testing											



HTS, Inc. Consultants
9416 Pickering Street
Houston, Texas 77091
Tel: (713) 692-8373 Fax: (713) 692-8501

SPECIFIC GRAVITY OF SOIL SOLIDS

(ASTM D-854)

Project No:	16-S-217	Sample Identification:	Samples transported to HTS Laboratory on 04/12/2016
Technician:	M. Coronado	Sample Description:	Fat Clay (CH)

Project : Laboratory Testing - GW Investigation / CPS Calaveras Station (ERM Project #: 0337367)

LABORATORY TEST DATA/ RESULTS

	Sample:	JKS-45, 60'-62'		
	Flask No.	F-1		
	Flask Weight (gms)	171.83		
	Weight of Dry Soil (gms)	50.02		
	Wt. Flask and Water (gms)	669.90		
	Wt. Flask+Water+Soil (gms)	701.37		
	Volume of Flask at 20° (ml)	500.0		
	Container No.	51		
	Wt. of Container (gms)	30.49		
	Wt. of Container + Soil (gms)	80.51		
	Temperature (° C)	20.9		
	Specific Gravity:	2.696		

Performed By: MC Date: 5/9/2016

Checked By: BFM Date: 05/13/16



HTS, Inc. Consultants
9416 Pickering Street
Houston, Texas 77091
Tel: (713) 692-8373 Fax: (713) 692-8501

FALLING HEAD / RISING TAIL HYDRAULIC CONDUCTIVITY TEST

(ASTM D-5084-03)

Project No:	16-S-217	Sample Identification:	JKS-45, Depth = 60'-62'
Technician:	M. Coronado	Sample Description:	Fat Clay (CH)

Project : Laboratory Testing - GW Investigation / CPS Calaveras Station (ERM #: 0337367)

INITIAL CONDITIONS				FINAL CONDITIONS			
WATER CONTENT		SPECIMEN DATA		WATER CONTENT		SPECIMEN DATA	
Tare No.:	50	Length, in:	2.065	Tare No.:	46	Length, in:	2.048
Wet+Tare, gms:	153.61	Diameter, in:	2.763	Wet+Tare, gms:	154.96	Diameter, in:	2.815
Dry+Tare, gms:	130.96	Wet mass, gms:	402.31	Dry+Tare, gms:	128.83	Wet mass, gms:	413.68
Tare Weight, gms:	30.50	Area, cm ² :	38.68	Tare Weight, gms:	30.50	Area, cm ² :	40.15
Moisture, %	22.5	Volume, cc:	202.9	Moisture, %	26.6	Volume, cc:	208.9
		Unit wet wt, pcf:	123.7			Unit wet wt, pcf:	123.6
Specific Gravity:	2.696	Unit dry wt, pcf:	101.0	Specific Gravity:	2.696	Unit dry wt, pcf:	97.6
Saturation, %:	91.2	Void Ratio:	0.666	Saturation, %:	99.1	Void Ratio:	0.723
Perm. Cell No.:	3	Burret diam, cm:	1.123	Burret area, cm ² :	0.991	Burret factor, cm/cc:	1.009
Cell Pressure, psi:	10.0	Head Pressure, psi:	7.0	Tail Pressure, psi:	5.0	Hydraulic Gradient:	30.3

PERMEABILITY MEASUREMENTS

Date	Time	Elapsed Time (sec)	Temp (C)	Pressure Diff. (psi)	Head Rdg (cc)	Tail Rdg (cc)	Head Change (cm)	Tail Change (cm)	Total Head (cm)	Permeability Kt (cm/sec)	Permeability K ₂₀ (cm/sec)
5/2/2016	9:15a	0	21.9	2.0	2.00	20.00	0.000	0.000	158.76	0.00E+00	0.00E+00
5/2/2016	12:15p	10800	21.9	2.0	2.20	19.70	0.202	0.303	158.26	1.89E-08	1.81E-08
5/2/2016	3:20p	11100	22.0	2.0	2.50	19.40	0.303	0.303	157.65	2.22E-08	2.12E-08
5/3/2016	9:15a	64500	21.9	2.0	4.00	17.90	1.514	1.514	154.63	1.93E-08	1.85E-08
5/3/2016	12:20p	11100	21.9	2.0	4.50	17.40	0.505	0.505	153.62	3.79E-08	3.63E-08
5/4/2016	9:25a	75900	21.9	2.0	6.00	16.00	1.514	1.413	150.69	1.63E-08	1.56E-08
5/4/2016	12:55p	12600	22.0	2.0	6.30	15.70	0.303	0.303	150.08	2.05E-08	1.96E-08
5/4/2016	4:35p	13200	22.0	2.0	6.60	15.40	0.303	0.303	149.48	1.97E-08	1.88E-08
5/5/2016	9:10a	59700	21.9	2.0	8.00	14.10	1.413	1.312	146.75	1.98E-08	1.89E-08

Coefficient of Permeability, k = **1.82E-08** cm/sec

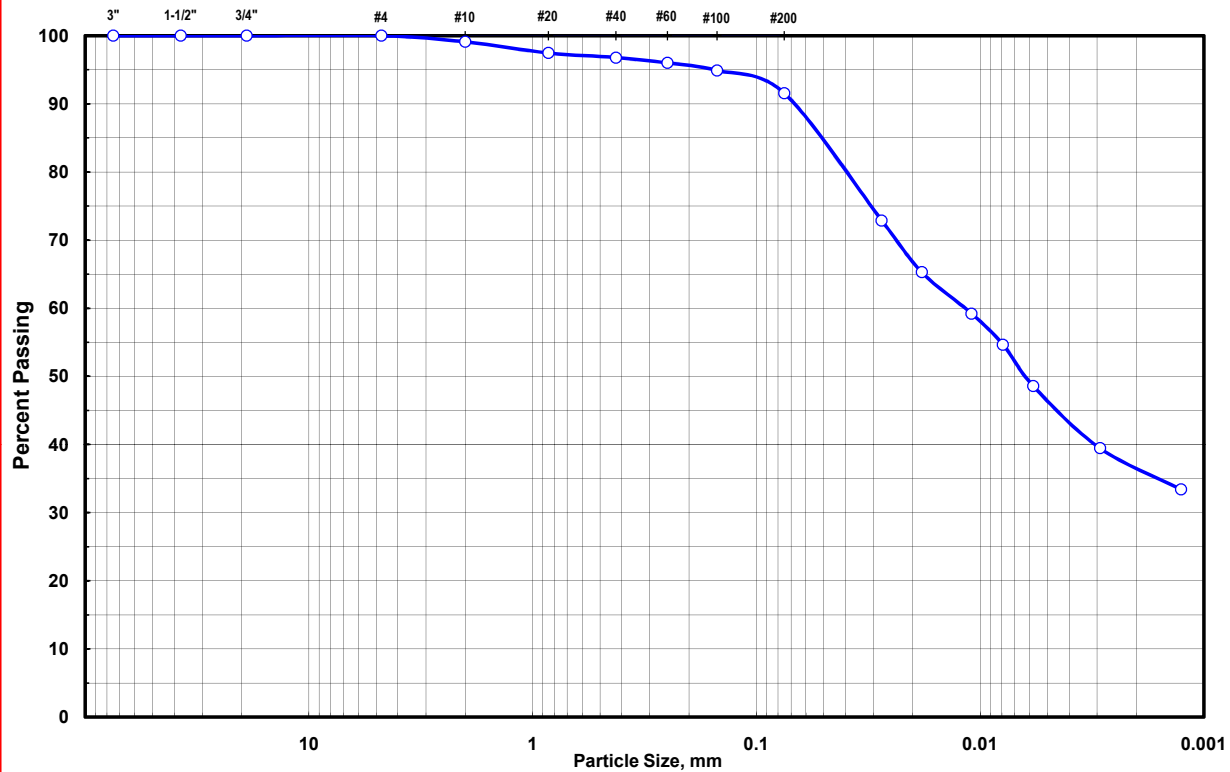
Performed By: MC Date: 4/26/2016 Checked By: BFM Date: 05/13/16



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

Project:	Laboratory Testing - GW Investigation / CPS Calaveras Station	Liquid Limit:	61	% Pass No. 200:	91.6
Client:	ERM	Plastic Limit:	22	% Moisture:	24.3
Project No.:	16-S-217	Plasticity Index:	39	Test Method:	ASTM D-422
Sample ID:	JKS-45, 28'-30'	Tested By:	MC	Date Tested:	4/25/2016
Remarks:	ERM Project #: 0337367	Checked By:	BFM		
Description:	Fat Clay (CH)	Date Checked:	5/12/2016		

HYDROMETER ANALYSIS

CLIENT: ERM PROJECT: CPS Calaveras Station DATE: 4/25/2016

DATE SAMPLED: 04/12/16 LABORATORY I.D. NO: _____

SAMPLE LOCATION: JKS-45, 28'-30' SAMPLE DESCRIPTION: Fat Clay (CH)

DISPERSING AGENT: Sodium Hexametaphosphate COMPOSITE CORRECTION: 3

SPECIFIC GRAVITY OF SOIL: 2.70 (estimated) DRY WEIGHT OF SOIL: 65.02

GRADUATE: 1000 ML HYDROMETER: 152H a VALUE: 0.99

TIME OF READING	ELAPSED TIME (min)	TEMP READING (C)	ACTUAL HYDROMETER READING	CORRECTED HYDROMETER READING (Composite Reading)	EFFECTIVE DEPTH L, cm	VALUE OF K	DIAMETER OF PARTICLE SIZE, mm	PERCENT FINER
9:57 AM	0							
9:59 AM	2	20.9	51.0	48.0	8.40	0.01344	0.0275	73.5
10:02 AM	5	20.9	46.0	43.0	9.20	0.01344	0.0182	65.9
10:12 AM	15	20.9	42.0	39.0	9.90	0.01344	0.0109	59.7
10:27 AM	30	20.9	39.0	36.0	10.40	0.01344	0.0079	55.1
10:57 AM	60	20.9	35.0	32.0	11.10	0.01344	0.0058	49.0
2:07 PM	250	21.0	29.0	26.0	12.00	0.01328	0.0029	39.8
9:57 AM	1440	20.9	25.0	22.0	12.70	0.01344	0.0013	33.7

SIEVE ANALYSIS

STARTING WEIGHT: 65.02 gms. Container ID: F STARTING DRY WEIGHT: 64.63 gms.

Container + Soil: 29.35 gms. (corrected for hygroscopic moisture)

Container + Dry Soil: 29.26 gms.

Wt. of Container: 14.33 gms.

Hygroscopic Moisture: 0.60 %

SIEVE SIZE	PARTICLE SIZE, mm	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
3"	75.0000	0.00	0.0	100.0
1-1/2"	37.5000	0.00	0.0	100.0
3/4"	19.0000	0.00	0.0	100.0
#4	4.7500	0.00	0.0	100.0
#10	2.0000	0.57	0.9	99.1
#20	0.8500	1.08	1.7	97.5
#40	0.4250	1.53	2.3	96.8
#60	0.2500	2.04	3.1	96.0
#100	0.1500	2.76	4.3	94.9
#200	0.0750	4.97	7.6	91.6
	0.0275			72.9
	0.0182			65.3
	0.0109			59.2
	0.0079			54.7
	0.0058			48.6
	0.0029			39.5
	0.0013			33.4

HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-422)

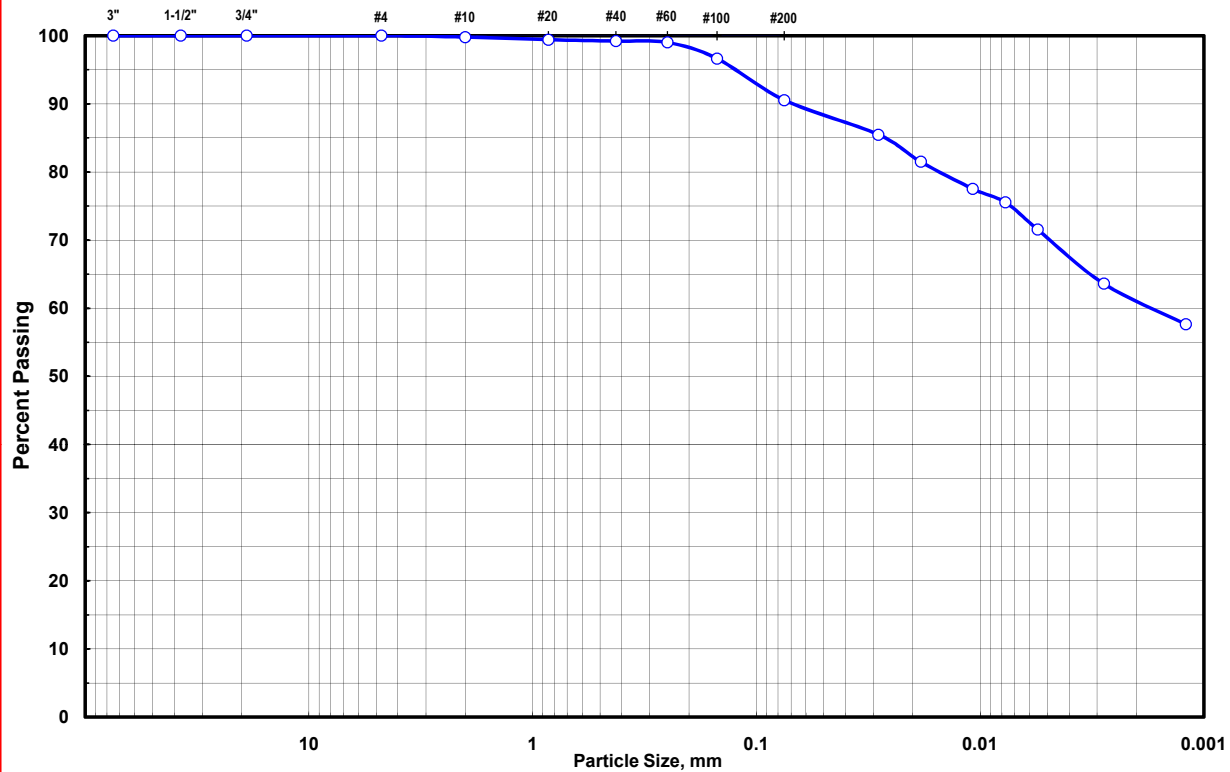




HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

Project:	Laboratory Testing - GW Investigation / CPS Calaveras Station	Liquid Limit:	67	% Pass No. 200:	90.5
Client:	ERM	Plastic Limit:	24	% Moisture:	19.0
Project No.:	16-S-217	Plasticity Index:	43	Test Method:	ASTM D-422
Sample ID:	JKS-45, 36'-38'	Tested By:	MC	Date Tested:	4/25/2016
Remarks:	ERM Project #: 0337367	Checked By:	BFM		
Description:	Fat Clay (CH)	Date Checked:	5/12/2016		

HYDROMETER ANALYSIS

CLIENT: ERM PROJECT: CPS Calaveras Station DATE: 4/25/2016

DATE SAMPLED: 04/12/16 LABORATORY I.D. NO: _____

SAMPLE LOCATION: JKS-45, 36'-38' SAMPLE DESCRIPTION: Fat Clay (CH)

DISPERSING AGENT: Sodium Hexametaphosphate COMPOSITE CORRECTION: 3

SPECIFIC GRAVITY OF SOIL: 2.70 (estimated) DRY WEIGHT OF SOIL: 50.04

GRADUATE: 1000 ML HYDROMETER: 152H a VALUE: 0.99

TIME OF READING	ELAPSED TIME (min)	TEMP READING (C)	ACTUAL HYDROMETER READING	CORRECTED HYDROMETER READING (Composite Reading)	EFFECTIVE DEPTH L, cm	VALUE OF K	DIAMETER OF PARTICLE SIZE, mm	PERCENT FINER
10:07 AM	0							
10:09 AM	2	21.0	46.0	43.0	9.20	0.01328	0.0285	85.6
10:12 AM	5	21.0	44.0	41.0	9.60	0.01328	0.0184	81.7
10:22 AM	15	21.0	42.0	39.0	9.90	0.01328	0.0108	77.7
10:37 AM	30	21.0	41.0	38.0	10.10	0.01328	0.0077	75.7
11:07 AM	60	21.0	39.0	36.0	10.40	0.01328	0.0055	71.7
2:17 PM	250	21.0	35.0	32.0	11.10	0.01328	0.0028	63.7
10:07 AM	1440	20.9	32.0	29.0	11.50	0.01344	0.0012	57.8

SIEVE ANALYSIS

STARTING WEIGHT: 50.04 gms. Container ID: B STARTING DRY WEIGHT: 49.71 gms.

Container + Soil: 29.35 gms. (corrected for hygroscopic moisture)

Container + Dry Soil: 29.25 gms.

Wt. of Container: 14.32 gms.

Hygroscopic Moisture: 0.67 %

SIEVE SIZE	PARTICLE SIZE, mm	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
3"	75.0000	0.00	0.0	100.0
1-1/2"	37.5000	0.00	0.0	100.0
3/4"	19.0000	0.00	0.0	100.0
#4	4.7500	0.00	0.0	100.0
#10	2.0000	0.10	0.2	99.8
#20	0.8500	0.20	0.4	99.4
#40	0.4250	0.29	0.6	99.2
#60	0.2500	0.40	0.8	99.0
#100	0.1500	1.58	3.2	96.6
#200	0.0750	4.65	9.3	90.5
	0.0285			85.5
	0.0184			81.5
	0.0108			77.5
	0.0077			75.5
	0.0055			71.6
	0.0028			63.6
	0.0012			57.6

HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-422)

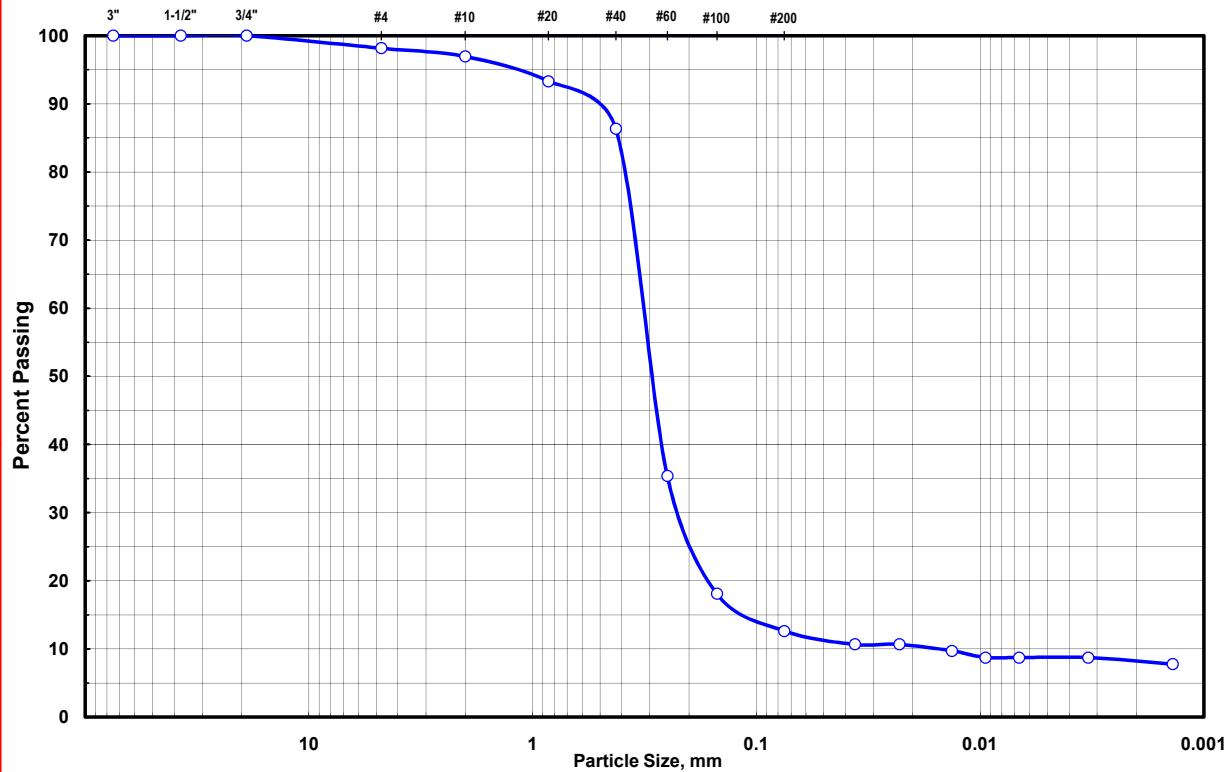




HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

Project:	Laboratory Testing - GW Investigation / CPS Calaveras Station	Liquid Limit:	Non-Plastic	% Pass No. 200:	12.6
Client:	ERM	Plastic Limit:	Non-Plastic	% Moisture:	18.0
Project No.:	16-S-217	Plasticity Index:	Non-Plastic	Test Method:	ASTM D-422
Sample ID:	JKS-45, 50'-52'	Tested By:	MC	Date Tested:	3/29/2016
Remarks:	ERM Project #: 0337367	Checked By:	BFM		
Description:	Silty Sand (SM)	Date Checked:	5/12/2016		

HYDROMETER ANALYSIS

CLIENT: ERM PROJECT: CPS Calaveras Station DATE: 5/2/2016

DATE SAMPLED: 04/12/16 LABORATORY I.D. NO: _____

SAMPLE LOCATION: JKS-45, 50'-52' SAMPLE DESCRIPTION: Silty Sand (SM)

DISPERSING AGENT: Sodium Hexametaphosphate COMPOSITE CORRECTION: 3

SPECIFIC GRAVITY OF SOIL: 2.65 (estimated) DRY WEIGHT OF SOIL: 100.02

GRADUATE: 1000 ML HYDROMETER: 152H a VALUE: 1.00

TIME OF READING	ELAPSED TIME (min)	TEMP READING (C)	ACTUAL HYDROMETER READING	CORRECTED HYDROMETER READING (Composite Reading)	EFFECTIVE DEPTH L, cm	VALUE OF K	DIAMETER OF PARTICLE SIZE, mm	PERCENT FINER
10:22 AM	0							
10:24 AM	2	21.2	14.0	11.0	14.50	0.01348	0.0363	11.0
10:27 AM	5	21.2	14.0	11.0	14.50	0.01348	0.0230	11.0
10:37 AM	15	21.2	13.0	10.0	14.70	0.01348	0.0133	10.0
10:52 AM	30	21.2	12.0	9.0	14.80	0.01348	0.0095	9.0
11:22 AM	60	21.3	12.0	9.0	14.80	0.01348	0.0067	9.0
2:32 PM	250	21.3	12.0	9.0	14.80	0.01348	0.0033	9.0
10:22 AM	1440	21.0	11.0	8.0	15.00	0.01348	0.0014	8.0

SIEVE ANALYSIS

STARTING WEIGHT: 100.02 gms. Container ID: A STARTING DRY WEIGHT: 99.89 gms.

Container + Soil: 29.49 gms. (corrected for hygroscopic moisture)

Container + Dry Soil: 29.47 gms.

Wt. of Container: 14.42 gms.

Hygroscopic Moisture: 0.13 %

SIEVE SIZE	PARTICLE SIZE, mm	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
3"	75.0000	0.00	0.0	100.0
1-1/2"	37.5000	0.00	0.0	100.0
3/4"	19.0000	0.00	0.0	100.0
#4	4.7500	1.83	1.8	98.2
#10	2.0000	3.04	3.0	97.0
#20	0.8500	3.76	3.8	93.3
#40	0.4250	10.95	11.0	86.3
#60	0.2500	63.50	63.5	35.4
#100	0.1500	81.36	81.3	18.1
#200	0.0750	87.00	87.0	12.6
	0.0363			10.7
	0.0230			10.7
	0.0133			9.7
	0.0095			8.7
	0.0067			8.7
	0.0033			8.7
	0.0014			7.8

HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-422)

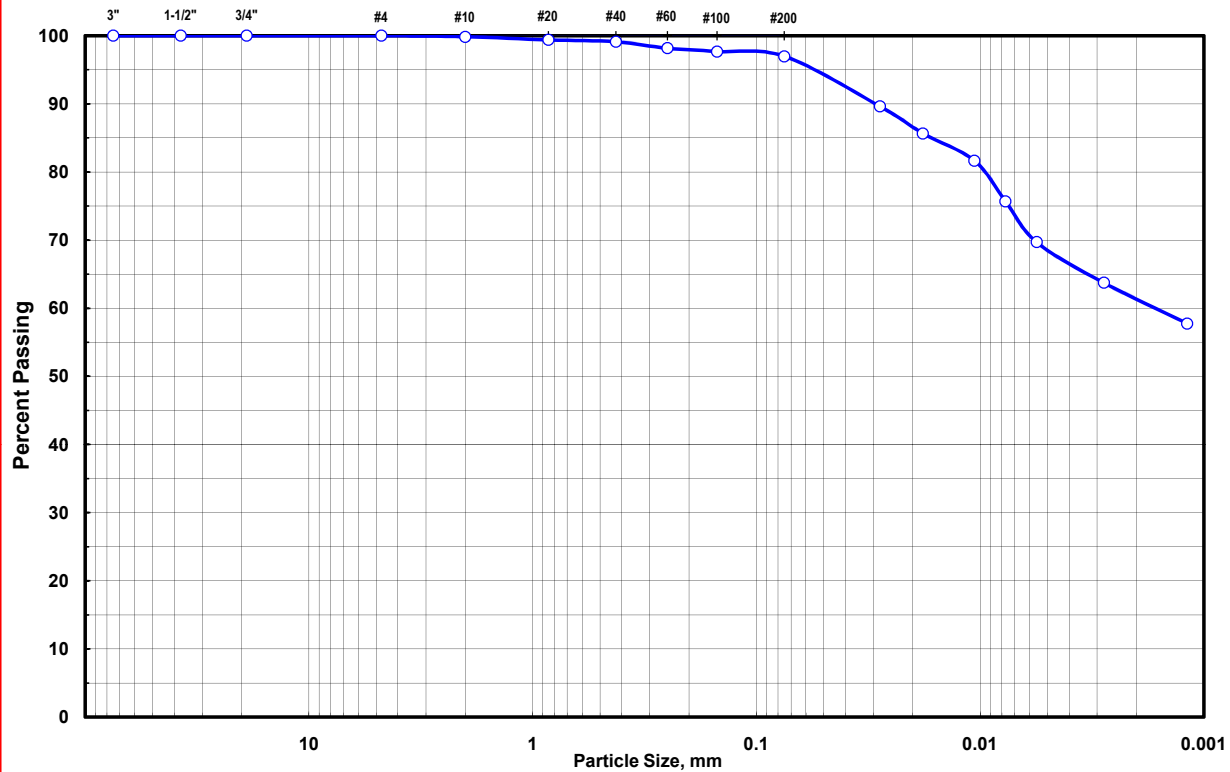




HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

Project:	Laboratory Testing - GW Investigation / CPS Calaveras Station	Liquid Limit:	75	% Pass No. 200:	97.0
Client:	ERM	Plastic Limit:	28	% Moisture:	27.9
Project No.:	16-S-217	Plasticity Index:	47	Test Method:	ASTM D-422
Sample ID:	JKS-45, 55'-57'	Tested By:	MC	Date Tested:	5/2/2016
Remarks:	ERM Project #: 0337367	Checked By:	BFM		
Description:	Fat Clay (CH)	Date Checked:	5/13/2016		

HYDROMETER ANALYSIS

CLIENT: ERM PROJECT: CPS Calaveras Station DATE: 5/2/2016

DATE SAMPLED: 04/12/16 LABORATORY I.D. NO: _____

SAMPLE LOCATION: JKS-45, 55'-57' SAMPLE DESCRIPTION: Fat Clay (CH)

DISPERSING AGENT: Sodium Hexametaphosphate COMPOSITE CORRECTION: 3

SPECIFIC GRAVITY OF SOIL: 2.70 (estimated) DRY WEIGHT OF SOIL: 50.02

GRADUATE: 1000 ML HYDROMETER: 152H a VALUE: 0.99

TIME OF READING	ELAPSED TIME (min)	TEMP READING (C)	ACTUAL HYDROMETER READING	CORRECTED HYDROMETER READING (Composite Reading)	EFFECTIVE DEPTH L, cm	VALUE OF K	DIAMETER OF PARTICLE SIZE, mm	PERCENT FINER
10:32 AM	0							
10:34 AM	2	21.4	48.0	45.0	8.90	0.01328	0.0280	89.8
10:37 AM	5	21.4	46.0	43.0	9.20	0.01328	0.0180	85.8
10:47 AM	15	21.4	44.0	41.0	9.60	0.01328	0.0106	81.8
11:02 AM	30	21.4	41.0	38.0	10.10	0.01328	0.0077	75.8
11:32 AM	60	21.4	38.0	35.0	10.60	0.01328	0.0056	69.8
2:42 PM	250	21.4	35.0	32.0	11.10	0.01328	0.0028	63.8
10:32 AM	1440	21.0	32.0	29.0	11.50	0.01328	0.0012	57.9

SIEVE ANALYSIS

STARTING WEIGHT: 50.02 gms. Container ID: D STARTING DRY WEIGHT: 49.62 gms.

Container + Soil: 29.20 gms. (corrected for hygroscopic moisture)

Container + Dry Soil: 29.08 gms.

Wt. of Container: 14.19 gms.

Hygroscopic Moisture: 0.81 %

SIEVE SIZE	PARTICLE SIZE, mm	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
3"	75.0000	0.00	0.0	100.0
1-1/2"	37.5000	0.00	0.0	100.0
3/4"	19.0000	0.00	0.0	100.0
#4	4.7500	0.00	0.0	100.0
#10	2.0000	0.08	0.2	99.8
#20	0.8500	0.23	0.5	99.4
#40	0.4250	0.36	0.7	99.1
#60	0.2500	0.84	1.7	98.2
#100	0.1500	1.08	2.2	97.7
#200	0.0750	1.44	2.9	97.0
	0.0280			89.6
	0.0180			85.7
	0.0106			81.7
	0.0077			75.7
	0.0056			69.7
	0.0028			63.7
	0.0012			57.8

HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-422)

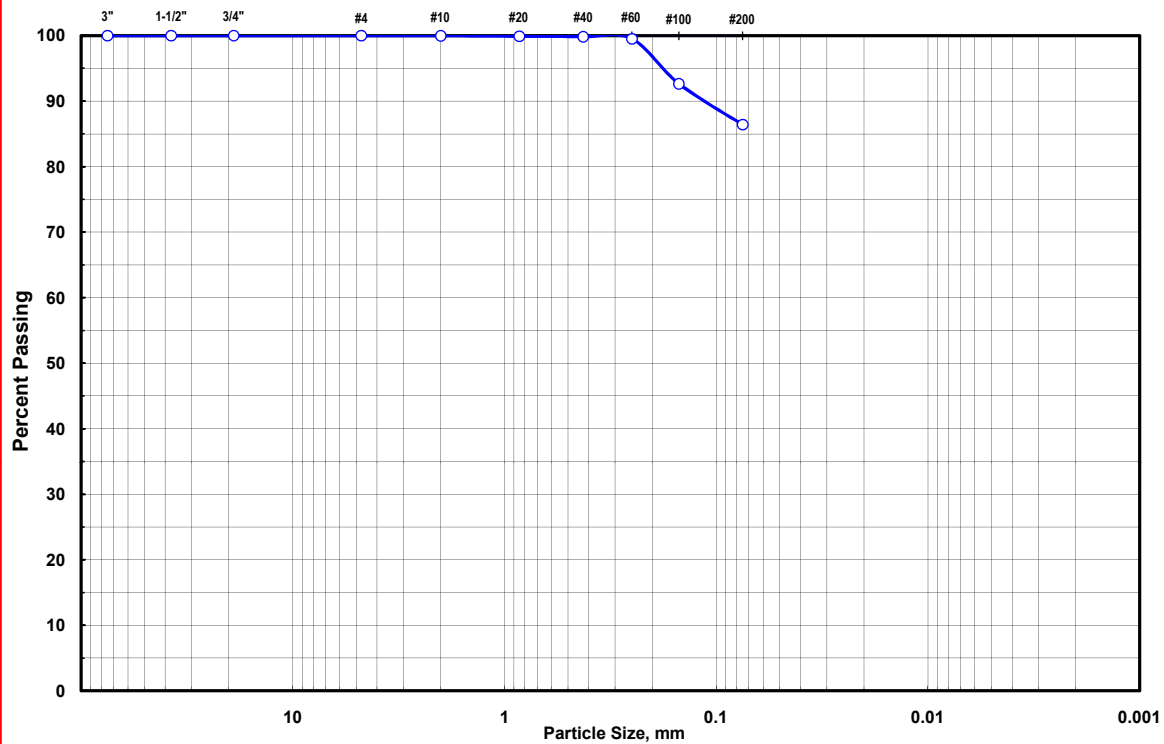




HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

Project:	Laboratory Testing - GW Investigation / CPS Calaveras Station	Liquid Limit:	75	% Pass No. 200:	86.4
Client:	ERM	Plastic Limit:	26	% Moisture:	22.6
Project No.:	16-S-217	Plasticity Index:	49	Test Method:	ASTM D-421
Sample ID:	JKS-45, 60'-62'	Tested By:	MC	Date Tested:	5/2/2016
Remarks:	ERM Project #: 0337367	Checked By:	BFM		
Description:	Fat Clay (CH)	Date Checked:	5/13/2016		

HYDROMETER ANALYSIS

CLIENT: ERM PROJECT: CPS Calaveras Station DATE: 4/28/2016

DATE SAMPLED: 04/12/16 LABORATORY I.D. NO: _____

SAMPLE LOCATION: JK-45, 60'-62' SAMPLE DESCRIPTION: Fat Clay (CH)

DISPERSING AGENT: Sodium Hexametaphosphate COMPOSITE CORRECTION: 3

SPECIFIC GRAVITY OF SOIL: 2.70 (estimated) DRY WEIGHT OF SOIL: 220.50

GRADUATE: 1000 ML HYDROMETER: 152H a VALUE: 0.99

TIME OF READING	ELAPSED TIME (min)	TEMP READING (C)	ACTUAL HYDROMETER READING	CORRECTED HYDROMETER READING (Composite Reading)	EFFECTIVE DEPTH L, cm	VALUE OF K	DIAMETER OF PARTICLE SIZE, mm	PERCENT FINER

SIEVE ANALYSIS

STARTING WEIGHT: 220.50 gms. Container ID: E STARTING DRY WEIGHT: 220.50 gms.

Container + Soil: 527.07 gms. (corrected for hygroscopic moisture)

Container + Dry Soil: 527.07 gms.

Wt. of Container: 365.51 gms.

Hygroscopic Moisture: 0.00 %

SIEVE SIZE	PARTICLE SIZE, mm	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
3"	75.0000	0.00	0.0	100.0
1-1/2"	37.5000	0.00	0.0	100.0
3/4"	19.0000	0.00	0.0	100.0
#4	4.7500	0.00	0.0	100.0
#10	2.0000	0.02	0.0	100.0
#20	0.8500	0.20	0.1	99.9
#40	0.4250	0.37	0.2	99.8
#60	0.2500	1.08	0.5	99.5
#100	0.1500	16.21	7.4	92.6
#200	0.0750	29.92	13.6	86.4

HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-421)

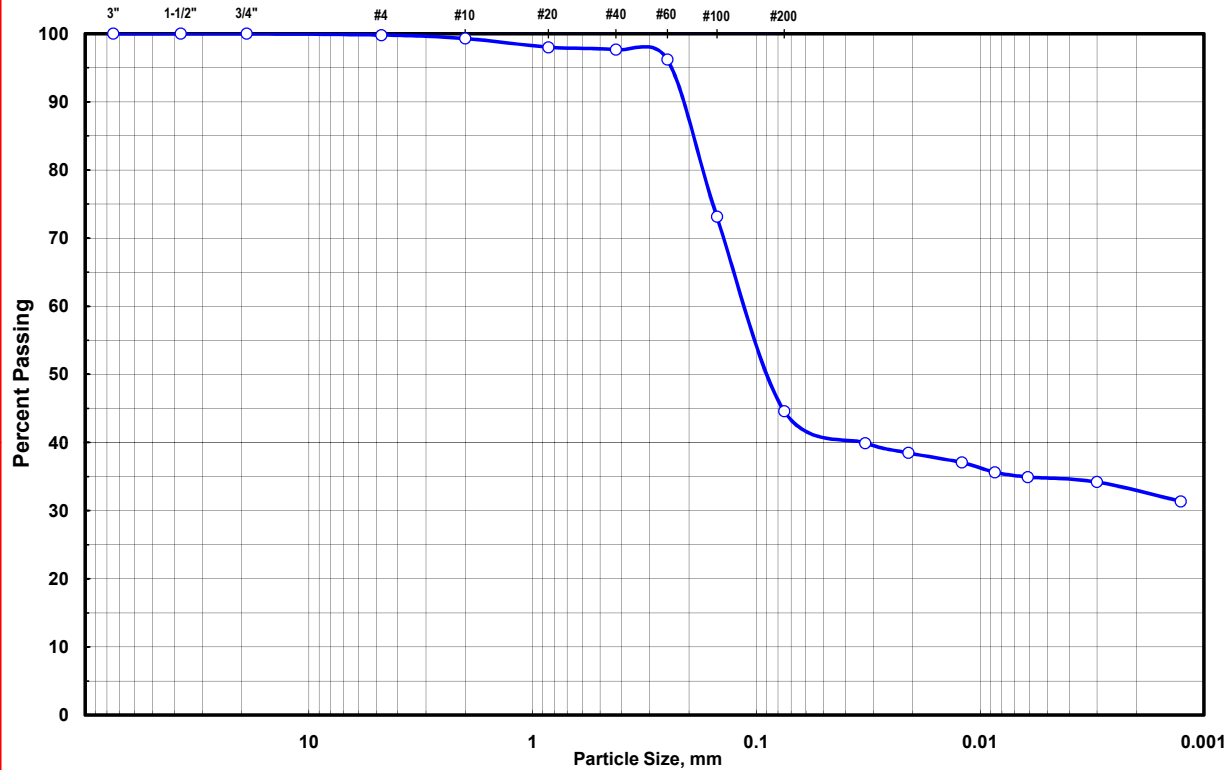




HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

Project:	Laboratory Testing - GW Investigation / CPS Calaveras Station	Liquid Limit:	35	% Pass No. 200:	44.6
Client:	ERM	Plastic Limit:	16	% Moisture:	20.5
Project No.:	16-S-217	Plasticity Index:	19	Test Method:	ASTM D-422
Sample ID:	JKS-48, 10'-12.5'	Tested By:	MC	Date Tested:	5/2/2016
Remarks:	ERM Project #: 0337367	Checked By:	BFM		
Description:	Clayey Sand (SC)	Date Checked:	5/13/2016		

HYDROMETER ANALYSIS

CLIENT: ERM PROJECT: CPS Calaveras Station DATE: 4/28/2016

DATE SAMPLED: 04/12/16 LABORATORY I.D. NO: _____

SAMPLE LOCATION: JK-48, 10'-12.5' SAMPLE DESCRIPTION: Clayey Sand (SC)

DISPERSING AGENT: Sodium Hexametaphosphate COMPOSITE CORRECTION: 3

SPECIFIC GRAVITY OF SOIL: 2.65 (estimated) DRY WEIGHT OF SOIL: 70.03

GRADUATE: 1000 ML HYDROMETER: 152H a VALUE: 1.00

TIME OF READING	ELAPSED TIME (min)	TEMP READING (C)	ACTUAL HYDROMETER READING	CORRECTED HYDROMETER READING (Composite Reading)	EFFECTIVE DEPTH L, cm	VALUE OF K	DIAMETER OF PARTICLE SIZE, mm	PERCENT FINER
10:52 AM	0							
10:54 AM	2	21.3	31.0	28.0	11.70	0.01348	0.0326	40.2
10:57 AM	5	21.3	30.0	27.0	12.00	0.01348	0.0209	38.8
11:07 AM	15	21.3	29.0	26.0	12.00	0.01348	0.0121	37.3
11:22 AM	30	21.3	28.0	25.0	12.20	0.01348	0.0086	35.9
11:52 AM	60	21.3	27.5	24.5	12.40	0.01348	0.0061	35.2
3:02 PM	250	21.5	27.0	24.0	12.40	0.01348	0.0030	34.5
10:52 AM	1440	21.3	25.0	22.0	12.70	0.01348	0.0013	31.6

SIEVE ANALYSIS

STARTING WEIGHT: 70.03 gms. Container ID: G STARTING DRY WEIGHT: 69.66 gms.

Container + Soil: 29.37 gms. (corrected for hygroscopic moisture)

Container + Dry Soil: 29.29 gms.

Wt. of Container: 14.32 gms.

Hygroscopic Moisture: 0.53 %

SIEVE SIZE	PARTICLE SIZE, mm	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
3"	75.0000	0.00	0.0	100.0
1-1/2"	37.5000	0.00	0.0	100.0
3/4"	19.0000	0.00	0.0	100.0
#4	4.7500	0.15	0.2	99.8
#10	2.0000	0.48	0.7	99.3
#20	0.8500	0.92	1.3	98.0
#40	0.4250	1.17	1.7	97.7
#60	0.2500	2.18	3.1	96.2
#100	0.1500	18.46	26.4	73.1
#200	0.0750	38.58	55.1	44.6
	0.0326			39.9
	0.0209			38.5
	0.0121			37.1
	0.0086			35.6
	0.0061			34.9
	0.0030			34.2
	0.0013			31.4

HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-422)

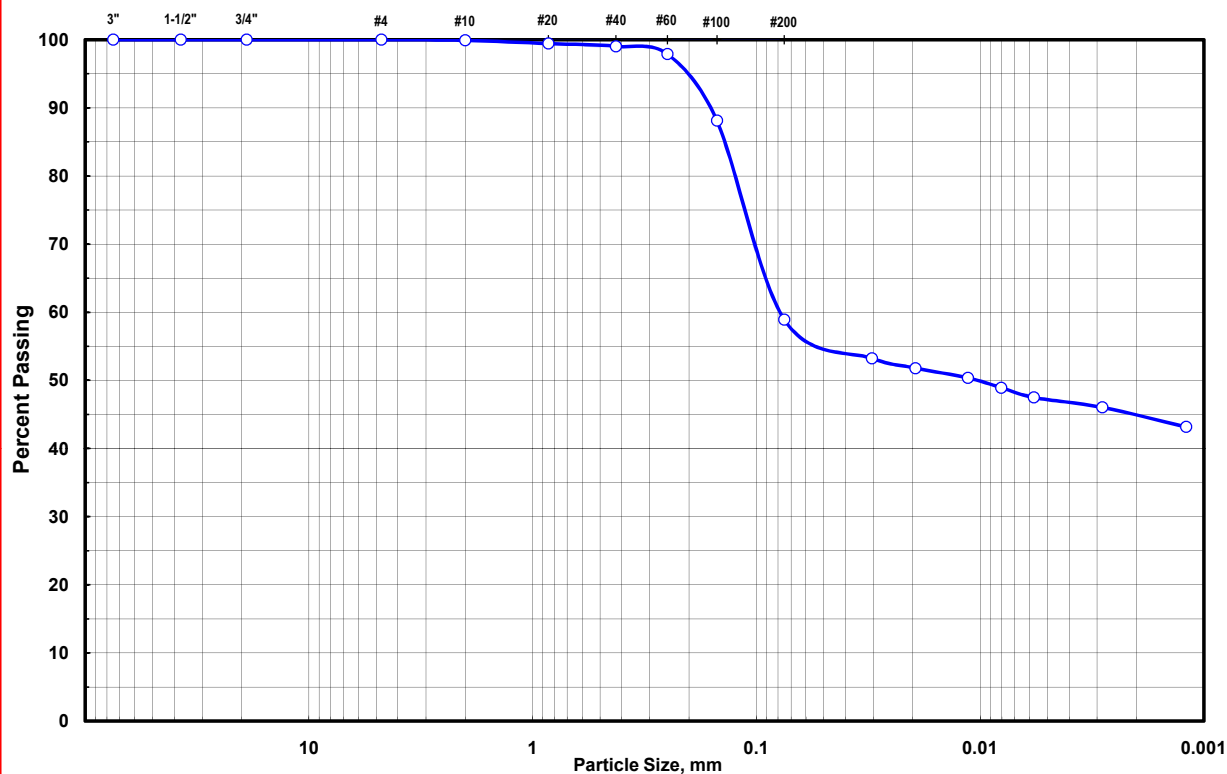




HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

Project:	Laboratory Testing - GW Investigation / CPS Calaveras Station	Liquid Limit:	48	% Pass No. 200:	58.9
Client:	ERM	Plastic Limit:	19	% Moisture:	19.1
Project No.:	16-S-217	Plasticity Index:	29	Test Method:	ASTM D-422
Sample ID:	JKS-48, 15'-16.5'	Tested By:	MC	Date Tested:	4/29/2016
Remarks:	ERM Project #: 0337367	Checked By:	BFM		
Description:	Sandy Lean Clay (CL)	Date Checked:	5/13/2016		

HYDROMETER ANALYSIS

CLIENT: ERM PROJECT: CPS Calaveras Station DATE: 4/29/2016

DATE SAMPLED: 04/12/16 LABORATORY I.D. NO: _____

SAMPLE LOCATION: JK-48, 15'-16.5' SAMPLE DESCRIPTION: Sandy Lean Clay (CL)

DISPERSING AGENT: Sodium Hexametaphosphate COMPOSITE CORRECTION: 3

SPECIFIC GRAVITY OF SOIL: 2.65 (estimated) DRY WEIGHT OF SOIL: 70.03

GRADUATE: 1000 ML HYDROMETER: 152H a VALUE: 1.00

TIME OF READING	ELAPSED TIME (min)	TEMP READING (C)	ACTUAL HYDROMETER READING	CORRECTED HYDROMETER READING (Composite Reading)	EFFECTIVE DEPTH L, cm	VALUE OF K	DIAMETER OF PARTICLE SIZE, mm	PERCENT FINER
11:02 AM	0							
11:04 AM	2	21.2	40.0	37.0	10.20	0.01348	0.0304	53.3
11:07 AM	5	21.2	39.0	36.0	10.40	0.01348	0.0194	51.9
11:17 AM	15	21.2	38.0	35.0	10.60	0.01348	0.0113	50.4
11:32 AM	30	21.2	37.0	34.0	10.70	0.01348	0.0081	49.0
12:02 PM	60	21.2	36.0	33.0	10.90	0.01348	0.0057	47.5
3:12 PM	250	21.4	35.0	32.0	11.10	0.01348	0.0028	46.1
11:02 AM	1440	21.2	33.0	30.0	11.40	0.01348	0.0012	43.2

SIEVE ANALYSIS

STARTING WEIGHT: 70.03 gms. Container ID: H STARTING DRY WEIGHT: 69.43 gms.

Container + Soil: 29.39 gms. (corrected for hygroscopic moisture)

Container + Dry Soil: 29.26 gms.

Wt. of Container: 14.34 gms.

Hygroscopic Moisture: 0.87 %

SIEVE SIZE	PARTICLE SIZE, mm	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
3"	75.0000	0.00	0.0	100.0
1-1/2"	37.5000	0.00	0.0	100.0
3/4"	19.0000	0.00	0.0	100.0
#4	4.7500	0.00	0.0	100.0
#10	2.0000	0.06	0.1	99.9
#20	0.8500	0.33	0.5	99.4
#40	0.4250	0.61	0.9	99.0
#60	0.2500	1.41	2.0	97.9
#100	0.1500	8.26	11.8	88.1
#200	0.0750	28.74	41.0	58.9
	0.0304			53.2
	0.0194			51.8
	0.0113			50.4
	0.0081			48.9
	0.0057			47.5
	0.0028			46.1
	0.0012			43.2

HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-422)

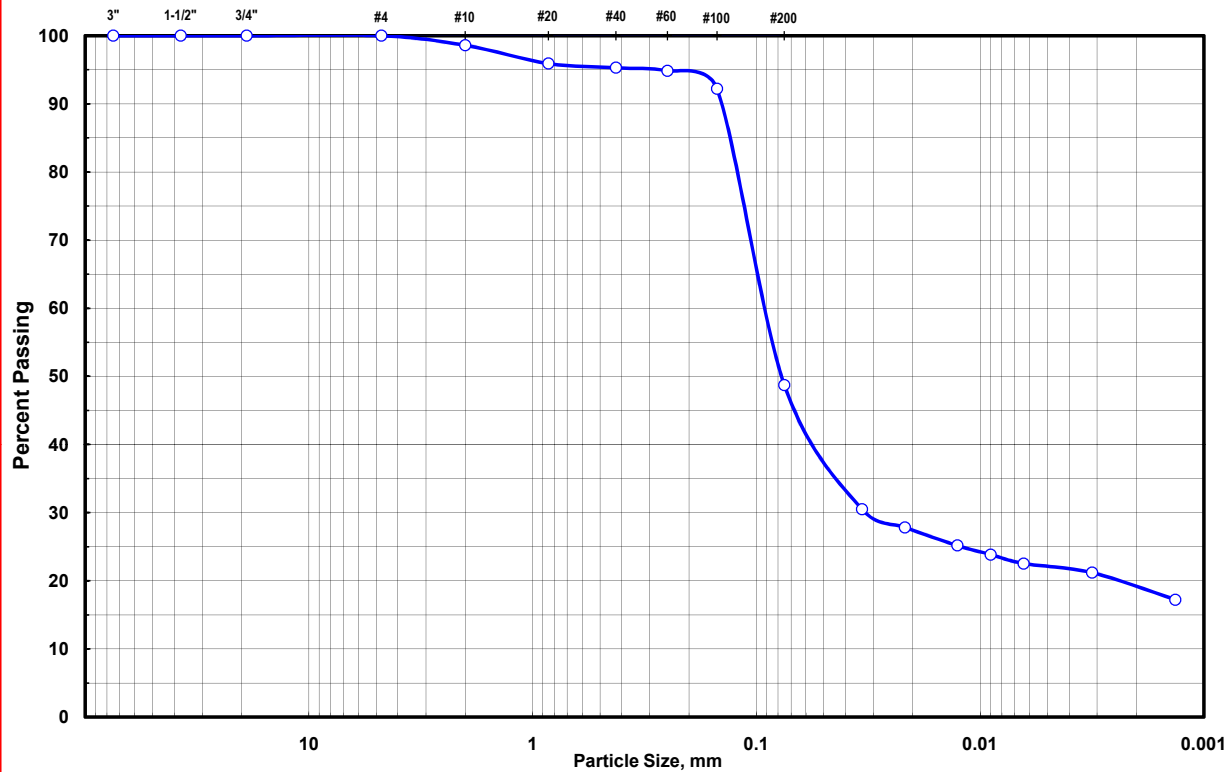




HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

Project:	Laboratory Testing - GW Investigation / CPS Calaveras Station	Liquid Limit:	26	% Pass No. 200:	48.7
Client:	ERM	Plastic Limit:	16	% Moisture:	25.2
Project No.:	16-S-217	Plasticity Index:	10	Test Method:	ASTM D-422
Sample ID:	JKS-48, 19'-20'	Tested By:	MC	Date Tested:	5/2/2016
Remarks:	ERM Project #: 0337367	Checked By:	BFM		
Description:	Clayey Sand (SC)	Date Checked:	5/13/2016		

HYDROMETER ANALYSIS

CLIENT: ERM PROJECT: CPS Calaveras Station DATE: 5/2/2016

DATE SAMPLED: 04/12/16 LABORATORY I.D. NO: _____

SAMPLE LOCATION: JK-48, 19'-20' SAMPLE DESCRIPTION: Sandy Lean Clay (CL)

DISPERSING AGENT: Sodium Hexametaphosphate COMPOSITE CORRECTION: 3

SPECIFIC GRAVITY OF SOIL: 2.65 (estimated) DRY WEIGHT OF SOIL: 75.02

GRADUATE: 1000 ML HYDROMETER: 152H a VALUE: 1.00

TIME OF READING	ELAPSED TIME (min)	TEMP READING (C)	ACTUAL HYDROMETER READING	CORRECTED HYDROMETER READING (Composite Reading)	EFFECTIVE DEPTH L, cm	VALUE OF K	DIAMETER OF PARTICLE SIZE, mm	PERCENT FINER
10:42 AM	0							
10:44 AM	2	21.2	26.0	23.0	12.50	0.01348	0.0337	30.9
10:47 AM	5	21.2	24.0	21.0	12.90	0.01348	0.0217	28.2
10:57 AM	15	21.2	22.0	19.0	13.20	0.01348	0.0126	25.5
11:12 AM	30	21.2	21.0	18.0	13.30	0.01348	0.0090	24.2
11:42 AM	60	21.2	20.0	17.0	13.50	0.01348	0.0064	22.9
2:52 PM	250	21.4	19.0	16.0	13.70	0.01348	0.0032	21.5
10:42 AM	1440	21.2	16.0	13.0	14.20	0.01348	0.0013	17.5

SIEVE ANALYSIS

STARTING WEIGHT: 75.02 gms. Container ID: F STARTING DRY WEIGHT: 74.37 gms.

Container + Soil: 29.36 gms. (corrected for hygroscopic moisture)

Container + Dry Soil: 29.23 gms.

Wt. of Container: 14.32 gms.

Hygroscopic Moisture: 0.87 %

SIEVE SIZE	PARTICLE SIZE, mm	CUMULATIVE WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING
3"	75.0000	0.00	0.0	100.0
1-1/2"	37.5000	0.00	0.0	100.0
3/4"	19.0000	0.00	0.0	100.0
#4	4.7500	0.00	0.0	100.0
#10	2.0000	1.06	1.4	98.6
#20	0.8500	2.04	2.7	95.9
#40	0.4250	2.50	3.3	95.3
#60	0.2500	2.85	3.8	94.8
#100	0.1500	4.83	6.4	92.2
#200	0.0750	37.93	50.6	48.7
	0.0337			30.5
	0.0217			27.8
	0.0126			25.2
	0.0090			23.9
	0.0064			22.5
	0.0032			21.2
	0.0013			17.2

HYDROMETER ANALYSIS CALCULATION.XLS

Particle Size Analysis of Soils (ASTM D-422)



TABLE 1
LABORATORY TEST SUMMARY

PROJECT: Phase II - CCR Well Network Installation
CPS Calaveras Power Station
LOCATION: San Antonio, Texas
CLIENT: Environmental Resources Management

PAGE 1 OF 1
HTS PROJECT NO.: 16-S-370
ERM PROJECT #: 0366643

Sample ID	Sample Depth (feet)	Type of Material	Moisture Content (%)	Bulk Density (pcf)	Atterberg Limits (%)			-200 Sieve* (%)	Coefficient of Permeability, k (cm/sec)	Solids Specific Gravity	Remarks
					LL	PL	PI				
JKS-53	10-12.5	Clayey Sand (SC)	24.2	101.8	30	14	16	35.9	5.34E-06	2.68	10'-12.5': Particle Size Analysis (ASTM D421)
	12.5-15	Clayey Sand (SC)	23.6	97.1	29	15	14	48.8	4.13E-08	2.68	12.5'-15': Particle Size Analysis (ASTM D421)
	20-21	Clayey Sand (SC)	29.5		27	14	13	37.6			20'-21': Particle Size Analysis (ASTM D422)
JKS-54	13-14	Silty Clayey Sand (SC-SM)	25.5		22	15	7	33.5			13'-14': Particle Size Analysis (ASTM D422)
JKS-58	26-27	Sandy Lean Clay (CL)	22.7		38	18	20	50.9			26'-27': Particle Size Analysis (ASTM D422)
	30-32.5	Fat Clay (CH)	20.3	100.0	57	20	37	89.1	1.53E-07	2.72	30'- 32.5': Particle Size Analysis (ASTM D421)
JKS-62	35-37	Clayey Sand (SC)	18.4	93.8	38	17	21	32.3	6.63E-07	2.68	35'-37': Particle Size Analysis (ASTM D421)
JKS-64	20-30	Clayey Sand (SC)	28.6		29	14	15	30.1			20'-30': Particle Size Analysis (ASTM D422)
ASTM D 421: Particle Size Analysis without Hydrometer ASTM D 422: Particle Size Analysis With Hydrometer											
* From Particle Size Analysis testing											





HTS, Inc. Consultants
9416 Pickering Street
Houston, Texas 77091
Tel: (713) 692-8373 Fax: (713) 692-8501

SPECIFIC GRAVITY OF SOIL SOLIDS

(ASTM D-854)

Project No:	16-S-370	Project Name:	Laboratory Testing, CCR Well Network/CPS Calaveras Station, ERM Project No. 0366643
Technician:	M. Coronado	Testing Date:	10/05/2016 and 10/06/2016

LABORATORY TEST DATA/ RESULTS

Sample ID: JKS-53, 10'-12.5'		Sample: JKS-53, 12.5'-15'		Sample: JKS-58, 30'-32.5'		Sample: JKS-62, 35'-37'	
Flask No.	A-1	Flask No.	B-1	Flask No.	C-1	Flask No.	D-1
Flask Weight (gms)	169.35	Flask Weight (gms)	169.41	Flask Weight (gms)	174.29	Flask Weight (gms)	171.31
Weight of Dry Soil (gms)	75.18	Weight of Dry Soil (gms)	75.05	Weight of Dry Soil (gms)	50.10	Weight of Dry Soil (gms)	75.08
Wt. Flask and Water (gms)	667.02	Wt. Flask and Water (gms)	667.28	Wt. Flask and Water (gms)	672.37	Wt. Flask and Water (gms)	669.05
Wt. Flask+Water+Soil (gms)	714.16	Wt. Flask+Water+Soil (gms)	714.36	Wt. Flask+Water+Soil (gms)	704.03	Wt. Flask+Water+Soil (gms)	716.07
Volume of Flask at 20° (ml)	500.0	Volume of Flask at 20° (ml)	500.0	Volume of Flask at 20° (ml)	500.0	Volume of Flask at 20° (ml)	500.0
Container No.	40	Container No.	41	Container No.	42	Container No.	43
Wt. of Container (gms)	30.43	Wt. of Container (gms)	30.53	Wt. of Container (gms)	30.55	Wt. of Container (gms)	30.40
Wt. of Container + Soil (gms)	105.61	Wt. of Container + Soil (gms)	105.58	Wt. of Container + Soil (gms)	80.65	Wt. of Container + Soil (gms)	105.48
Temperature (°C)	22.8	Temperature (°C)	22.7	Temperature (°C)	22.5	Temperature (°C)	22.4
Specific Gravity:	2.681	Specific Gravity:	2.683	Specific Gravity:	2.717	Specific Gravity:	2.676

Checked By: BFM Date: 10/12/16



HTS, Inc. Consultants
 9416 Pickering Street
 Houston, Texas 77091
 Tel: (713) 692-8373 Fax: (713) 692-8501

FALLING HEAD / RISING TAIL HYDRAULIC CONDUCTIVITY TEST
 (ASTM D-5084-03)

Project No:	16-S-370	Sample Identification:	JKS-53, Depth = 10'-12.5'
Technician:	M. Coronado	Sample Description:	Tan and brown CLAYEY SAND (SC)

Project: Laboratory Testing, CCR Well Network/CPS Calaveras Station (ERM Project No. 0366643)

INITIAL CONDITIONS				FINAL CONDITIONS			
WATER CONTENT		SPECIMEN DATA		WATER CONTENT		SPECIMEN DATA	
Tare No.:	54	Length, in:	2.062	Tare No.:	40	Length, in:	2.030
Wet+Tare, gms:	131.44	Diameter, in:	2.725	Wet+Tare, gms:	131.44	Diameter, in:	2.738
Dry+Tare, gms:	111.76	Wet mass, gms:	397.05	Dry+Tare, gms:	111.66	Wet mass, gms:	394.94
Tare Weight, gms:	30.56	Area, cm ² :	37.63	Tare Weight, gms:	30.42	Area, cm ² :	37.99
Moisture, %	24.2	Volume, cc:	197.1	Moisture, %	24.3	Volume, cc:	195.9
		Unit wet wt, pcf:	125.7			Unit wet wt, pcf:	125.8
Specific Gravity:	2.681	Unit dry wt, pcf:	101.2	Specific Gravity:	2.681	Unit dry wt, pcf:	101.2
Saturation, %:	99.5	Void Ratio:	0.653	Saturation, %:	99.8	Void Ratio:	0.653
Perm. Cell No.:	5	Burret diam, cm:	1.06	Burret area, cm ² :	1.06	Burret factor, cm/cc:	1.009
Cell Pressure, psi:	5.0	Head Pressure, psi:	2.0	Tail Pressure, psi:	1.0	Hydraulic Gradient:	16.9

PERMEABILITY MEASUREMENTS

Date	Time	Elapsed Time (sec)	Temp (C)	Pressure Diff. (psi)	Head Rdg (cc)	Tail Rdg (cc)	Head Change (cm)	Tail Change (cm)	Total Head (cm)	Permeability Kt (cm/sec)	Permeability K ₂₀ (cm/sec)
10/6/2016	9:30a	0	23.6	1.0	2.00	20.00	0.000	0.000	88.46	0.00E+00	0.00E+00
10/6/2016	9:35a	300	23.6	1.0	3.00	19.00	1.009	1.009	86.44	5.53E-06	5.07E-06
10/6/2016	9:40a	300	23.6	1.0	4.20	17.60	1.211	1.413	83.82	7.39E-06	6.77E-06
10/6/2016	9:45a	300	23.6	1.0	5.10	16.50	0.908	1.110	81.80	5.84E-06	5.36E-06
10/6/2016	9:50a	300	23.6	1.0	6.00	15.80	0.908	0.706	80.19	4.78E-06	4.38E-06
10/6/2016	9:55a	300	23.6	1.0	7.00	14.80	1.009	1.009	78.17	6.11E-06	5.60E-06
10/6/2016	10:00a	300	23.6	1.0	8.00	13.70	1.009	1.110	76.05	6.59E-06	6.04E-06

Coefficient of Permeability, k = **5.34E-06** cm/sec

Performed By: MC Date: 10/3/2016

Checked By: BFM Date: 10/12/16



HTS, Inc. Consultants
 9416 Pickering Street
 Houston, Texas 77091
 Tel: (713) 692-8373 Fax: (713) 692-8501

FALLING HEAD / RISING TAIL HYDRAULIC CONDUCTIVITY TEST
 (ASTM D-5084-03)

Project No:	16-S-370	Sample Identification:	JKS-53, Depth = 12.5'-15'
Technician:	M. Coronado	Sample Description:	Light brown and brown CLAYEY SAND (SC)

Project: Laboratory Testing, CCR Well Network/CPS Calaveras Station (ERM Project No. 0366643)

INITIAL CONDITIONS				FINAL CONDITIONS			
WATER CONTENT		SPECIMEN DATA		WATER CONTENT		SPECIMEN DATA	
Tare No.:	53	Length, in:	2.095	Tare No.:	43	Length, in:	2.095
Wet+Tare, gms:	136.44	Diameter, in:	2.705	Wet+Tare, gms:	132.79	Diameter, in:	2.703
Dry+Tare, gms:	116.19	Wet mass, gms:	393.77	Dry+Tare, gms:	112.35	Wet mass, gms:	393.23
Tare Weight, gms:	30.54	Area, cm ² :	37.08	Tare Weight, gms:	30.41	Area, cm ² :	37.02
Moisture, %	23.6	Volume, cc:	197.3	Moisture, %	24.9	Volume, cc:	197.0
		Unit wet wt, pcf:	124.5			Unit wet wt, pcf:	124.6
Specific Gravity:	2.683	Unit dry wt, pcf:	100.7	Specific Gravity:	2.683	Unit dry wt, pcf:	99.7
Saturation, %:	95.8	Void Ratio:	0.662	Saturation, %:	98.5	Void Ratio:	0.679
Perm. Cell No.:	1	Burret diam, cm:	1.06	Burret area, cm ² :	0.991	Burret factor, cm/cc:	1.009
Cell Pressure, psi:	5.0	Head Pressure, psi:	2.0	Tail Pressure, psi:	1.0	Hydraulic Gradient:	16.6

PERMEABILITY MEASUREMENTS

Date	Time	Elapsed Time (sec)	Temp (C)	Pressure Diff. (psi)	Head Rdg (cc)	Tail Rdg (cc)	Head Change (cm)	Tail Change (cm)	Total Head (cm)	Permeability Kt (cm/sec)	Permeability K ₂₀ (cm/sec)
10/6/2016	10:10a	0	23.9	1.0	2.00	20.00	0.000	0.000	88.46	0.00E+00	0.00E+00
10/6/2016	11:15a	3900	23.9	1.0	2.10	19.90	0.101	0.101	88.26	4.17E-08	3.79E-08
10/6/2016	12:15p	3600	23.9	1.0	2.20	19.80	0.101	0.101	88.06	4.53E-08	4.12E-08
10/6/2016	1:15p	3600	23.9	1.0	2.30	19.70	0.101	0.101	87.86	4.54E-08	4.13E-08
10/6/2016	2:15p	3600	23.9	1.0	2.40	19.60	0.101	0.101	87.65	4.55E-08	4.14E-08
10/6/2016	3:15p	3600	23.9	1.0	2.50	19.50	0.101	0.101	87.45	4.56E-08	4.14E-08

Coefficient of Permeability, k = **4.13E-08** cm/sec

Performed By: MC Date: 10/3/2016

Checked By: BFM Date: 10/12/16



HTS, Inc. Consultants
 9416 Pickering Street
 Houston, Texas 77091
 Tel: (713) 692-8373 Fax: (713) 692-8501

FALLING HEAD / RISING TAIL HYDRAULIC CONDUCTIVITY TEST

(ASTM D-5084-03)

Project No:	16-S-370	Sample Identification:	JKS-58, Depth = 30'-32.5'
Technician:	M. Coronado	Sample Description:	Dark gray FAT CLAY (CH)

Project: Laboratory Testing, CCR Well Network/CPS Calaveras Station (ERM Project No. 0366643)

INITIAL CONDITIONS				FINAL CONDITIONS			
WATER CONTENT		SPECIMEN DATA		WATER CONTENT		SPECIMEN DATA	
Tare No.:	51	Length, in:	1.932	Tare No.:	42	Length, in:	1.930
Wet+Tare, gms:	133.56	Diameter, in:	2.700	Wet+Tare, gms:	131.43	Diameter, in:	2.710
Dry+Tare, gms:	116.21	Wet mass, gms:	360.36	Dry+Tare, gms:	110.27	Wet mass, gms:	365.13
Tare Weight, gms:	30.56	Area, cm ² :	36.94	Tare Weight, gms:	30.55	Area, cm ² :	37.21
Moisture, %	20.3	Volume, cc:	181.3	Moisture, %	26.5	Volume, cc:	182.4
		Unit wet wt, pcf:	124.0			Unit wet wt, pcf:	124.9
Specific Gravity:	2.717	Unit dry wt, pcf:	103.2	Specific Gravity:	2.717	Unit dry wt, pcf:	98.7
Saturation, %:	85.5	Void Ratio:	0.644	Saturation, %:	100.4	Void Ratio:	0.717
Perm. Cell No.:	2	Burret diam, cm:	1.06	Burret area, cm ² :	0.991	Burret factor, cm/cc:	1.009
Cell Pressure, psi:	7.0	Head Pressure, psi:	3.0	Tail Pressure, psi:	2.0	Hydraulic Gradient:	18.0

PERMEABILITY MEASUREMENTS

Date	Time	Elapsed Time (sec)	Temp (C)	Pressure Diff. (psi)	Head Rdg (cc)	Tail Rdg (cc)	Head Change (cm)	Tail Change (cm)	Total Head (cm)	Permeability Kt (cm/sec)	Permeability K ₂₀ (cm/sec)
10/6/2016	10:45a	0	23.7	1.0	2.00	20.00	0.000	0.000	88.46	0.00E+00	0.00E+00
10/6/2016	11:15a	1800	23.7	1.0	2.20	19.80	0.202	0.202	88.06	1.66E-07	1.52E-07
10/6/2016	11:30a	900	23.7	1.0	2.30	19.70	0.101	0.101	87.86	1.66E-07	1.52E-07
10/6/2016	11:45a	900	23.7	1.0	2.50	19.50	0.202	0.202	87.45	3.34E-07	3.05E-07
10/6/2016	12:45a	3600	23.7	1.0	2.80	19.30	0.303	0.202	86.95	1.05E-07	9.59E-08
10/6/2016	1:45p	3600	23.7	1.0	3.00	19.00	0.202	0.303	86.44	1.06E-07	9.64E-08
10/6/2016	2:45p	3600	23.7	1.0	3.30	18.70	0.303	0.303	85.84	1.27E-07	1.16E-07

Coefficient of Permeability, k = **1.53E-07** cm/sec

Performed By: MC Date: 10/3/2016

Checked By: BFM Date: 10/12/16



HTS, Inc. Consultants
 9416 Pickering Street
 Houston, Texas 77091
 Tel: (713) 692-8373 Fax: (713) 692-8501

FALLING HEAD / RISING TAIL HYDRAULIC CONDUCTIVITY TEST

(ASTM D-5084-03)

Project No:	16-S-370	Sample Identification:	JKS-62, Depth = 35'-37'
Technician:	M. Coronado	Sample Description:	Light brown and brown CLAYEY SAND (SC)

Project: Laboratory Testing, CCR Well Network/CPS Calaveras Station (ERM Project No. 0366643)

INITIAL CONDITIONS				FINAL CONDITIONS			
WATER CONTENT		SPECIMEN DATA		WATER CONTENT		SPECIMEN DATA	
Tare No.:	52	Length, in:	2.040	Tare No.:	41	Length, in:	2.033
Wet+Tare, gms:	133.74	Diameter, in:	2.695	Wet+Tare, gms:	135.61	Diameter, in:	2.700
Dry+Tare, gms:	117.68	Wet mass, gms:	347.14	Dry+Tare, gms:	114.90	Wet mass, gms:	357.91
Tare Weight, gms:	30.54	Area, cm ² :	36.80	Tare Weight, gms:	30.53	Area, cm ² :	36.94
Moisture, %	18.4	Volume, cc:	190.7	Moisture, %	24.5	Volume, cc:	190.7
		Unit wet wt, pcf:	113.6			Unit wet wt, pcf:	117.1
Specific Gravity:	2.676	Unit dry wt, pcf:	95.9	Specific Gravity:	2.676	Unit dry wt, pcf:	94.0
Saturation, %:	66.6	Void Ratio:	0.741	Saturation, %:	84.5	Void Ratio:	0.776
Perm. Cell No.:	3	Burret diam, cm:	1.06	Burret area, cm ² :	0.991	Burret factor, cm/cc:	1.009
Cell Pressure, psi:	5.0	Head Pressure, psi:	2.0	Tail Pressure, psi:	1.0	Hydraulic Gradient:	17.1

PERMEABILITY MEASUREMENTS

Date	Time	Elapsed Time (sec)	Temp (C)	Pressure Diff. (psi)	Head Rdg (cc)	Tail Rdg (cc)	Head Change (cm)	Tail Change (cm)	Total Head (cm)	Permeability Kt (cm/sec)	Permeability K ₂₀ (cm/sec)
10/6/2016	10:30a	0	24.6	1.0	2.00	20.00	0.000	0.000	88.46	0.00E+00	0.00E+00
10/6/2016	10:40a	600	24.6	1.0	2.50	19.70	0.505	0.303	87.65	1.06E-06	9.44E-07
10/6/2016	10:50a	600	24.6	1.0	2.70	19.50	0.202	0.202	87.25	5.33E-07	4.75E-07
10/6/2016	11:00a	600	24.6	1.0	2.90	19.00	0.202	0.505	86.54	9.38E-07	8.37E-07
10/6/2016	11:10a	600	24.6	1.0	3.20	18.70	0.303	0.303	85.94	8.10E-07	7.23E-07
10/6/2016	11:20a	600	24.6	1.0	3.40	18.40	0.202	0.303	85.44	6.80E-07	6.06E-07
10/6/2016	11:30a	600	24.6	1.0	3.60	18.20	0.202	0.202	85.03	5.47E-07	4.88E-07

Coefficient of Permeability, k = **6.63E-07** cm/sec

Performed By: MC Date: 10/6/2016

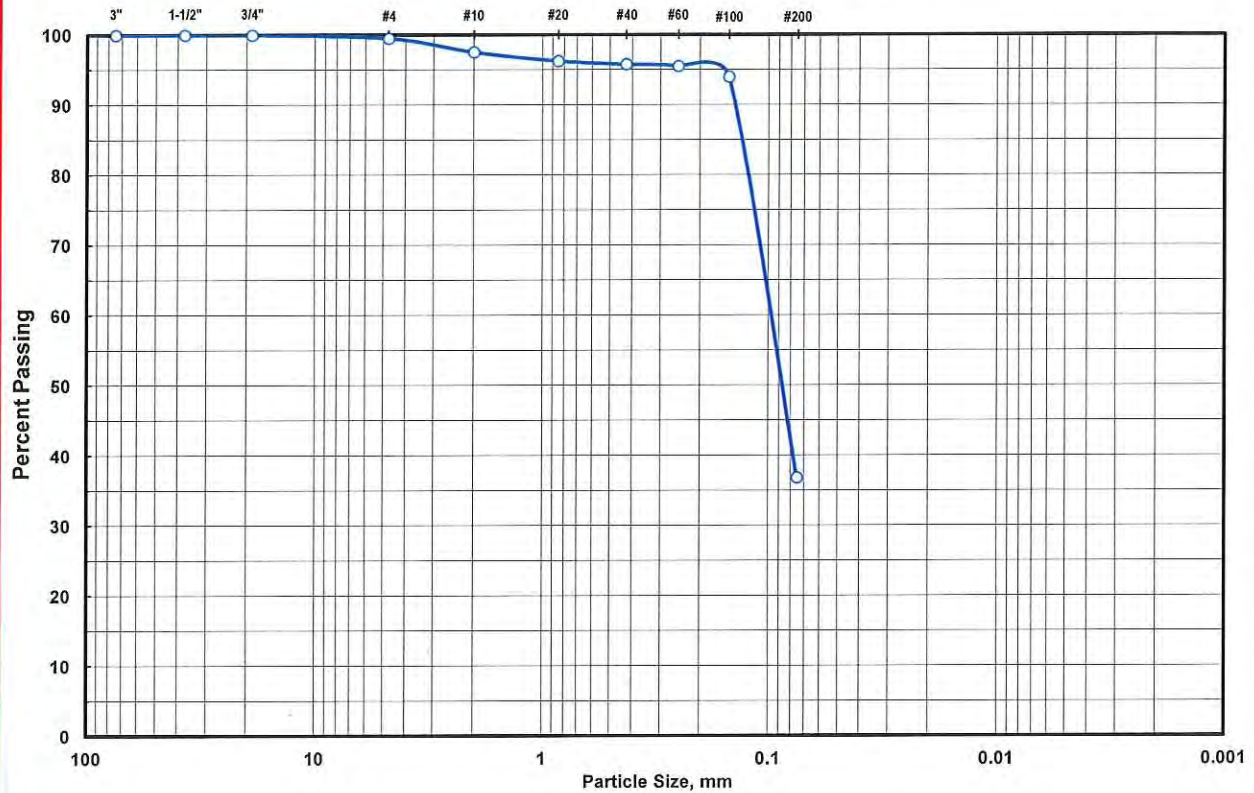
Checked By: BFM Date: 10/12/16



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-421)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

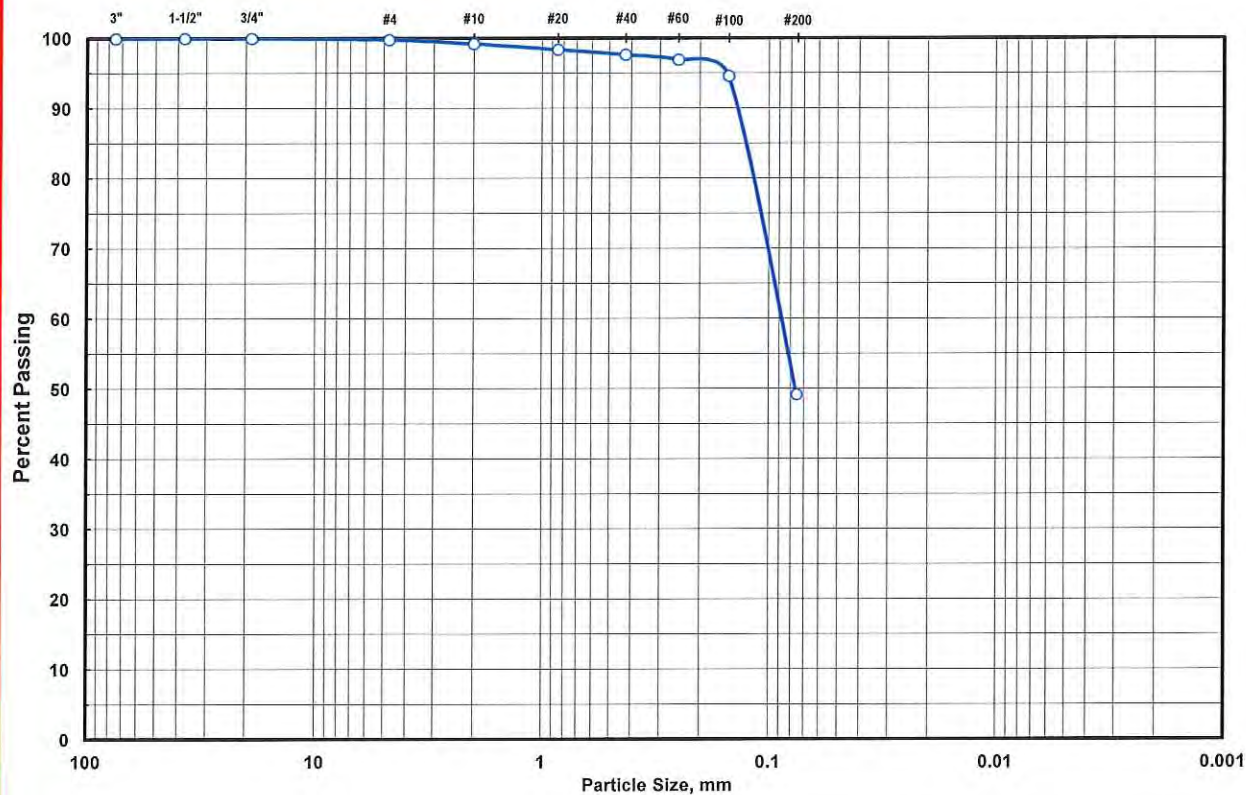
Project:	Phase II - CCR Well Network Installation, CPS Calaveras Power Station	Liquid Limit:	30	% Pass No. 200:	36.8
Client:	Environmental Resources Management	Plastic Limit:	14	% Moisture:	24.2
Project No.:	16-S-370	Plasticity Index:	16	Test Method:	ASTM D-421
Sample ID:	JKS- 53 , Depth = 10' - 12.5'	Tested By:	MC	Date Tested:	10/5/2016
Remarks:		Checked By:	BHA		
Description:	Tan and brown CLAYEY SAND (SC)	Date Checked:	10/12/2016		



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-421)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

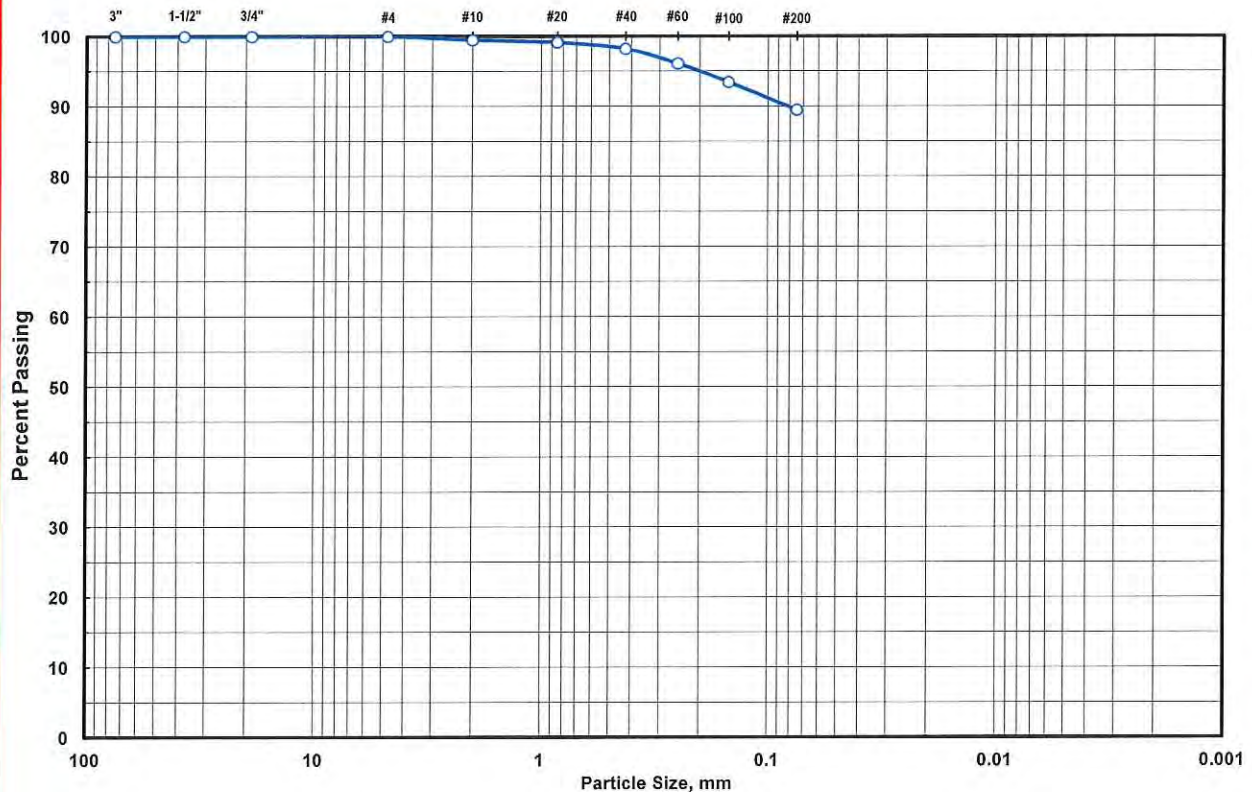
Project:	Phase II - CCR Well Network Installation, CPS Calaveras Power Station	Liquid Limit:	29	% Pass No. 200:	49.2
Client:	Environmental Resources Management	Plastic Limit:	15	% Moisture:	23.6
Project No.:	16-S-370	Plasticity Index:	14	Test Method:	ASTM D-421
Sample ID:	JKS- 53 , Depth = 12.5' - 15'	Tested By:	MC	Date Tested:	10/5/2016
Remarks:		Checked By:	BHA		
Description:	Tan and brown CLAYEY SAND (SC)	Date Checked:	10/12/2016		



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-421)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

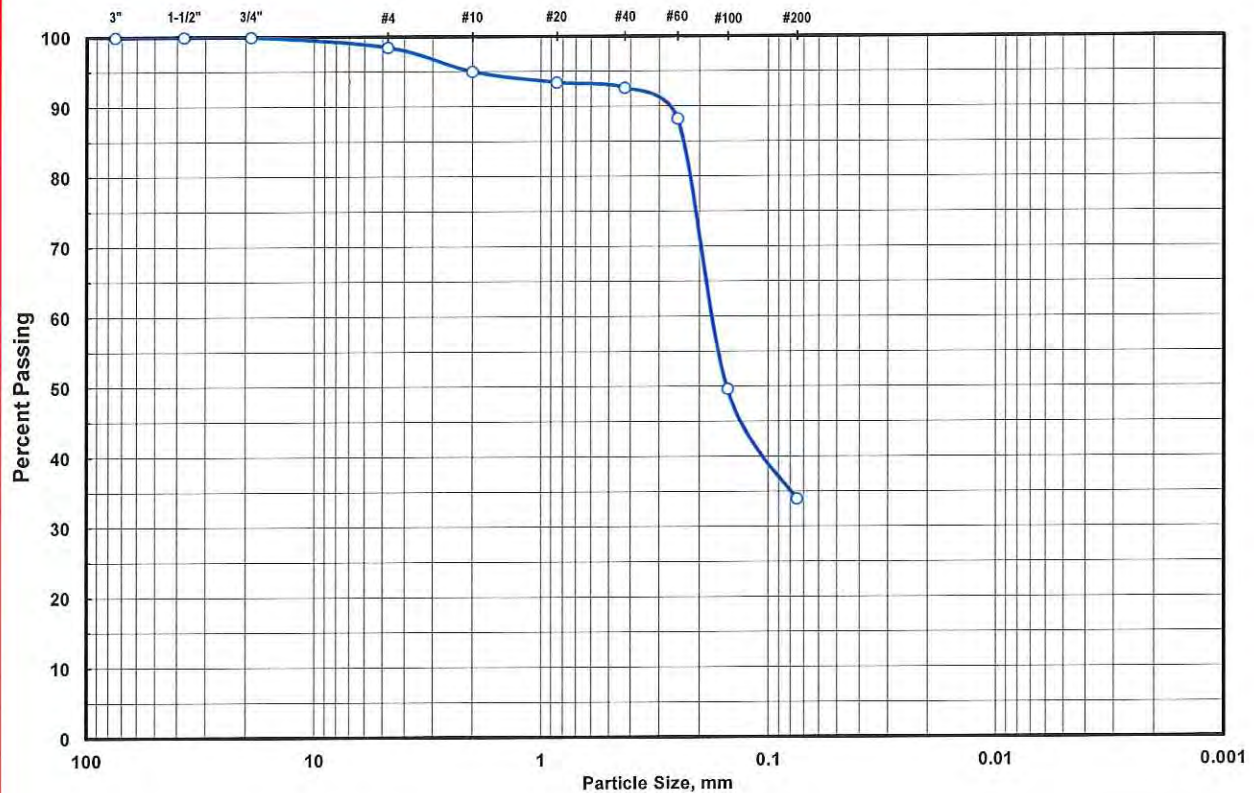
Project:	Phase II - CCR Well Network Installation, CPS Calaveras Power Station	Liquid Limit:	57	% Pass No. 200:	89.5
Client:	Environmental Resources Management	Plastic Limit:	20	% Moisture:	20.3
Project No.:	16-S-370	Plasticity Index:	37	Test Method:	ASTM D-421
Sample ID:	JKS- 58 , Depth = 30' - 32.5'	Tested By:	MC	Date Tested:	10/5/2016
Remarks:		Checked By:	BHA		
Description:	Dark gray FAT CLAY (CH)	Date Checked:	10/12/2016		



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-421)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

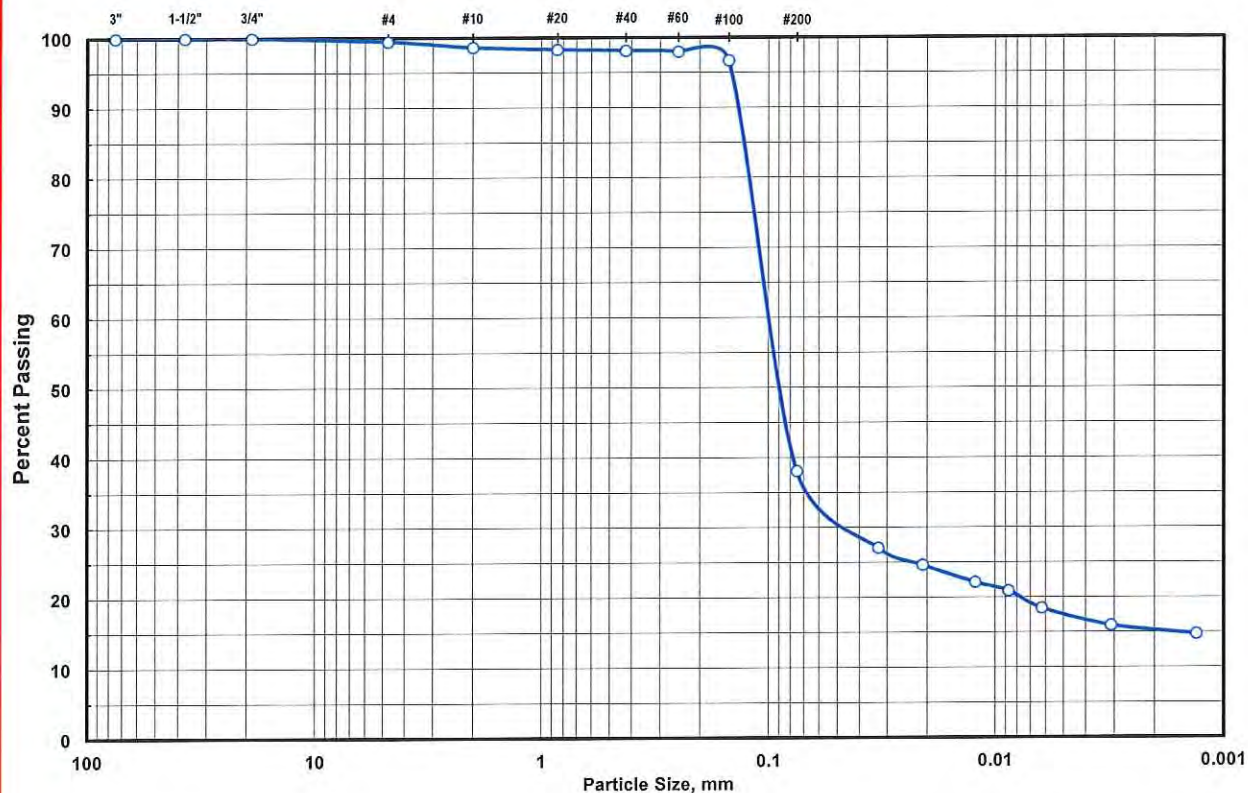
Project:	Phase II - CCR Well Network Installation, CPS Calaveras Power Station	Liquid Limit:	38	% Pass No. 200:	34.0
Client:	Environmental Resources Management	Plastic Limit:	17	% Moisture:	18.4
Project No.:	16-S-370	Plasticity Index:	21	Test Method:	ASTM D-421
Sample ID:	JKS- 62 , Depth = 35' - 37'	Tested By:	MC	Date Tested:	10/5/2016
Remarks:		Checked By:	BHA		
Description:	Light brown and brown CLAYEY SAND (SC)	Date Checked:	10/12/2016		



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

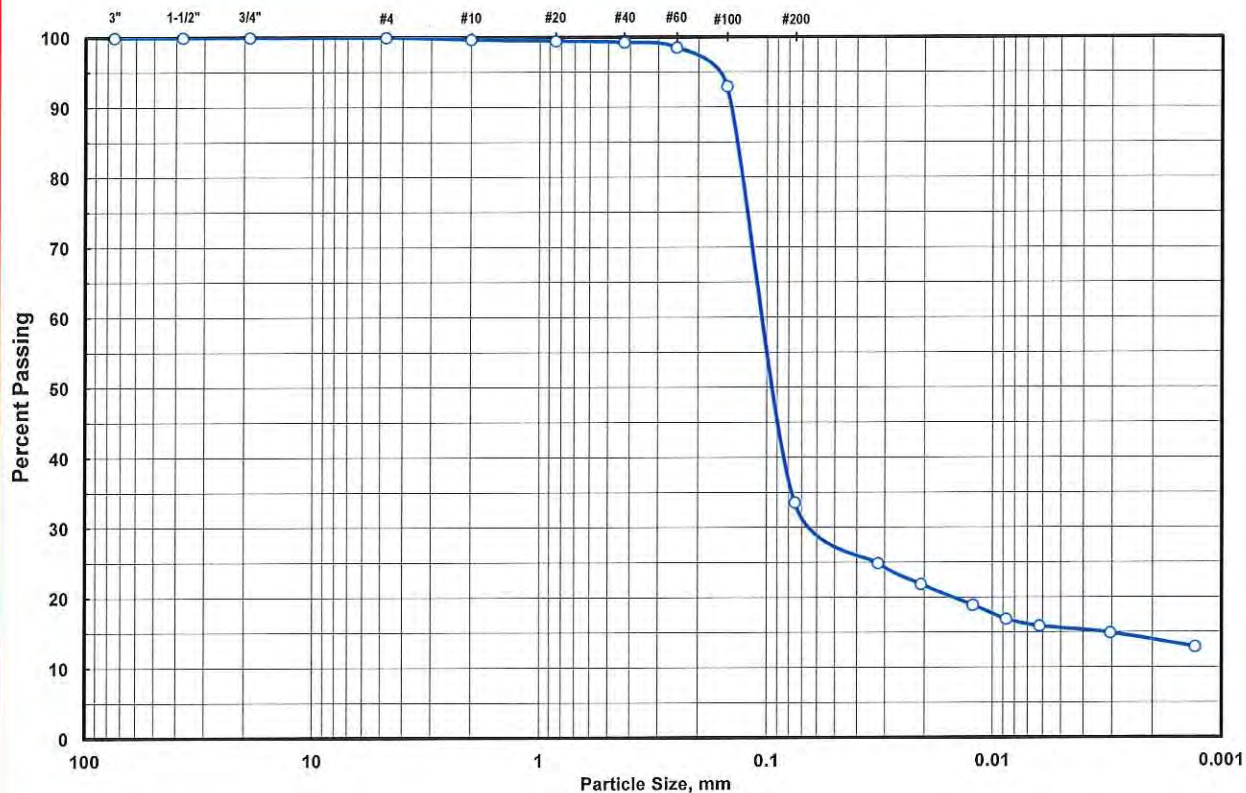
Project:	Phase II - CCR Well Network Installation, CPS Calaveras Power Station	Liquid Limit:	27	% Pass No. 200:	38.1
Client:	Environmental Resources Management	Plastic Limit:	14	% Moisture:	29.5
Project No.:	16-S-370	Plasticity Index:	13	Test Method:	ASTM D-422
Sample ID:	JKS- 53 , Depth = 20' - 21'	Tested By:	MC	Date Tested:	10/4/2016
Remarks:		Checked By:	BHA		
Description:	Tan and light brown CLAYEY SAND (SC)	Date Checked:	10/12/2016		



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)

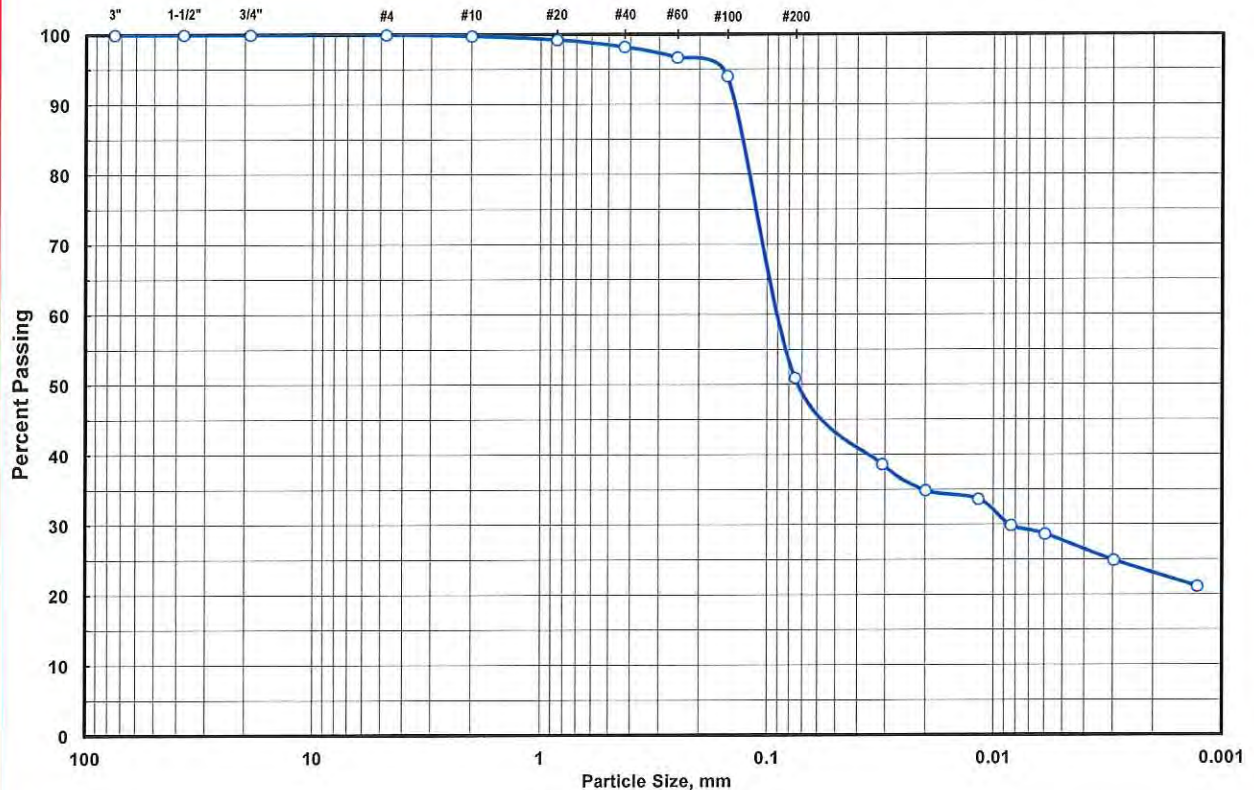




HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

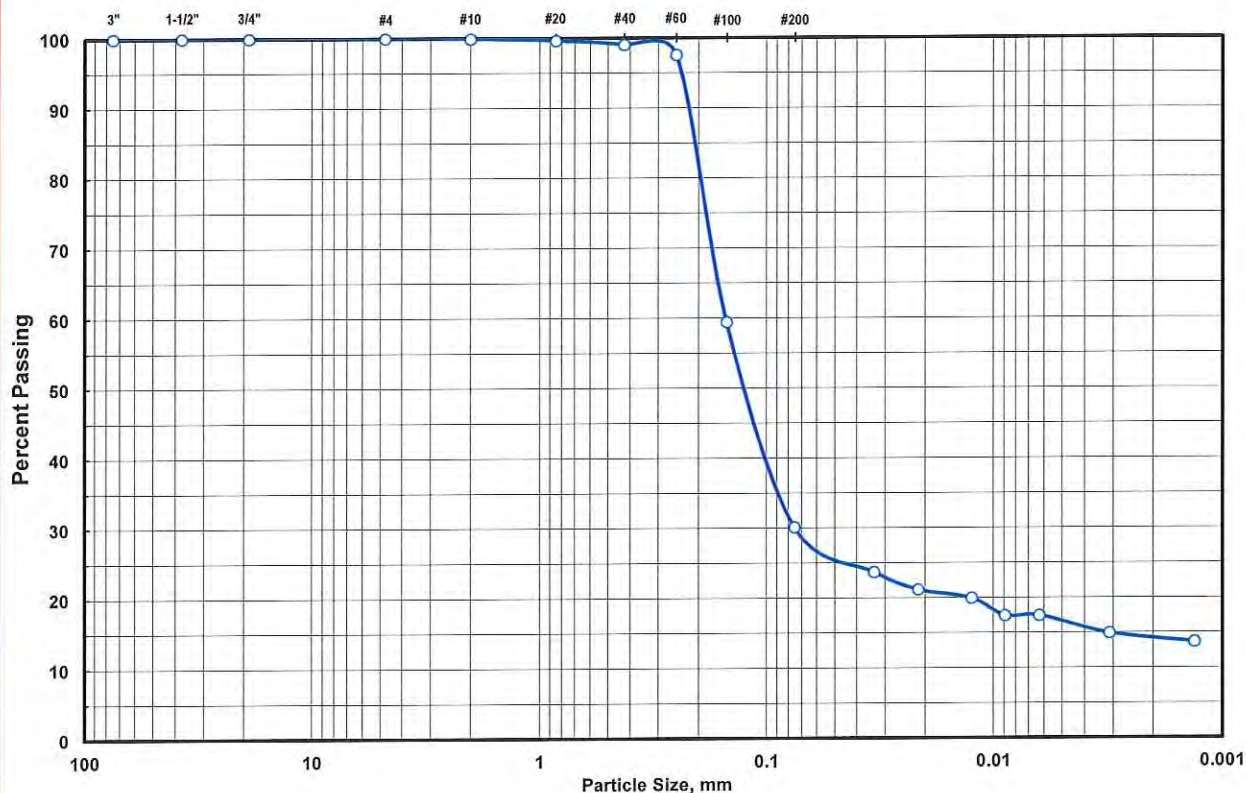
Project:	Phase II - CCR Well Network Installation, CPS Calaveras Power Station	Liquid Limit:	38	% Pass No. 200:	51.0
Client:	Environmental Resources Management	Plastic Limit:	18	% Moisture:	22.7
Project No.:	16-S-370	Plasticity Index:	20	Test Method:	ASTM D-422
Sample ID:	JKS- 58 , Depth = 26' - 27'	Tested By:	MC	Date Tested:	10/4/2016
Remarks:		Checked By:	BHA		
Description:	Tan and brown SANDY LEAN CLAY (CL)	Date Checked:	10/12/2016		



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-422)



GRAVEL		SAND			SILT	CLAY
Coarse	Fine	Coarse	Medium	Fine		

ASTM D-2487 SOIL CLASSIFICATION

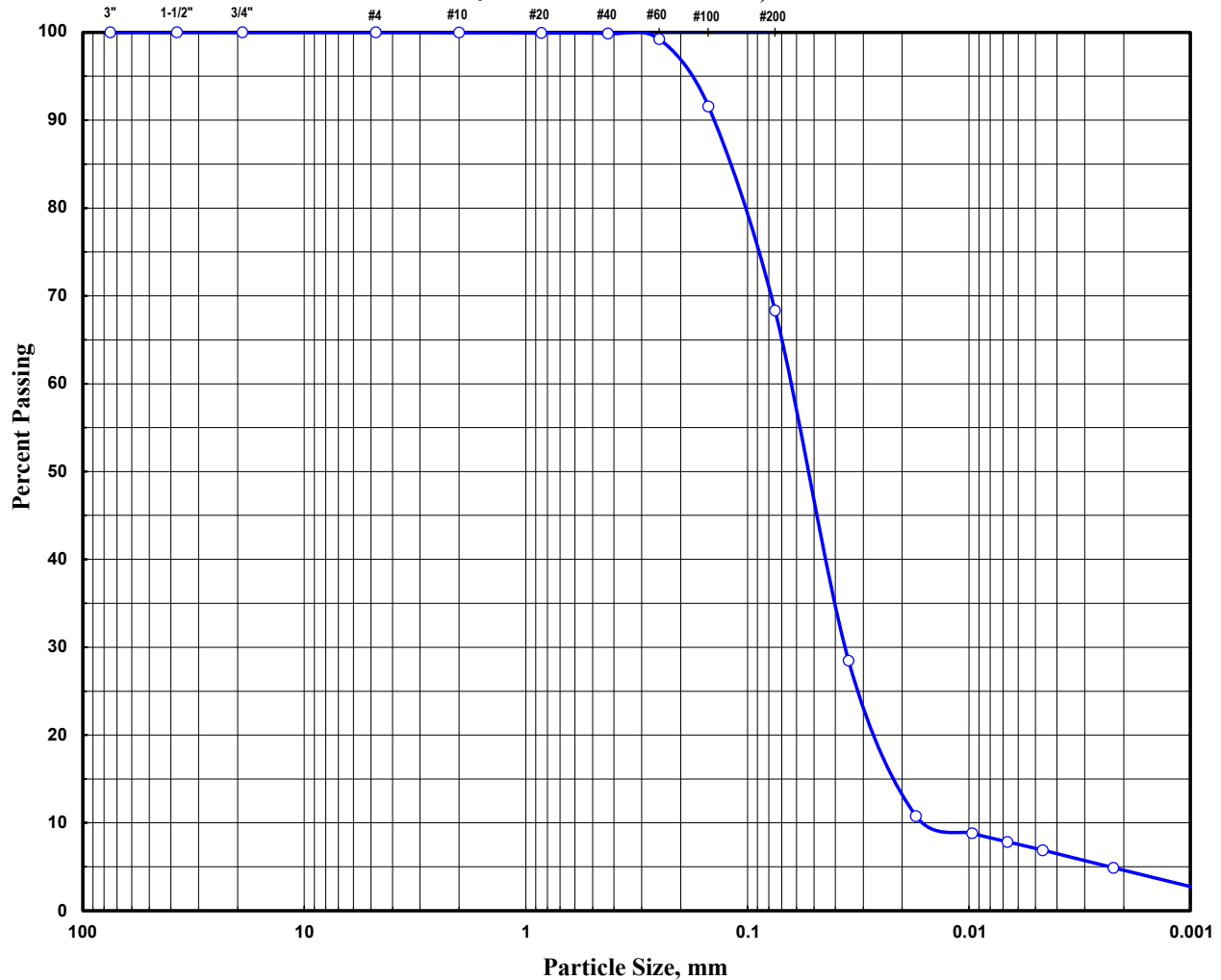
Project:	Phase II - CCR Well Network Installation, CPS Calaveras Power Station	Liquid Limit:	29	% Pass No. 200:	30.2
Client:	Environmental Resources Management	Plastic Limit:	14	% Moisture:	28.6
Project No.:	16-S-370	Plasticity Index:	15	Test Method:	ASTM D-422
Sample ID:	JKS- 64 , Depth = 20' - 30'	Tested By:	MC	Date Tested:	10/4/2016
Remarks:		Checked By:	BHA		
Description:	Dark brown CLAYEY SAND (SC)	Date Checked:	10/12/2016		



HTS, Inc. Consultants

416 Pickering Street
Houston, Texas 77091
Ph: 713-692-8373 Fax: 713-692-8502

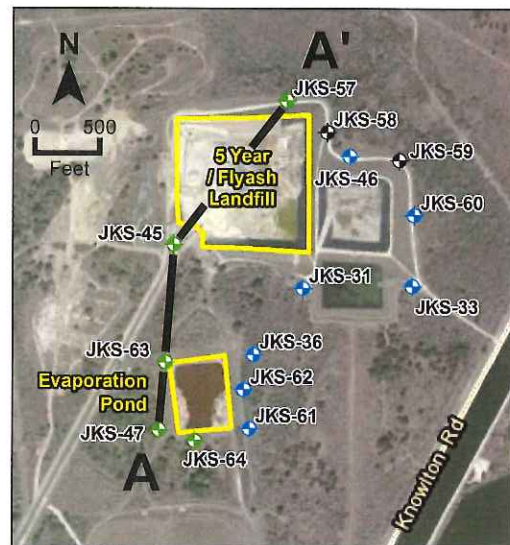
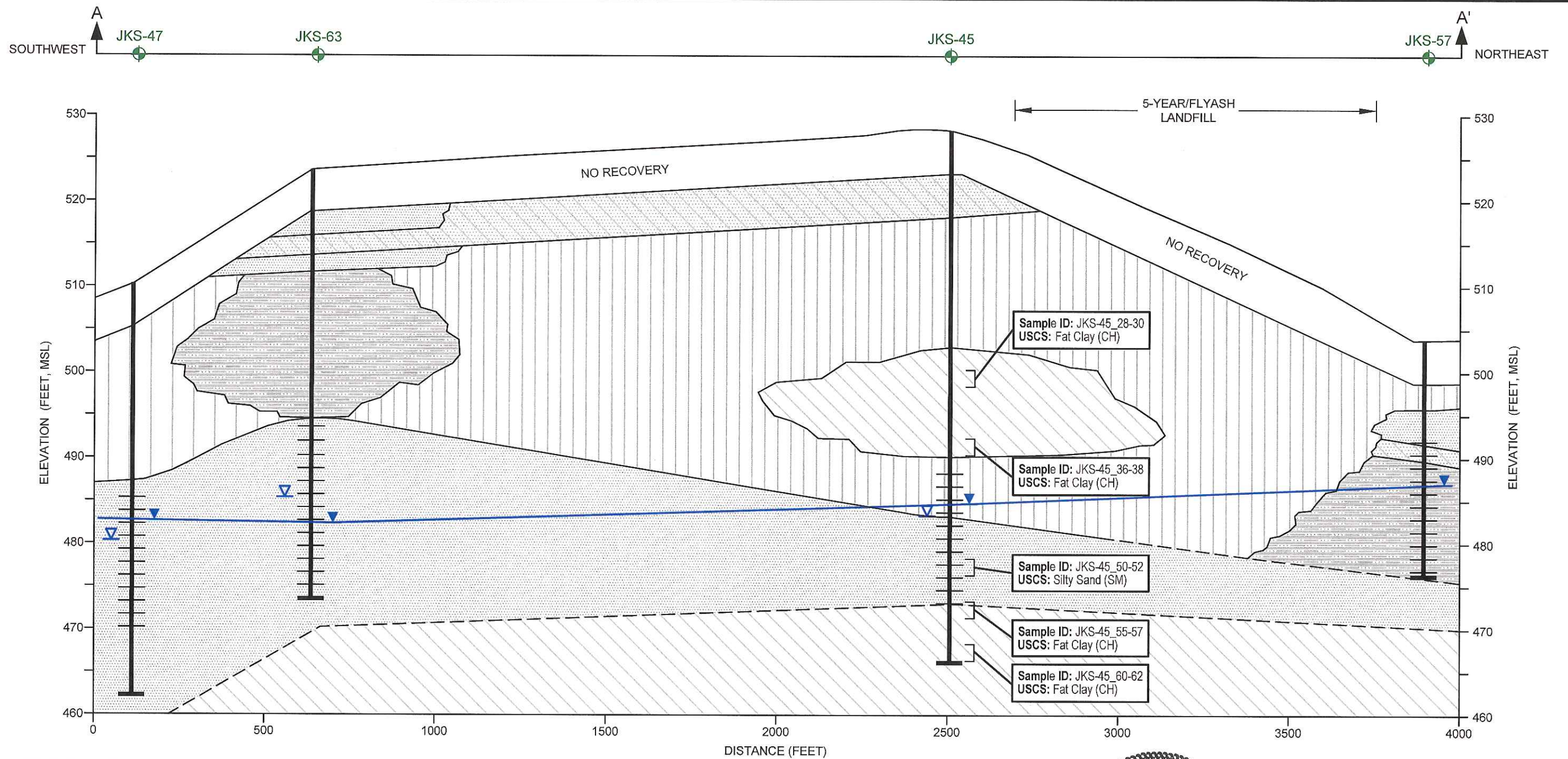
PARTICLE SIZE DISTRIBUTION CURVE (ASTM D-6913 & D-7928)



ASTM D-2487 SOIL CLASSIFICATION

Project:	2022 CCR Tasks/CPS Energy - Calaveras P.S.	Liquid Limit ASTM D 4318	30	% Pass No. 200:	68.3
Client:	ERM	Plastic Limit ASTM D 4318	16	% Moisture:	24.8
Project No.:	HTS 22-S-304	Plasticity Index ASTM D 4318	14	Date Tested:	7/17/22 to 7/28/2022
Sample ID:	Boring No. JKS-68, Depth 23' - 25'	Tested By:	ER		
Soil Class:	SANDY LEAN CLAY (CL)	Checked By:	AA	Figure 1	
Color:	Gray	Date Checked:	7/28/2022		

APPENDIX C STRATIGRAPHIC CROSS-SECTIONS



Environmental Resources Management

Figure 4A
Stratigraphic Cross Section A-A'

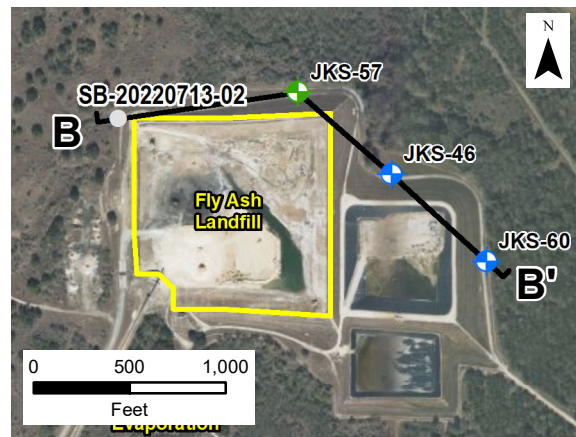
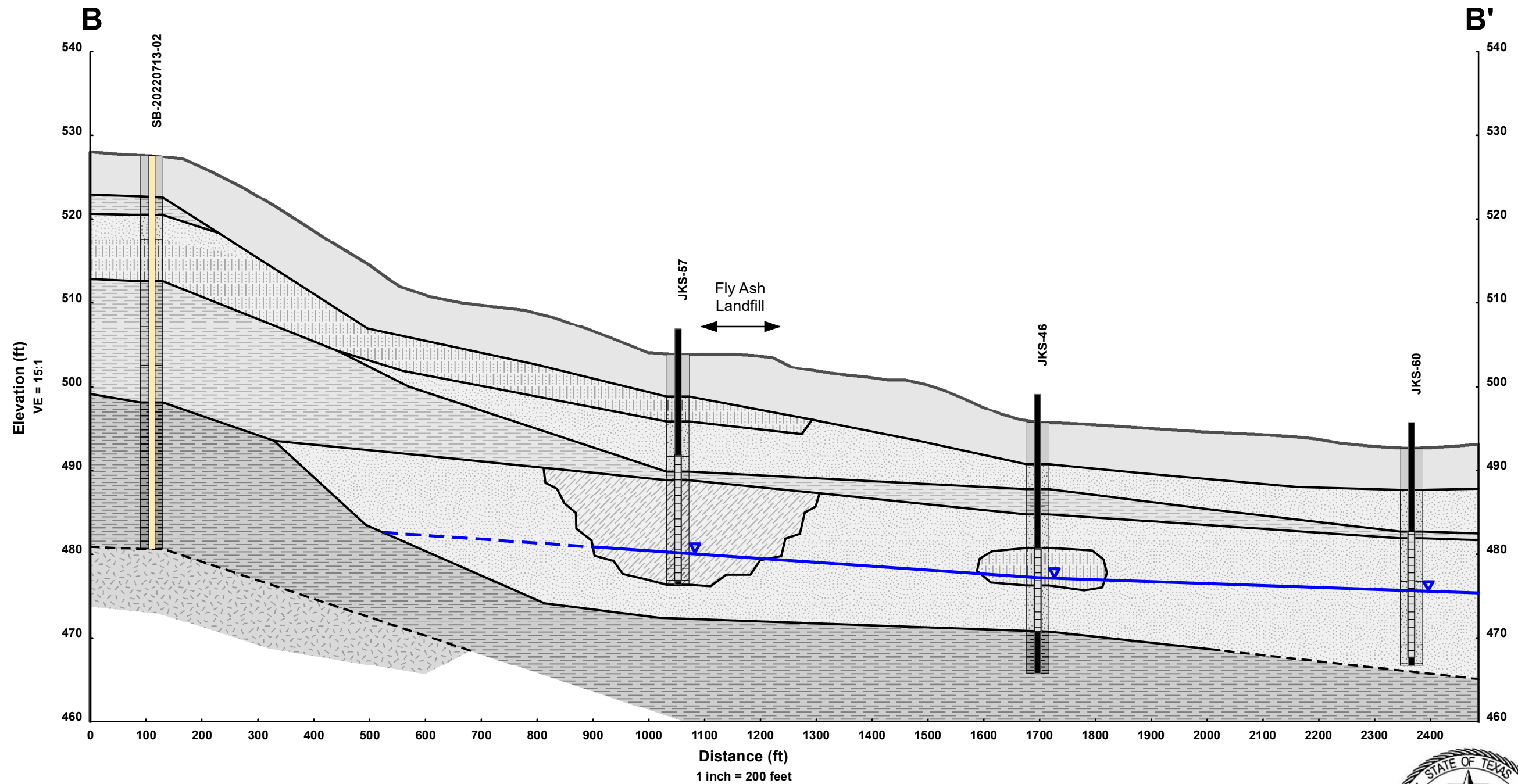
CPS Energy - Calaveras Power Station
San Antonio, Texas

DESIGN: NH	DRAWN: RLM	CHKD.:
DATE: 1/10/2017	SCALE: AS SHOWN	REV.:

W.O.NO.: T:\DWG\AutoCAD\dwg\0366643\0366643_xsecs_v4.dwg, 1/10/2017 4:54:14 PM

ERM

FILE: \\SCUSPRDGIS\FS01\Data\US\Projects\A-C\CPSEnergy\SanAntonio TX\MDX202211 Evaluation\B CrossSection\BIB_XSecBV2.mxd REVISED: 06/28/2023 SCALE: 1:2,400 when printed at 11x17 DRAWN BY: CLT - ABE



Legend

Gauged Water Level - October 22, 2022 (dashed where inferred)

Location Details

Boring
 Casing
 Screen

Soil Lithology

No Recovery
 Sand, Silty Sand, and/or Clayey Sand
 Silt, Sandy Silt, and/or Clayey Silt
 Low to medium plasticity Clay, Sandy Clay, and/or Silty Clay
 High Plasticity Clay
 Interbedded Sand and Clay
 Bedrock (Sandstone)

Notes:

1. Monitor well JKS-45 was installed in April 2016 and monitor wells JKS-57 and JKS-60 were installed in September 2016. Soil boring SB-20220713-02 was installed in July 2022.
2. Vertical Exaggeration = 15:1

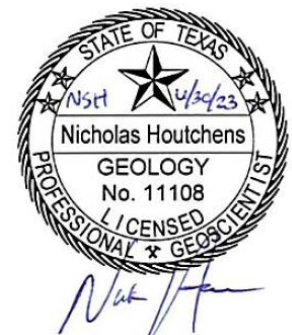
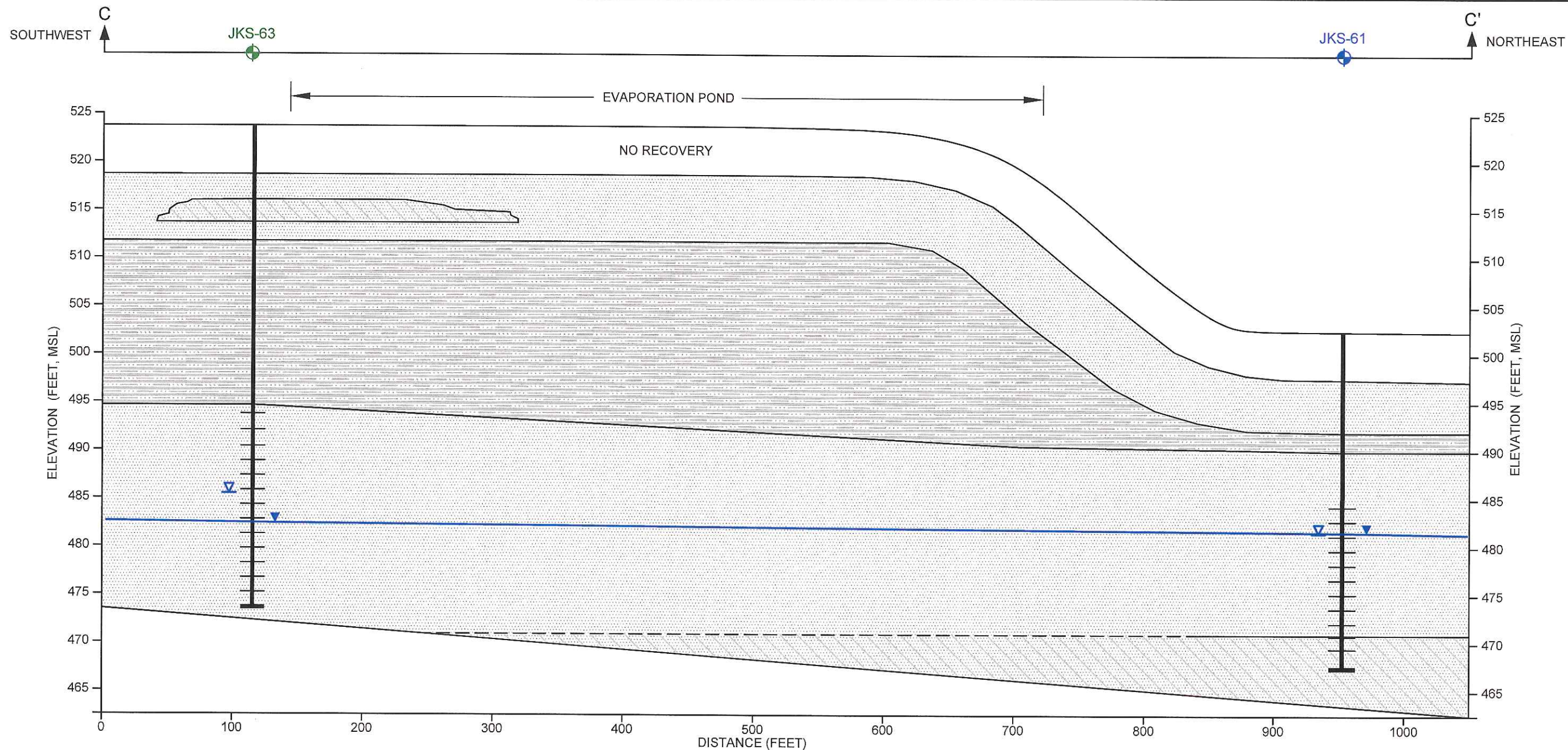


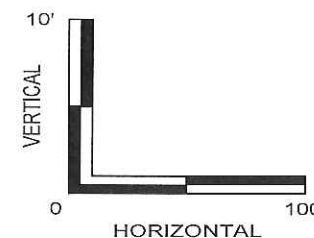
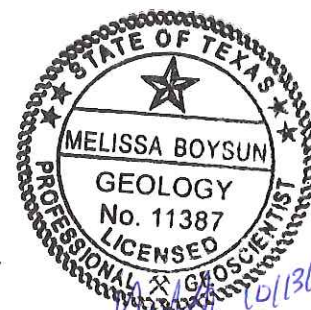
Figure 4B
Stratigraphic Cross-Section B-B'
Fly Ash Landfill
CPS Energy - Calaveras Power Station
San Antonio, Texas



- LEGEND**
- SAND, SILTY SAND, AND/OR CLAYEY SAND
 - SILT, SANDY SILT, AND/OR CLAYEY SILT
 - LOW TO MEDIUM PLASTICITY CLAY, SANDY CLAY, AND/OR SILTY CLAY
 - HIGH PLASTICITY CLAY
 - INTERBEDDED SAND, AND CLAY

- POTENTIOMETRIC SURFACE (MEASURED DECEMBER 6, 2016)
- INITIAL GROUNDWATER LEVEL ENCOUNTERED DURING WELL INSTALLATION

- MONITOR WELL (SCREENED INTERVAL DASHED)
- DOWNGRADEMENT MONITOR WELL
- BACKGROUND MONITOR WELL



- Notes:**
1. Approximate ground surface elevation interpolated from surveyed elevations.
 2. Aerial Source: ESRI.

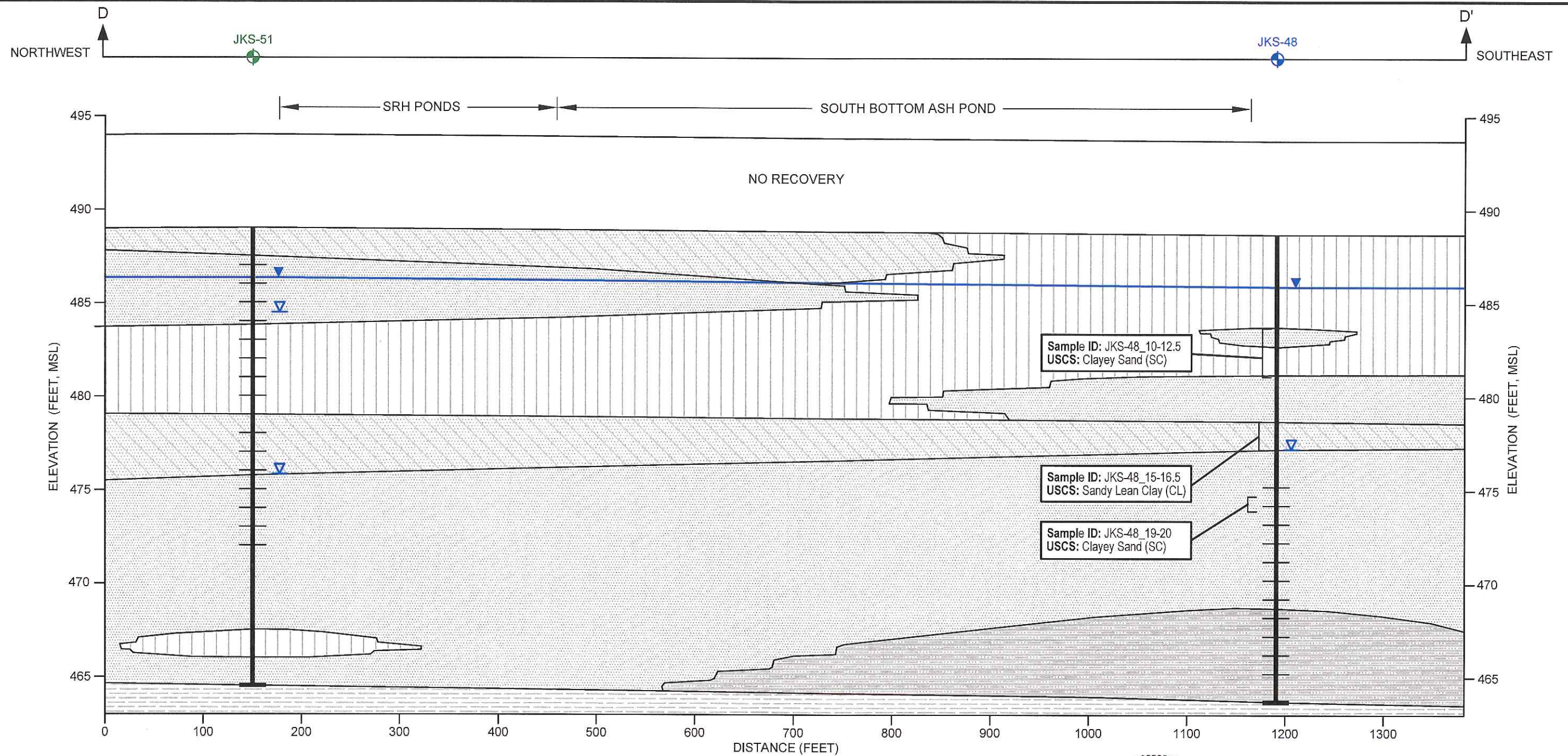
Environmental Resources Management

Figure 4C
Stratigraphic Cross Section C-C'

CPS Energy - Calaveras Power Station
San Antonio, Texas

DESIGN: NH	DRAWN: RLM	CHKD.:
DATE: 1/10/2017	SCALE: AS SHOWN	REV.:
W.O.NO.: T:\DWG\AutoCAD\dwg\0366643\0366643_xsecs_v4.dwg, 1/10/2017 4:54:17 PM		



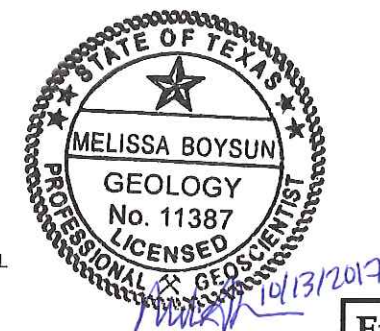


- SAND, SILTY SAND, AND/OR CLAYEY SAND
- SILT, SANDY SILT, AND/OR CLAYEY SILT
- LOW TO MEDIUM PLASTICITY CLAY, SANDY CLAY, AND/OR SILTY CLAY
- INTERBEDDED SAND, SILT, AND CLAY
- BEDROCK (SANDSTONE)

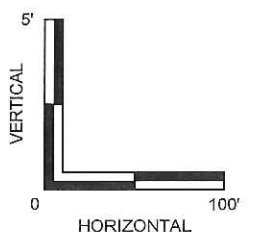
- LEGEND**
- POTENTIOMETRIC SURFACE (MEASURED DECEMBER 6, 2016)
 - INITIAL GROUNDWATER LEVEL ENCOUNTERED DURING WELL INSTALLATION
 - MONITOR WELL (SCREENED INTERVAL DASHED)
 - DOWNGRAIDENT MONITOR WELL
 - BACKGROUND MONITOR WELL

SOIL TEST DATA KEY

Sample ID
USCS Soil Classification



- Notes:**
1. Approximate ground surface elevation interpolated from surveyed elevations.
 2. Aerial Source: ESRI.

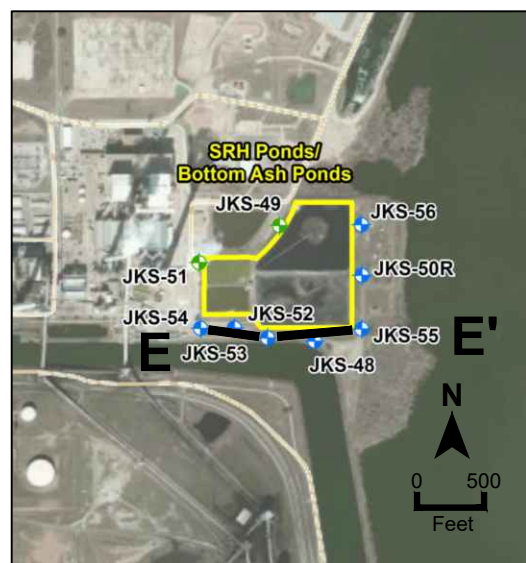
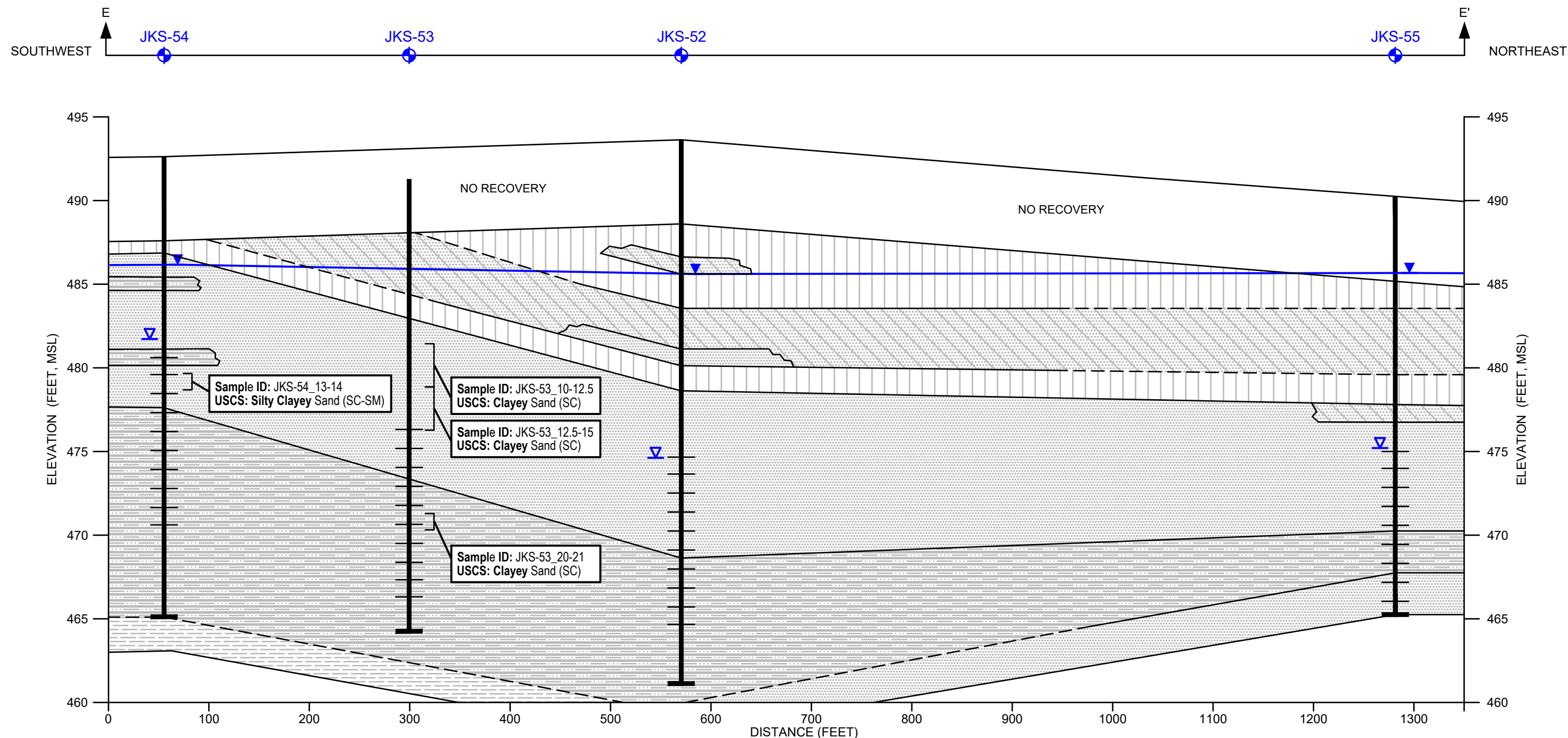


Environmental Resources Management

Figure 4D
Stratigraphic Cross Section D-D'
CPS Energy - Calaveras Power Station
San Antonio, Texas

DESIGN: NH	DRAWN: RLM	CHKD: WZ
DATE: 1/10/2017	SCALE: AS SHOWN	REV.: 1
W.O.NO.: T:\DWG\AutoCAD\dwg\0366643\0366643_xsecs_v4.dwg, 1/10/2017 4:54:18 PM		





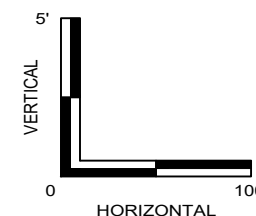
- SAND, SILTY SAND, AND/OR CLAYEY SAND
- SILT, SANDY SILT, AND/OR CLAYEY SILT
- LOW TO MEDIUM PLASTICITY CLAY, SANDY CLAY, AND/OR SILTY CLAY
- INTERBEDDED SAND, SILT, AND CLAY
- BEDROCK (SANDSTONE)

- LEGEND**
- POTENTIOMETRIC SURFACE (MEASURED DECEMBER 6, 2016)
 - INITIAL GROUNDWATER LEVEL ENCOUNTERED DURING WELL INSTALLATION

SOIL TEST DATA KEY

Sample ID
USCS Soil Classification

- MONITOR WELL (SCREENED INTERVAL DASHED)
- DOWNGRADIENT MONITOR WELL



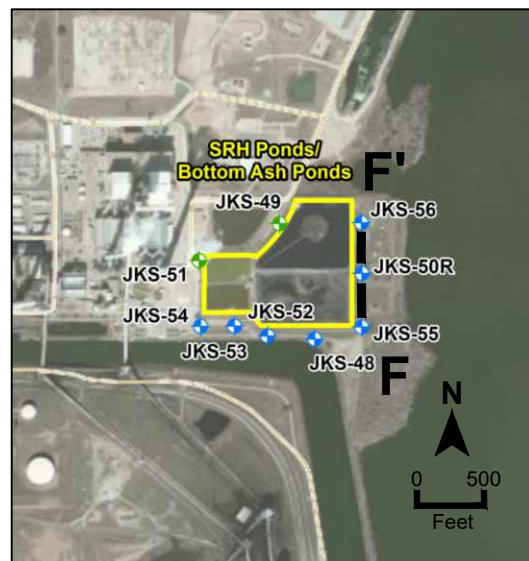
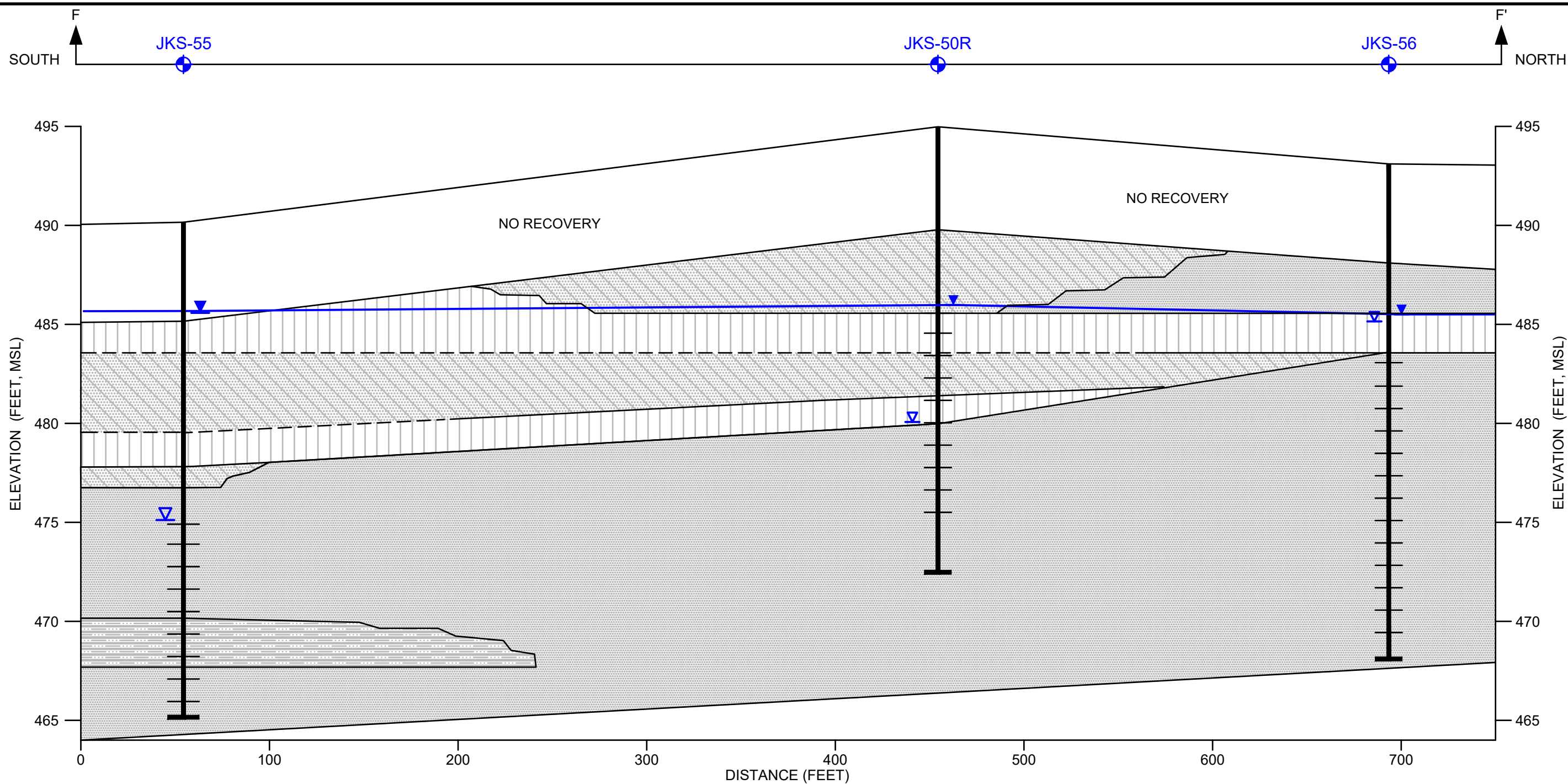
- Notes:**
1. Approximate ground surface elevation interpolated from surveyed elevations.
 2. Aerial Source: ESRI.

Environmental Resources Management

Figure 4E
Stratigraphic Cross Section E-E'
Hydrogeologic Investigation
CPS Energy - Calaveras Power Station
San Antonio, Texas

DESIGN: NH	DRAWN: RLM	CHKD.: WZ
DATE: 9/12/2022	SCALE: AS SHOWN	REV.: 5
W.O.NO.:		

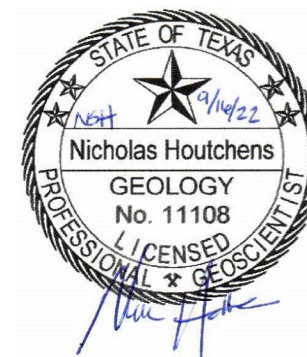




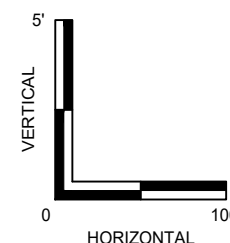
- LEGEND**
- SAND, SILTY SAND, AND/OR CLAYEY SAND
 - SILT, SANDY SILT, AND/OR CLAYEY SILT
 - LOW TO MEDIUM PLASTICITY CLAY, SANDY CLAY, AND/OR SILTY CLAY
 - INTERBEDDED SAND, AND CLAY
 - BEDROCK (SANDSTONE)

- POTENTIOMETRIC SURFACE (MEASURED DECEMBER 6, 2016)
- INITIAL GROUNDWATER LEVEL ENCOUNTERED DURING WELL INSTALLATION

- MONITOR WELL (SCREENED INTERVAL DASHED)
- DOWNGRADIENT MONITOR WELL



- Notes:**
1. Approximate ground surface elevation interpolated from surveyed elevations.
 2. Aerial Source: ESRI.



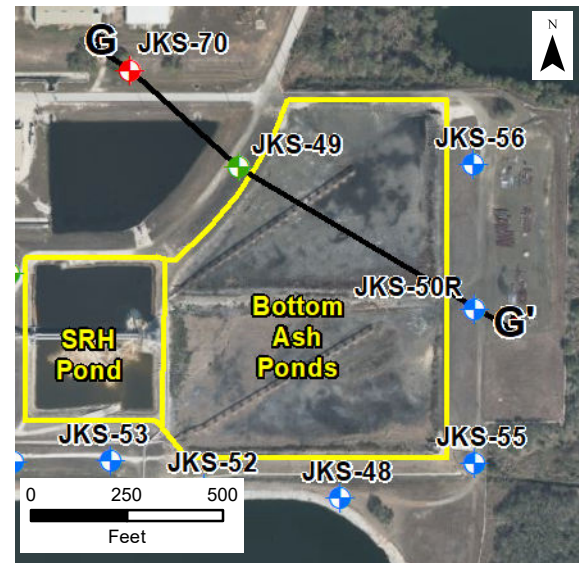
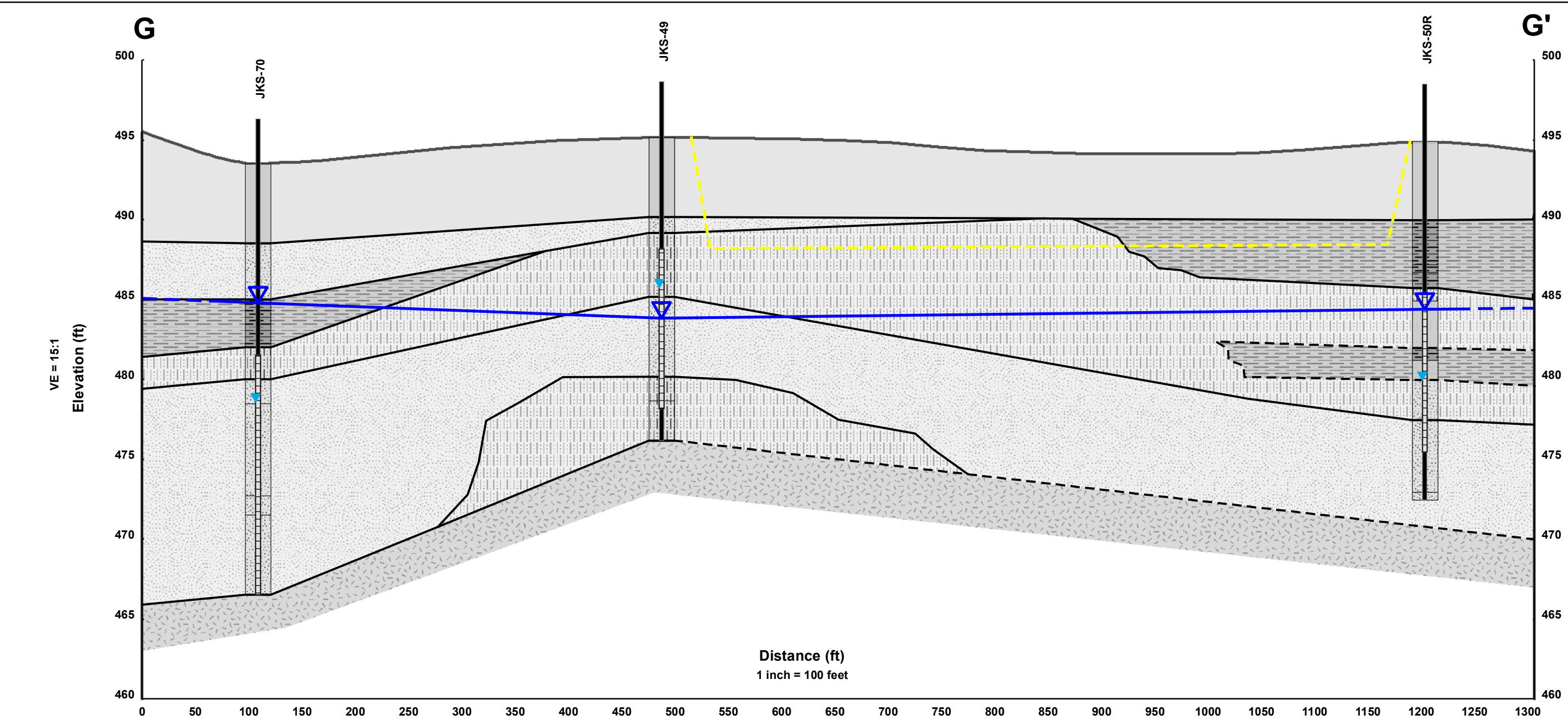
Environmental Resources Management

Figure 4F
Stratigraphic Cross Section F-F'
Hydrogeologic Investigation
CPS Energy - Calaveras Power Station
San Antonio, Texas

DESIGN: NH	DRAWN: EFC/RLM	CHKD.: WZ
DATE: 9/16/2022	SCALE: AS SHOWN	REV.: 5
W.O.NO.: T:\DWG\AutoCAD\dwg\0366643\0366643_xsecs_v5.dwg, 9/16/2022 1:44:14 PM		



FILE: \\OPSRD\CD\FILE01\Boson\Team\DMV\Clients A E\CPSEnergy\SanAntonio TX\MXD\202211 Evaluation\04G CrossSection\04G CrossSectionG.mxd REVISED: 11/28/2022 SCALE: 1:6,000 when printed at 11x17 DRAWN BY: CLT - ABE



Legend

- Gauged Water Level - October 13, 2022 (dashed where inferred)
- Water Level Encountered During Well / Boring Installation
- Approximate extent of Bottom Ash Ponds

Location Details

- Casing
- Screen

Soil Lithology

- No Recovery
- Sand, Silty Sand, and/or Clayey Sand
- Silt, Sandy Silt, and/or Clayey Silt
- Low to medium plasticity Clay, Sandy Clay, and/or Silty Clay
- Bedrock (Sandstone)

Notes:

1. Monitor well JKS-49, JKS-50R, and JKS-70 installed in April 2016, October 2016, and July 2022, respectively.
2. Location and design elevation of the Bottom Ash Ponds based on ERM 2018 Location Restrictions Demonstration Report.
3. Vertical Exaggeration = 15:1

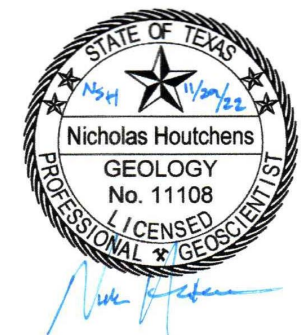
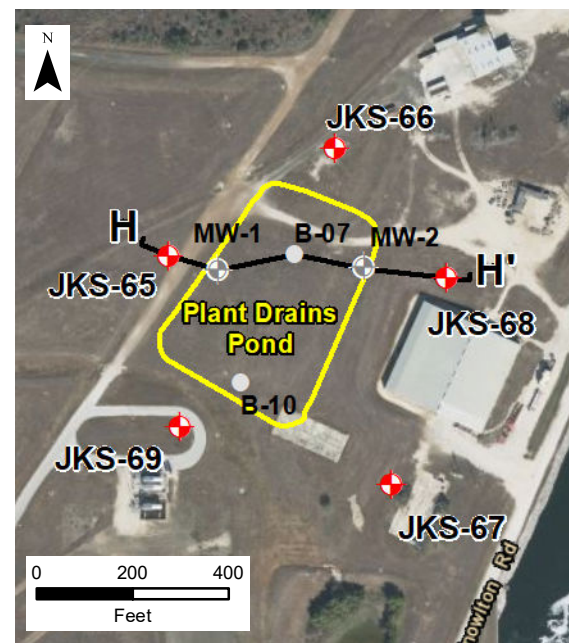
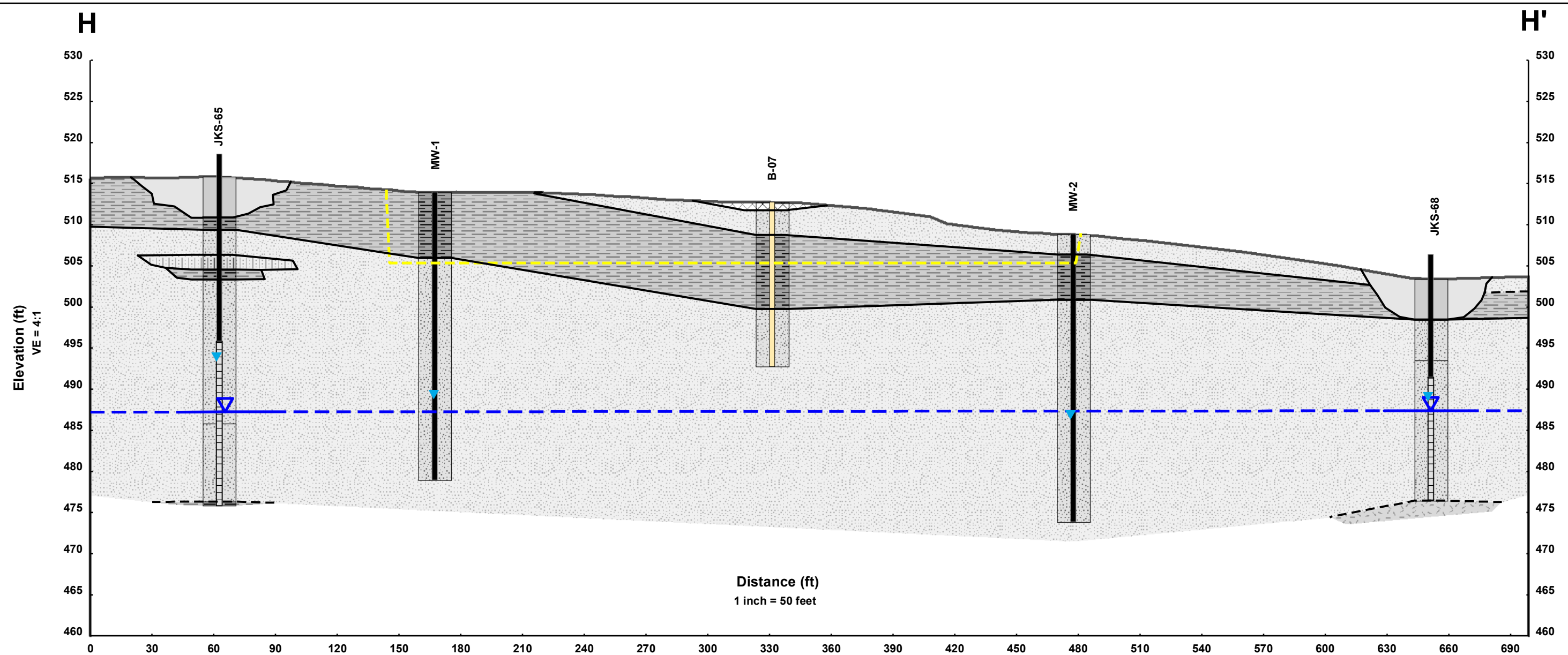





Figure 4G
Stratigraphic Cross-Section G-G'
Bottom Ash Ponds
CPS Energy - Calaveras Power Station
San Antonio, Texas














Legend

-  Gauged Water Level - November 8, 2022 (dashed where inferred)
-  Water Level Encountered During Well / Boring Installation
-  Anticipated Lowest Plant Drains Pond Design Elevation

Location Details

-  Boring
 Casing
 Screen

Soil Lithology

- | | |
|---|--|
|  | No Recovery |
|  | Fill Material |
|  | Sand, Silty Sand, and/or Clayey Sand |
|  | Silt, Sandy Silt, and/or Clayey Silt |
|  | Low to medium plasticity Clay, Sandy Clay, and/or Silty Clay |
|  | Bedrock (Sandstone) |

Notes:

1. Monitor well JKS-65 installed in August 2020 and JKS-68 installed in July 2022 by ERM.
2. Monitor wells MW-1 and MW-2 installed in December 2017, as documented in the Raba Kistner 2018 Geotechnical Engineering Study Report.
3. Soil Boring B-7 installed in July 2020, as documented in the Raba Kistner 2020 Geotechnical Engineering Study Report.
4. Approximate location of pond based on the Raba Kistner 2020 Geotechnical Engineering Study Report. The anticipated lowest design elevation based on AECOM Design Drawings entitled "Spruce Plant Drains Project", drawing number 2-470-C0005 dated 5/2/2022.
5. Vertical Exaggeration = 4:1

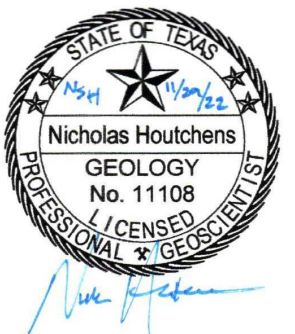
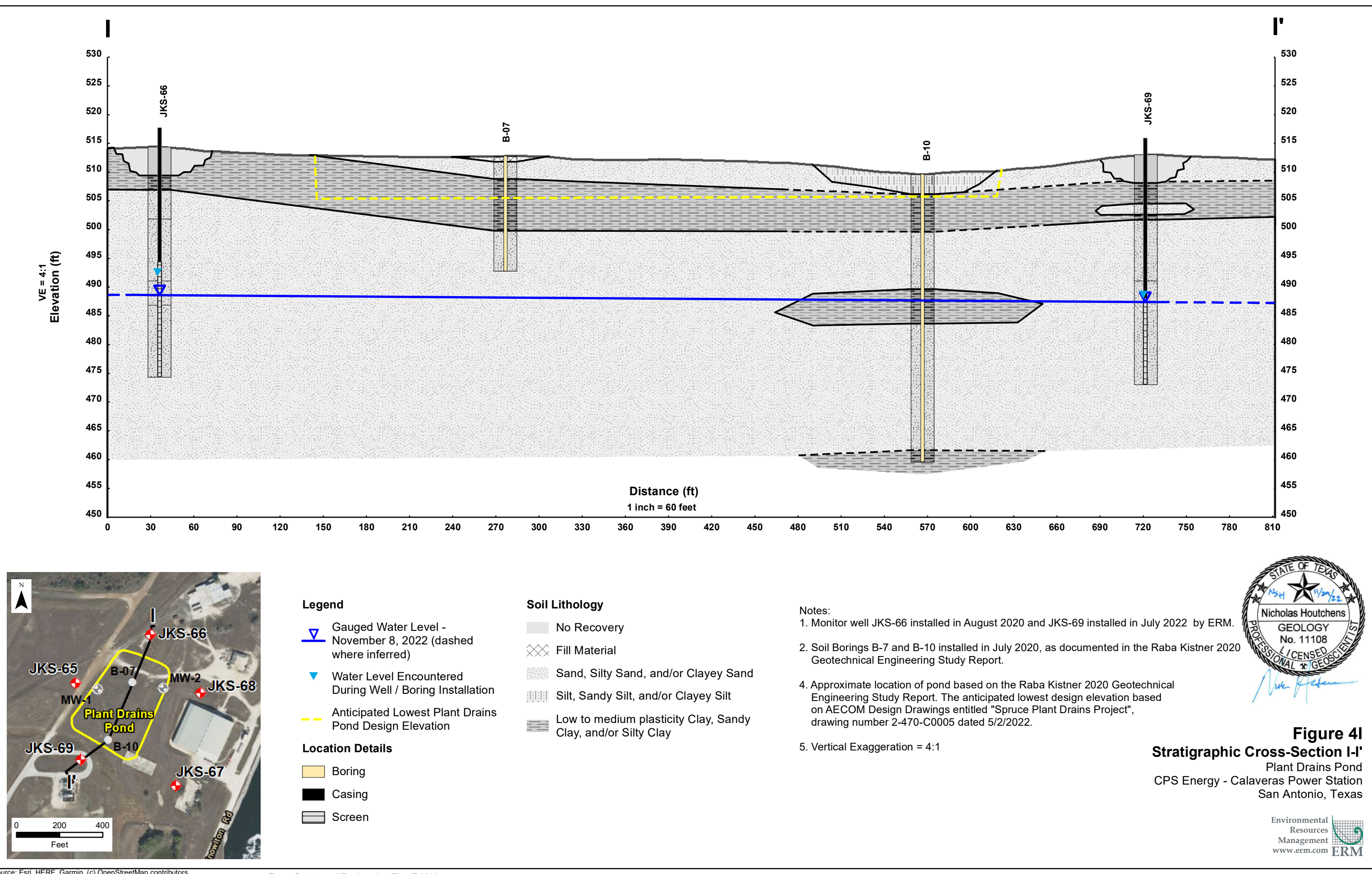


Figure 4H
Stratigraphic Cross-Section H-H'
Plant Drains Pond
CPS Energy - Calaveras Power Station
San Antonio, Texas

FILE: \\OPSRDC\FILE01\Data\Boson\Team\MMV\Clients A E\CPs Energy\SanAntonio TX\MXD\2022\11 Evaluation\041 CrossSection\041 XSect.mxd, SCALE: 1:4,800 when printed at 11x17
DRAWN BY: CLT - ABE



APPENDIX D RABA KISTNER GEOTECHNICAL ENGINEERING STUDIES



GEOTECHNICAL ENGINEERING STUDY

FOR

**J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS**



Project No. ASA17-096-00
February 5, 2018

Mr. Eric R. Olson
CPS Energy
c/o Mr. Steve Dean, P.E.
Pape-Dawson Engineers, Inc.
2000 NW Loop 410
San Antonio, Texas 78213

Raba Kistner
Consultants, Inc.
12821 W. Golden Lane
San Antonio, TX 78249
P.O. Box 690287
San Antonio, TX 78269
www.rkci.com

P 210 :: 699 :: 9090
F 210 :: 699 :: 6426
TBPE Firm F-3257

**RE: Geotechnical Engineering Study
J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas**

Dear Mr. Dean:

Raba Kistner Consultants Inc. (RKCI) is pleased to submit the report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with RKCI Proposal No. PSA17-189-00, dated December 7, 2017. The purpose of this study was to drill borings within the approximate footprint of the proposed Coal Combustion Residual (CCR) containment ponds, to perform laboratory testing to classify and characterize subsurface conditions, perform a geophysical survey to evaluate the seismic response of the underlying geometrical and to prepare an engineering report presenting our findings and recommendations for the proposed CCR ponds.

We appreciate the opportunity to be of service to you on this project. Should you have any questions about the information presented in this report, or if we may be of additional assistance with value engineering or on the materials testing-quality control program during construction, please call.

Very truly yours,

RABA KISTNER CONSULTANTS, INC.

Sam Haile, E.I.T.
Graduate Engineer

Eric J. Neuner, P.E.
Associate | Manager, San Antonio Engineering

SH/EJN/kv

Attachments

Copies Submitted: Electronic - PDF

GEOTECHNICAL ENGINEERING STUDY

For

**J.K. SPRUCE – CALAVERAS POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL CONTAINMENT PONDS
SAN ANTONIO, TEXAS**

Prepared for

PAPE-DAWSON ENGINEERS, INC.
San Antonio, Texas

Prepared by

RABA KISTNER CONSULTANTS, INC.
San Antonio, Texas

PROJECT NO. ASA17-096-00

February 5, 2018

TABLE OF CONTENTS

PROJECT DESCRIPTION	1
RISK.....	1
BORINGS AND LABORATORY TESTS.....	1
GENERAL SITE CONDITIONS.....	3
GEOLOGY	3
STRATIGRAPHY	3
GROUNDWATER.....	3
SEISMIC CONSIDERATIONS	4
Seismicity Discussion	4
References:	5
Developing Horizontal Peak Ground Acceleration.....	5
Liquefaction Potential	6
CCR POND DESIGN CONSIDERATIONS.....	7
ESTIMATED CCR POND BOTTOM.....	7
ANTICIPATED MATERIAL FOR BERM CONSTRUCTION.....	7
UNSUITABLE ONSITE MATERIALS	8
EXPANSIVE SOIL-RELATED MOVEMENTS	8
SETTLEMENT DUE TO BERM FILL AND CCR MATERIAL.....	9
BERM GLOBAL STABILITY ANALYSIS	9
Minimum Factor of Safety	9
Method of Analysis.....	10
Loading Conditions	10
Soil Properties.....	10
Results of Analyses	11
BERM CONSTRUCTION CONSIDERATIONS	11
LINER MATERIAL CONSIDERATIONS	13
LIMITATIONS.....	13

TABLE OF CONTENTS

ATTACHMENTS

Boring Location Map.....	Figure 1
Logs of Borings.....	Figures 2 through 12
Key to Terms and Symbols.....	Figure 13
Results of Soil Analyses.....	Figure 14
Unconfined Compression Curves.....	Figure 15
One-Dimensional Consolidation Tests.....	Figure 16
Consolidated-Undrained Triaxial Tests.....	Figure 17
Direct Shear Test.....	Figure 18
Seismic Vs100 Geophysical Investigation.....	Appendix A
NEHRP Seismic Provisions.....	Appendix B
Liquefaction Analyses	Appendix C
Slope Stability Analysis	Appendix D

PROJECT DESCRIPTION

We understand that two (2) new Coal Combustion Residual (CCR) containment ponds are proposed at the existing J.K. Spruce Power Plant. In general, the containment ponds will be located north and east of the existing power plant and west of Calaveras Lake, see Figure 1. Conceptually, the containment ponds will have dimensions of approximately 325 ft by 550 ft in plan view and the bottom may extend to depths of approximately 10 ft below the existing ground surface (or 5 feet above the upper limit of the observed groundwater surface). Currently, the existing ground surface slopes downward to the east and south with approximately 18 ft. of vertical relief.

The containment ponds will be lined and berms with maximum heights up to 6 ft are anticipated to extend above the lowest existing ground surface (approximately El 499 ft msl). We anticipate that the berms will be sloped at 1 Vertical (V) to 3 Horizontal (H), and an approximately 10-foot wide crest will be constructed. We assume that the berms will be tapered to accommodate the elevated grade change to the west.

We understand that CPS maintains the Calaveras Lake at a target pool elevation of El 485 ft msl with periodic fluctuations of plus or minus one foot. Levels above the target pool elevation are usually due to rainfall in the Calaveras Creek, Hondo Creek and Chupaderas Creek watersheds, and typically return to the target pool elevation within a few days of precipitation.

On the basis of historic aerial photographs, available from Google Earth, it appears that the site has been previously developed. Previous developments appeared to consist of a parking area, yard, and some other structures. Currently, the site appears to be covered with grass and a concrete slab. A water fill pond is present south and east of the proposed containment ponds.

RISK

The geotechnical engineering recommendations contained in this memorandum are intended to provide Pape-Dawson Engineers, Inc; CPS Energy; and the U.S. Environmental Protection Agency with information pertaining to the stability of the proposed CCR containment ponds at the referenced site.

The geotechnical properties of the soils encountered in this study involve variability. The selection of analysis parameters for this project was based on a review of the available geotechnical data, our knowledge of the project area, and design calculations using select surveyed geometries. The results of our analyses were then reviewed with respect to important trends and general concepts, keeping these conditions and limitations in mind. Our conceptual recommendations are based on a conservative approach as is warranted for the analyses.

BORINGS AND LABORATORY TESTS

Subsurface conditions at the site were evaluated by eleven borings drilled at the locations shown on the Boring Location Map, Figure 1. At seven of the boring locations, temporary monitoring wells (MW-series borings) were installed to observe groundwater levels over a relatively short time period (approximately 3 weeks after drilling) and to perform pump tests to calculate the underlying material hydraulic conductivity. The boring locations and elevations were surveyed by Pape-Dawson Engineers.

The surveyed ground surface elevation at each of the boring locations is listed in the table below as well as the approximate bottom elevation of each boring. Boring coordinates are provided on the provided boring logs.

Boring No.	Ground Surface Elevation (ft msl)	Approximate Boring Depth (ft)	Boring Bottom Elevation (ft, msl)
B-1	510.10	50	460.10
B-2	506.18	50	456.18
B-3	513.40	50	463.40
B-4	510.00	50	460.00
MW-1	513.91	35	478.91
MW-2	508.83	35	473.83
MW-3	516.86	35	481.86
MW-4	503.80	20	483.80
MW-5	503.36	35	468.36
MW-6	514.49	35	479.49
MW-7	500.22	35	465.22

The borings were drilled using a truck-mounted drilling rig. During drilling operations, Split-Spoon (with Standard Penetration Test), relatively undisturbed Shelby tube, and auger cutting samples were collected. Each sample was visually classified in the laboratory by a member of our geotechnical engineering staff. The geotechnical engineering properties of the strata were evaluated by the natural moisture content, Atterberg limits, swell, unconfined compression, sieve analysis with hydrometer tests, consolidation, hydraulic conductivities, triaxial and direct shear tests.

The results of the field and laboratory tests are presented in graphical or numerical form on the boring logs illustrated on Figures 2 through 12. A key to classification terms and symbols used on the logs is presented on Figure 13. The results of the laboratory and field testing are also tabulated on Figure 14 for ease of reference. Laboratory test results for the unconfined compression curves, one-dimensional consolidation, consolidated-undrained triaxial, and direct shear tests are presented on Figures 15, 16, 17, and 18, respectively.

Standard Penetration Test results are noted as “blows per ft” on the boring logs and Figure 14, where “blows per ft” refers to the number of blows by a falling hammer required for 1 ft. of penetration into the soil/weak rock (N-value). Where hard or dense materials were encountered, the tests were terminated at 50 blows even if one foot of penetration had not been achieved. When all 50 blows fall within the first 6 in. (seating blows), refusal “ref” for 6 in. or less will be noted on the boring logs and on Figure 14.

In addition, a Seismic Vs100 Geophysical Investigation was performed at the site to evaluate the average shear-wave velocity in the upper 100 ft of the geometrical to evaluate Seismic Site Class. The results of the geophysical investigation in presented in Appendix A.

GENERAL SITE CONDITIONS

GEOLOGY

A review of the *Geologic Atlas of Texas, San Antonio Sheet*, indicates that this site is naturally underlain with the soils/rocks of the Wilcox Group, which is composed of mudstone with varying amounts of sandstone and lignite. The Wilcox Group may weather to yellowish-brown clay, sandy clay, clayey sands, and sands.

The Wilcox Group grades downward into the Midway Group, which is composed of clay, silt, and sand, with some pebbles near its base. Glauconite is often encountered in these soils. **Key engineering considerations for development supported on the soils/rock of this formation typically include the presence of possible water-bearing layers, very hard mudstone/sandstone layers, and the expansive nature of the highly plasticity clays that can be present in this formation.**

STRATIGRAPHY

In general, the natural stratigraphy at this site consists of surficial sands that are underlain by fine-grained soils, which in turn are underlain by clayey to silty clayey sands. Exceptions include, Boring MW-1 where surficial sands were not observed, and Borings MW-6 and MW-7, where the fine-grained soil layer were not observed. **Cemented sands or sandstone were encountered at variable depths and intervals in our borings (annotated on our borings). In Boring MW-4, auger refusal on cemented sand/sandstone was encountered at a depth of 20 ft.** As previously discussed, the site has been previously developed. Although fill was not observed in our borings, remnants of past construction (localized fill materials that contain miscellaneous debris, utilities, abandoned foundations, rubble and other materials) should be anticipated during site grading.

Each stratum has been designated by grouping soils that possess similar physical and engineering characteristics. The boring logs should be consulted for more specific stratigraphic information. Unless noted on the boring logs, the lines designating the changes between various strata represent approximate boundaries. The transition between materials may be gradual or may occur between recovered samples. The stratification given on the boring logs, or described herein, is for use by RKCI in its analyses and should not be used as the basis of design or construction cost estimates without realizing that there can be variation from that shown or described.

The boring logs and related information depict subsurface conditions only at the specific locations and times where sampling was conducted. The passage of time may result in changes in conditions, interpreted to exist, at or between the locations where sampling was conducted.

GROUNDWATER

Groundwater observations are summarized in the following table.

Summary of Groundwater Observations

Boring No.	Ground Surface Elevation (ft msl)	Groundwater Elevation at Time of drilling (ft msl)	January 9, 2018 Groundwater Elevation (ft msl)	January 19, 2018 Groundwater Elevation (ft msl)	January 25, 2018 Groundwater Elevation (ft msl)
B-1	510.10	486.85	N/A	N/A	N/A
B-2	506.18	486.68	N/A	N/A	N/A
B-3	513.40	489.00	N/A	N/A	N/A
B-4	510.00	488.70	N/A	N/A	N/A
MW-1	513.91	488.71	489.41	488.51	489.19
MW-2	508.83	486.23	489.13	490.03	N/M
MW-3	516.86	489.36	490.96	490.96	490.72
MW-4	503.80	491.20	490.40	490.20	N/M
MW-5	503.36	486.56	487.46	488.16	486.89
MW-6	514.49	487.39	488.89	488.49	N/M
MW-7	500.22	488.32	489.02	488.62	488.79

N/A – Borings backfilled with grout after drilling.

N/R – Not measured.

As mentioned previously, this site is bounded to the west, south, and east by Calaveras Lake. The groundwater levels encountered at this site are most likely dominated by the surface water elevation of Calaveras Lake (El 485 ft msl). Fluctuations in groundwater levels are possible due to variations in rainfall and surface water run-off.

SEISMIC CONSIDERATIONS

Seismicity Discussion

In general, the site is located south and east of the Balcones Fault Zone (located generally north of the City of San Antonio). The Balcones Fault Zone extends approximately from the southwest part of the state near Del Rio, Texas to the north central region near Dallas, Texas along Interstate Highway 35 and consists of a northeast trending series of normal faults, which generally serves to contrast Upper Cretaceous rock formations in the southeast with Lower Cretaceous formations to the northwest. As a result of this large-scale, regional faulting, minor internal fault sequences and fractures exist throughout this zone that follow the same structural trend and accommodate localized displacement between rock units. The main tectonic events of the Balcones faulting are generally considered to have occurred during the Miocene epoch (27 to 12 million years ago), but there is considerable evidence that structural adjustments also took place during the earlier Cretaceous period, which ended approximately 66 million years ago (Abbott and Woodruff, 1986). On the basis of published literature, the Balcones Fault system has remained essentially inactive for nearly 15 million years, with the last major activity occurring during the Miocene. According to National Seismic Hazard maps developed by the U.S. Geological Survey (USGS, 2014), the Balcones Fault Zone is in one of the lowest-risk zones for earthquakes or other seismic hazards in the United States. Based on review of the 2014 USGS hazard map for the conterminous United States, the total number of

earthquake-shaking events causing damage within the San Antonio and Austin regions, expected within a 10,000-year time period, is less than two. As San Antonio and Austin are fully contained within an "aseismic zone" as defined by the USGS, the probability that an earthquake of damage-causing magnitude will occur during the lifetime of structures presently being constructed is considered to be very low.

References:

1. Patrick Abbott and C. M. Woodruff, eds., *The Balcones Escarpment: Geology, Hydrology, Ecology* (San Antonio: Geological Society of America, 1986).
2. Edward Collins and Stephen Lauback, *Faults and Fractures in the Balcones Fault Zone* (Austin: Austin Geological Society, 1990).
3. Robert T. Hill, "The Geologic Evolution of the Non-Mountainous Topography of the Texas Region: An Introduction to the Study of the Great Plains," *American Geologist* 10 (August 1892).
4. E. H. Sellards, W. S. Adkins, and F. B. Plummer, *The Geology of Texas* (University of Texas Bulletin 3232, 1932).
5. Grimshaw, Thomas W.; Charles Woodruff, Jr. (1986). "Structural Style in an En Echelon Fault System, Balcones Fault Zone, Central Texas: Geomorphologic and Hydrologic Implications". *The University of Texas*. Retrieved 2008-10-27.
6. "Peak Acceleration (%g) with 10% Probability of Exceedance in 50 Years". USGS. October 2002. Archived from the original on 2007-06-27.
7. Balcones Escarpment from the *Handbook of Texas Online*. Retrieved 30 July 2015. Texas State Historical Association
8. Seismic-Hazard Maps for the Conterminous United States, 2014 (USGS Scientific Investigations Map 3325)

Developing Horizontal Peak Ground Acceleration

We understand that the CCR pond will be designed to withstand the peak ground acceleration with a 2% probability of exceedance (PE) in 50 years (mean return time of 2,475 years). The National Earthquake Hazards Reduction Program (NEHRP) interactive deaggregations models were used to obtain the probabilistic bedrock accelerations at the site. The NEHRP models consider ground motion from many sources surrounding the site location with the assumption that the site condition is rock with an average shear wave velocity of 2,500 ft/s. Bedrock spectral response acceleration at short periods (S_s), and at 1-second periods (S_1) of 0.091 g and 0.031 g, respectively, were obtained from the NEHRP models (Appendix B).

A detailed site-specific seismic hazard analysis was beyond our scope of services. The guidelines established by NEHRP were used to propagate the bedrock acceleration (2% PE in 50 years) to the ground

surface (Per Section 11.4.2). On the basis of the average shear-wave velocity in the upper 100 ft (results presented in Appendix A), the geomaterial has a shear wave velocity ranging from 1,062 to 1,106 ft/second. Hence, the underlying soil profile within the upper 100 feet should be defined as Site Class D (Stiff Soil: Shear wave velocity range of 600 to 1,200 ft/second). Using Site Class D classification, the approximate surficial horizontal peak ground acceleration (HPGA) at this site is 0.075 g. The HPGA value of 0.075 g was used in our potential liquefaction analysis and berm global stability analysis for the seismic condition (presented later).

Liquefaction Potential

During an earthquake, sudden increases in pore water pressures can develop within saturated soil deposits due to seismic shaking. Where the increased pore water pressure exceeds the total overburden pressure loose and medium dense saturated sandy deposits may experience a sudden loss of strength, sometimes resulting in loss of bearing capacity, permanent lateral displacement, and/or settlement of the ground. This phenomenon is called soil liquefaction.

Based on the current subsurface exploration, loose to very dense sands are present below the upper cohesive soil layer. Groundwater is expected to be near the groundwater observations to date. For the liquefaction analyses, groundwater was considered to occur at El 491. The liquefaction potential assessment of sands was conducted using the "Simplified Procedure" developed by Seed and Idriss.^{1,2} This method is based on extensive analyses of field data from sites that had been subjected to liquefaction from various earthquakes. The corrected blow count $(N_1)_{60}$ is a number standardized by hammer efficiency and normalized to an effective overburden pressure. A peak ground acceleration of 0.075g (as previously discussed) and estimated moment magnitude of 7.5 was used in the analyses.

SPT borings were drilled using a drill rig equipped with an automatic hammer. Based on documentation provided by EnviroCore Drilling, Inc., the drill rig hammer used at the site has an average efficiency of 86.9 percent. The efficiency of the automatic hammers was measured and evaluated by others. The provided efficiency of the automatic hammer was used in the liquefaction potential analyses.

A minimum factor of safety (FOS) of 1.1 between the computed and design Cyclic Stress Ratios (CSR) was used for liquefaction analysis. Based on the liquefaction analyses for Borings B-1 through B-4, presented in Appendix C, the site soils have a calculated FOS greater than the minimum target FOS of 1.1 (calculated FOS ranging from approximately 8 to 14). On the basis of these findings, RKCI believes the site soils have a very low risk of experiencing liquefaction due to an earthquake.

¹ Seed, H.B. and Idriss, I.M. (1982). *Ground Motions and Soil Liquefaction During Earthquakes*, Earthquake Engineering Research Institute, CA.

² Seed, H.B., Tokimatsu, K., Harder, L.F. and Chung, R. H. (1985). "Influence of SPT Procedures in Soil Liquefaction Resistance Evaluation." *Journal of Geotechnical Engineering*, ASCE, Vol. 111, No.12, December, pp.1425-1455.

CCR POND DESIGN CONSIDERATIONS

ESTIMATED CCR POND BOTTOM

As discussed previously, the CCR Pond bottom may extend to depths of approximately 10 ft below the existing ground surface or 5 feet above the upper limit of the observed groundwater surface. On the basis of our groundwater observations to date, the highest groundwater reading was at approximately El 491 ft msl. For evaluation purposes, we assumed that the pond bottom may extend to approximately El 496. Therefore, we anticipate that excavations of approximately 4 to 21 ft may be required to construct the CCR pond. On the basis of the boring results and anticipated pond bottom, it appears the pond bottom (composite liner) may be founded on the underlying sand.

On the basis of the field pump tests performed on Borings MW-1, MW-3, MW-5, and MW-7 on January 25 and 26, 2018, the underlying sandy soils have field hydraulic conductivities ranging from 1.55×10^{-4} cm/sec to 9.56×10^{-4} cm/sec and are summarized in the following:

- MW-1: 9.56×10^{-4} cm/sec
- MW-3: 1.55×10^{-4} cm/sec
- MW-5: 5.31×10^{-4} cm/sec
- MW-7: 2.38×10^{-4} cm/sec

Collected intact Shelby tube samples tested in the laboratory had calculated hydraulic conductivities summarized in the following and annotated on the boring logs:

- B-2 (depth 6 to 8 ft, sandy clay): 1.88×10^{-7} cm/sec
- B-3 (depth 3 to 5 ft, silty sand): 2.05×10^{-6} cm/sec
- MW-4 (depth 11 to 13 ft, silty sand): 9.05×10^{-7} cm/sec

On the basis of the field and laboratory hydraulic conductivity tests, we anticipate that the lower component of the liner will need to consist of 2 ft of engineered fill capable of achieving a hydraulic conductivity of less than 1×10^{-7} cm/sec. Liner material considerations are presented in a later section.

ANTICIPATED MATERIAL FOR BERM CONSTRUCTION

Consideration may be given to using the onsite natural material to construct the berms. The natural materials are generally considered acceptable materials to use when constructing berms and slopes. In addition, the berms are not expected to be exposed to flowing water, other than rain that falls on the berm crest and berm slopes. The risk of berm failure due to erosion is considered to be very low. We recommend that vegetation be established on newly constructed slopes as quickly as possible. Care should be taken to prevent unnecessary disturbance to constructed slopes, as this can cause localized destabilization and erosion. Disturbance and/or erosion on finished slopes should be quickly repaired.

Excavation Equipment. In general, conventional excavation equipment is expected to be suitable for the excavation of the soils encountered in our borings. However, previous studies have encountered sandstone/cemented sand at varying depths in the vicinity of this site. **In Borings B-4, MW-1, and**

MW-6, sandstone/cemented sand material was encountered within or near the zone of the anticipated CCR pond bottom. Layers of mudstone, sandstone, and/or cemented sands/gravels are common in this area of San Antonio and therefore possible that these materials could be encountered during excavations. These layers are typically encountered at variable depths and with variable thicknesses. Although they can be massive, they are frequently present as isolated stringers or boulders. **Rock excavation equipment will be required where these layers are encountered.** Our boring logs are not intended for use in determining construction means and methods and may therefore be misleading if used for that purpose. We recommend that earth-work contractors interested in bidding on the work perform their own test in the form of test pits to determine the quantities of the different materials to be excavated, as well as the preferred excavation methods and equipment for this project.

UNSUITABLE ONSITE MATERIALS

Although not observed in our borings, localized fill materials that contain miscellaneous debris, rubble, remnants of past construction and other materials may be encountered. In addition, an existing concrete slab is located within the footprint of the northern pond. Consideration must be given to removing all vegetation, organic topsoil, existing structures, abandoned foundations, utilities, associated backfill, and other deleterious material. We recommend that these materials be entirely removed from below the pond bottom and proposed berms, if any.

EXPANSIVE SOIL-RELATED MOVEMENTS

With the exception of Boring MW-5, the CCR pond bottom is anticipated to be founded on sand. Expansive soil related movements for the natural sand material are not anticipated. However, in the vicinity of Boring MW-5, we estimate approximately 1 ft of potentially expansive soil may remain below the pond bottom in this areas. We anticipate that some of this material may be removed and replaced to construct the composite liner, and eventually be surcharged by CCR product. In addition, the existing potentially expansive soil is expected to remain below the proposed berms or the excavated side walls for the CCR Pond.

The anticipated ground movements due to swelling of the underlying expansive soils at the site were estimated using the empirical procedure, Texas Department of Transportation (TxDOT) Tex-124-E, Method for Determining the Potential Vertical Rise (PVR). Where the potentially expansive clays will be surcharged by berms and/or CCR product, PVR values of 1 in. or less were estimated for the stratigraphic conditions as previously discussed. However, where the clay will remain near the ground surface, cut slopes, or nominal berm fill will be placed, PVR values of on the order of 2 in. were estimated for the stratigraphic conditions as previously discussed. Once grading plans and berm configurations are developed, we recommend that the differential soil-related movements be further evaluated.

The TxDOT method of estimating expansive soil-related movements is considered an acceptable method for this project, and is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content (an active zone of 15 ft, and dry moisture conditions were assumed in estimating the above PVR values).

SETTLEMENT DUE TO BERM FILL AND CCR MATERIAL

Berm fills with heights up to 6 ft are anticipated at this site. On the basis of our settlement models, we calculated settlements on the order of 1 inch for berm heights up to 6 ft. Typically, 50 percent of the total settlement will occur during construction of the fill. Settlement along the berm alignment is anticipated to decrease (to nominal) as the height of the berm fill decreases to the west. This potential settlement should be considered as differential (estimated on the order of 1/2 inch).

Cuts of approximately 4 to 21 ft are anticipated for the CCR pond. The weight of CCR material is expected to be less than the weight of soil/cemented materials to be replaced, and hence only nominal settlement is anticipated below the CCR Pond.

BERM GLOBAL STABILITY ANALYSIS

Global stability analysis of the anticipated cuts and berms was performed for Sections A-A' (cut slope), B-B' (berm), C-C' (cut slope), and D-D' (berm) as illustrated on Figure 1. The plotted sections were based on conceptual sections/elevations and the estimated CCR pond bottom elevation. The groundwater surface was assumed to occur near El 491 ft msl. Models for an empty CCR pond and "Maximum Pool," as modeled in our sections, were estimated.

Minimum Factor of Safety

Slope stability analysis consists of comparing the sliding and restraining forces along a possible slide plane and determining the factor of safety. Gravity (i.e. surcharge, soil weight and water in the slope) provides the driving force while shear strength of the soil provides the restraining force. When the driving force acting on the slope is greater than the restraining force, the slope will move. The factor of safety of the slope is the ratio of the restraining force divided by the driving force. Slides occur when the factor of safety is 1.0 or less. The target factor of safety for the short-term (end of construction), long-term condition, and pseudo-static conditions (i.e., seismic loading) are summarized in the following table.

Global Stability Minimum Target Factor of Safety	
Condition	Minimum Target Factor of Safety
Short-Term, End of Construction	≥ 1.3
Long-Term, Maximum Pool	≥ 1.4 to 1.5
Seismic Loading	≥ 1.0

We consider a significant slope failure to involve a volume of slope material that is large enough to substantially impair the serviceability or operation of the berm or that could imperil human life. Shallow, sloughing slope failures that involve relatively little material or that can be repaired locally without substantially impacting the ash pond operations are considered to be minor slope failures and do not control the conclusions of our stability analyses.

Method of Analysis

While there are many different methods of stability analysis and numerous available computer programs, we have selected the program Slide version 6.014, a slope stability computer program, developed by Rocscience. The Spencer method with a non-circular sliding surface was utilized for the conditions being considered.

Loading Conditions

For satisfactory performance, an earth embankment should have an acceptable factor of safety during construction and throughout its projected service lifetime. Stability analyses should include variations in stress conditions brought on by construction practices and sequencing, external loadings, and any anticipated changes in hydraulic conditions. The following paragraphs discuss each stability condition analyzed in our study.

External Loads External loads for the roadways along the berm crest have also been modeled. A traffic loading of HS20 (modeled as an equivalent uniform surcharge of 100 psf) was applied to the crest of the berm.

CCR Material Load On the basis of our historic field density testing on typical CCR material (Circa 2014), the total weight of the material varied from 92 to 122 pounds per cubic foot (pcf). We have included a total weight of 120 pcf (modeled as no strength) for additional loads in the analyses conducted for the “maximum pool” of the berms. These loads account for the increase in pressure in the bottom of the ponds and along the berm slopes due to weight of the CCR material in the ponds. The increase in the pressure due to this material is modeled in our analysis.

Soil Properties

The soil properties used in our analyses are based on limited laboratory testing, index properties of the soil, empirical correlations, and our experience. The soil properties used in the models are summarized in the following table and are considered as conservative.

SOIL PROPERTIES USED IN THE GLOBAL STABILITY MODEL

Soil Type	Density (pcf)	End of Construction Cohesion (psf)	Long-Term Friction Angle (degrees)
Estimated Engineered Berm Fill	125	1,000	25 ^a
Natural Cohesive Soil	125	1,000 ^b	27 ^b
Upper Natural Cohesionless Soil	120	0 ^d	35 ^c
Lower Natural Cohesionless Soil	130	0 ^d	38 ^c
CCR Material	120	No Strength	No Strength

^a Estimated strength for compacted engineered material

^b Estimated from laboratory tests and correlations

^c Estimated from SPT correlations

^d Friction angle used for this condition

Results of Analyses

The following table contains a summary of the results from our slope stability analyses for each static loading condition and slope configuration. In general, the point where a potential slide surface was permitted to intersect the slope face not allowed to occur (within relevant slope crest). This limitation was intended to reduce the occurrence of “non-critical” shallow failure surfaces resulting from the analyses. A graphical presentation of the most critical failure surface from our SLIDE iterations for each berm profile studied can be found in Appendix D.

Computed Factors of Safety – Static Condition

Slope Profile	End of Construction (Short-Term)	Pond Side (Long-Term)	Dry Side (Long-Term)	Maximum Pool on Pond Side (Long Term)	Maximum Pool on Dry Side (Long Term)
A-A'	>1.5 (A-1)	>1.5 (A-2)	N/A	>1.5 (A-4)	N/A
B-B'	>1.5 (B-1 & B-6)	>1.5 (B-7)	>1.5 (B-2)	>1.5 (B-9)	>1.5 (B-4)
C-C'	>1.5 (C-1)	>1.5 (C-2)	N/A	>1.5 (C-4)	N/A
D-D'	>1.5 (D-1 & D-6)	>1.5 (D-7)	>1.5 (D-2)	>1.5 (D-9)	>1.5 (D-4)

(Referenced Figure in Appendix D)

Pseudo-static (seismic) analyses were performed with soil behavior modeled using undrained soil strength values. A summary of the calculated factors of safety are presented in the following table.

Computed Factors of Safety – Pseudo-Static Condition (Seismic)
Horizontal Peak Ground Acceleration = 0.075g

Slope Profile	Pond Side	Dry Side	Maximum Pool on Pond Side	Maximum Pool on Dry Side
A-A'	>1.5 (A-3)	N/A	>1.5 (A-5)	N/A
B-B'	>1.5 (B-8)	>1.5 (B-3)	>1.5 (B-10)	>1.5 (B-5)
C-C'	>1.5 (C-3)	N/A	>1.5 (C-5)	N/A
D-D'	>1.5 (D-8)	>1.5 (D-3)	>1.5 (D-10)	>1.5 (D-5)

(Referenced Figure in Appendix D)

In general, the global stability analyses for the conditions evaluated resulted in calculated factors of safety greater than the targeted factor of safety for short-term, long-term, and seismic conditions. If steeper slopes are planned, CCR pond bottom elevation changes, or the berm configuration is altered, then additional evaluation will be required.

BERM CONSTRUCTION CONSIDERATIONS

Proposed berm fill materials should be further tested in the laboratory to evaluate that the proposed material has strength characteristics greater than those estimated in the global stability analysis. The laboratory testing should be performed on remolded samples compacted to a minimum of 95 or 90

percent of the maximum dry density as determined by the Standard Proctor (ASTM D698) or Modified Proctor (ASTM D1557), respectively. The strength tests (minimum of three tests) may consist of either:

- ASTM D3080/D3080M-11 Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions; or
- ASTM D4767-11 Standard Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils

The contractor will also be responsible for ensuring that the properties of all delivered berm fill materials are similar to those tested in the laboratory.

Consideration can be given to utilizing the excavated on-site natural material for the berm construction. However, cemented sand/sandstone may be encountered and processing of the excavated material may be required to reduce the maximum particle size to 4 in. in any dimension. Processed material larger than 4 inches should be discarded or processed to the maximum dimension. Care should be taken when placing the larger pieces so that they are not concentrated in a manner such that voids develop between nested pieces; a sufficient quantity of fines should be provided to reduce this risk. Furthermore, special care will be required during excavation activities to separate organics and any deleterious material.

Berm fill should be placed in maximum 8-inch thick loose lifts and compacted to the levels given in the following Compaction Summary. The fill should be placed at a moisture content compatible with the required density. Depending on the soil moisture at the time of construction, aeration or wetting may be required to achieve proper compaction. The fill should not be placed on soft or yielding materials.

COMPACTION SUMMARY		
Category	Minimum Compaction ^a (Percent)	
	Standard Proctor	Modified Proctor
Prepared Subgrade and Berm Engineered Fill	95 ^b	90 ^b
^a Measured as a percent of the maximum dry density as determined by the Standard or Modified Proctor test (ASTM D698 or D1557), respectively.		
^b Moisture content within 3% of optimum moisture content.		

Please note that finished slopes have an increased potential for erosion and relatively shallow slip surface failures. Therefore, installation of erosion control measures and/or increased slope maintenance may be required until vegetation is established. Failures, if any, should be overexcavated beyond the failure plane and replaced with compacted fill placed in benches.

Fill slopes steeper than 1V:4H should be benched prior to placement of fill or a clay liner directly on them. Benching the fill/liner will help reduce the potential for sloughing or creating an artificial failure plane in which the material is being placed on. Bench shelves should be approximately 6 feet wide, but bench faces should not be higher than 2 feet. Fill/liner slopes should be constructed by extending the compacted fill beyond the planned profile of the slope and then trimming the slope to the desired configuration.

LINER MATERIAL CONSIDERATIONS

Consideration may be given to trying to use the onsite fine-grained soils as clay liner material. **However, the characteristics/variability of this material can change considerably in relatively short horizontal and vertical distances as evident in our boring logs, and additional evaluation of the onsite fine-grained soil as use of liner material is warranted.**

It has been our experience that compacted clay liners of a minimum of 24 in. are adequate to reduce water seepage to acceptable limits. Soils used as the liner material should be classified as fat clay (CH) or lean clay (CL) in accordance with ASTM D 2487-10 Unified Soil Classification System. In addition, soil liner material should adhere to the following specifications:

Soil Liner Specifications		
Property	Unit	Specification
Plasticity Index	%	≥ 20
Liquid Limit	%	≥ 45
% Passing (200 sieve)	%	≥ 50
Maximum Particle Size	in.	3/4*

* or minimum particle size specified by the geomembrane supplier.

Soils that adhere to the liner specifications presented above, typically have a saturated soil permeability less than 1×10^{-7} cm/sec. Compacted soil liner material should be free of refuse, roots, rocks, and other deleterious materials. Soil liner material should be placed in maximum 8-inch thick loose lifts and compacted to the levels given in the Compaction Summary under Section titled *Berm Construction Considerations*. Particles larger than 3/4 in. in dimension (or the maximum particle size specified by the Geomembrane supplier), roots, and deleterious material should not be permitted in the soil liner. Additional soil liner placement considerations can be provided when additional information and direction become available.

LIMITATIONS

This engineering report has been prepared in accordance with accepted Geotechnical Engineering practices in the region of south/central Texas and for the use of Pape-Dawson Engineers, Inc. (CLIENT) and its representatives for design purposes. This report may not contain sufficient information for purposes of other parties or other uses. This report is not intended for use in determining construction means and methods.

If this report is provided to prospective subcontractors, the client should make it clear that the information is provided for factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil or rock conditions may require the expenditure of additional funds to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

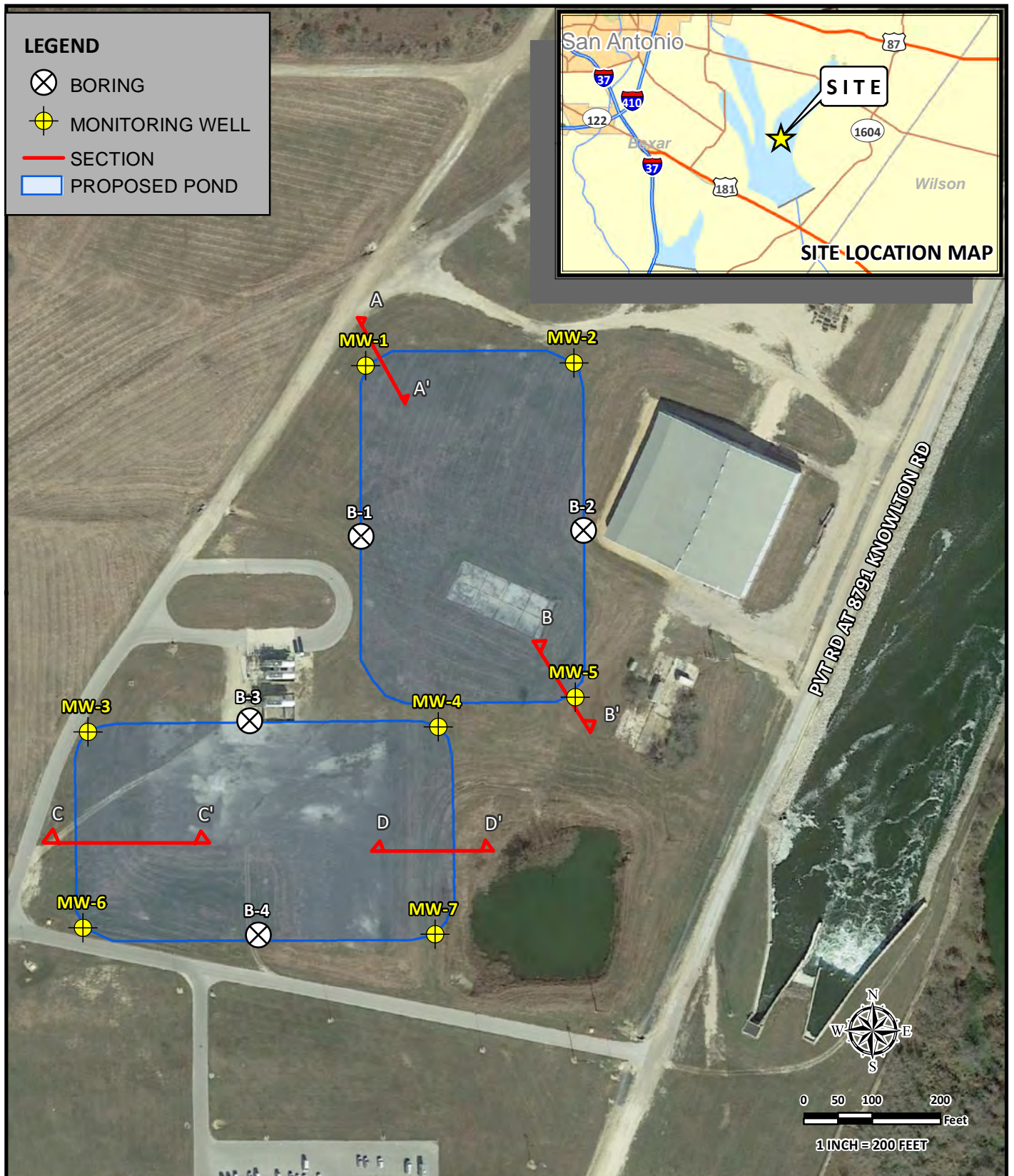
The recommendations submitted in this report are based on the data obtained from 11 borings drilled at this site and our understanding of the project information provided to us. If the project information described in this report is incorrect, is altered, or if new information is available, we should be retained to review and modify our recommendations.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Discrete sampling cannot be relied on to accurately reflect natural variations in stratigraphy that may exist between sample locations and/or intervals. This report may not reflect the actual variations of the subsurface conditions across the site. However, it is important to note that a significant portion of the apparent site variability is due to variation in the proportions of sand and clay in the native soils. These variations cause the soil classification to change between borings, while our experience indicates the behavior of these soils varies within a relatively narrow range.

The scope of our Geotechnical Engineering Study does not include an environmental assessment of the air, soil, rock, or water conditions either on or adjacent to the site. No environmental opinions are presented in this report.

* * * * *

ATTACHMENTS



12821 West Golden Lane
San Antonio, Texas 78249
www.rkci.com
P 210 :: 699 :: 9090
F 210 :: 699 :: 6426

TBPE Firm F-3257 / TBPG Firm #50220

SOURCE: Aerial Photography Obtained from Google Earth Pro - 2017

BORING LOCATION MAP

J.K. SPRUCE - CALAVERAS LAKE POWER PLANT
PROPOSED TWO NEW COAL COMBUSTION
RESIDUAL CONTAINMENT PONDS
SAN ANTONIO, TEXAS

REVISIONS:

No.	DATE	DESCRIPTION

PROJECT No.:

ASA17-189-00

ISSUE DATE: 12/12/2017

DRAWN BY: KRB

CHECKED BY: EJN

REVIEWED BY: EJN

FIGURE

1

NOTE: This Drawing is Provided for Illustration Only, May Not be to Scale and is Not Suitable for Design or Construction Purposes

LOG OF BORING NO. B-1

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31326; W 98.31708

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²								PLASTICITY INDEX	% >200
						0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
			SURFACE ELEVATION: 510.1 ft												
			SAND, Silty, Loose, Brown	8											28
5			CLAY, Sandy, Very Stiff, Tan												
				107										11	
10			SAND, Silty, Medium Dense to Very Dense, Tan	16											36
15			Estimated Pond Bottom	25											
20				14											
25			- with cemented sand/sandstone to 37 ft	50/8"											
30				50/7"											
35				50/8"											48
				35											
DEPTH DRILLED: 50.0 ft			DEPTH TO WATER: 23.25 ft			PROJ. No.: ASA17-096-00									
DATE DRILLED: 12/20/2017			DATE MEASURED: 12/20/2017			FIGURE: 2a									

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-1

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31326; W 98.31708

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0													
						PLASTIC LIMIT				WATER CONTENT				LIQUID LIMIT					
			SURFACE ELEVATION: 510.1 ft			10	20	30	40	50	60	70	80						
			SAND, Silty, Medium Dense to Very Dense, Tan <i>(continued)</i>																
45			- becomes gray	37															
50			Boring Terminated	50/8"															
55																			
60																			
65																			
70																			
75																			
DEPTH DRILLED: 50.0 ft			DEPTH TO WATER: 23.25 ft			PROJ. No.: ASA17-096-00													
DATE DRILLED: 12/20/2017			DATE MEASURED: 12/20/2017			FIGURE: 2b													

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-2

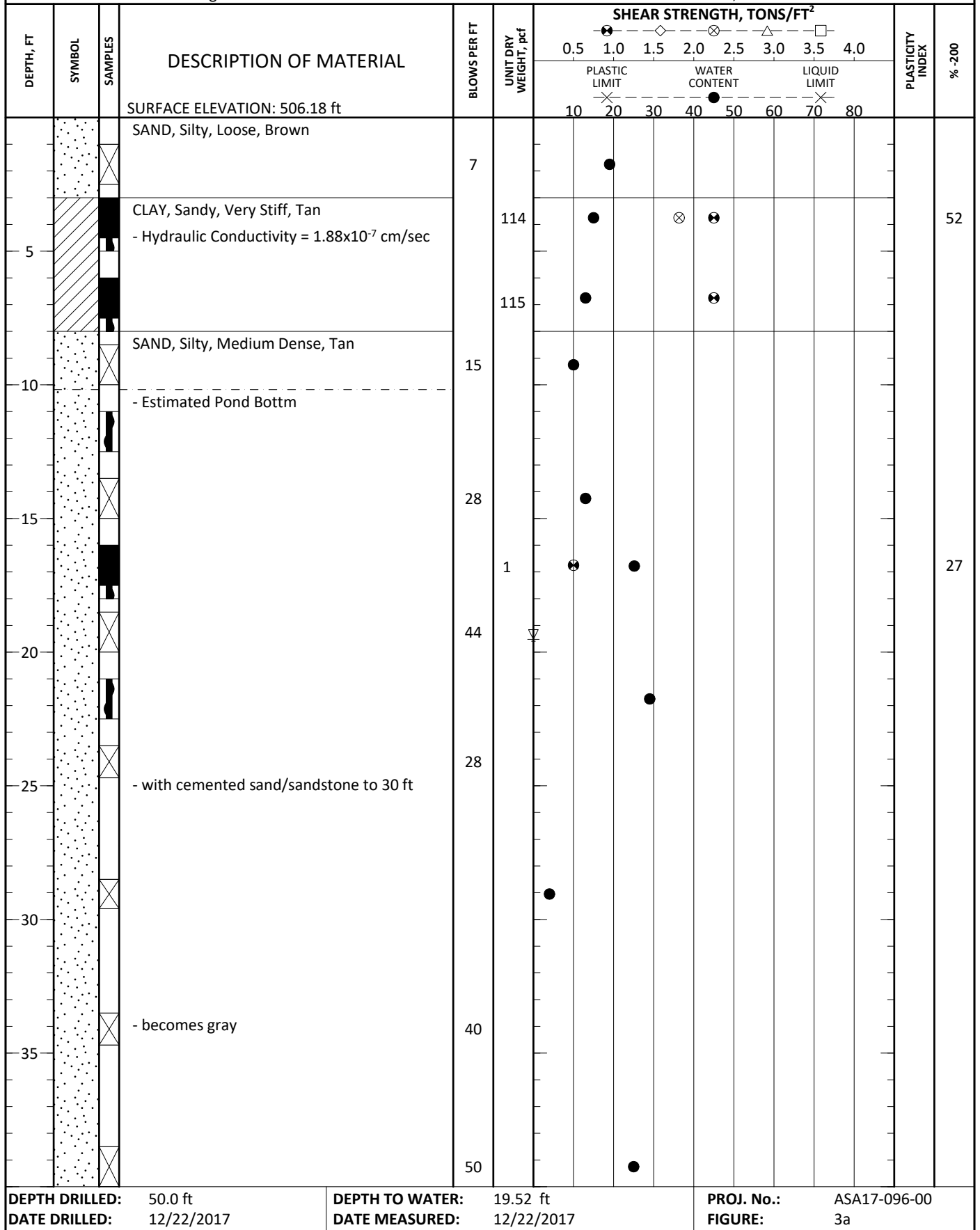
J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



BPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31328; W 98.31606



DEPTH DRILLED: 50.0 ft
DATE DRILLED: 12/22/2017

DEPTH TO WATER: 19.52 ft
DATE MEASURED: 12/22/2017

PROJ. No.: ASA17-096-00
FIGURE: 3a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-2

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31328; W 98.31606

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0													
						PLASTIC LIMIT				WATER CONTENT				LIQUID LIMIT					
			SURFACE ELEVATION: 506.18 ft			10	20	30	40	50	60	70	80						
			SAND, Silty, Medium Dense, Tan <i>(continued)</i>																
45		⊗		50															
		⊗																	
50		⊗		26															
			Boring Terminated																
55																			
60																			
65																			
70																			
75																			
DEPTH DRILLED:			50.0 ft	DEPTH TO WATER:			19.52 ft			PROJ. No.:			ASA17-096-00						
DATE DRILLED:			12/22/2017	DATE MEASURED:			12/22/2017			FIGURE:			3b						

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

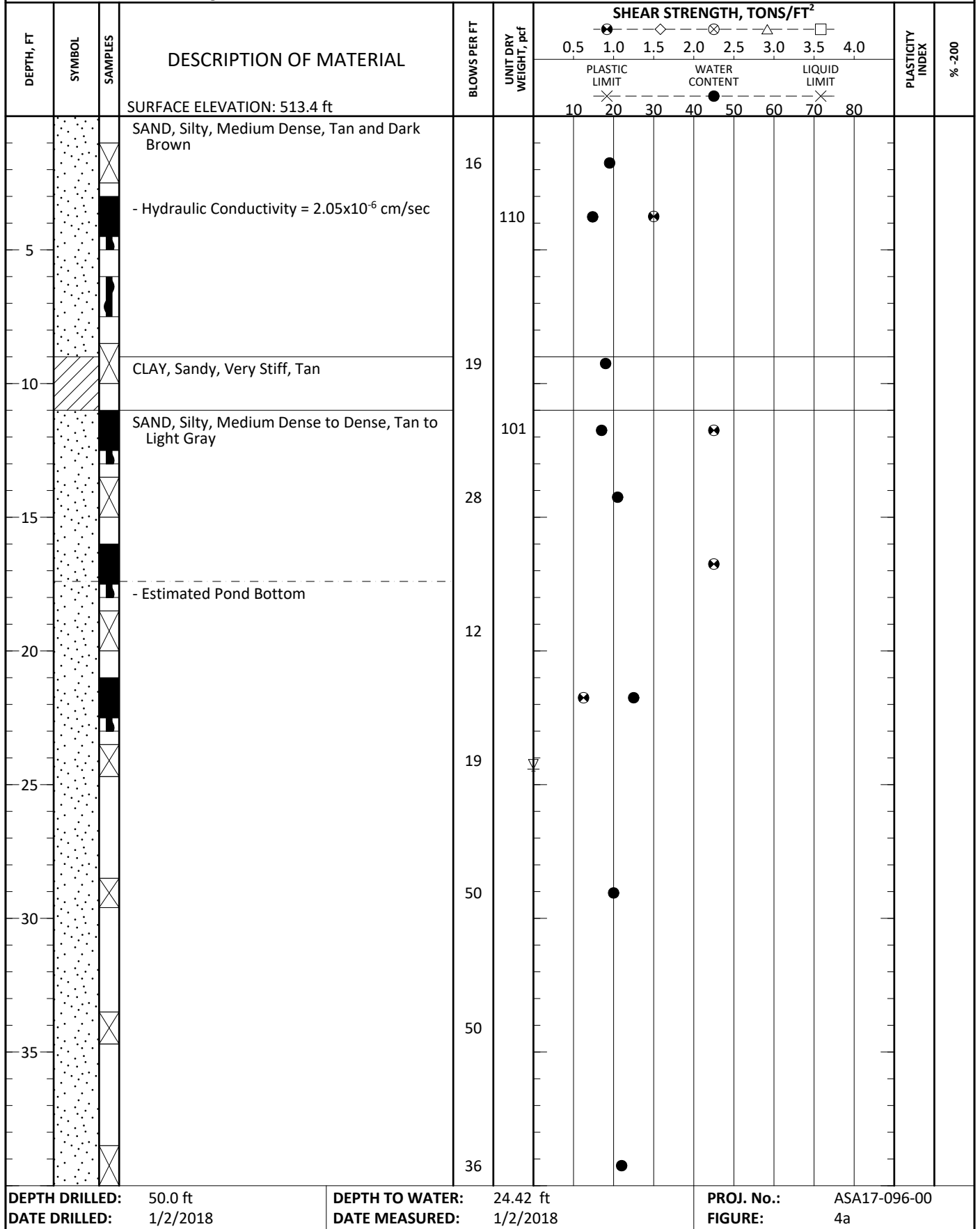
LOG OF BORING NO. B-3

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31245; W 98.31760



DEPTH DRILLED: 50.0 ft	DEPTH TO WATER: 24.42 ft	PROJ. No.: ASA17-096-00
DATE DRILLED: 1/2/2018	DATE MEASURED: 1/2/2018	FIGURE: 4a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-3

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31245; W 98.31760

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0													
						PLASTIC LIMIT				WATER CONTENT				LIQUID LIMIT					
SURFACE ELEVATION: 513.4 ft						10	20	30	40	50	60	70	80						
			SAND, Silty, Medium Dense to Dense, Tan to Light Gray (continued)	50															
45																			
				44															
50			Boring Terminated																
55																			
60																			
65																			
70																			
75																			
DEPTH DRILLED: 50.0 ft			DEPTH TO WATER: 24.42 ft			PROJ. No.: ASA17-096-00													
DATE DRILLED: 1/2/2018			DATE MEASURED: 1/2/2018			FIGURE: 4b													

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

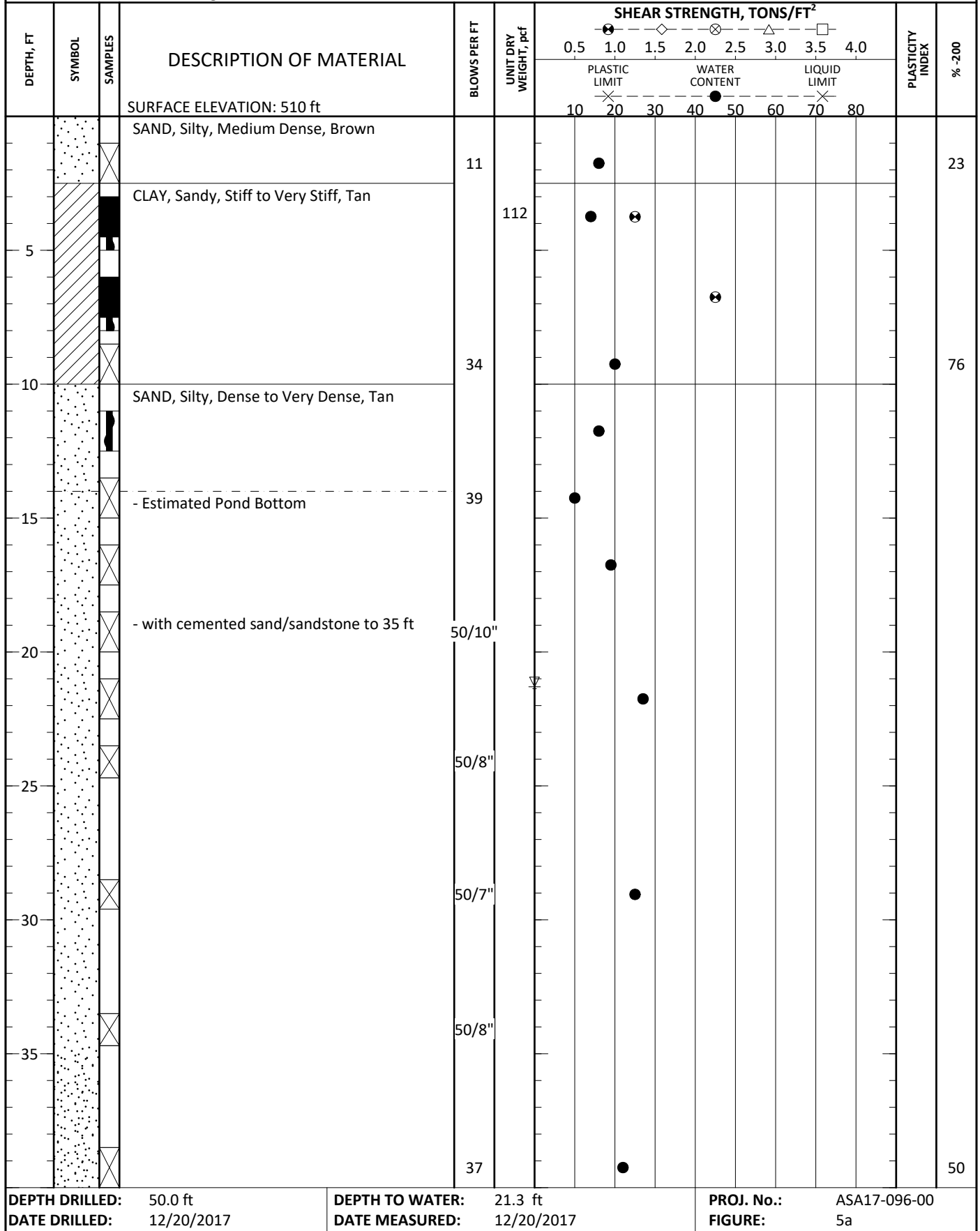
LOG OF BORING NO. B-4

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31166; W 98.31756



DEPTH DRILLED: 50.0 ft
DATE DRILLED: 12/20/2017

DEPTH TO WATER: 21.3 ft
DATE MEASURED: 12/20/2017

PROJ. No.: ASA17-096-00
FIGURE: 5a

LOG OF BORING NO. B-4

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31166; W 98.31756

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0													
						PLASTIC LIMIT				WATER CONTENT				LIQUID LIMIT					
			SURFACE ELEVATION: 510 ft			10	20	30	40	50	60	70	80						
45			SAND, Silty, Dense to Very Dense, Tan (continued) - becomes gray - becomes gray (continued)	50/10"															
50				50/8"															
			Boring Terminated																
55																			
60																			
65																			
70																			
75																			
DEPTH DRILLED: 50.0 ft			DEPTH TO WATER: 21.3 ft			PROJ. No.: ASA17-096-00													
DATE DRILLED: 12/20/2017			DATE MEASURED: 12/20/2017			FIGURE: 5b													

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. MW-1

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



BPE Firm Registration No. F-3257

DRILLING METHOD:

Hollow Stem Auger

LOCATION: N 29.31395; W 98.31705

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% >200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0											
						PLASTIC LIMIT WATER CONTENT LIQUID LIMIT											
			SURFACE ELEVATION: 513.91 ft			10	20	30	40	50	60	70	80				
			CLAY, Sandy, Hard to Very Stiff, Tan	36											55		
5																	
			SAND, Silty, Medium Dense to Very Dense, Tan	18											29		
10																	
				49													
15																	
			- Estimated Pond Bottom														
20			- with cemented sand/sandstone to 35 ft	50/9"													
25				50/10"													
30				50/9"													
35			Boring Terminated	50/7"													
DEPTH DRILLED: 35.0 ft			DEPTH TO WATER: 25.15 ft			PROJ. No.:			ASA17-096-00								
DATE DRILLED: 12/20/2017			DATE MEASURED: 12/20/2017			FIGURE:			6								

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 35.0 ft
DATE DRILLED: 12/20/2017

DEPTH TO WATER: 25.15 ft
DATE MEASURED: 12/20/2017

PROJ. No.: ASA17-096-00
FIGURE: 6

LOG OF BORING NO. MW-2

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31395; W 98.31610

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²								PLASTICITY INDEX	% -200
						0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
			SURFACE ELEVATION: 508.83 ft												
			SAND, Silty, Medium Dense, Brown	11			●								
5			CLAY, Sandy, Very Stiff, Tan	117			●		⊗	⊗					
			SAND, Silty, Medium Dense to Very Dense, Tan	38		●									
			- Estimated Pond Bottom	22			●								
20				25				●							
25			- with cemented sand/sandstone to 30 ft	50/8"				●							
30				50/9"											
35			Boring Terminated	50			●								
<div>DEPTH DRILLED: 35.0 ft</div> <div>DATE DRILLED: 12/20/2017</div> <div>DEPTH TO WATER: 22.57 ft</div> <div>DATE MEASURED: 12/20/2017</div> <div>PROJ. No.: ASA17-096-00</div> <div>FIGURE: 7</div>															

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. MW-3

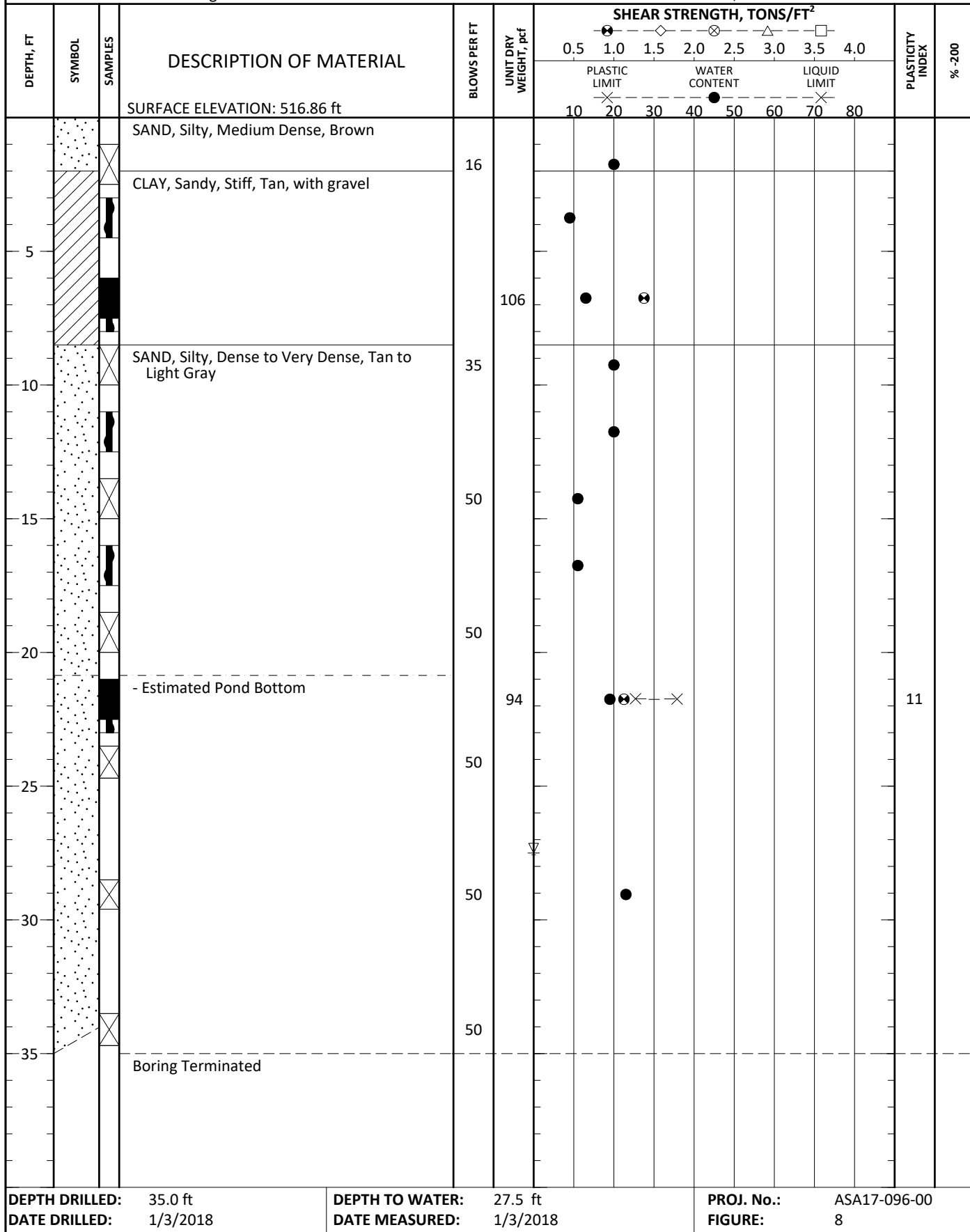
J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



DRILLING METHOD:

Hollow Stem Auger

LOCATION: N 29.31249; W 98.31836



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 35.0 ft
DATE DRILLED: 1/3/2018

DEPTH TO WATER: 27.5 ft
DATE MEASURED: 1/3/2018

PROJ. No.: ASA17-096-00
FIGURE: 8

LOG OF BORING NO. MW-4

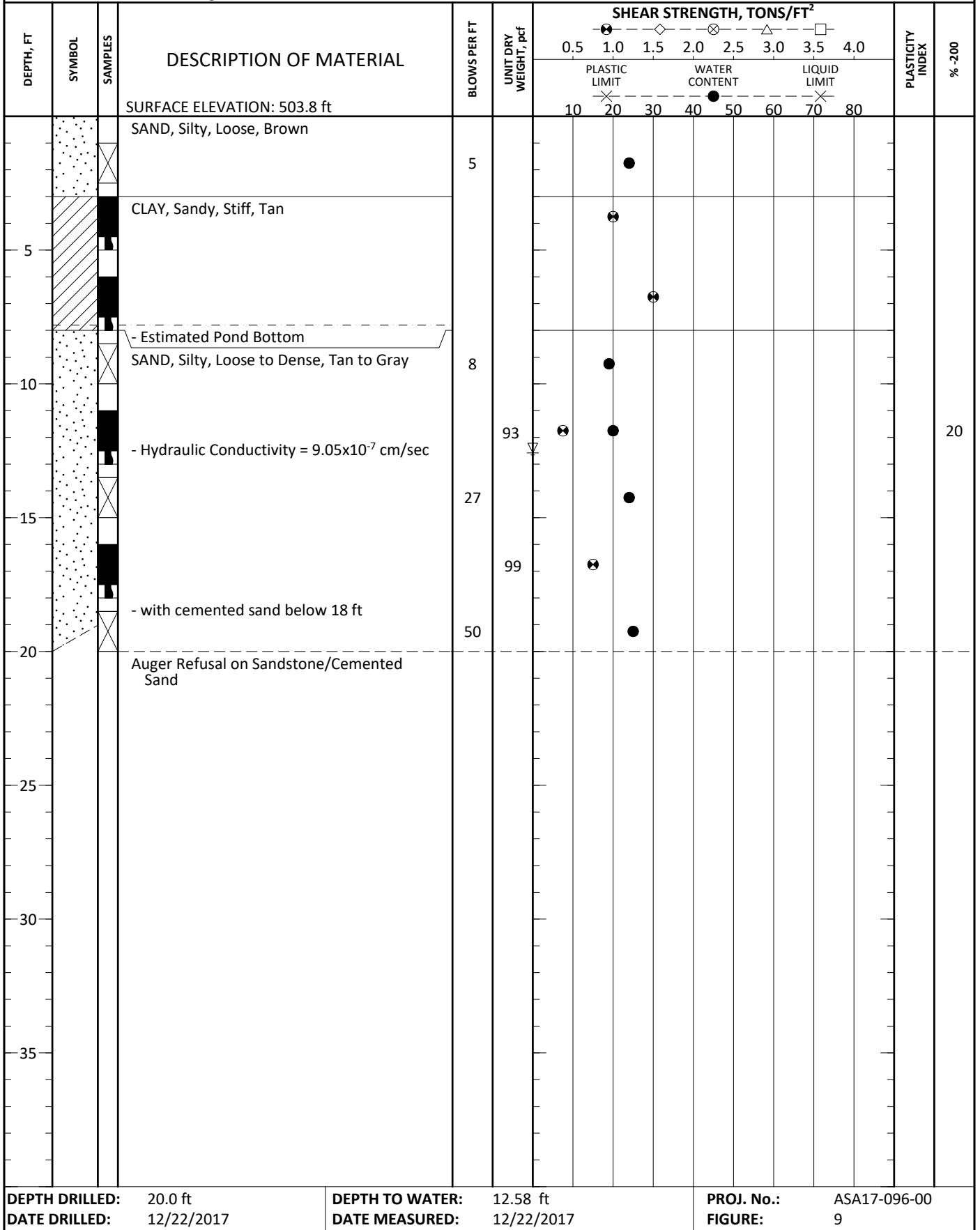
J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



BPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31250; W 98.31673



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 20.0 ft **DEPTH TO WATER:** 12.58 ft **PROJ. No.:** ASA17-096-00
DATE DRILLED: 12/22/2017 **DATE MEASURED:** 12/22/2017 **FIGURE:** 9

LOG OF BORING NO. MW-5

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



BPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31261; W 98.31610

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²								PLASTICITY INDEX	% -200
						0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
			SURFACE ELEVATION: 503.36 ft												
			SAND, Silty, Medium Dense, Brown	11											
5			CLAY, Sandy, Stiff, Tan				×	●	---	×				26	56
			- Estimated Pond Bottom					●							
10			SAND, Silty, Medium Dense to Very Dense, Tan	16			●								
15							●								
20				49					●						
				50/3"											38
25			- with cemented sand/sandstone to 35 ft - becomes gray						●						
30				50											
35			Boring Terminated	43			●								
DEPTH DRILLED: 35.0 ft			DEPTH TO WATER: 16.8 ft			PROJ. No.: ASA17-096-00									
DATE DRILLED: 12/21/2017			DATE MEASURED: 12/21/2017			FIGURE: 10									

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. MW-6

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas



BPE Firm Registration No. F-3257

DRILLING METHOD: Hollow Stem Auger

LOCATION: N 29.31177; W 98.31841

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% -200						
						0.5		1.0		1.5		2.0		2.5				3.0		3.5		4.0	
						PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT													
			SURFACE ELEVATION: 514.49 ft			10	20	30	40	50	60	70	80										
			SAND, Silty, Medium Dense, Brown	10																			
			SAND, Clayey, Medium Dense, Tan	28																			
5																							
				111																			
				13																			
10			SAND, Silty, Very Dense, Tan to Gray																				
			- with cemented sand/sandstone to 35 ft																				
				50/7"																			
15																							
			- Estimated Pond Bottom	50																			
20																							
				50																			
25																							
			- DRILLER'S NOTE: WATER encountered at 27 ft	50																			
30																							
				50																			
35			Boring Terminated																				
DEPTH DRILLED: 35.0 ft			DEPTH TO WATER: 27.09 ft			PROJ. No.: ASA17-096-00																	
DATE DRILLED: 1/3/2018			DATE MEASURED: 1/3/2018			FIGURE: 11																	

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

STBPE Firm Registration No. F-3257

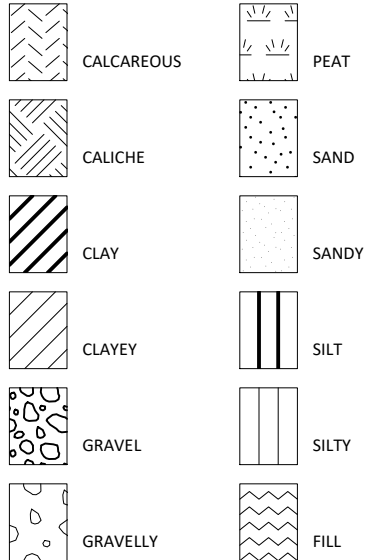
LOCATION: N 29.31166; W 98.31675

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

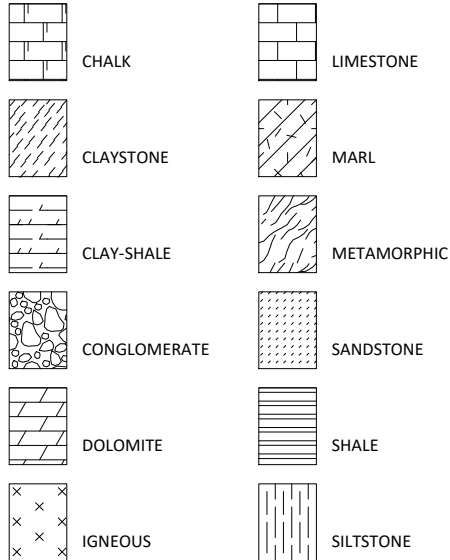
KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

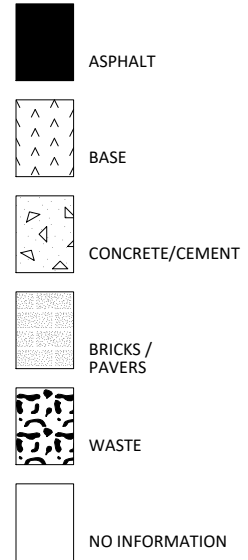
SOIL TERMS



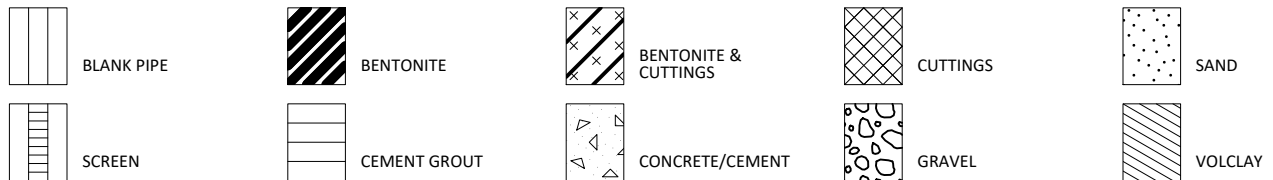
ROCK TERMS



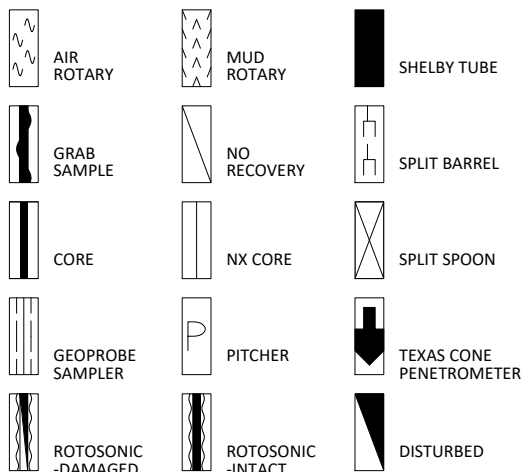
OTHER



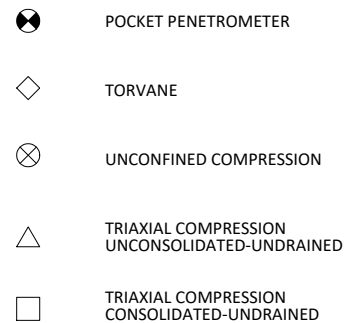
WELL CONSTRUCTION AND PLUGGING MATERIALS



SAMPLE TYPES



STRENGTH TEST TYPES



NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. ASA17-096-00

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY

COHESIVE STRENGTH

PLASTICITY

<u>Penetration Resistance Blows per ft</u>	<u>Relative Density</u>	<u>Resistance Blows per ft</u>	<u>Consistency</u>	<u>Cohesion TSF</u>	<u>Plasticity Index</u>	<u>Degree of Plasticity</u>
0 - 4	Very Loose	0 - 2	Very Soft	0 - 0.125	0 - 5	None
4 - 10	Loose	2 - 4	Soft	0.125 - 0.25	5 - 10	Low
10 - 30	Medium Dense	4 - 8	Firm	0.25 - 0.5	10 - 20	Moderate
30 - 50	Dense	8 - 15	Stiff	0.5 - 1.0	20 - 40	Plastic
> 50	Very Dense	15 - 30	Very Stiff	1.0 - 2.0	> 40	Highly Plastic
		> 30	Hard	> 2.0		

ABBREVIATIONS

B = Benzene	Qam, Qas, Qal = Quaternary Alluvium	Kef = Eagle Ford Shale
T = Toluene	Qat = Low Terrace Deposits	Kbu = Buda Limestone
E = Ethylbenzene	Qbc = Beaumont Formation	Kdr = Del Rio Clay
X = Total Xylenes	Qt = Fluvial Terrace Deposits	Kft = Fort Terrett Member
BTEX = Total BTEX	Qao = Seymour Formation	Kgt = Georgetown Formation
TPH = Total Petroleum Hydrocarbons	Qle = Leona Formation	Kep = Person Formation
ND = Not Detected	Q-Tu = Uvalde Gravel	Kek = Kainer Formation
NA = Not Analyzed	Ewi = Wilcox Formation	Kes = Escondido Formation
NR = Not Recorded/No Recovery	Emi = Midway Group	Kew = Walnut Formation
OVA = Organic Vapor Analyzer	Mc = Catahoula Formation	Kgr = Glen Rose Formation
ppm = Parts Per Million	EI = Laredo Formation	Kgru = Upper Glen Rose Formation
	Kknm = Navarro Group and Marlbrook Marl	Kgrl = Lower Glen Rose Formation
	Kpg = Pecan Gap Chalk	Kh = Hensell Sand
	Kau = Austin Chalk	

PROJECT NO. ASA17-096-00

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

SAMPLING METHODS

RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-in.-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

FILE NAME: ASA17-096-00.GPJ

2/5/2018

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-1	1.0 to 2.5	8							28		
	3.0 to 4.5									2.25	PP
	4.5 to 5.0										
	6.0 to 7.5		16	27	16	11		107			
	7.5 to 8.0										
	8.5 to 10.0	16	22								
	11.0 to 12.5		20						36		
	13.5 to 15.0	25									
	16.0 to 17.5		15								
	18.5 to 20.0	14	27								
	21.0 to 22.5										
	23.5 to 24.7	50/8"	24								
	28.5 to 29.6	50/7"									
	33.5 to 34.7	50/8"	23						48		
	38.5 to 40.0	35									
	43.5 to 45.0	37	26								
	48.5 to 49.7	50/8"									
B-2	1.0 to 2.5	7	19								
	3.0 to 4.5		15					114	52	1.82	UC
	4.5 to 5.0										
	6.0 to 7.5		14					115		2.25	PP
	7.5 to 8.0										
	8.5 to 10.0	15	10								
	11.0 to 12.5										
	13.5 to 15.0	28	13								
	16.0 to 17.5		25					91	27	0.50	PP
	17.5 to 18.0										
	18.5 to 20.0	44									
	21.0 to 22.5		29								
	23.5 to 24.7	28									
	28.5 to 29.6		4								
	33.5 to 34.7	40									
	38.5 to 40.0	50	25								
	43.5 to 45.0	50									
	48.5 to 49.7	26	33								
B-3	1.0 to 2.5	16	19								
	3.0 to 4.5		15								
	4.5 to 5.0							110		1.50	PP
	6.0 to 7.5										

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA17-096-00

RABAKISTNER

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

FILE NAME: ASA17-096-00.GPJ

2/5/2018

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-3	8.5 to 10.0	19	18								
	11.0 to 12.5		17					101		2.25	PP
	12.5 to 13.0										
	13.5 to 15.0	28	21								
	16.0 to 17.5									2.25	PP
	17.5 to 18.0										
	18.5 to 20.0	12									
	21.0 to 22.5		25							0.63	PP
	22.5 to 23.0										
	23.5 to 24.7	19									
	28.5 to 29.6	50	20								
	33.5 to 34.7	50									
	38.5 to 40.0	36	22								
	43.5 to 45.0	50									
	48.5 to 49.7	44	25								
B-4	1.0 to 2.5	11	16						23		
	3.0 to 4.5									1.25	PP
	4.5 to 5.0										
	6.0 to 7.5									2.25	PP
	7.5 to 8.0										
	8.5 to 10.0	34	20						76		
	11.0 to 12.5		16								
	13.5 to 15.0	39	10								
	16.0 to 17.5		19								
	18.5 to 20.0	50/10"									
	21.0 to 22.5		27								
	23.5 to 24.7	50/8"									
	28.5 to 29.6	50/7"	25								
	33.5 to 34.7	50/8"									
	38.5 to 40.0	37	22						50		
MW-1	43.5 to 45.0	50/10"									
	48.5 to 49.7	50/8"	27								
	1.0 to 2.5	36	9						55		
	3.0 to 4.5		13					112		2.25	PP
	4.5 to 5.0										
	6.0 to 7.5									2.25	PP
	7.5 to 8.0										
	8.5 to 10.0	18	12								
	11.0 to 12.5		10						29		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA17-096-00

RABAKISTNER

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

FILE NAME: ASA17-096-00.GPJ

2/5/2018

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
MW-1	13.5 to 15.0	49	10								
	16.0 to 17.5										
	18.5 to 20.0	50/9"	12								
	21.0 to 22.5										
	23.5 to 24.7	50/10"	21								
MW-2	28.5 to 29.6	50/9"									
	33.5 to 34.7	50/7"	24								
	1.0 to 2.5	11	15					117		2.64	UC
	3.0 to 4.5		15								
	4.5 to 5.0									1.75	PP
MW-3	6.0 to 7.5										
	7.5 to 8.0										
	8.5 to 10.0	38	12								
	11.0 to 12.5		15								
	13.5 to 15.0	22	20						34		
MW-4	16.0 to 17.5										
	18.5 to 20.0	25	26								
	21.0 to 22.5										
	23.5 to 24.7	50/8"	24								
	28.5 to 29.6	50/9"									
MW-5	33.5 to 34.7	50	22						45		
	1.0 to 2.5	16	20								
	3.0 to 4.5		9								
	6.0 to 7.5		13							1.38	PP
	7.5 to 8.0										
MW-6	8.5 to 10.0	35	20								
	11.0 to 12.5		20								
	13.5 to 15.0	50	11								
	16.0 to 17.5		11								
	18.5 to 20.0	50									
MW-7	21.0 to 22.5		19	35	24	11		94		1.13	PP
	22.5 to 23.0										
	23.5 to 24.7	50									
	28.5 to 29.6	50	23								
	33.5 to 34.7	50									
MW-8	1.0 to 2.5	5	24								
	3.0 to 4.5									1.00	PP
	4.5 to 5.0										
	6.0 to 7.5									1.50	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA17-096-00

RABAKISTNER

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

FILE NAME: ASA17-096-00.GPJ

2/5/2018

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
MW-4	7.5 to 8.0	8	19					93	20	0.38	PP
	8.5 to 10.0		20								
	11.0 to 12.5		20								
	12.5 to 13.0	27	24					99		0.75	PP
	13.5 to 15.0		28								
	16.0 to 17.5		28								
MW-5	17.5 to 18.0	50	25	41	15	26	CL		56	1.13	PP
	18.5 to 20.0		25								
	1.0 to 2.5		11								
	3.0 to 4.5	16	25								
	6.0 to 7.5		15								
	7.5 to 8.0		14								
MW-6	8.5 to 10.0	49	15	36	15	21	SC	111	37	1.78	UC
	11.0 to 12.5		14								
	13.5 to 15.0		23								
	16.0 to 17.5	50/3"	23								
	18.5 to 20.0		23								
	21.0 to 21.8		23								
	23.5 to 25.0	50	21								
	28.5 to 29.6		15								
	33.5 to 34.7		12								
	1.0 to 2.5	13	10								
	3.0 to 4.5		10								
	6.0 to 7.5		15								
	7.5 to 8.0	50/7"	14								
	8.5 to 10.0		10								
MW-7	11.0 to 12.5		9								
	12.5 to 13.0	50	17								
	13.5 to 15.0		12								
	16.0 to 17.5		17								
	18.5 to 20.0	4	36								
	21.0 to 22.5		36								
	22.5 to 23.0		36								
	23.5 to 24.7	50	17								
	28.5 to 29.6		12								
	33.5 to 34.7		12								
MW-7	1.0 to 2.5	4	36								
	3.0 to 4.5		36								
	4.5 to 5.0		36								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA17-096-00

RABAKISTNER

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual Containment Ponds
San Antonio, Texas

FILE NAME: ASA17-096-00.GPJ

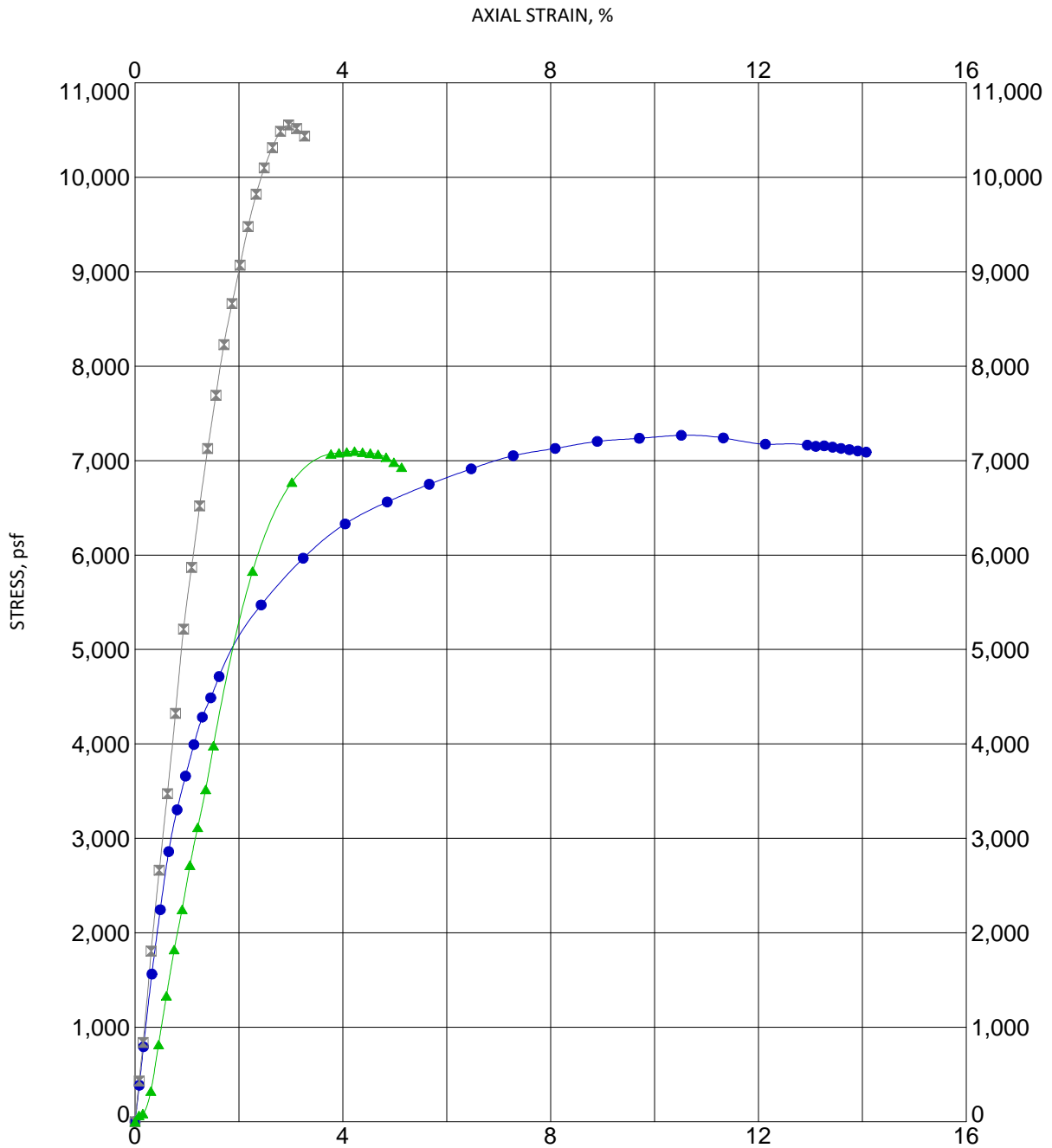
2/5/2018

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
MW-7	6.0 to 7.5									1.00	PP
	7.5 to 8.0										
	8.5 to 10.0	25	13								
	11.0 to 12.5		21					108		0.50	PP
	12.5 to 13.0										
	13.5 to 15.0	27	32								
	16.0 to 17.5									0.63	PP
	17.5 to 18.0										
	18.5 to 20.0	50	26								
	21.0 to 22.5									0.25	PP
	22.5 to 23.0										
	23.5 to 25.0	49	24								
	28.5 to 29.6	50									
	33.5 to 34.7	28	23								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial
CU = Consolidated Undrained Triaxial

PROJECT NO. ASA17-096-00

RABAKISTNER



Specimen Identification	Classification		Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● B-2 3 ft	Sandy Clay - CL		1.8	10.5		114.0	14.6
⊠ MW-2 3 ft	Sandy Clay - CL		2.6	3.0		117.5	14.5
▲ MW-6 6 ft	Clayey Sand - SC		1.8	4.2	21	111.4	10.4



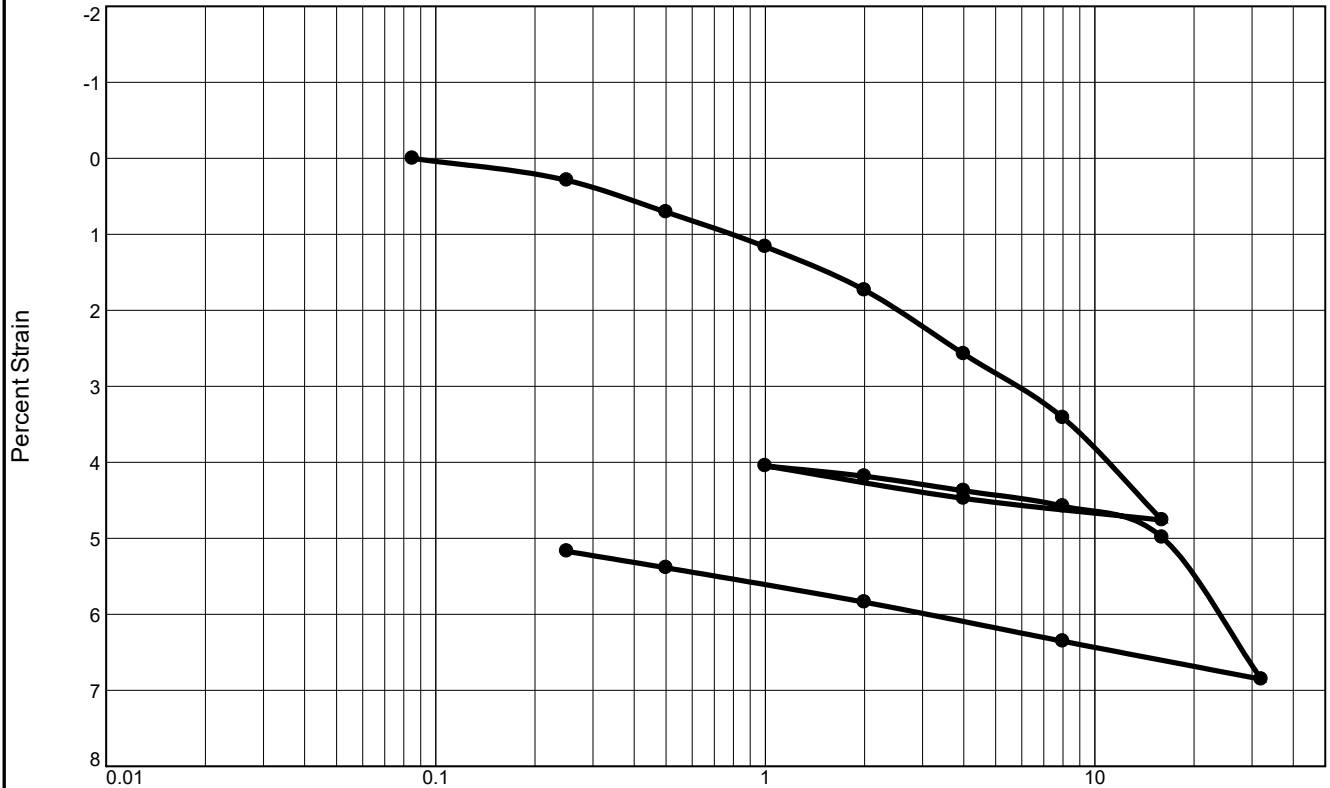
12821 W. Golden Lane
San Antonio, Texas 78249
(210) 699-9090
(210) 699-6426 fax
www.rkci.com

UNCONFINED COMPRESSION

J.K. Spruce - Calaveras Lake Power Plant
Proposed Two New Coal Combustion Residual
Containment Ponds
San Antonio, Texas

FIGURE 15

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.25	3.638		9	4.00	6.829		16	8.00	3.188	
3	0.50	0.969		10	1.00	3.486		17	2.00	3.233	
4	1.00	0.901		11	2.00	14.265		18	0.50	1.630	
5	2.00	1.640		12	4.00	7.855		19	0.25	0.239	
6	4.00	0.893		13	8.00	0.470					
7	8.00	0.960		14	16.00	0.794					
8	16.00	1.672		15	32.00	0.347					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
82.1 %	25.3 %	91.1	N/A	N/A	2.65	0.97	0.8	0.05	0.03	0.816

MATERIAL DESCRIPTION								USCS	AASHTO
Silty Sand								SM	

Project No. ASA17-096 **Client:** Pape-Dawson Engineers

Project: CCR Containment Ponds- Calaveras Lake

Location: Boring 2 Sample 9 16-18ft

Depth: 16-18

Sample Number: 9

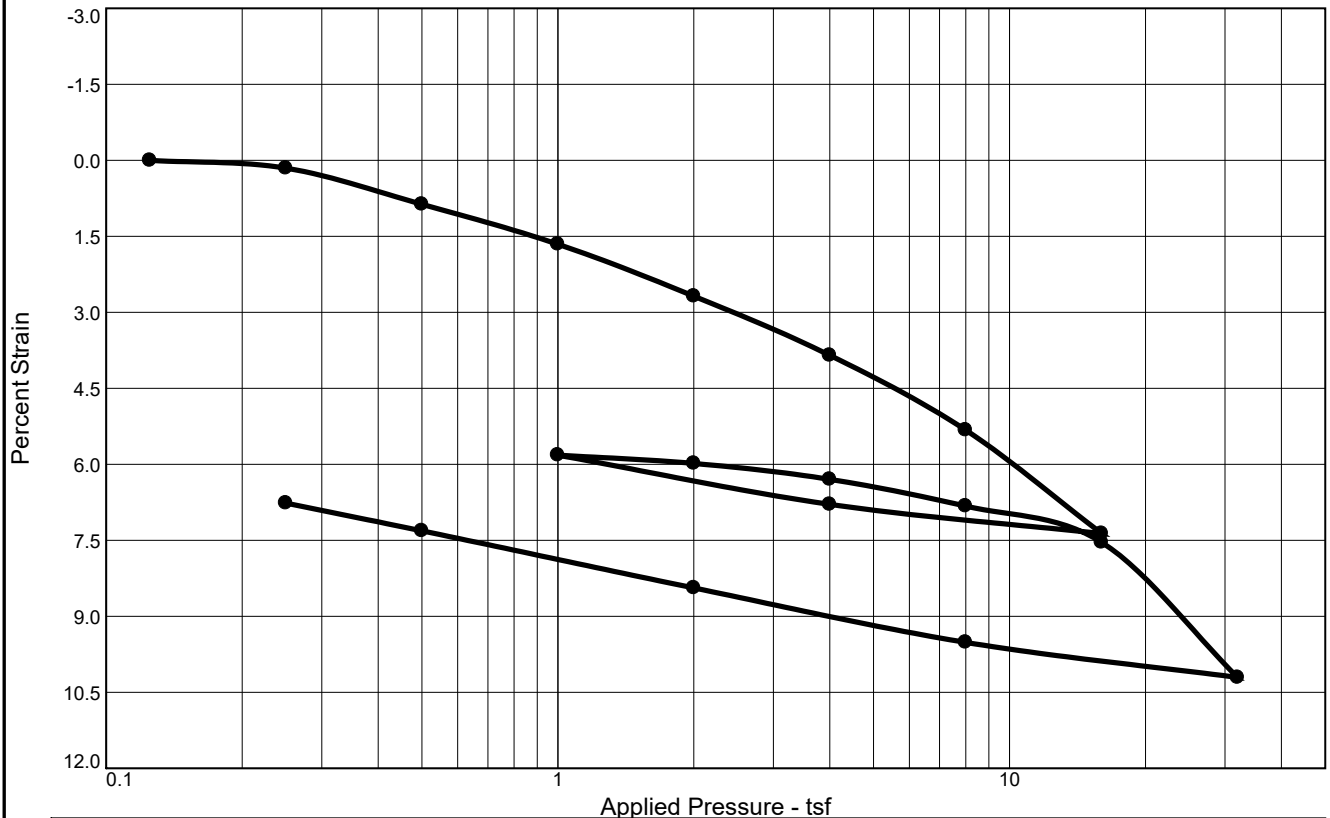
Remarks:

ASTM D2435
estimated specific gravity
weight added to prevent swell after
inundation=0.085tsf

RABA KISTNER CONSULTANTS, INC.

Figure 16a

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.25	2.156		9	4.00	41.121		16	8.00	2.394	
3	0.50	0.937		10	1.00	0.440		17	2.00	0.781	
4	1.00	0.878		11	2.00	3.224		18	0.50	0.410	
5	2.00	0.896		12	4.00	2.967		19	0.25	0.043	
6	4.00	1.904		13	8.00	1.799					
7	8.00	2.991		14	16.00	3.851					
8	16.00	0.940		15	32.00	1.595					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
79.6 %	18.8 %	101.7	N/A	N/A	2.65	.72	0.3	0.04	0.05	0.627

MATERIAL DESCRIPTION								USCS	AASHTO
Silty Sand								SM	

Project No. ASA17-096 **Client:** Pape-Dawson Engineers

Project: CCR Containment Ponds- Calaveras Lake

Location: Boring 3 Sample 7 11-13ft

Depth: 11-13

Sample Number: 7

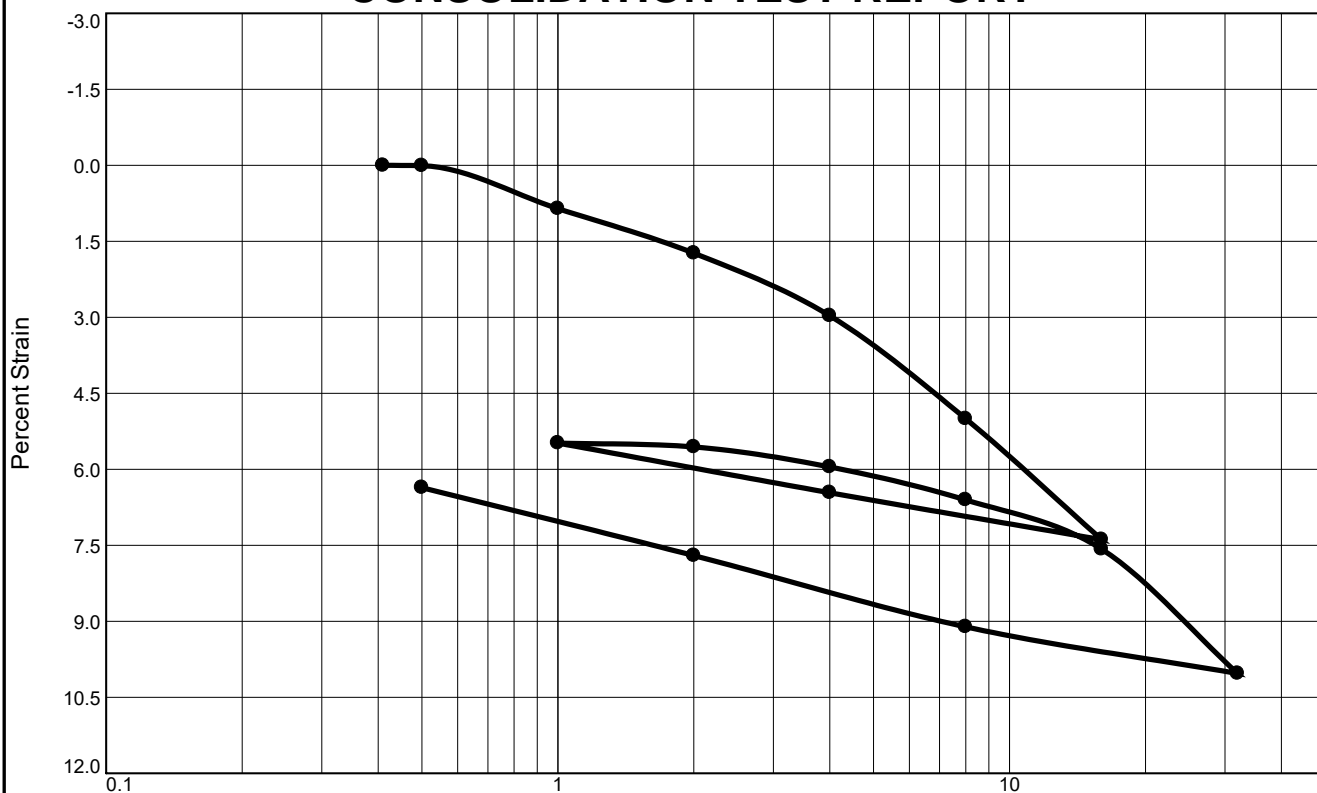
Remarks:

ASTM D2435
estimated specific gravity
weight added to prevent swell after
inundation=0.125tsf

RABA KISTNER CONSULTANTS, INC.

Figure 16b

CONSOLIDATION TEST REPORT



Applied Pressure - tsf

Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.50	0.596		9	1.00	0.083		16	2.00	0.023	
3	1.00	3.082		10	2.00	4.172		17	0.50	0.005	
4	2.00	2.028		11	4.00	1.426					
5	4.00	1.837		12	8.00	0.443					
6	8.00	6.282		13	16.00	0.388					
7	16.00	0.854		14	32.00	0.100					
8	4.00	1.454		15	8.00	1.404					

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
78.5 %	13.9 %	112.5	N/A	N/A	2.65	0.26	0.6	0.05	0.04	0.471

MATERIAL DESCRIPTION								USCS	AASHTO
Sandy Clay								CL	

Project No. ASA17-096 **Client:** Pape-Dawson Engineers

Project: CCR Containment Ponds- Calaveras Lake

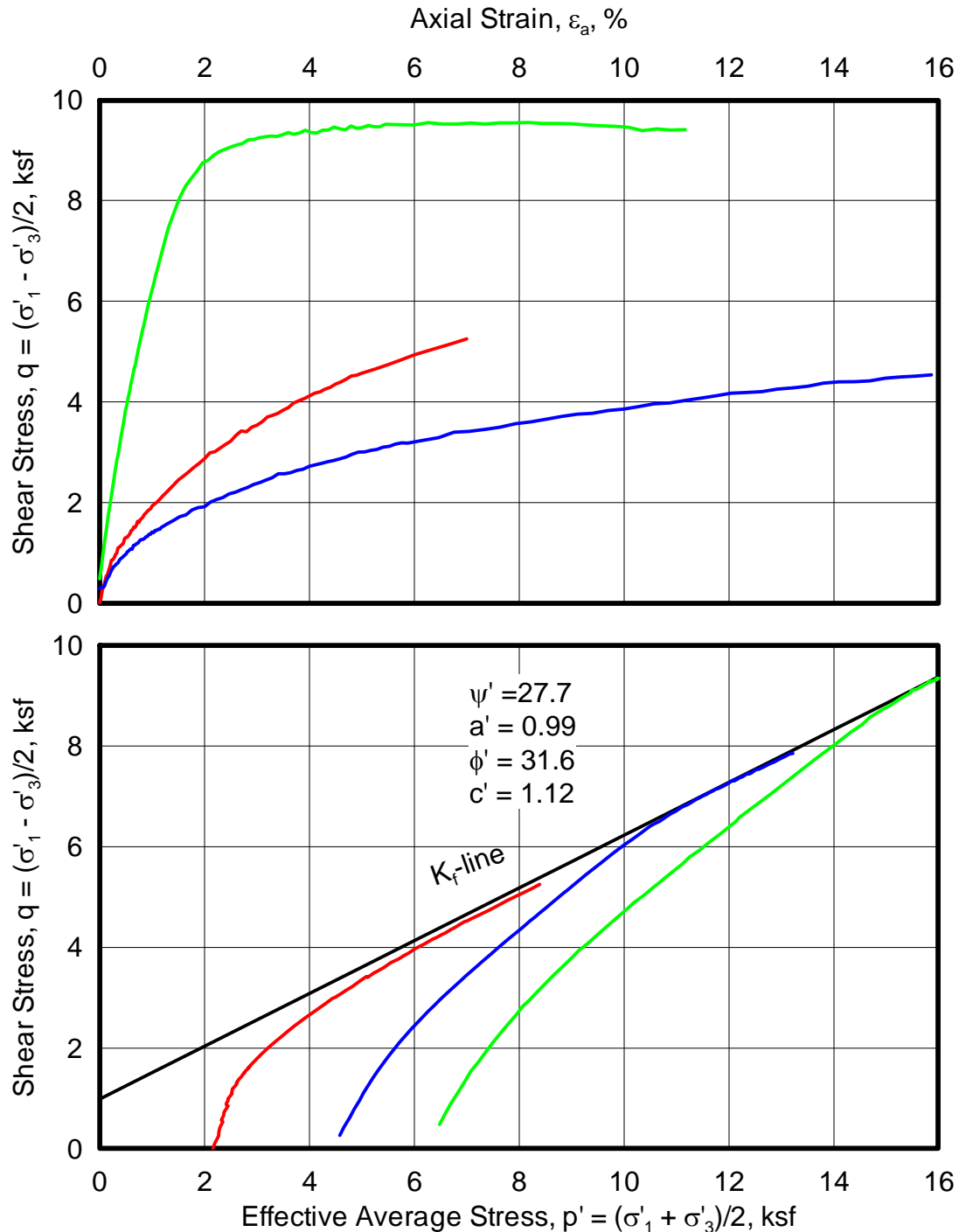
Location: Boring MW-1 Sample 2 3-5ft **Depth:** 3-5 **Sample Number:** 2

RABA KISTNER CONSULTANTS, INC.

Remarks:

ASTM D2435
estimated specific gravity
weigh added to prevent swell after
inundation=0.41tsf

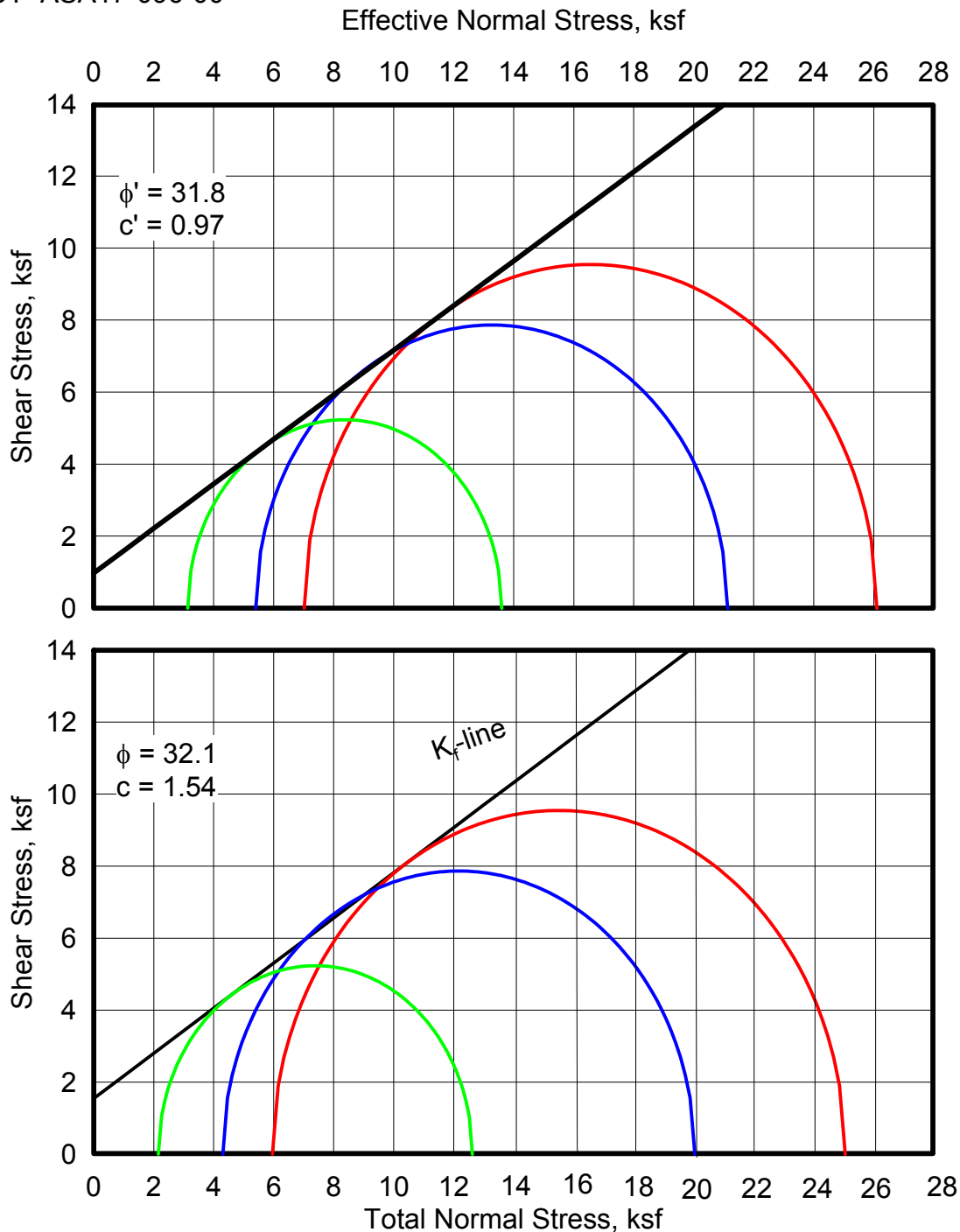
Figure 16c

**MULTI STAGE TRIAXIAL UNDRAINED COMPRESSION TEST RESULTS**

ISOTROPICALLY CONSOLIDATED - STRESS PATH
SINGLE SAMPLE MULTI-STAGE CU

MATERIAL: Silty Sand - SM
INITIAL WATER CONTENT: 27.97%
INITIAL DRY UNIT WEIGHT: 99.69 pcf
INITIAL VOID RATIO: 0.66
SPECIFIC GRAVITY: 2.65 (assumed)

FINAL WATER CONTENT: 27.42%
INITIAL DEGREE OF SATURATION: 92.6%
FINAL DEGREE OF SATURATION: 100.0%



MULTI STAGE TRIAXIAL UNDRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
SINGLE SAMPLE MULTI-STAGE CU

MATERIAL: Silty Sand - SM

INITIAL WATER CONTENT: 27.97%

INITIAL DRY UNIT WEIGHT: 99.69 pcf

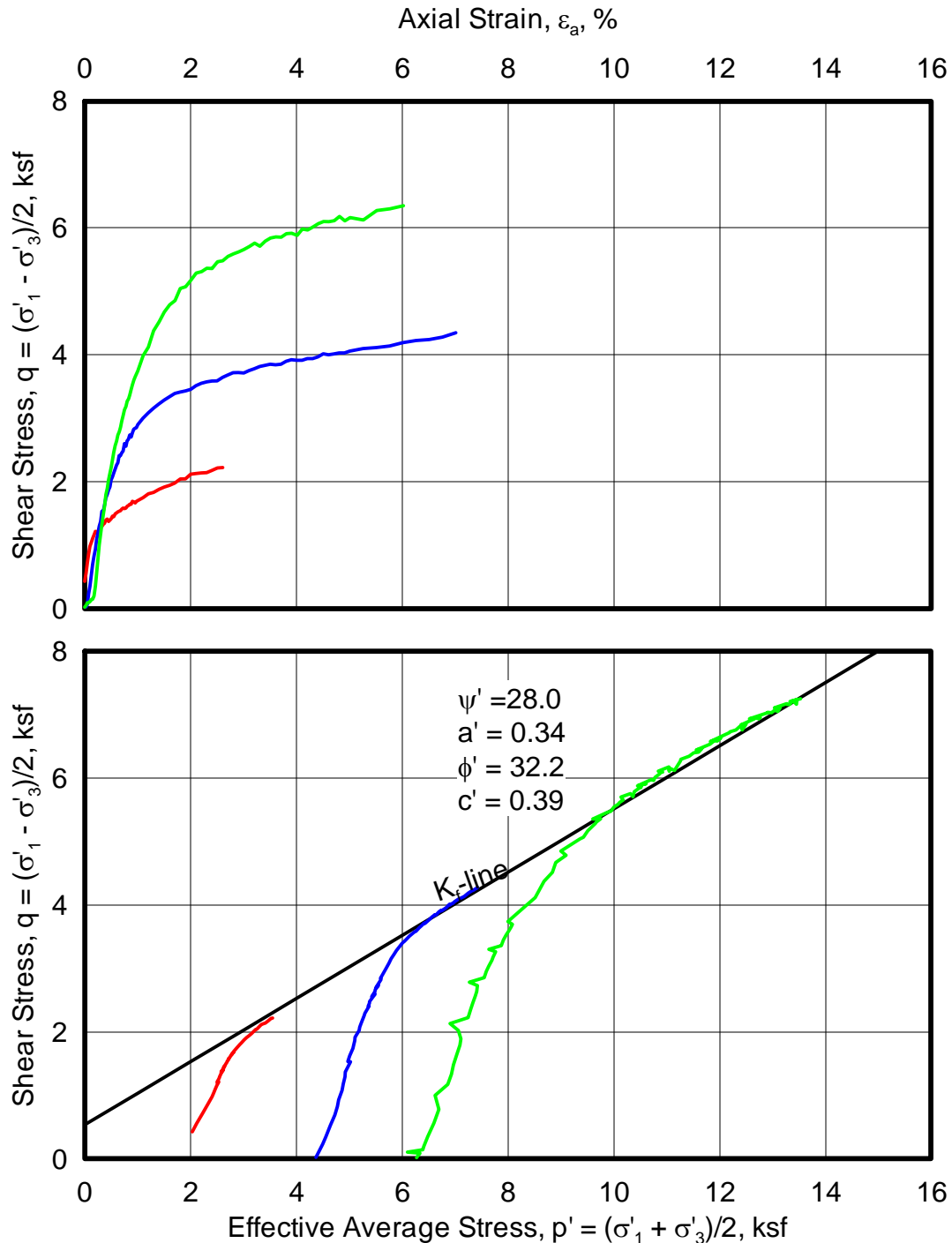
INITIAL VOID RATIO: 0.66

SPECIFIC GRAVITY: 2.65 (assumed)

FINAL WATER CONTENT: 27.42%

INITIAL DEGREE OF SATURATION: 92.6%

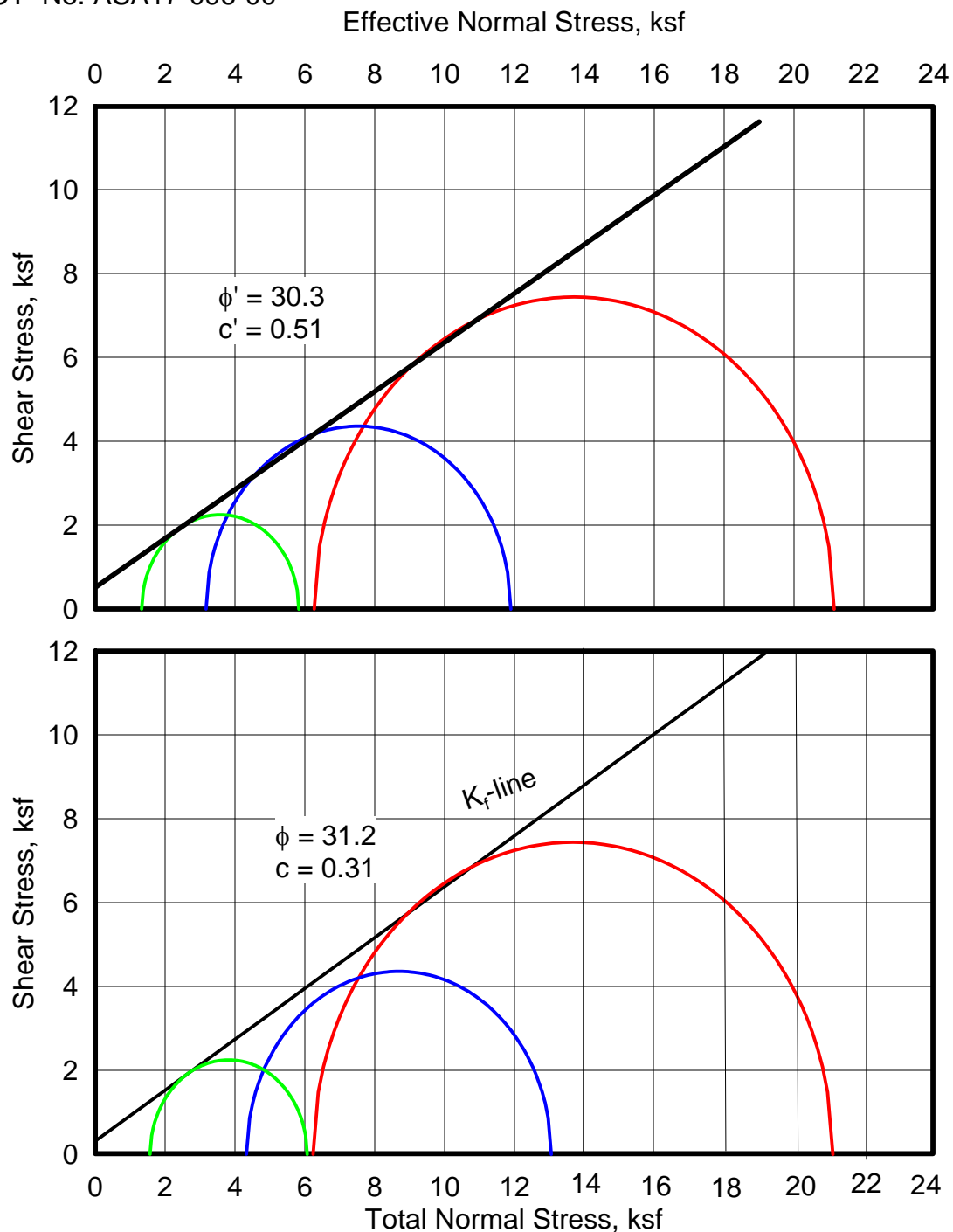
FINAL DEGREE OF SATURATION: 100.0%

**MULTI STAGE TRIAXIAL UNDRAINED COMPRESSION TEST RESULTS**

ISOTROPICALLY CONSOLIDATED - STRESS PATH
SINGLE SAMPLE MULTI STAGE CU

MATERIAL: Sandy Clay-(SC)
INITIAL WATER CONTENT: 16.29%
INITIAL DRY UNIT WEIGHT: 107.26 pcf
INITIAL VOID RATIO: 0.60
SPECIFIC GRAVITY: 2.74 (measured)

FINAL WATER CONTENT: 19.92%
INITIAL DEGREE OF SATURATION: 75.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 27 ; PL = 16 ; PI = 11

**MULTI STAGE TRIAXIAL UNDRAINED COMPRESSION TEST RESULTS**

ISOTROPICALLY CONSOLIDATED - STRESS PATH
SINGLE SAMPLE MULTI STAGE CU

MATERIAL: Reddish brown Clayey Sand (SC), w/ stone and clay layers

INITIAL WATER CONTENT: 16.29%

INITIAL DRY UNIT WEIGHT: 107.26 pcf

INITIAL VOID RATIO: 0.60

SPECIFIC GRAVITY: 2.74 (measured)

FINAL WATER CONTENT: 19.92%

INITIAL DEGREE OF SATURATION: 75.0%

FINAL DEGREE OF SATURATION: 100.0%

LL = 27; PL = 16; PI = 11

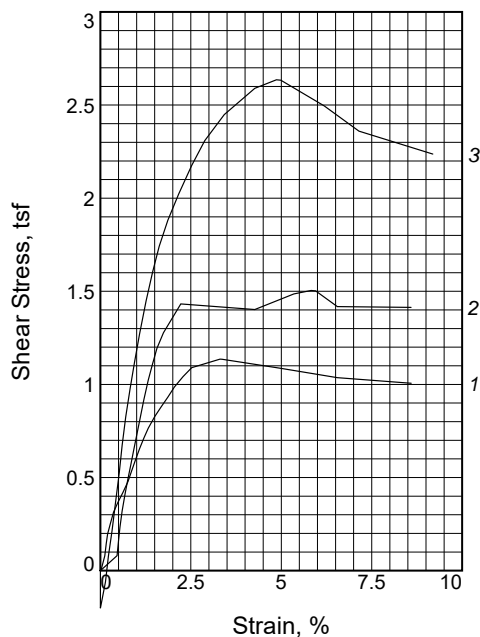
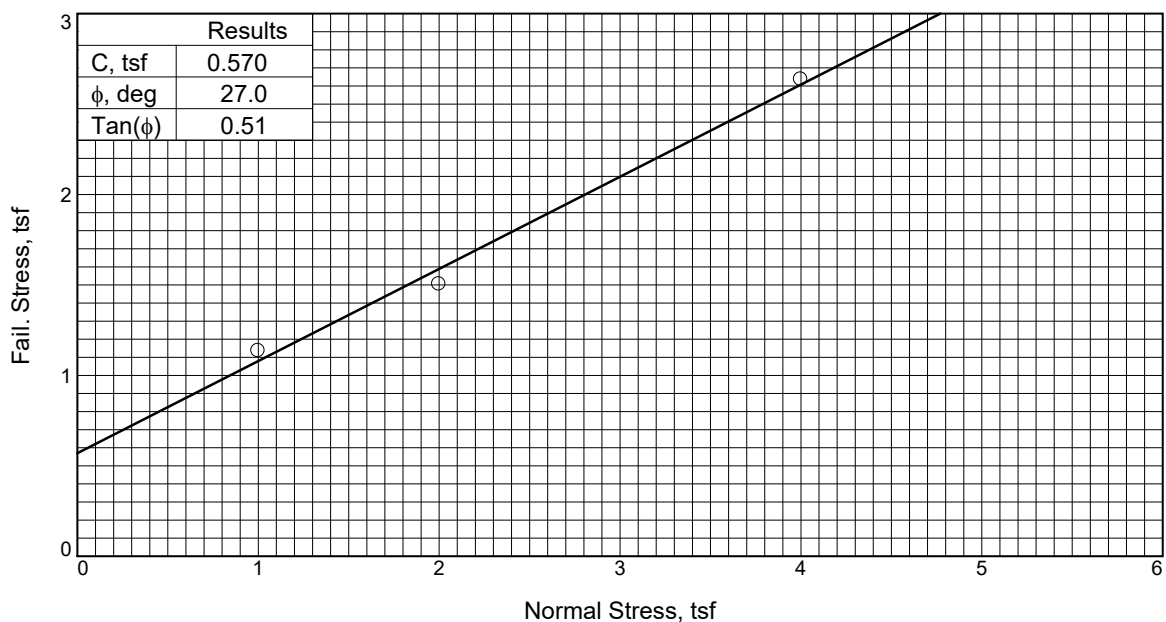
FIGURE



TBPE Firm Registration No. F-3257

12821 West Golden Lane
San Antonio, Texas 78249
(210) 699-9090 TEL
(210) 699-6426 FAX
www.rkci.com

**J.K. SPRUCE - CALAVERAS LAKE POWER
PLANT PROPOSED NEW COAL COMBUSTION
RESIDUAL PONDS
SAN ANTONIO, TEXAS
MOHR CIRLE
BORING B-1, DEPTH 6 TO 8 FT**



Sample No.		1	2	3
Initial	Water Content, %	18.0	17.4	19.9
	Dry Density, pcf	94.6	94.2	94.9
	Saturation, %	64.0	61.4	71.2
	Void Ratio	0.7429	0.7503	0.7375
	Diameter, in.	2.50	2.50	2.50
	Height, in.	0.99	0.99	0.99
At Test	Water Content, %	31.4	31.2	31.4
	Dry Density, pcf	93.0	92.9	91.3
	Saturation, %	107.2	106.4	102.8
	Void Ratio	0.7734	0.7758	0.8071
	Diameter, in.	2.50	2.50	2.50
	Height, in.	1.01	1.01	1.03
Normal Stress, tsf		1.000	2.000	4.000
Fail. Stress, tsf		1.136	1.504	2.636
Strain, %		3.3	5.8	4.9
Ult. Stress, tsf				
Strain, %				
Strain rate, in./min.		0.00	0.00	0.00

Sample Type: Silty Sand - SM

Description: Tan to gray

LL= 35 **PL=** 24 **PI=** 11

Specific Gravity= 2.642

Remarks: MTE# 21-011

Client:

Project: J.K. SPRUCE -CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

Location: MW-3

Sample Number: 12 **Depth:** 21-23FT

Proj. No.: ASA17-096-00 **Date Sampled:**

DIRECT SHEAR TEST REPORT

RABA-KISTNER CONSULTANTS, INC.

Figure 18

Tested By: Chain **Checked By:** JB

APPENDIX A

Seismic Vs100 Geophysical Investigation



January 5, 2018

Raba Kistner Consultants, Inc.
12821 W Golden Lane
San Antonio, TX 78249

Attn: Eric Neuner, P.E.
Phone: 210.699.9090
Email: eneuner@rkci.com

Re: Seismic (Vs100) Geophysical Investigation
San Antonio CPS
San Antonio, TX
Olson Project No. 5966A

Olson Engineering, Inc. (Olson) conducted a geophysical investigation located at the CPS Energy Facility, southeast of San Antonio, TX (Figure 1). The objective of the survey was to obtain the one-dimensional (1D) vertical distribution of shear-wave velocities to a depth of 100 feet (~30 meters) to determine the IBC average shear-wave velocity; that is, the Vs100 (feet) or Vs30 (meters). To meet the objective, a geophysical survey was completed using the passive Multi-channel Analysis of Surface Waves (MASW) method.

The survey was performed based on the scope of work outlined in Olson Proposal No. P2017357.1PG. The field work was conducted on December 13th, 2017 by Olson geophysicist Miriam Moller. The following report presents results from the surface wave investigation and summarizes the site conditions, field methods, data acquisition and interpretation procedures. For further information regarding the intricacies of the MASW technique for determination of Vs100, Olson can submit an addendum to this report upon request.

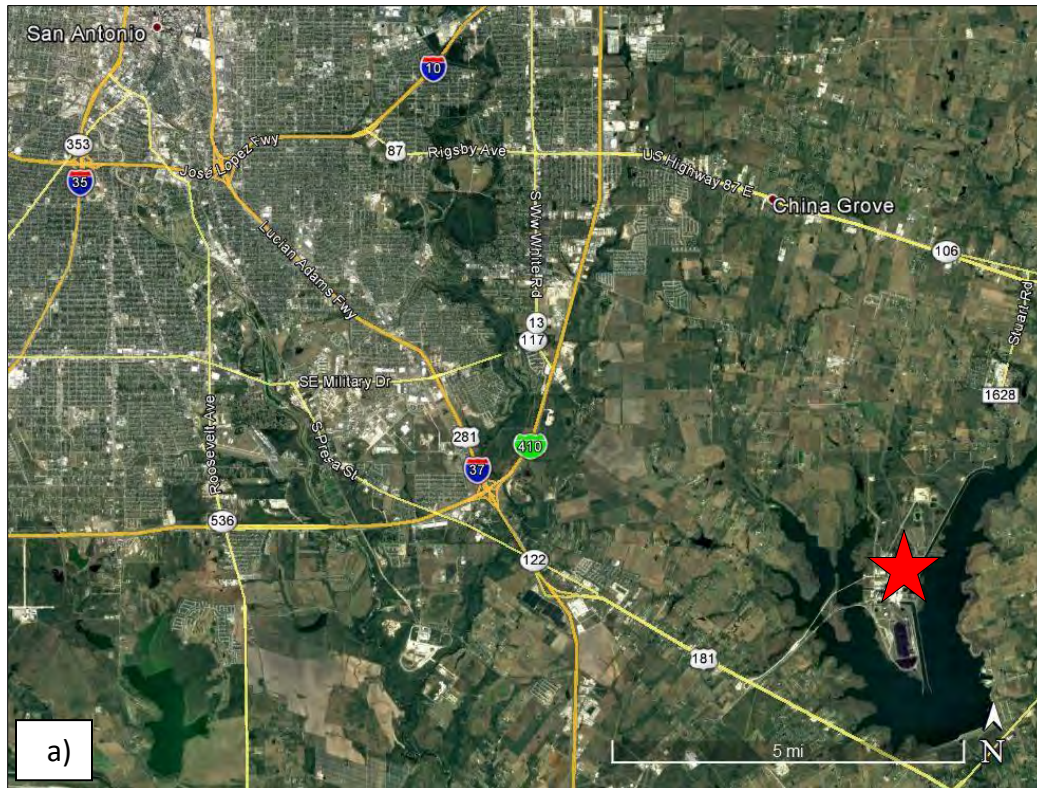


Figure 1. A) Approximate site location indicated by red star; b) line locations indicated by red lines.

Data Acquisition

The geophysical lines were collected with 24 4.5 Hz geophones spaced 10 feet apart for a total length of 230 feet (*inset photo at right*). Seismic data were acquired using a Geometrics Geode 24-channel digital seismograph. This system utilizes a state-of-the-art, 24-bit seismograph connected to a field laptop via Ethernet cable. Analog data from the geophones are collected in the Geode seismograph where the data are digitized, transmitted to the laptop computer, and then recorded on the hard drive.

There are no predefined source points for passive-source surface seismic surveys. Instead, the method uses ambient noise, or vibrational energy, that exists at a site. Small-strain vibrations generated by vehicular motion and other activities create surface wave energy that propagates in all directions across a site. For this project, additional ‘sources’ of ambient noise were generated with a sledgehammer and moving vehicle off the end of the line to improve the signal-to-noise ratio. It is best to orient each array such that surface wave energy propagates along the array. When using the passive surface wave method, this ‘ambient signal’ is the wave-energy measured and recorded for analysis. A minimum of 12 unfiltered 32 second ambient vibrational energy records were recorded for each line using a 2 millisecond (ms) sample rate.



Figure 1b (above) shows the layout of the four lines where MASW seismic data were acquired at the site. Line numbering is purely sequential to the order of acquisition. Locations for the seismic lines were selected based on the site access, crew & equipment safety, and ability to collect quality data.

Data Processing

Passive MASW analysis consists of generating a frequency-velocity transform from surface waves, picking the transformed data to derive a dispersion curve, and inverting this dispersion curve to a layered Vs model. Figure 2 illustrates the dispersion curve picking approach used for passive MASW records, with a sample from Line 3 of this investigation. These steps are repeated for each sounding location using all 24 geophones at a time, resulting in a one-dimensional (1D) layered Vs sounding model. The program SurfSeis, version 5.3, by the Kansas Geological Survey was used to accomplish these steps. In addition to providing a 1D Vs sounding, the layer-weighted average Vs value is computed to a total depth of 100 feet (~30 meters) for each sounding site, in accordance with the IBC 2009 specifications. This approach is generally conservative, as velocity is much more likely to increase with depth than it is to stay constant or decrease. This computation yields the Vs100 foot (or Vs30 meter) value, detailed in Table 1613.5.5 of the 2009 International Building Code (IBC).

While four lines were collected, the results of Line 1 were of poor quality, and as such are not presented or used in the overall Vs100 calculation for the site. The dispersion curve which was generated was of poor quality and as such, so was the resultant 1D sounding.

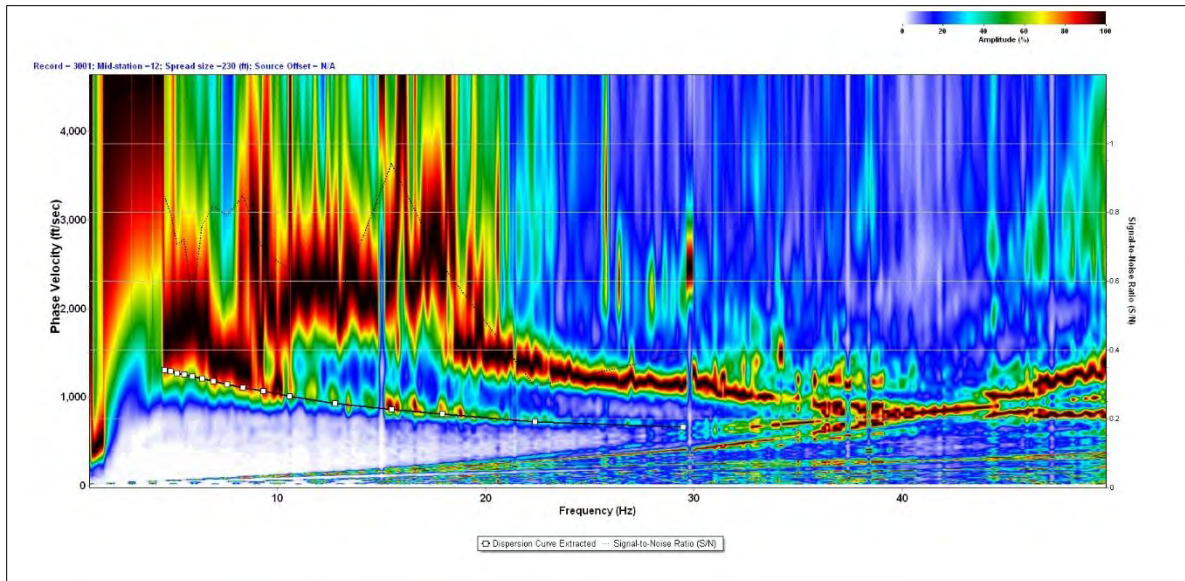


Figure 2. Example dispersion curve from Line 3 of this investigation.

Vs100 Results

The shear-wave velocity curves derived from the MASW method are presented in a single plot on Figure 3, and tabulated in Table 1. The 1D Vs graphs represent a seismic sounding centered at the middle of each line. Olson makes an attempt to collect multiple lines at any given site in order to show if any variation in the subsurface seismic conditions exist; as well as acquire records with ambient energy approaching the linear array of geophones from different angles.

The passive surface-wave data obtained at this site produced Vs100 values of (*using equation 16-40, IBC 2009, section 1613.5.5*):

Line 2 Vs100 = 1,080 ft/s

Line 3 Vs100 = 1,062 ft/s

Line 4 Vs100 = 1,106 ft/s

The average value for the three seismic lines at this site is **Vs100= 1,083 ft/s (330 meters/second)**. The results from the 1D Vs graph indicate generally increasing velocity values with depth. Vs100 values listed above, and presented in Figure 3, were computed in order to be used with Table 1613.5.5 of IBC 2009, or current equivalent, for determining the Site Class. Based on our experience, Vs100 results from passive surface-wave testing have been found to fall within 10 to 15% of Vs data obtained via more expensive crosshole or downhole seismic testing.

Table 1. Tabulated velocity results for three MASW lines.

Line 2 - Vs 100 = 1080 ft/s			
Depth Range (feet)			Vs (ft/s)
0.0	-	4.6	746
4.6	-	10.3	610
10.3	-	17.5	569
17.5	-	26.5	1311
26.5	-	37.7	893
37.7	-	51.7	895
51.7	-	69.2	1581
69.2	-	91.1	1629
91.1	-	100.0	1839

Line 3 - Vs 100 = 1062 ft/s			
Depth Range (feet)			Vs (ft/s)
0.0	-	3.8	731
3.8	-	8.7	617
8.7	-	14.7	670
14.7	-	22.2	1026
22.2	-	31.6	954
31.6	-	43.3	1019
43.3	-	58.0	1323
58.0	-	76.3	1393
76.3	-	99.2	1226
99.2	-	100.0	1564

Line 4 - Vs 100 = 1106 ft/s			
Depth Range (feet)			Vs (ft/s)
0.0	-	3.4	783
3.4	-	7.7	760
7.7	-	13.0	663
13.0	-	19.6	917
19.6	-	28.0	1084
28.0	-	38.4	1035
38.4	-	51.3	1086
51.3	-	67.6	1293
67.6	-	87.9	1346
87.9	-	100.0	1541

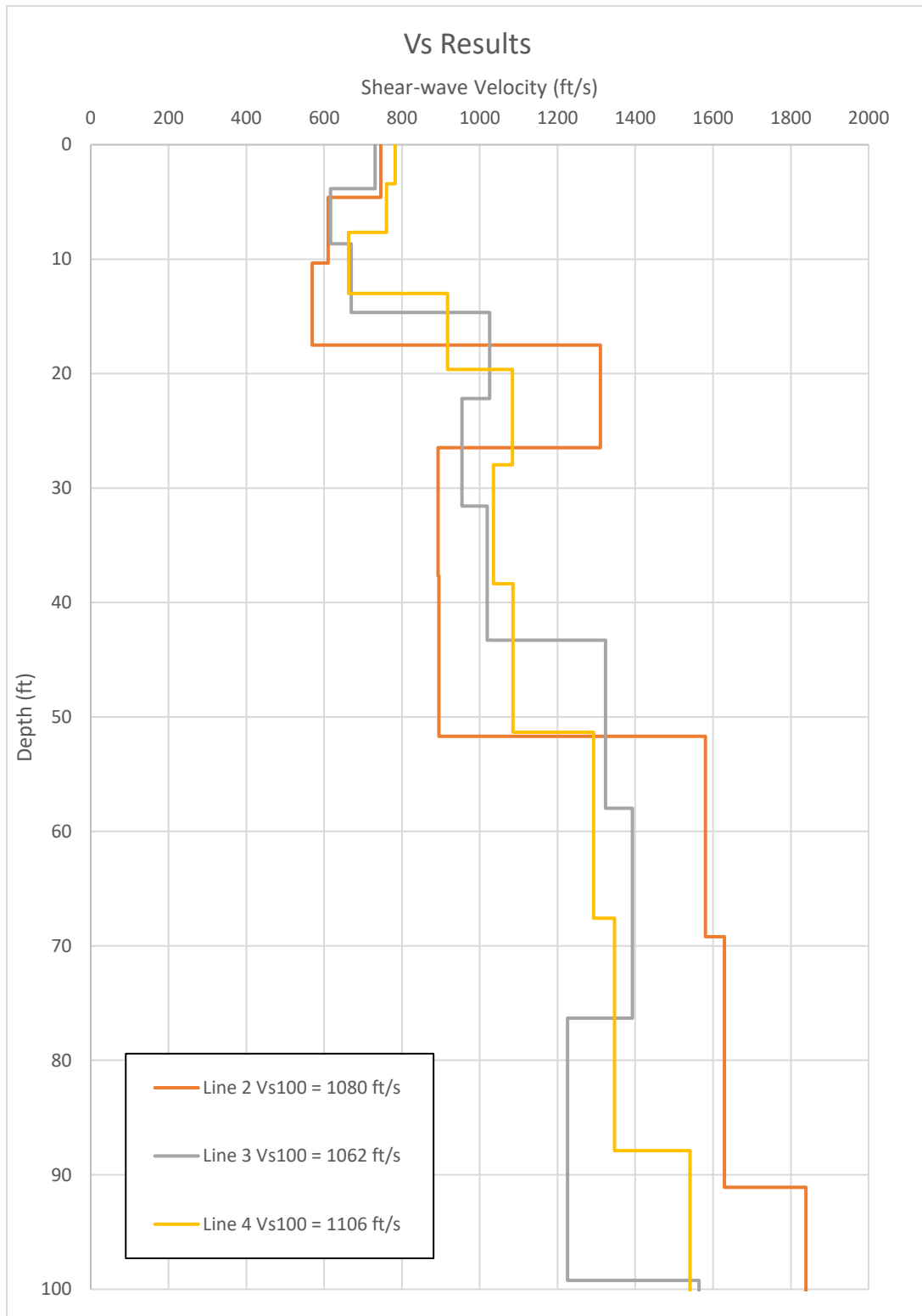


Figure 3. 1D Shear-wave velocity models for Lines 2 through 4.

Closure

The quality of the passive surface wave data was good for the three presented lines at this site. Based on the quality of the passive surface-wave data and the repeatability of the results, we have confidence that the 1D shear-wave velocity results and calculated Vs100 values are representative of the site conditions.

Olson Engineering does not assign a seismic site classification based on Vs measurements, because we are aware that other site factors may influence the classification. Site classification is an engineering judgment and decision; Olson is presenting Vs profiles and the resultant average shear-wave velocities in graphical and tabular format (computed according to IBC specifications) beneath each seismic line. Due caution and a conservative approach should be employed when evaluating site conditions as related to structural assessment and/or foundation design at any project site.

The geophysical methods and field procedures defined in this report were applicable to the project objectives and have been successfully applied by Olson to investigations of similar size and nature. However, sometimes field or subsurface conditions are different from those anticipated and the resultant data may not achieve the project objectives. Olson warrants that our services were performed within the limits prescribed for this project, with the usual thoroughness and competence of the geophysical profession. Olson conducted this project using the current standards of the geophysical industry and utilized in house quality control standards to produce a precise geophysical survey.

If you have any questions regarding the field procedures, seismic data analysis, or the Vs results presented herein, please do not hesitate to contact us. We appreciate working with you and look forward to providing Raba Kistner with geophysical or engineering services in the future.

Respectfully submitted,
Olson Engineering, Inc.



Miriam Moller
Staff Geophysicist



Nicole Pendrigh
Senior Geophysicist

(1 copy e-mailed PDF format)

APPENDIX B

NEHRP Seismic Provisions



Design Maps Detailed Report

2009 NEHRP Recommended Seismic Provisions (29.313°N, 98.316°W)

Site Class D – “Stiff Soil”, Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters and Risk Coefficients

Note: Ground motion values contoured on Figures 22-1, 2, 5, & 6 below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_{SUH} and S_{SD}) and 1.3 (to obtain S_{1UH} and S_{1D}). Maps in the Proposed 2015 NEHRP Provisions are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

Figure 22-1: Uniform-Hazard (2% in 50-Year) Ground Motions of 0.2-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B

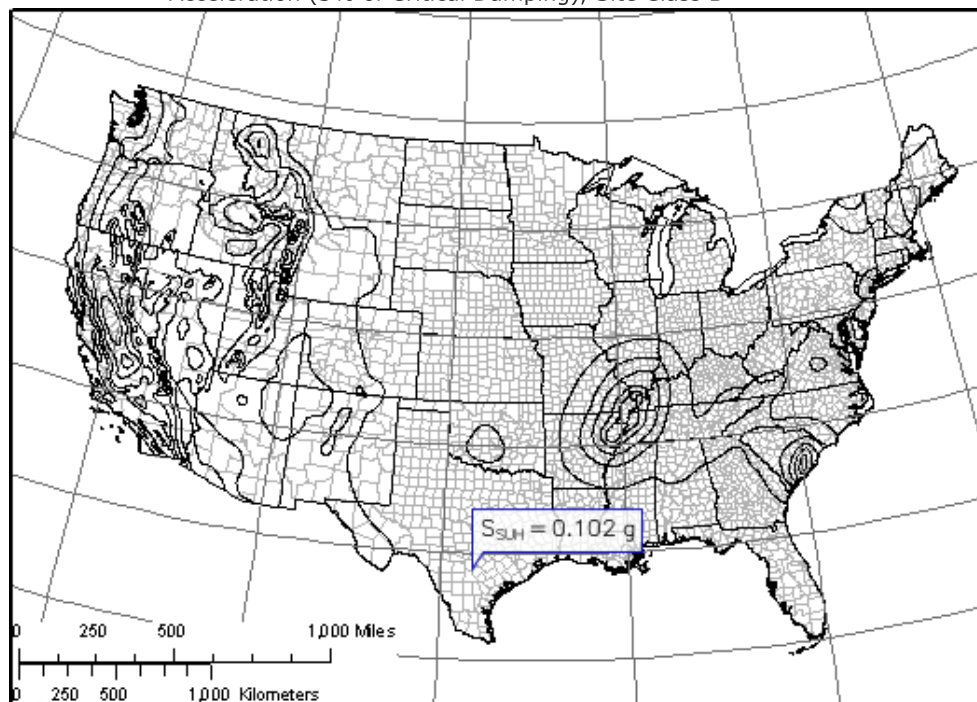


Figure 22-2: Uniform-Hazard (2% in 50-Year) Ground Motions of 1.0-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B

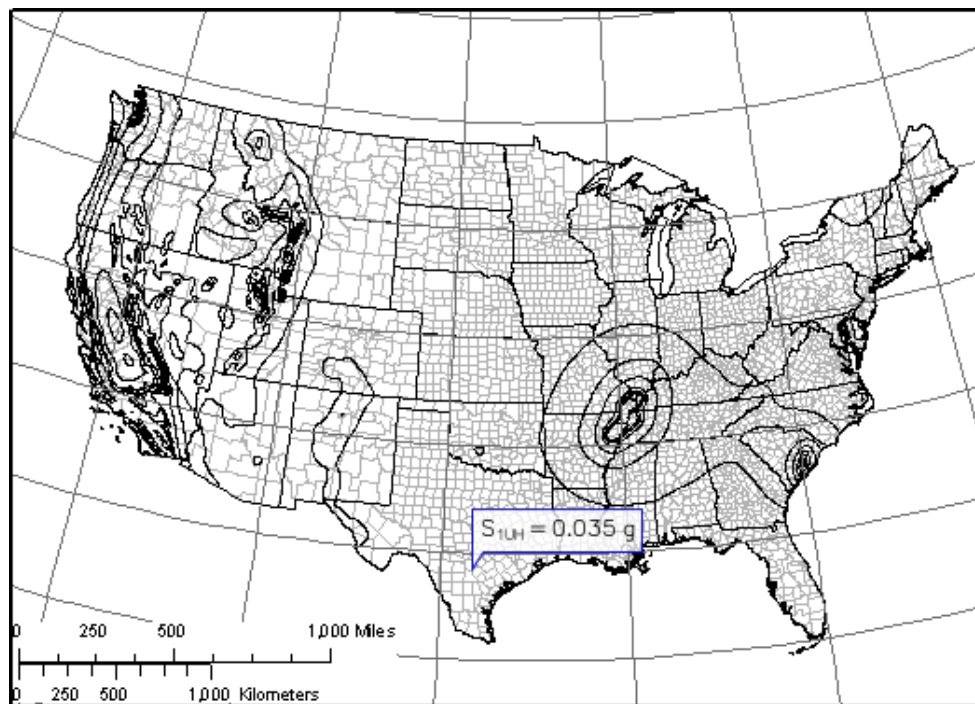


Figure 22-3: Risk Coefficient at 0.2-Second Spectral Response Period

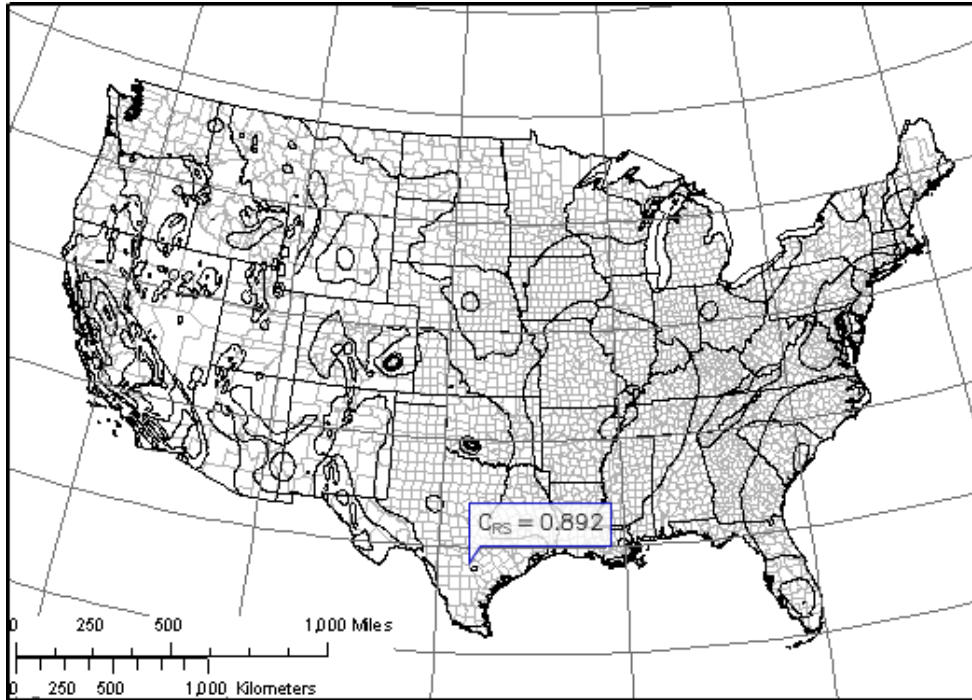


Figure 22-4: Risk Coefficient at 1.0-Second Spectral Response Period

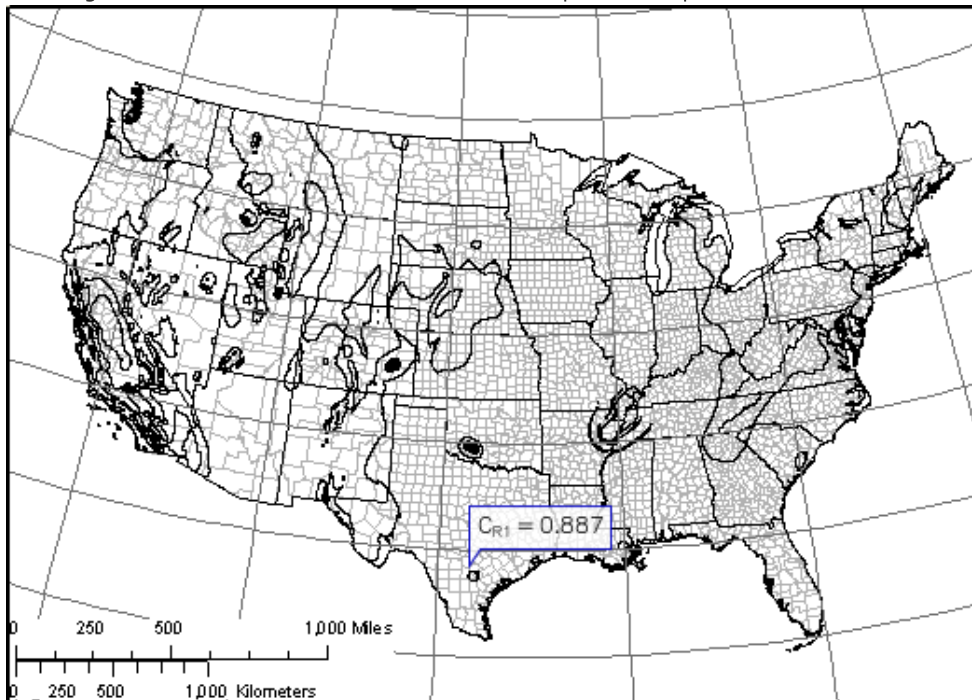


Figure 22-5: Deterministic Ground Motions of 0.2-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B

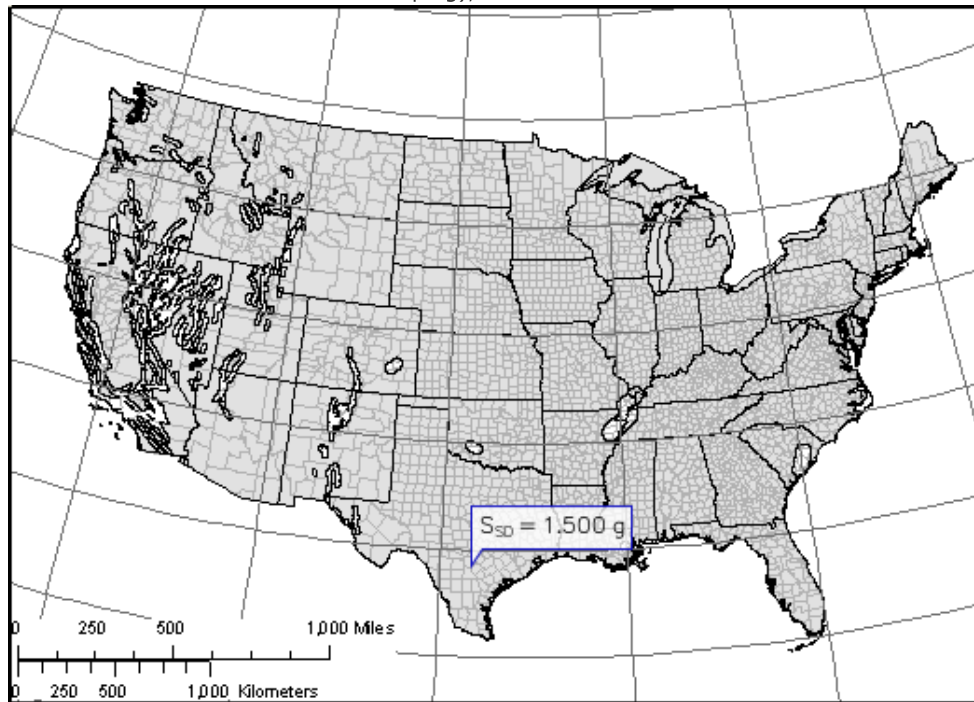
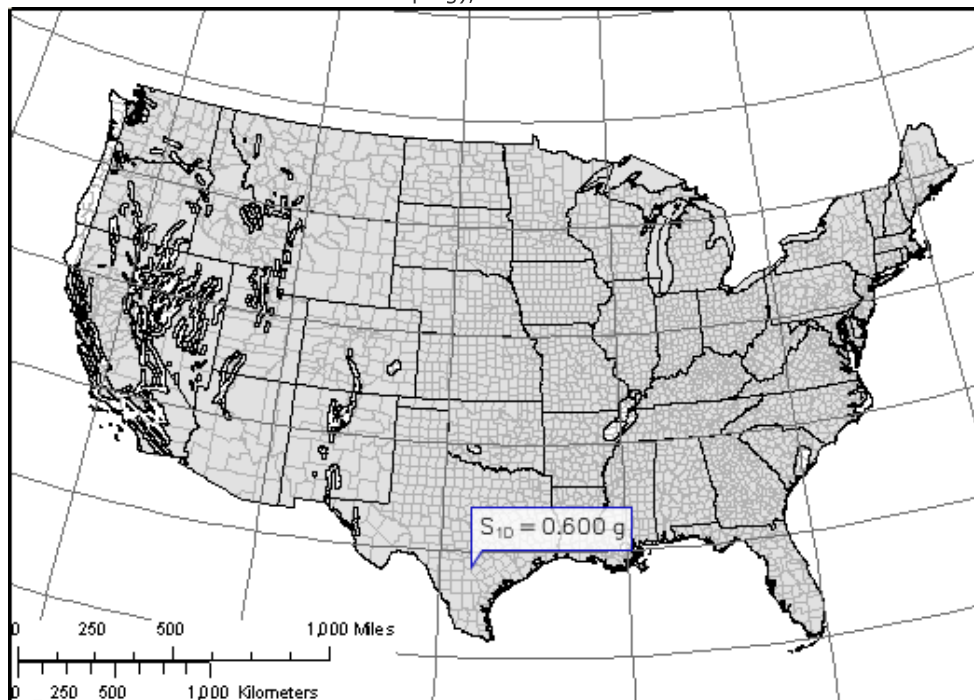


Figure 22-6: Deterministic Ground Motions of 1.0-Second Spectral Response Acceleration (5% of Critical Damping), Site Class B



Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	\bar{v}_s	\bar{N} or \bar{N}_{ch}	\bar{s}_u
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
Any profile with more than 10 ft of soil having the characteristics: <ul style="list-style-type: none">• Plasticity index $PI > 20$,• Moisture content $w \geq 40\%$, and• Undrained shear strength $\bar{s}_u < 500$ psf			
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients, Risk Coefficients, and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Equation (11.4-1):	$C_{RS}S_{SUH} = 0.892 \times 0.102 = 0.091 \text{ g}$
Equation (11.4-2):	$S_{SD} = 1.500 \text{ g}$
$S_s \equiv \text{"Lesser of values from Equations (11.4-1) and (11.4-2)"} = 0.091 \text{ g}$	
Equation (11.4-3):	$C_{R1}S_{1UH} = 0.887 \times 0.035 = 0.031 \text{ g}$
Equation (11.4-4):	$S_{1D} = 0.600 \text{ g}$
$S_1 \equiv \text{"Lesser of values from Equations (11.4-3) and (11.4-4)"} = 0.031 \text{ g}$	

Table 11.4-1: Site Coefficient F_a

Site Class	Spectral Response Acceleration Parameter at Short Period				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_s

For Site Class = D and $S_s = 0.091$ g, $F_a = 1.600$

Table 11.4-2: Site Coefficient F_v

Site Class	Spectral Response Acceleration Parameter at 1-Second Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = D and $S_1 = 0.031$ g, $F_v = 2.400$

Equation (11.4-5):

$$S_{MS} = F_a S_s = 1.600 \times 0.091 = 0.146 \text{ g}$$

Equation (11.4-6):

$$S_{M1} = F_v S_1 = 2.400 \times 0.031 = 0.075 \text{ g}$$

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4-7):

$$S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 0.146 = 0.097 \text{ g}$$

Equation (11.4-8):

$$S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.075 = 0.050 \text{ g}$$

Section 11.4.5 — Design Response Spectrum

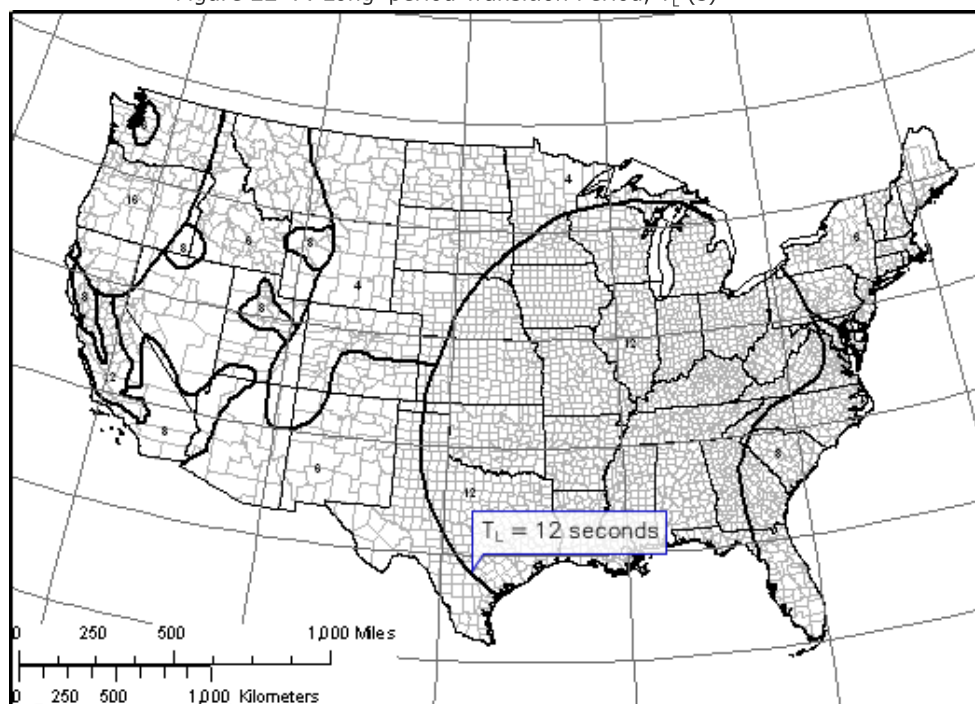
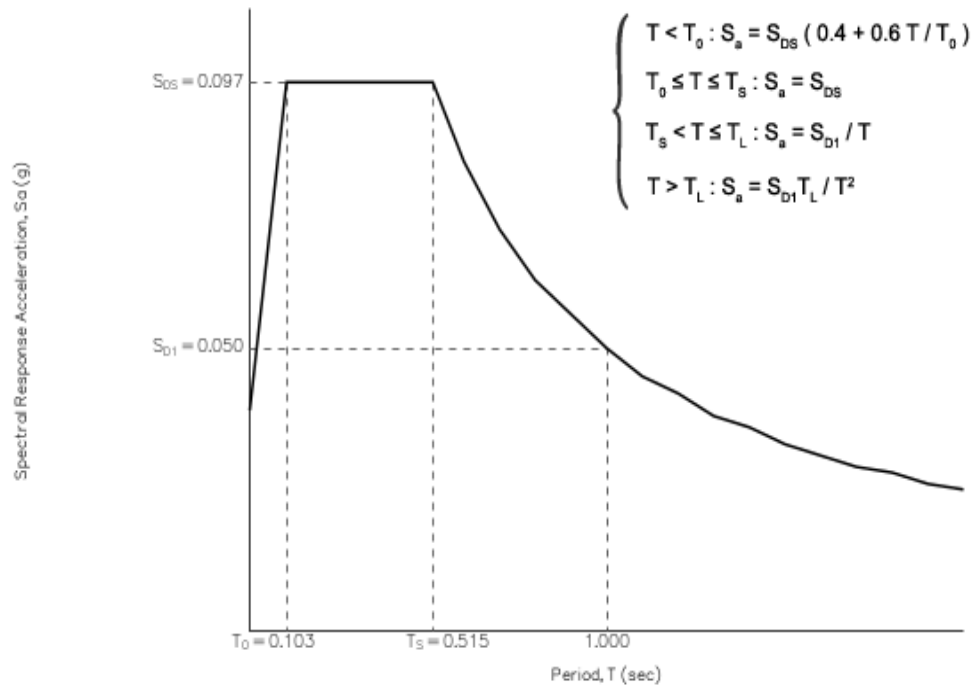
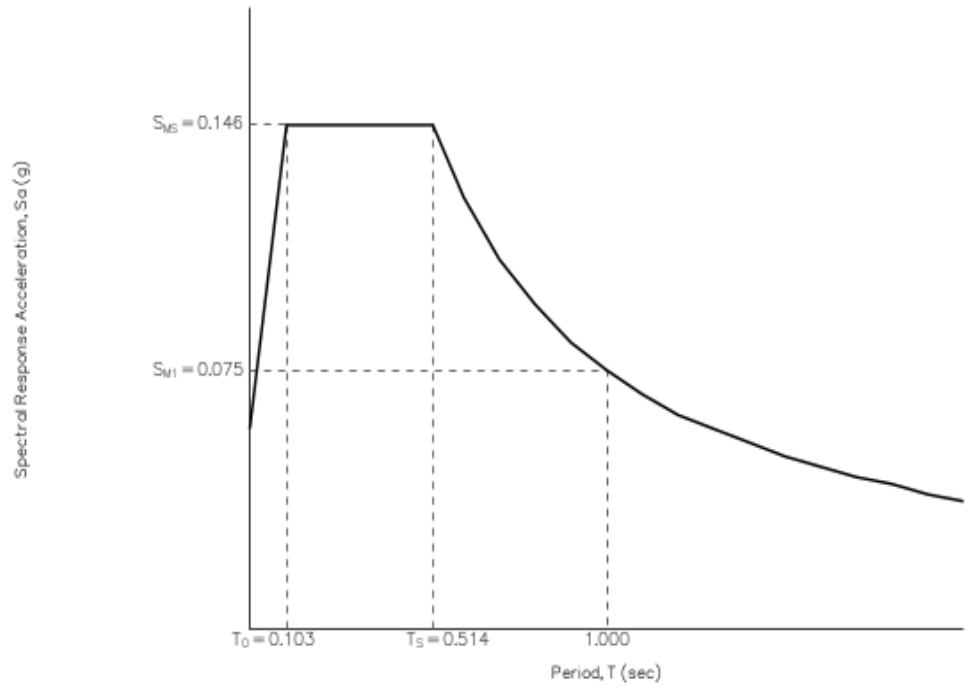
Figure 22-7: Long-period Transition Period, T_L (s)

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — MCE_R Response Spectrum

The MCE_R response spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

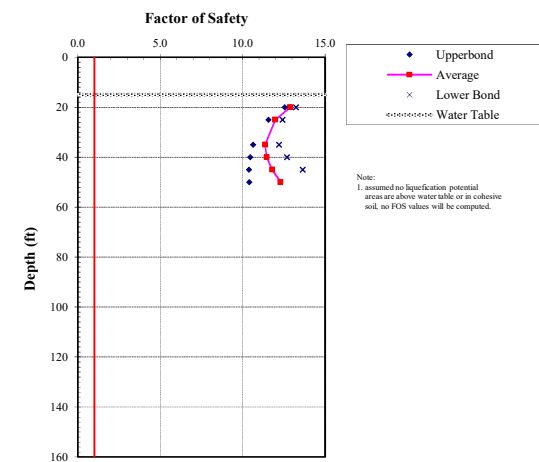
For Site Class = D and PGA = 0.047 g, $F_{PGA} = 1.600$

Mapped PGA	PGA = 0.047 g
Equation (11.8–1):	$PGA_M = F_{PGA}PGA = 1.600 \times 0.047 = 0.075 \text{ g}$

APPENDIX C

Liquefaction Analyses

Project Name: CPS CCR Ponds				Boring No.: B-1																													
Job No.: ASA17-096-00																																	
Total Depth: 50.0 ft		Design Maximum Acceleration: 0.075 g																															
Water Level: 15 ft		Design EQ Magnitude: 7.5																															
Depth (ft)	Thick- ness (ft)	Soil Type	Unit Weigh- t (pcf)	Over- burden Stress (psf)	Pore Water Pressure (psf)	Effective Overburden Stress (psf)	γ_d (stress reduction coefficient)			Field SPT Value (N)	Correction Factor		SPT (Corrected)		Computed CSR for γ_d @			% of Fine	Expected CSR vs. N_{60}		Factor of Safety			Depth (ft)	EQ induced Volumetric Strain (%)			Post Liquefaction Settlement (in)					
							Upper Bound	Lower Bound	Average		CN	Er %	N_{70}	N_{60}	Upper Bound	Lower Bound	Average		@ given % Fine & M7.5	@ given % Fine & Magnitude	Upper Bound	Lower Bound	Average		Upper Bound	Lower Bound	Average						
0.0				0	0.0	0	1.000	1.000	1.000																								
3	3	Sand	115	345	0.0	345	0.998	0.992	0.995	8	2.408	87	24	28	Above GWT	Above GWT	Above GWT	28	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	3									
8	5	Clay	115	920	0.0	920	0.997	0.978	0.987	0	1.474	87	0	0	Above GWT	Above GWT	Above GWT	52	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	8									
10	2	Sand	120	1160	0.0	1160	0.996	0.972	0.984	16	1.313	87	26	30	Above GWT	Above GWT	Above GWT	36	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	10									
15	5	Sand	125	1785	0.0	1785	0.993	0.957	0.975	25	1.059	87	33	38	Above GWT	Above GWT	Above GWT	36	Above GWT	Above GWT	>>1.00	>>1.00	>>1.00	15									
20	5	Sand	125	2410	312.0	2098	0.989	0.938	0.963	14	0.976	87	17	20	0.055	0.053	0.054	36	0.394	0.520	9	10	10	20									
25	5	Sand	130	3060	624.0	2436	0.982	0.913	0.948	50	0.906	87	56	66	0.060	0.056	0.058	36	0.500	0.661	11	12	11	25									
30	5	Sand	130	3710	936.0	2774	0.971	0.880	0.926	50	0.849	87	53	61	0.063	0.057	0.060	36	0.500	0.661	10	12	11	30									
35	5	Sand	130	4360	1248.0	3112	0.957	0.834	0.895	50	0.802	87	50	58	0.065	0.057	0.061	48	0.500	0.661	10	12	11	35									
40	5	Sand	130	5010	1560.0	3450	0.939	0.773	0.856	35	0.761	87	33	39	0.066	0.055	0.061	48	0.500	0.661	10	12	11	40									
45	5	Sand	130	5660	1872.0	3788	0.919	0.699	0.809	37	0.727	87	33	39	0.067	0.051	0.059	48	0.500	0.661	10	13	11	45									
50	5	Sand	130	6310	2184.0	4126	0.897	0.618	0.758	50	0.696	87	43	50	0.067	0.046	0.056	48	0.500	0.661	10	14	12	50									



Project Name:	CPS CCR Ponds	Boring No.:	B-4
Job No.:	ASA17-096-00		
Total Depth:	50.0 ft	Design Maximum Acceleration:	0.075 g
Water Level:	19 ft	Design EQ Magnitude:	7.5

[illegible]
$$\text{Cyclic Ratio} = 0.65 \times \frac{a_{\max}}{g} \times \frac{\sigma_o}{\sigma'_o} \quad (\text{Seed \& Idriss, 1982})$$

Where

γ_a : Stress Reduction Coefficient (Fig. 40, "Ground Motions and Soil Liquefaction During Earthquakes", Seed & Idriss, 1982)

$$N_{corrected} = N_{field} \times C_N \times \frac{E_r}{60\%} \times \eta_2 \times \eta_3 \times \eta_4 \text{ (Bowles, "Foundation Analysis and Design", 4th Edition)}$$

Where

$$C_N = \frac{1}{\sqrt{\sigma_0}} \quad \overline{\sigma_0} \text{ in tsf}$$

 E_r : % of Input Energy

η_2 : Rod Length Correction

η_3 : Sampler Correction

η_4 : Borehole Diameter Correction

Assumed: $\eta_2, \eta_3, \eta_4 = 1$

Post - Liquefaction Settlement

$$S = \varepsilon_y \times H (FHWA - SA - 97 - 076, ch8)$$

Where

ε_v : Volumetric Strain for Different EQ Magnitude, (%)
(Tokimatsu & Seed, 1987)

H: Thickness of Liquefiable Layer

Ratios between M7.5 & Different EQ Magnitude (Seed & Idriss, 1982)

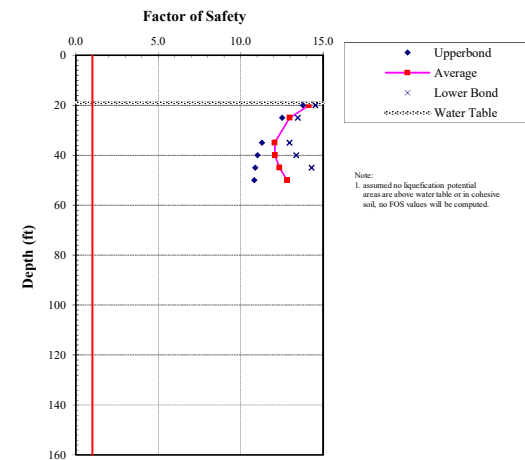
M8.5 *0.89*

M7.5 1.00

M6.75 1.13

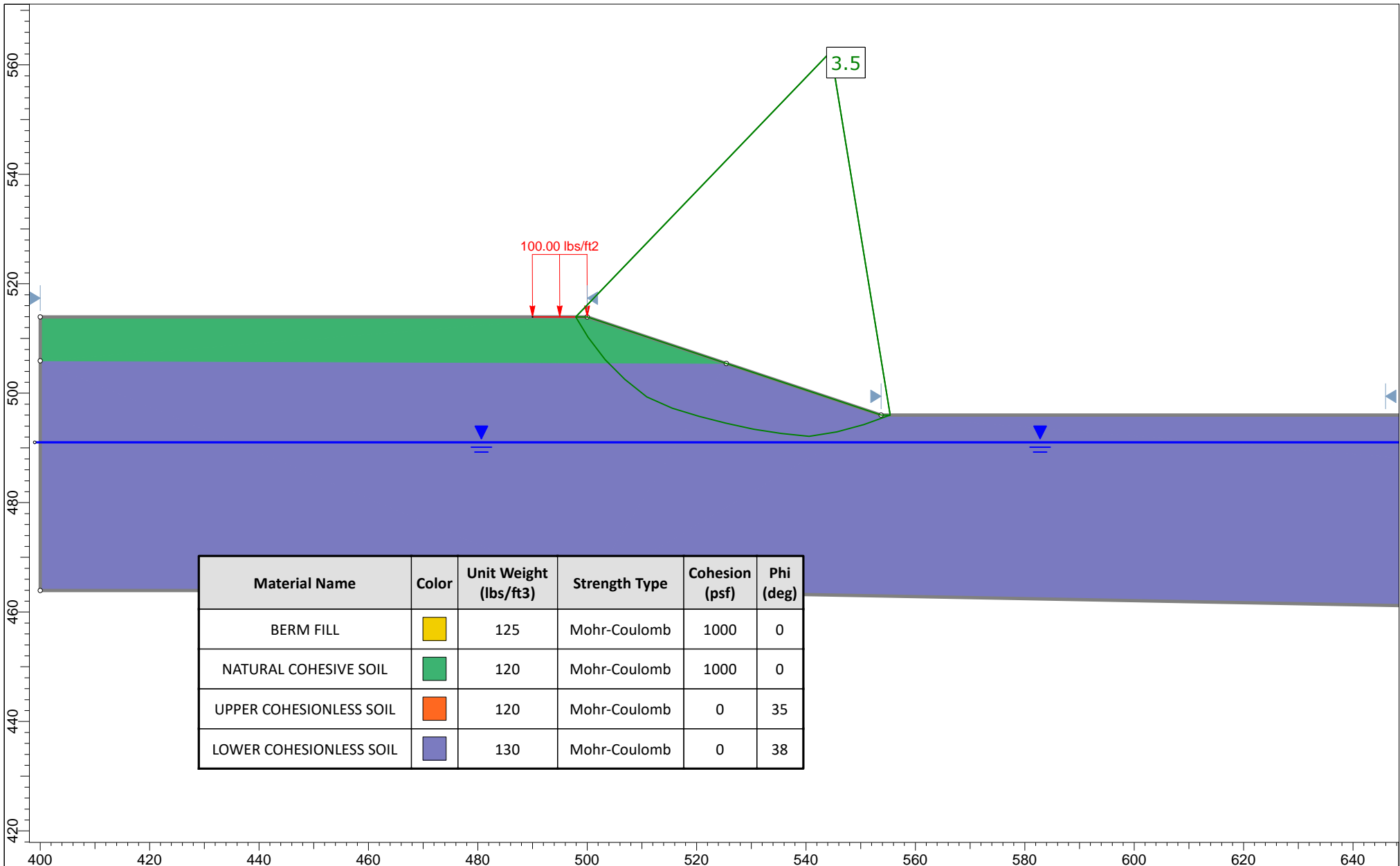
M6.0 *1.32*

M5.25 1.50



APPENDIX D

Slope Stability Analysis

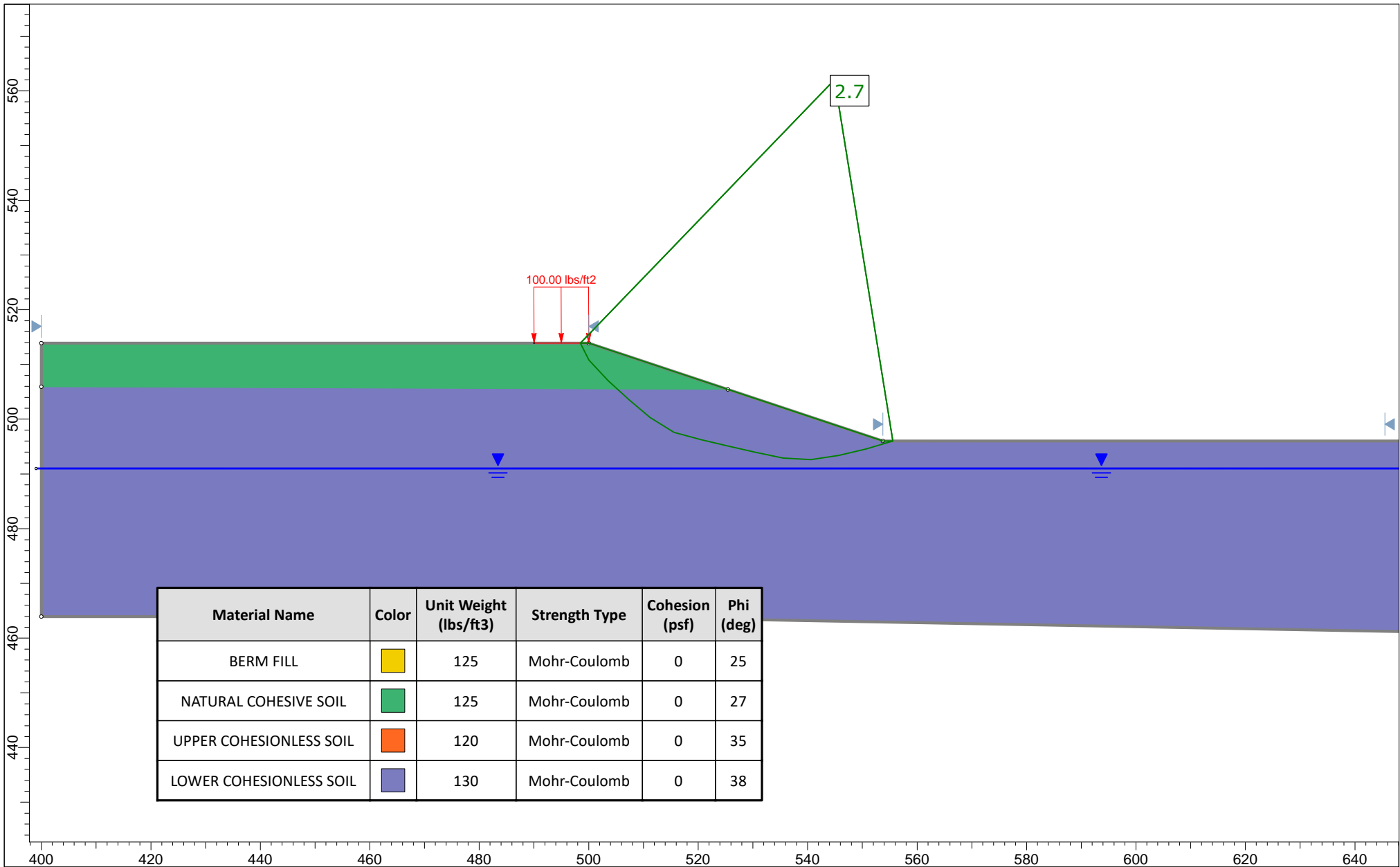


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION A-A
END OF CONSTRUCTION (SHORT TERM)

FIGURE A-1



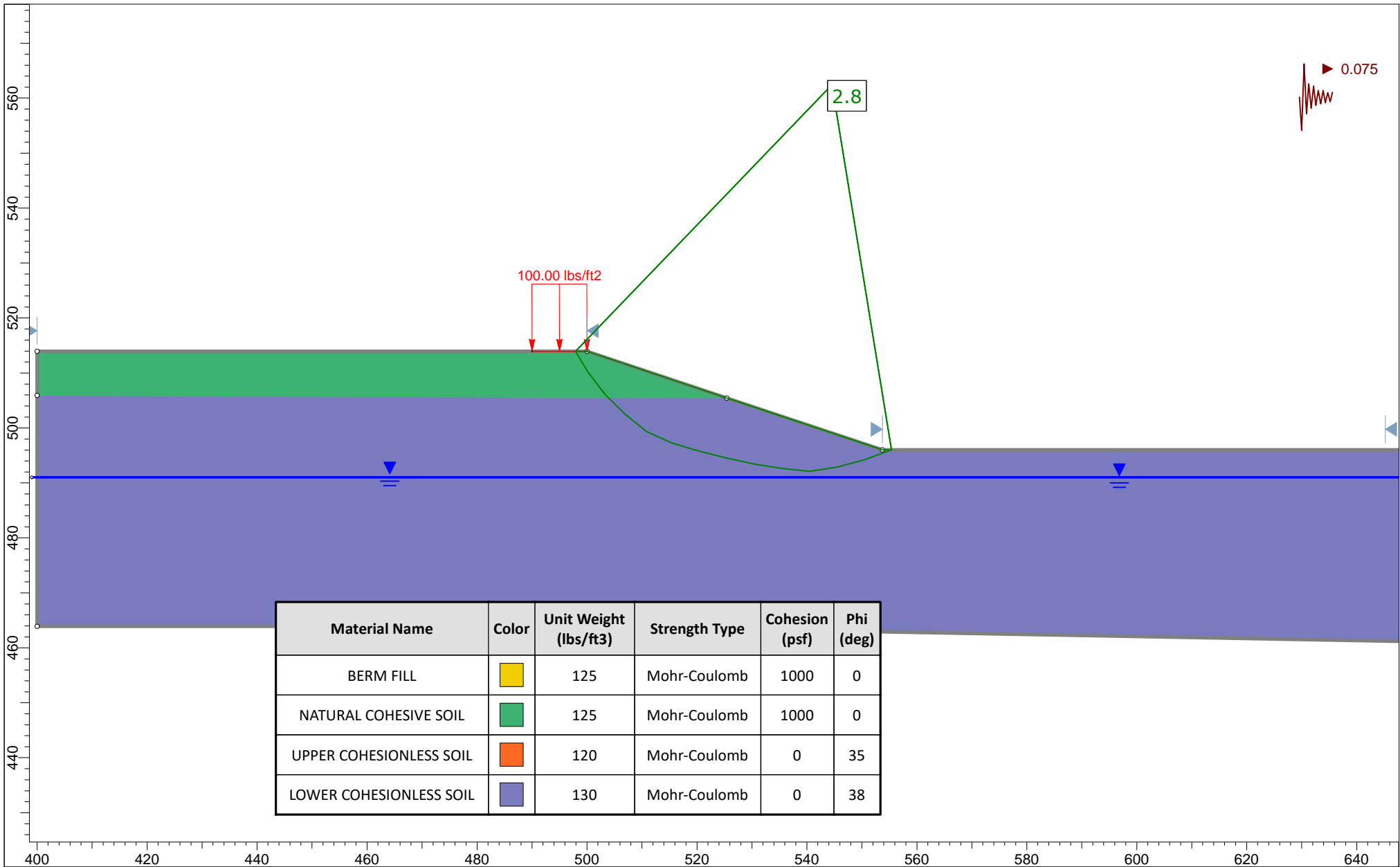


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

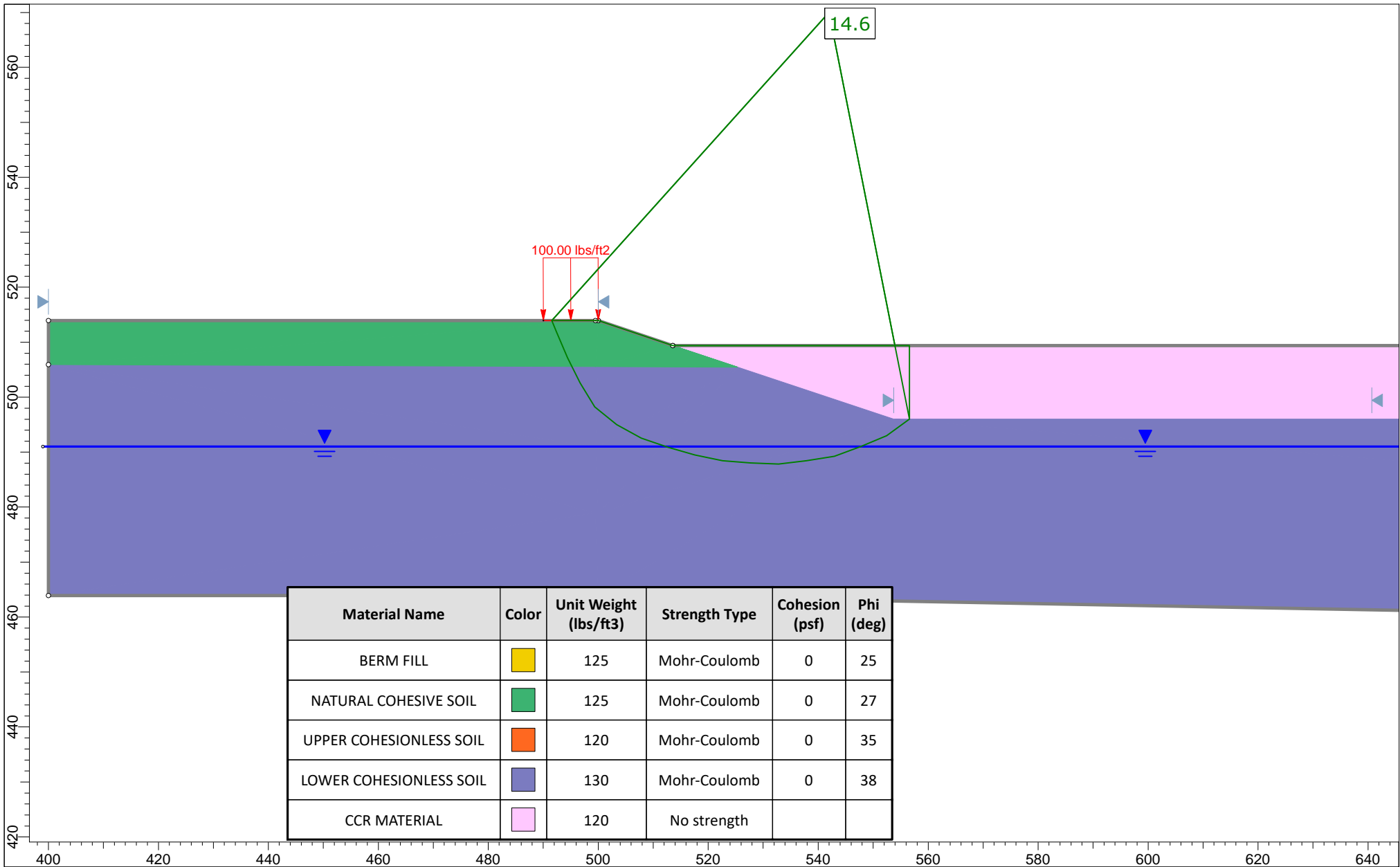
GLOBAL STABILITY ANALYSIS
SECTION A-A
LONG TERM

FIGURE A-2

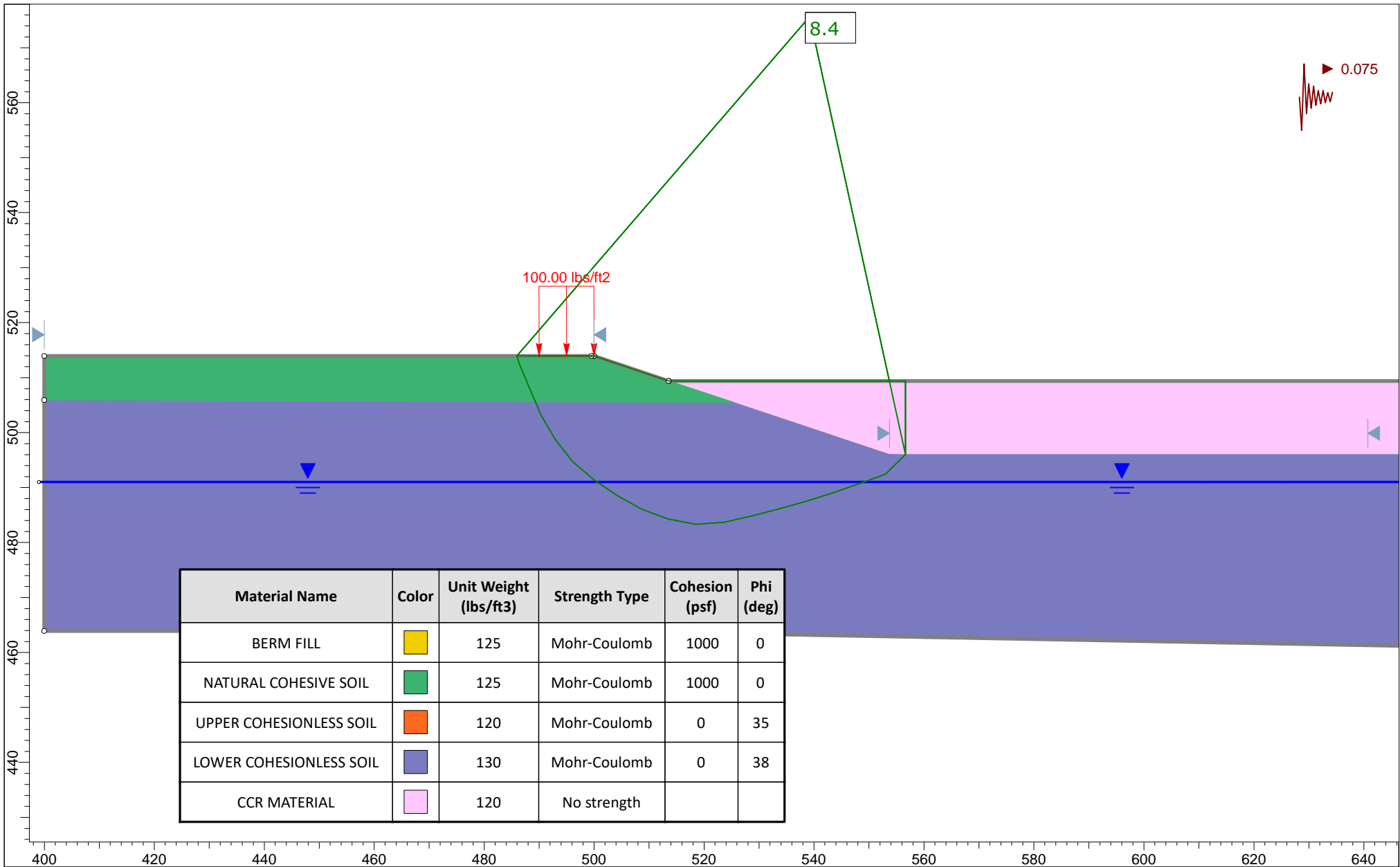




<p>ASA17-096-00</p> <p>J.K. SPRUCE –CALAVERAS LAKE POWER PLANT</p> <p>PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS</p> <p>SAN ANTONIO, TEXAS</p>	<p>GLOBAL STABILITY ANALYSIS</p> <p>SECTION A-A</p> <p>SEISMIC CONDITION</p>	<p>FIGURE A-3</p> <p>RABA KISTNER CONSULTANTS</p>
---	--	--



ASA17-096-00 J.K. SPRUCE –CALAVERAS LAKE POWER PLANT PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS SAN ANTONIO, TEXAS	GLOBAL STABILITY ANALYSIS SECTION A-A LONG TERM	FIGURE A-4

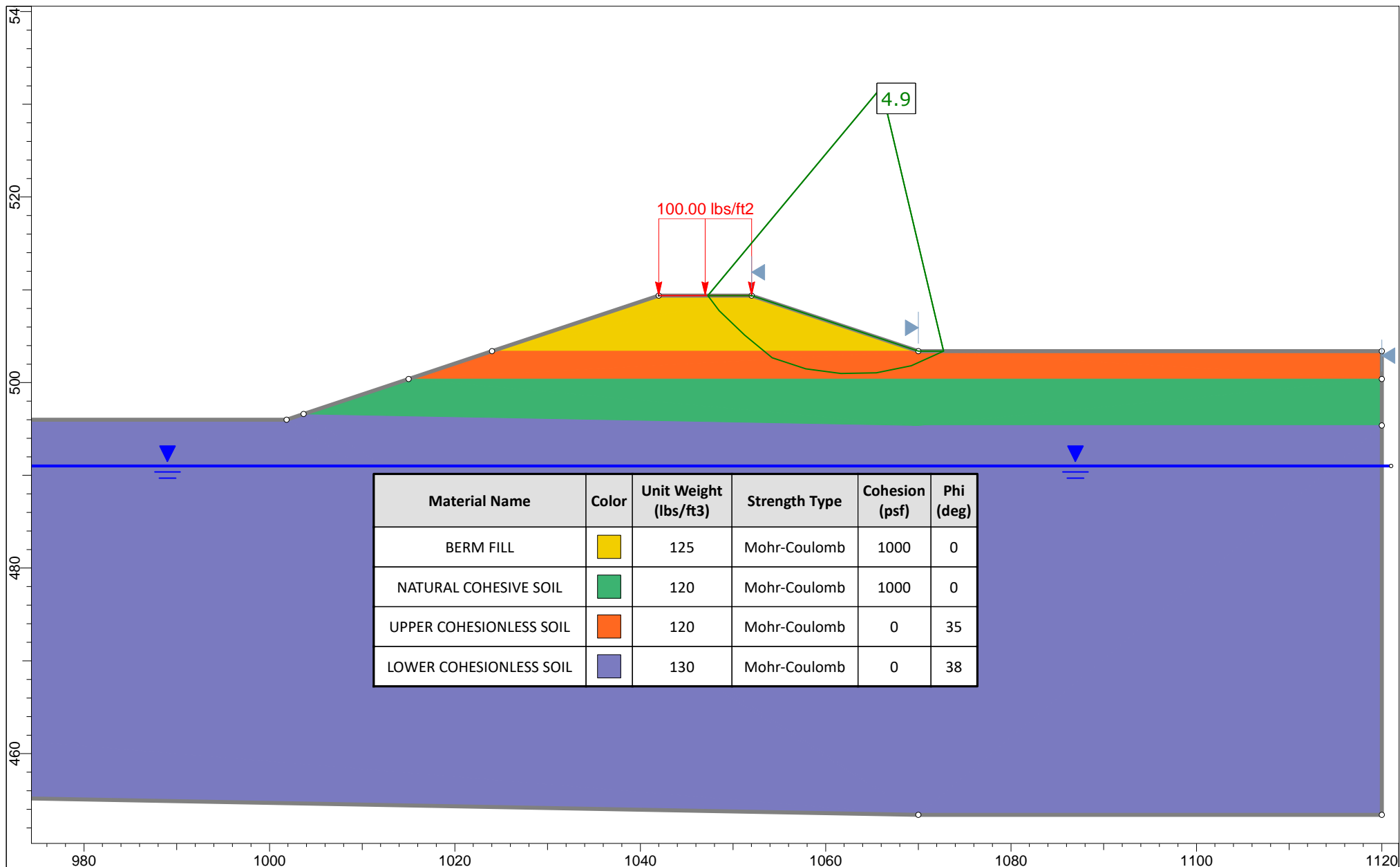


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION A-A
SIESMIC CONDITION

FIGURE A-5



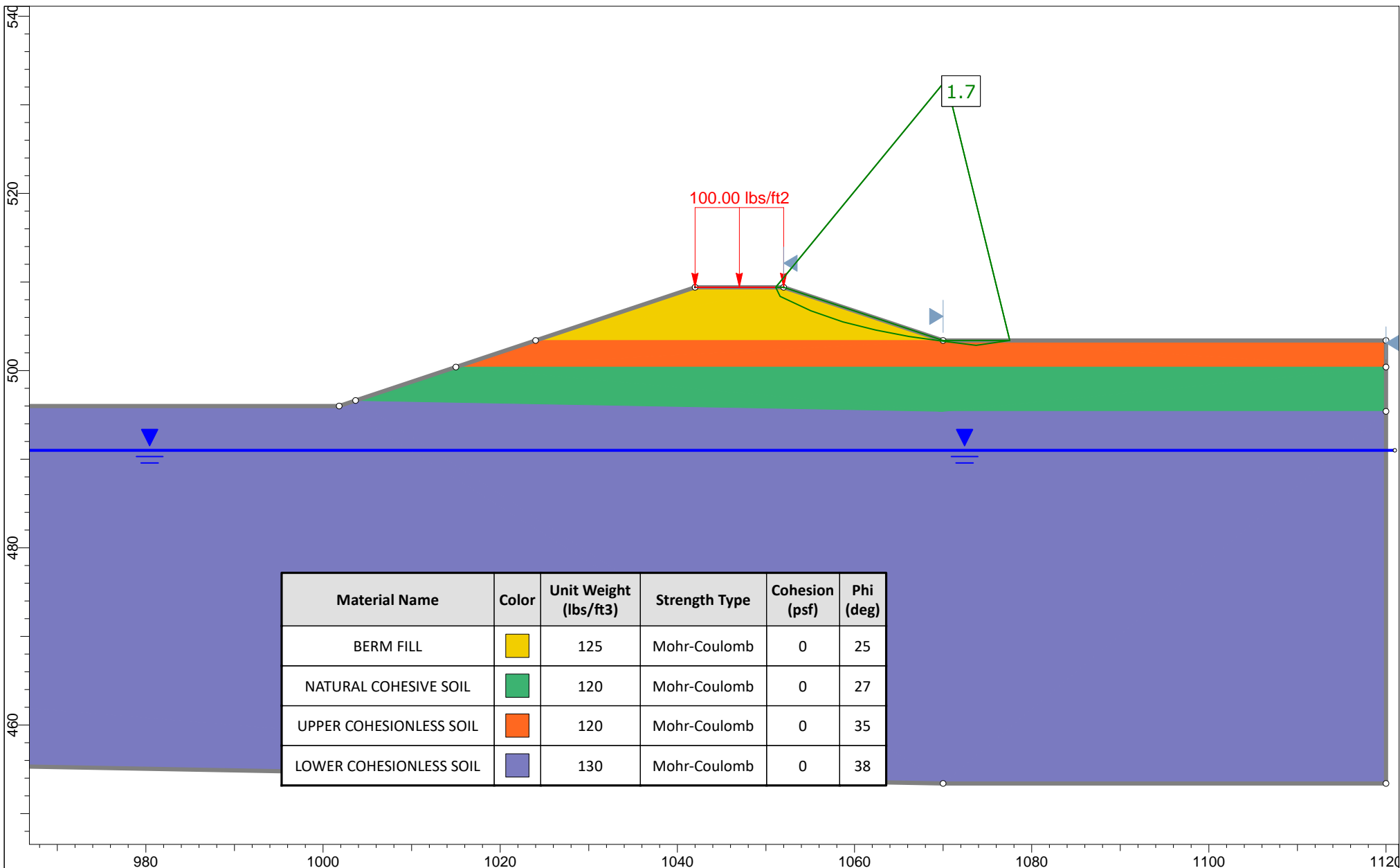


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION B-B' DRY SIDE
END OF CONSTRUCTION (SHORT TERM)

FIGURE B-1



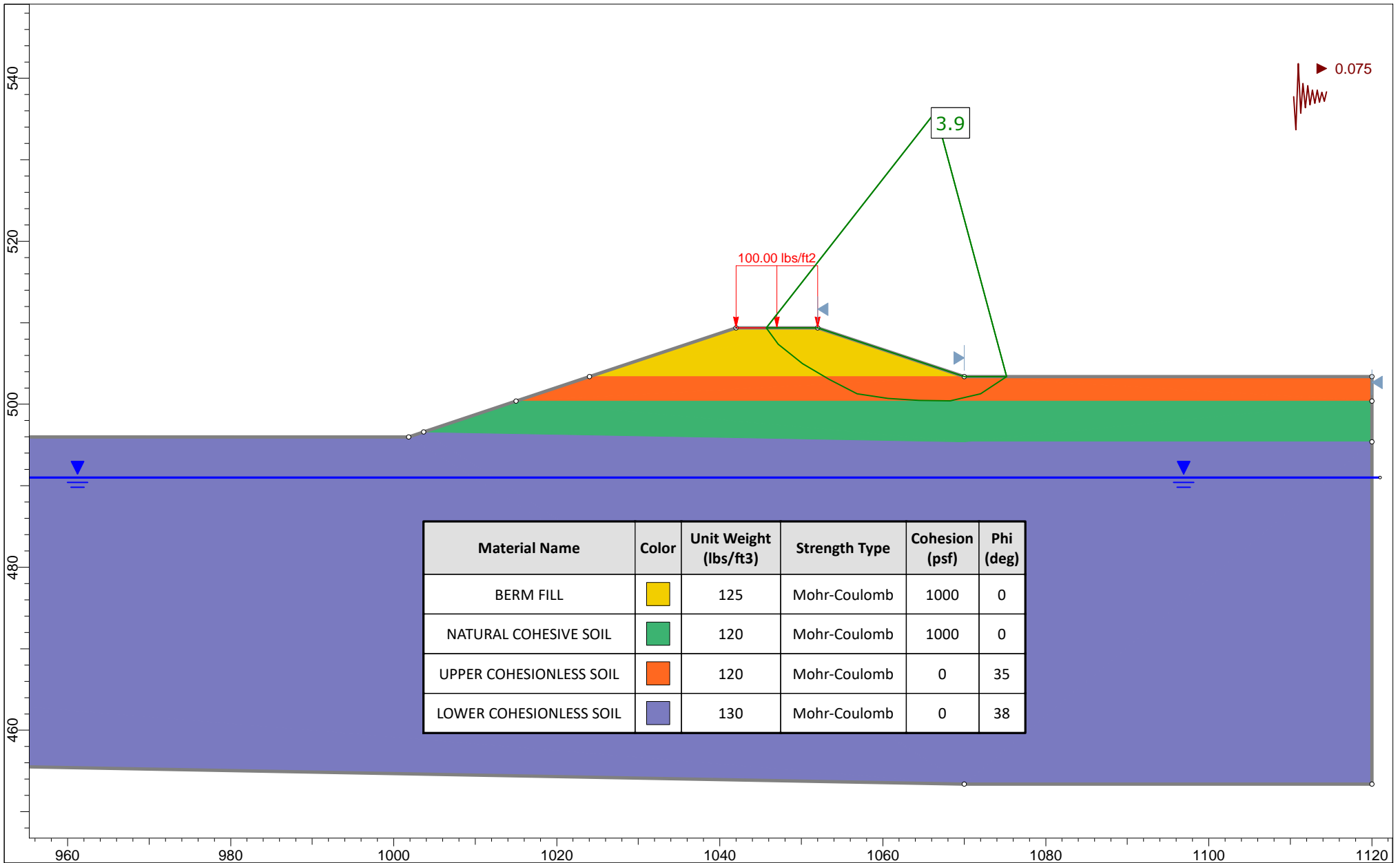


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION B-B' DRY SIDE
LONG TERM

FIGURE B-2



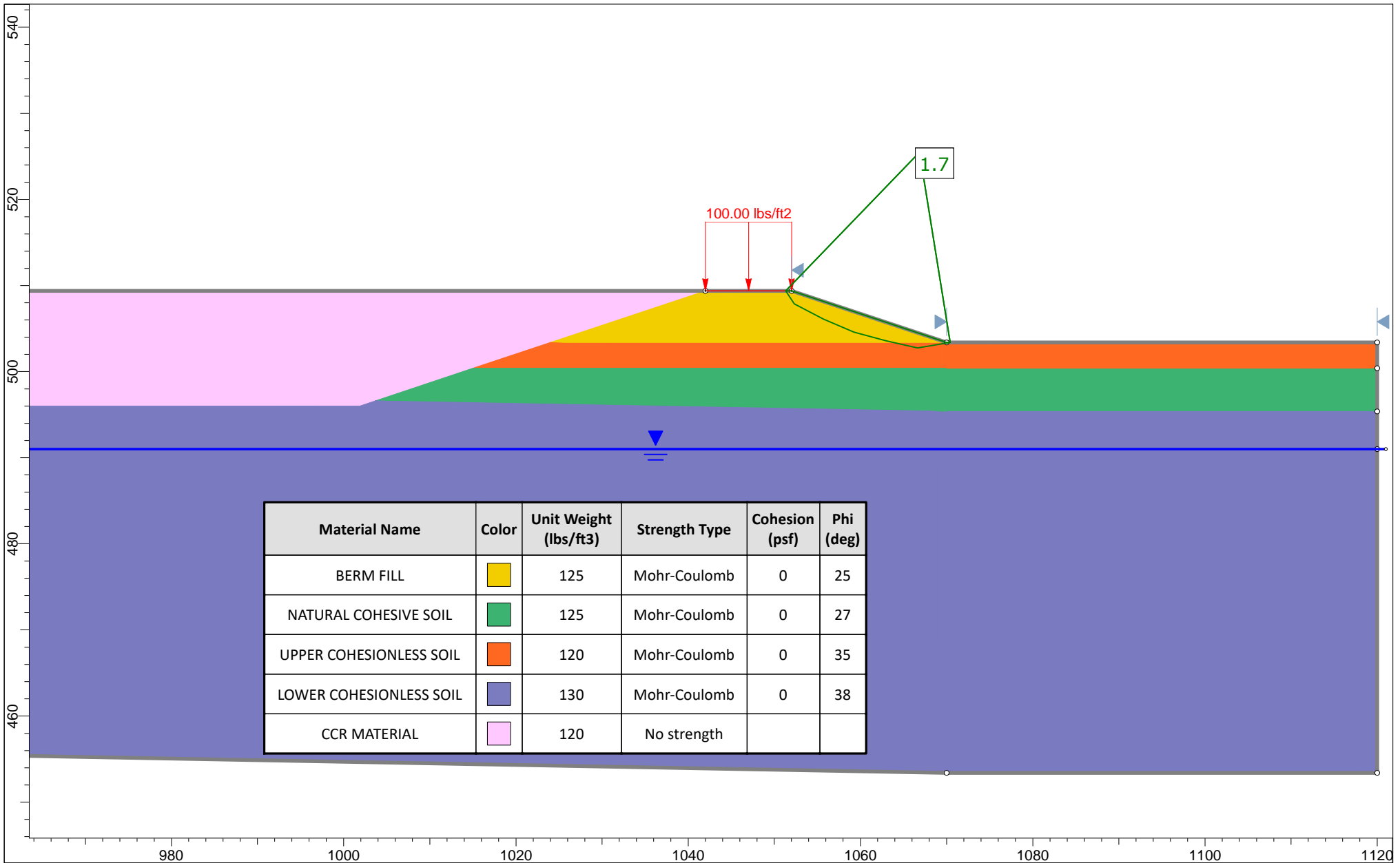


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION B-B' DRY SIDE
SEISMIC CONDITION

FIGURE B-3



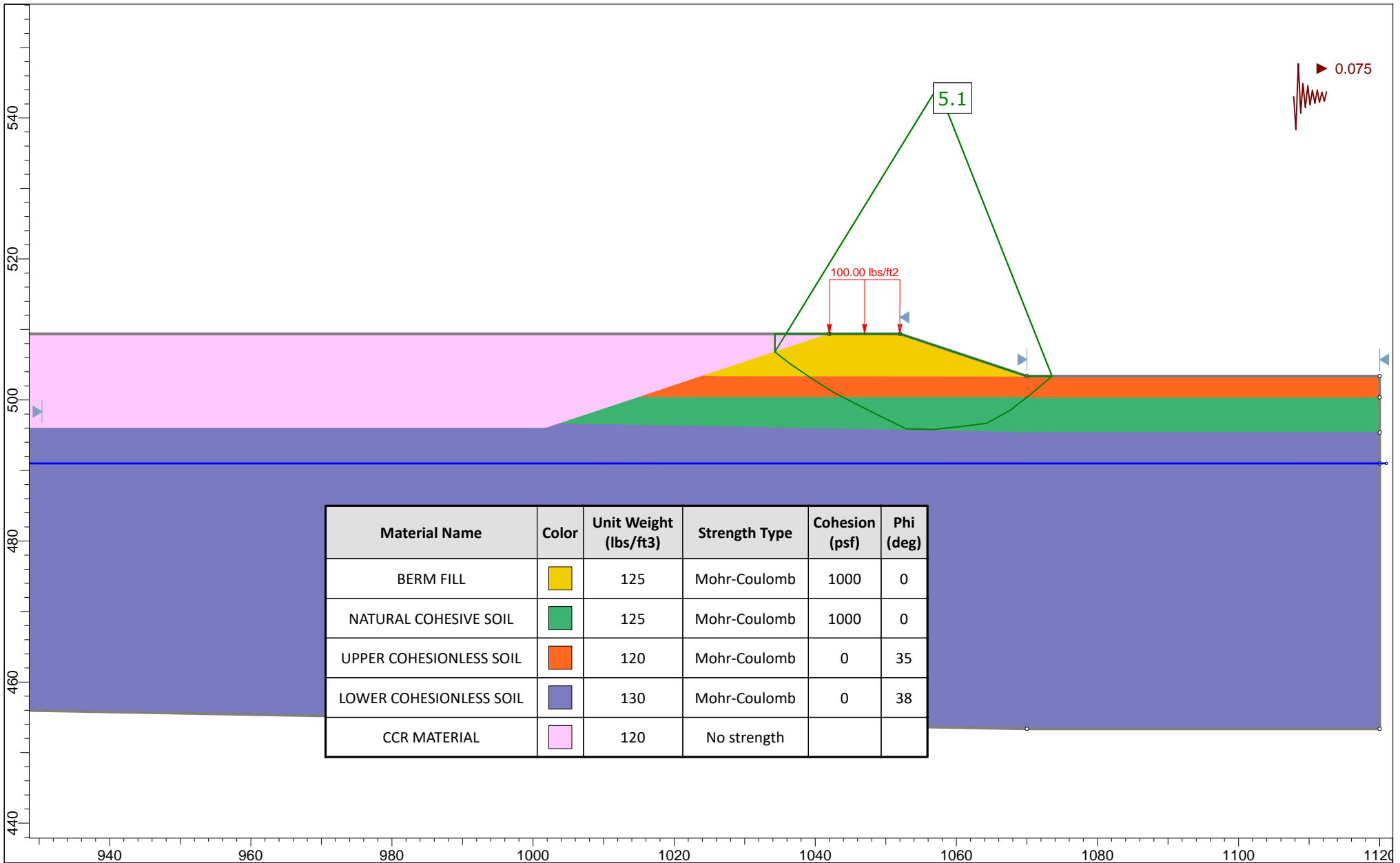


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

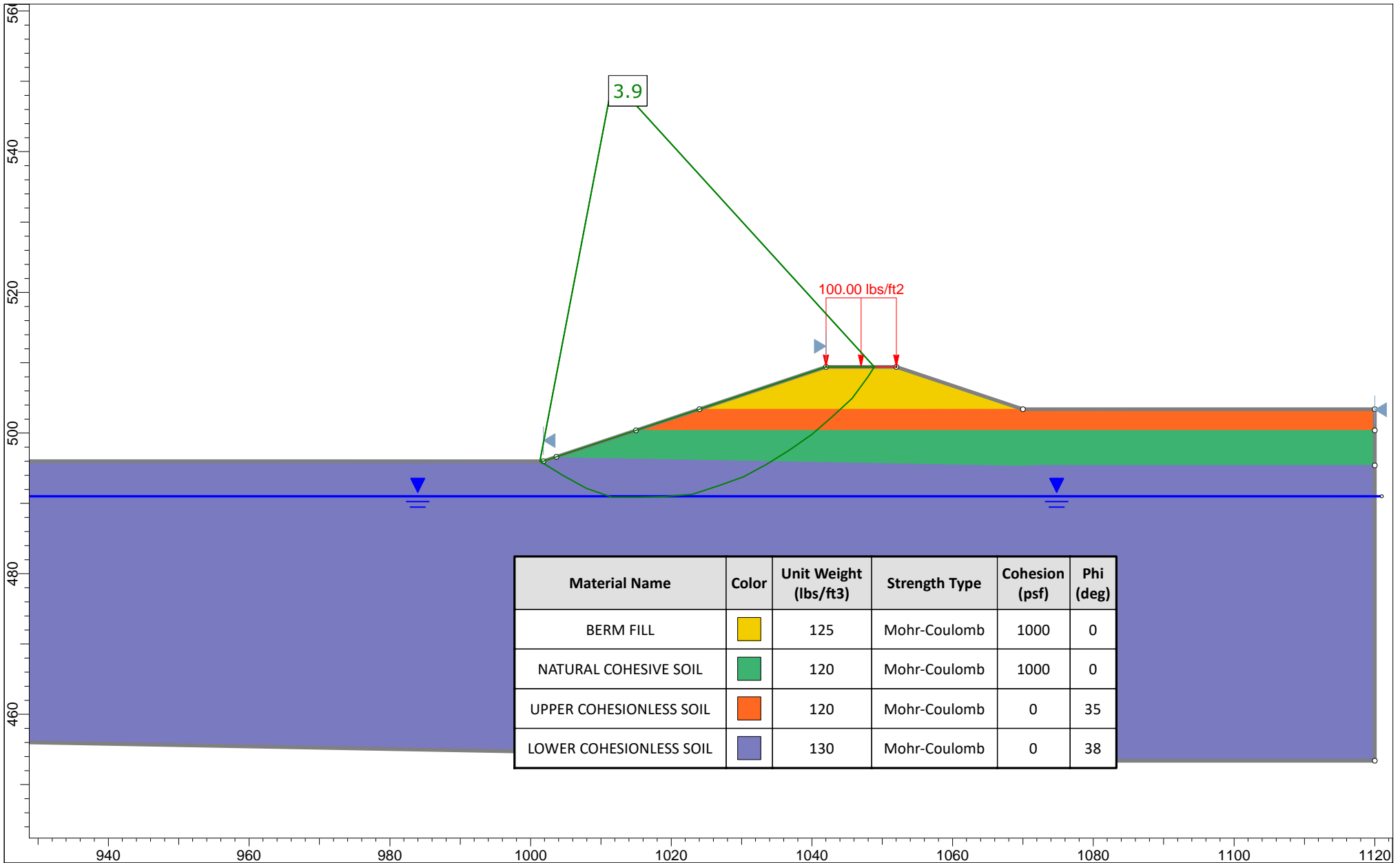
GLOBAL STABILITY ANALYSIS
SECTION B-B' DRY SIDE
LONG TERM

FIGURE B-4





ASA17-096-00 J.K. SPRUCE –CALAVERAS LAKE POWER PLANT PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS SAN ANTONIO, TEXAS	GLOBAL STABILITY ANALYSIS SECTION B-B' DRY SIDE SEISMIC CONDITION	FIGURE B-5

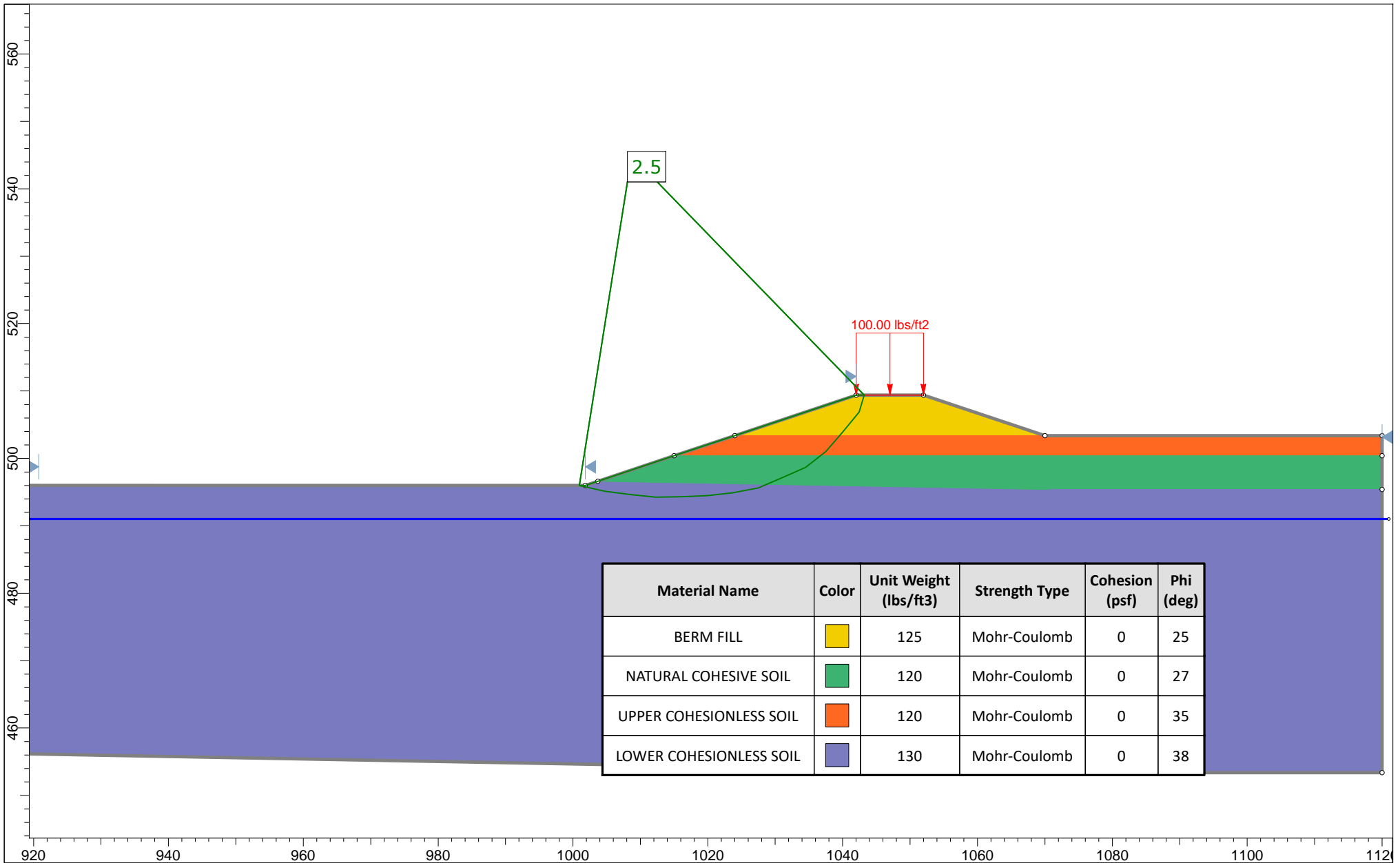


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION B-B' POND SIDE
END OF CONSTRUCTION (SHORT TERM)

FIGURE B-6



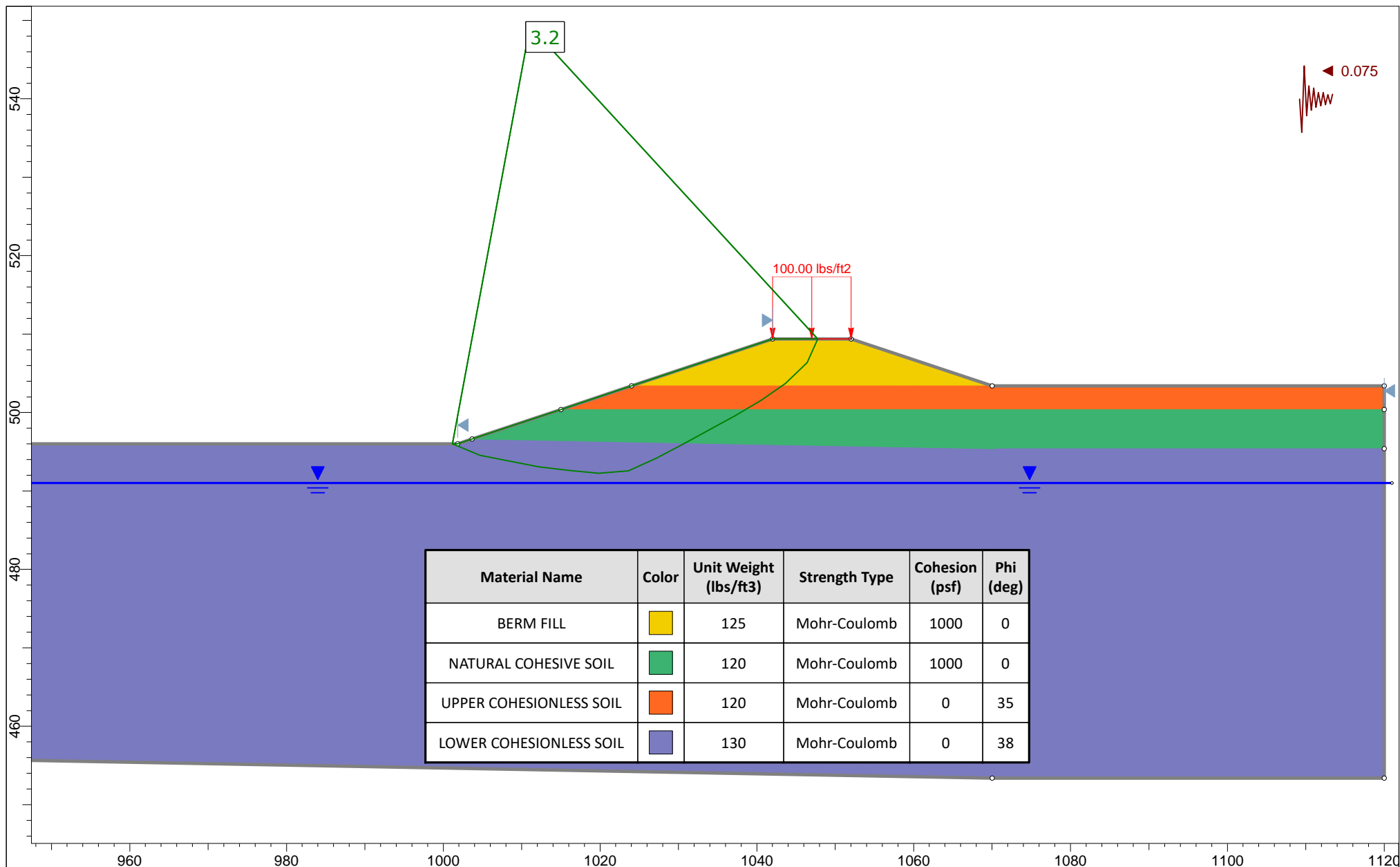


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION B-B' POND SIDE
LONG TERM

FIGURE B-7



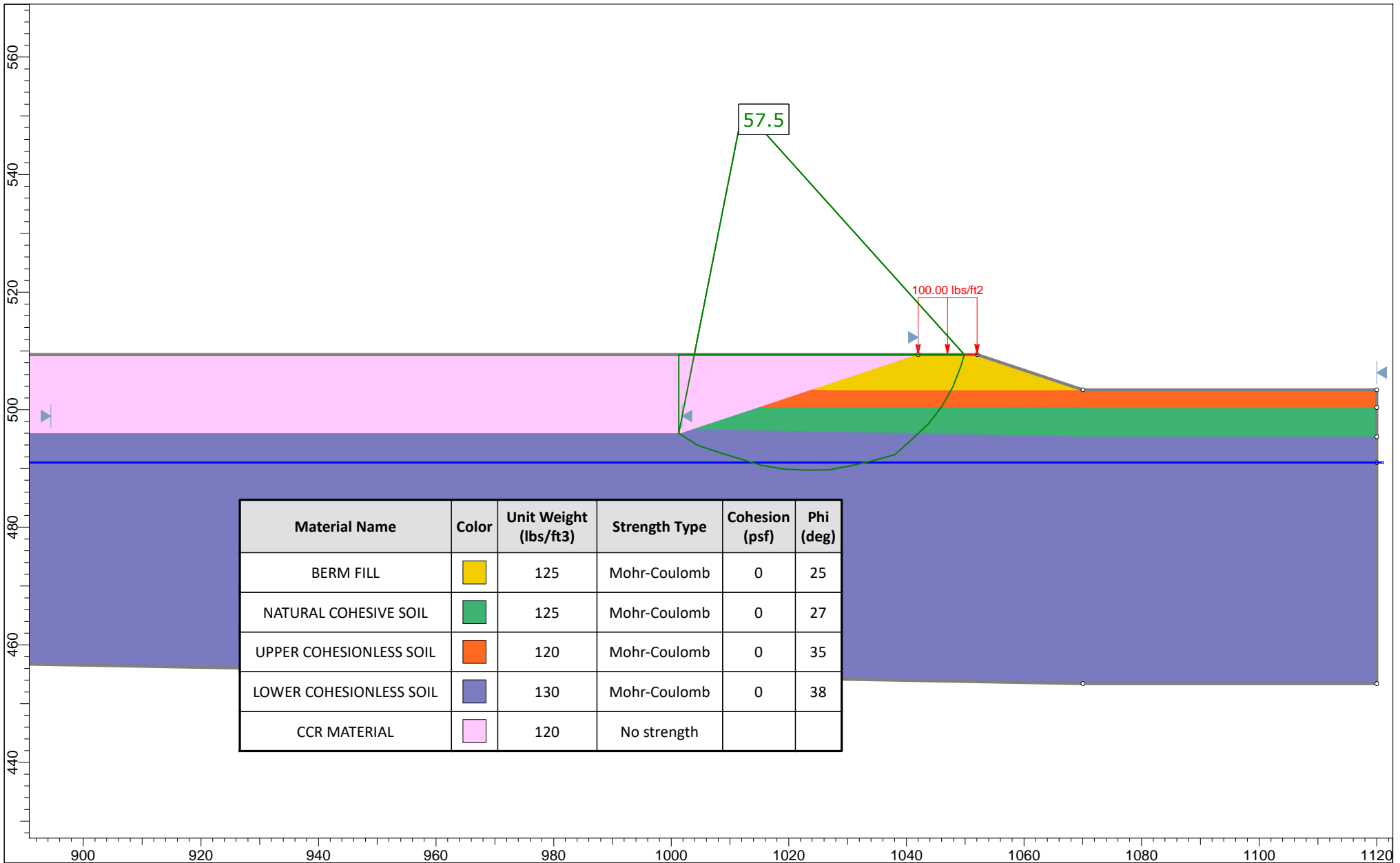


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION B-B' POND SIDE
SEISMIC CONDITION

FIGURE B-8



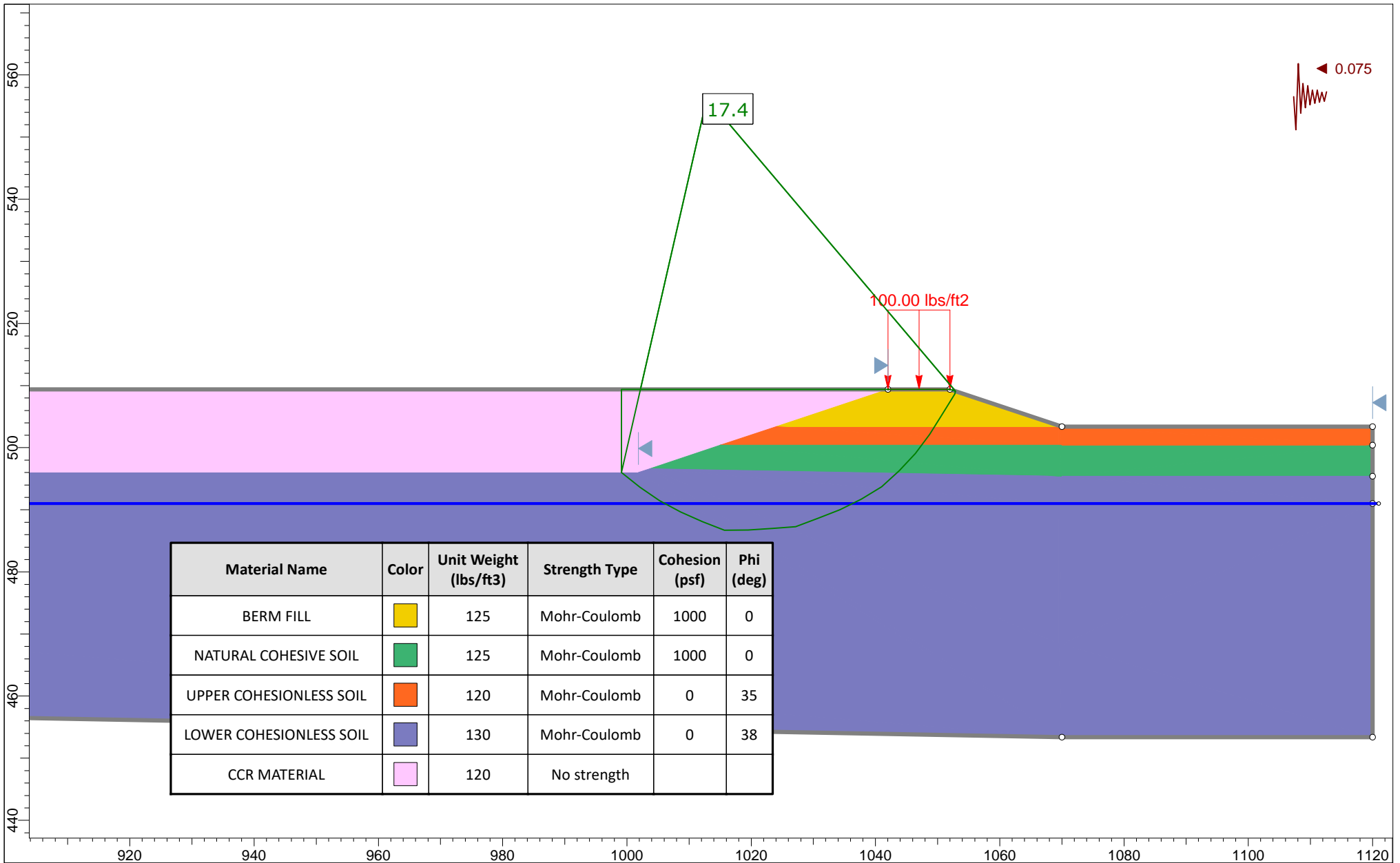


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION B-B' POND SIDE
LONG TERM

FIGURE B-9



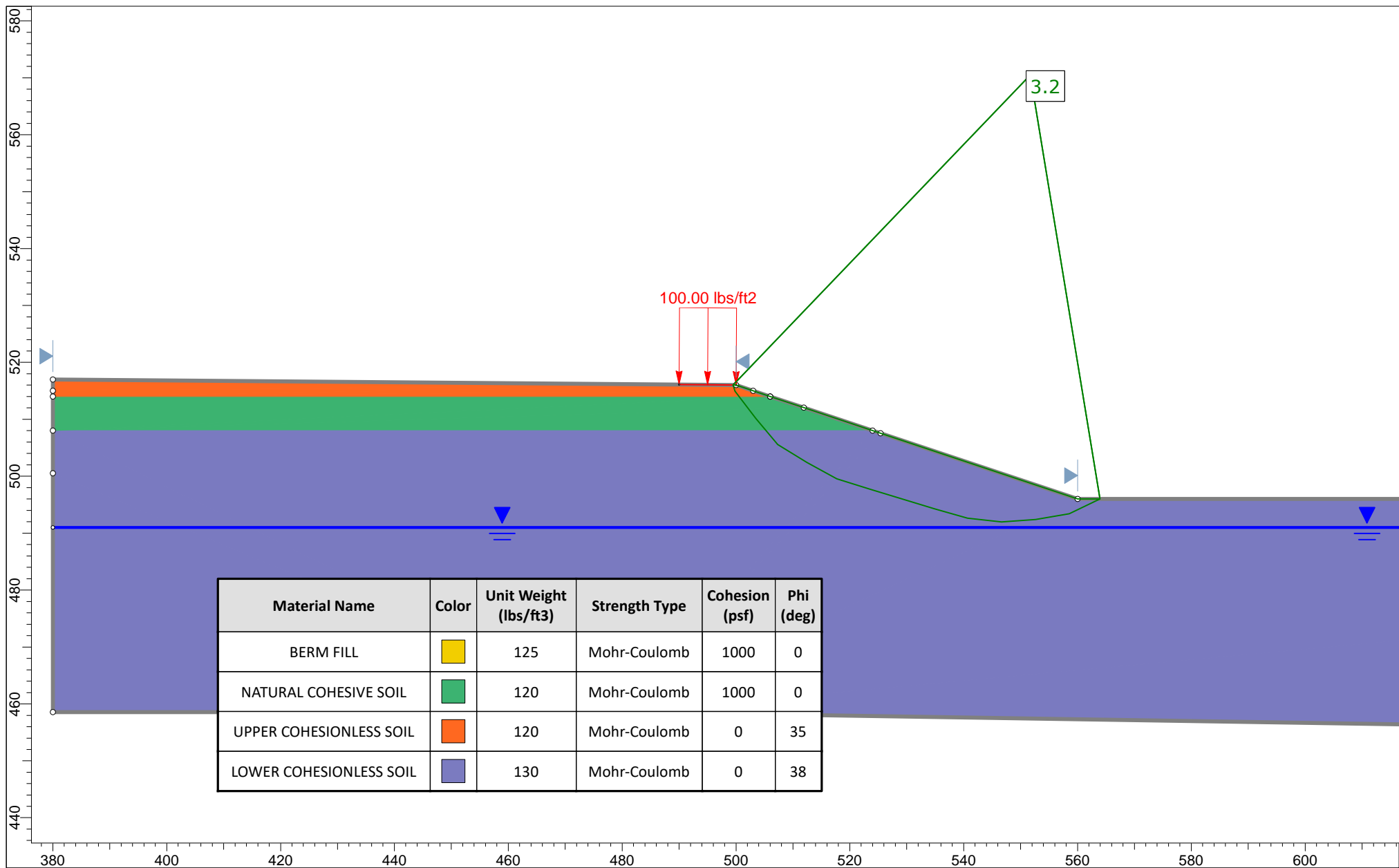


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION B-B' POND SIDE
SEISMIC CONDITION

FIGURE B-10



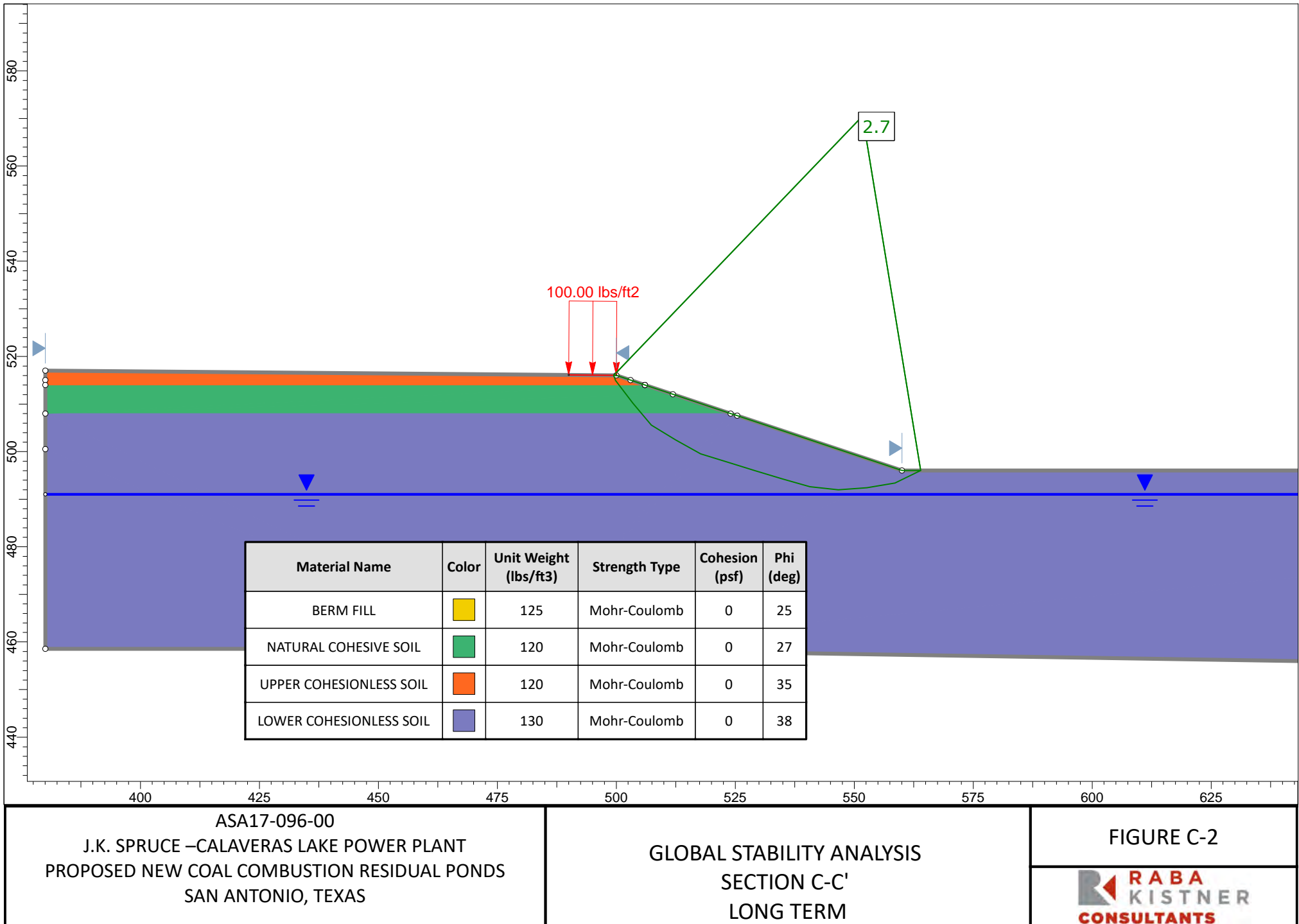


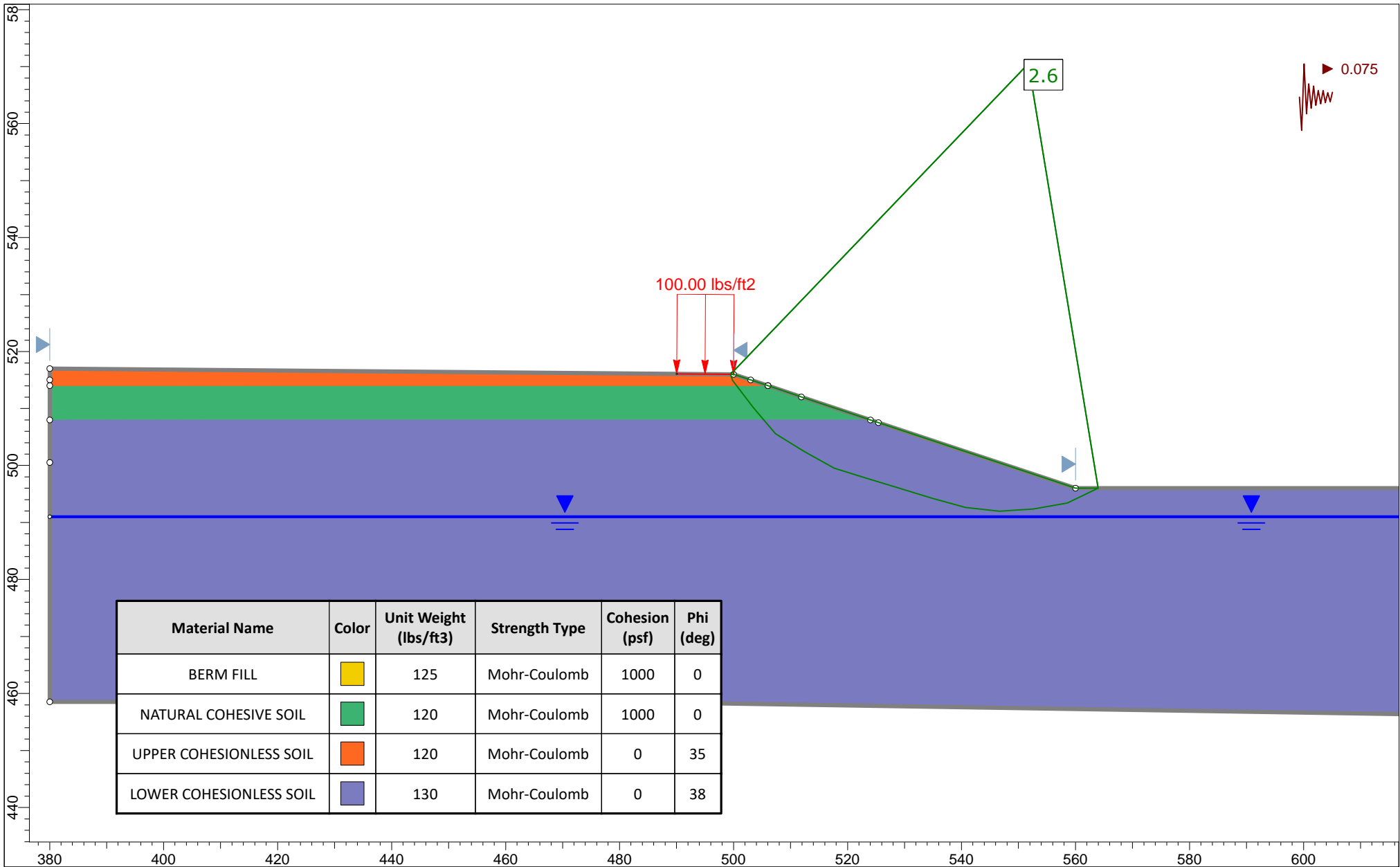
ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION C-C'
END OF CONSTRUCTION (SHORT TERM)

FIGURE C-1





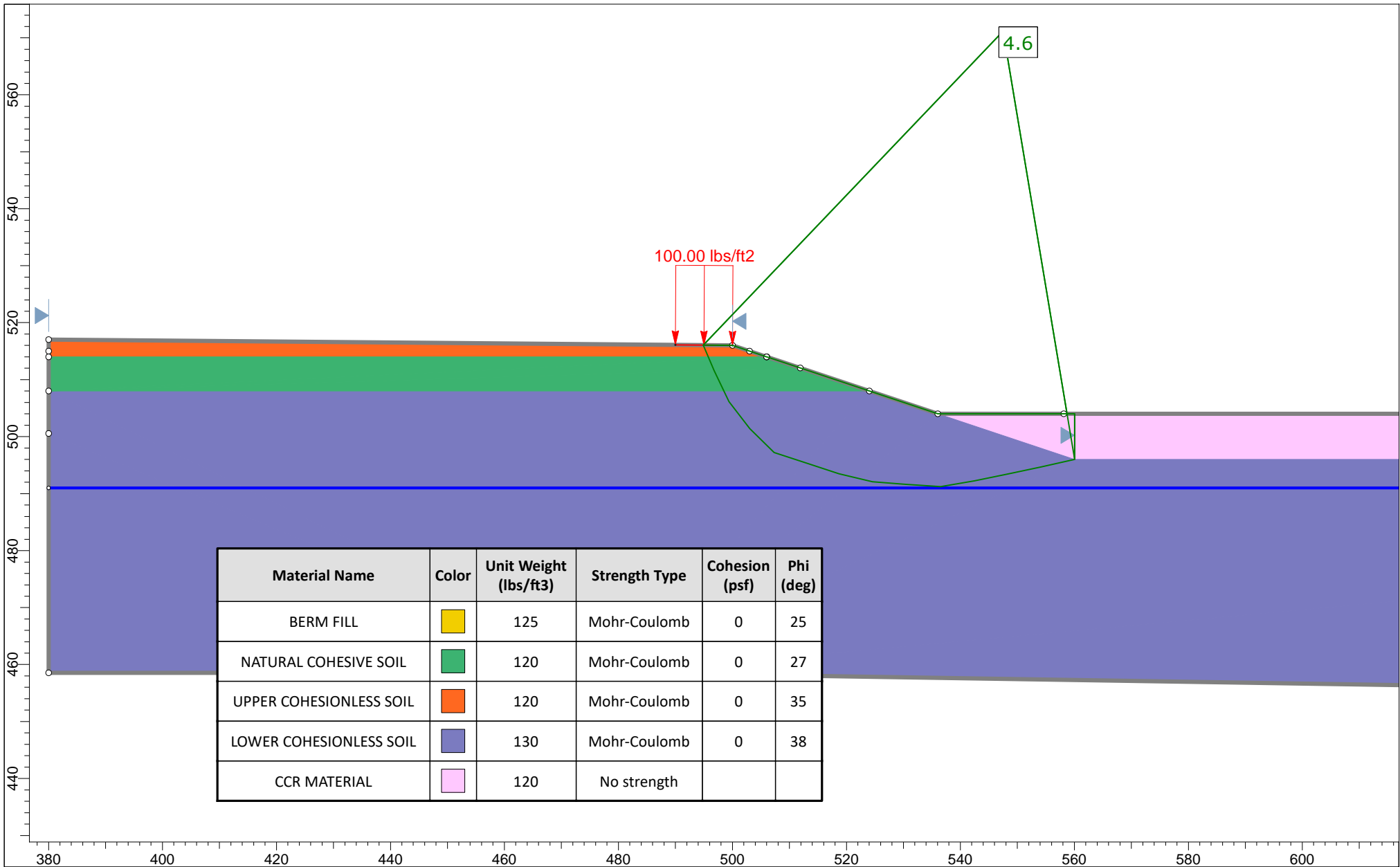


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION C-C'
SEISMIC CONDITION

FIGURE C-3



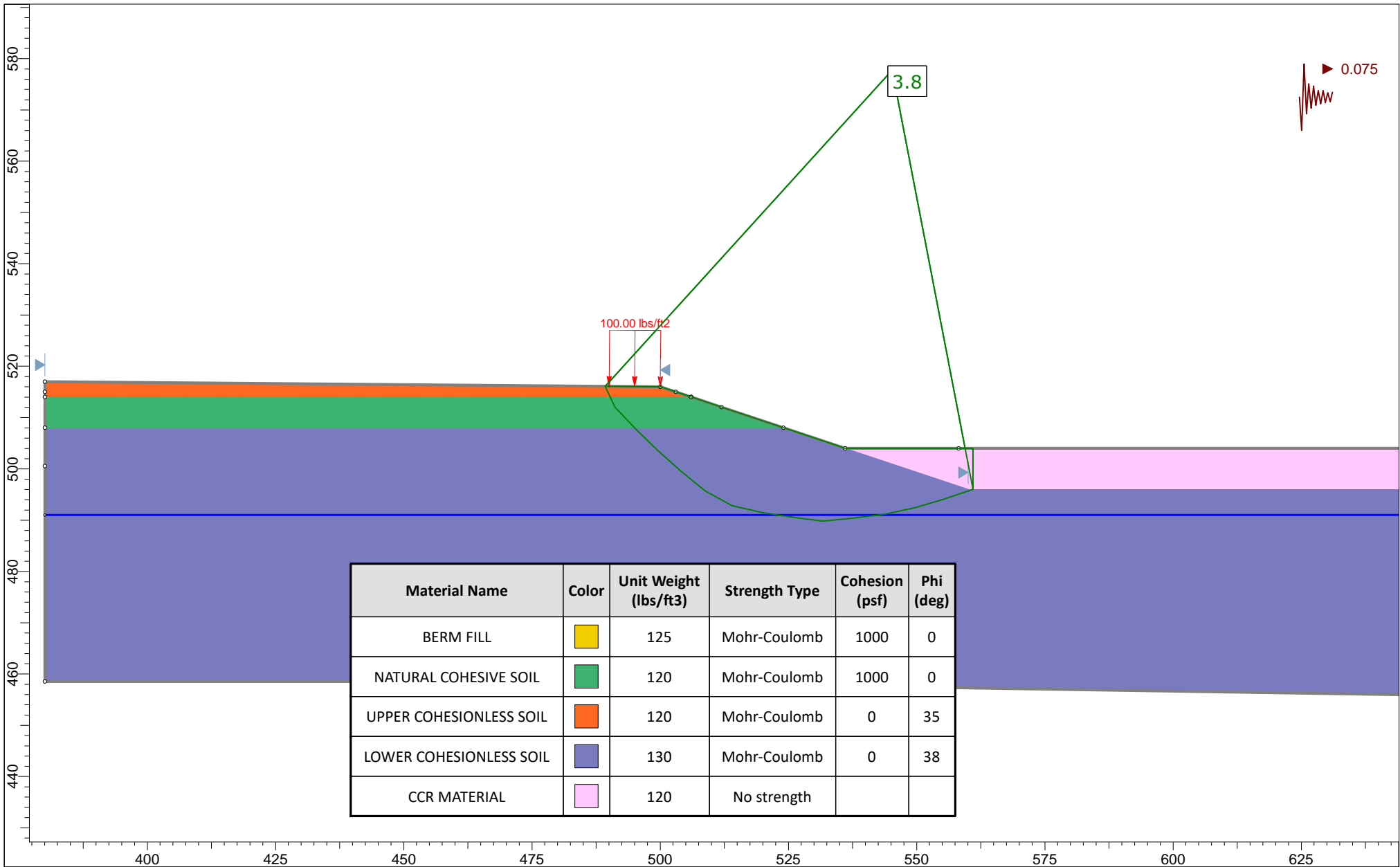


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

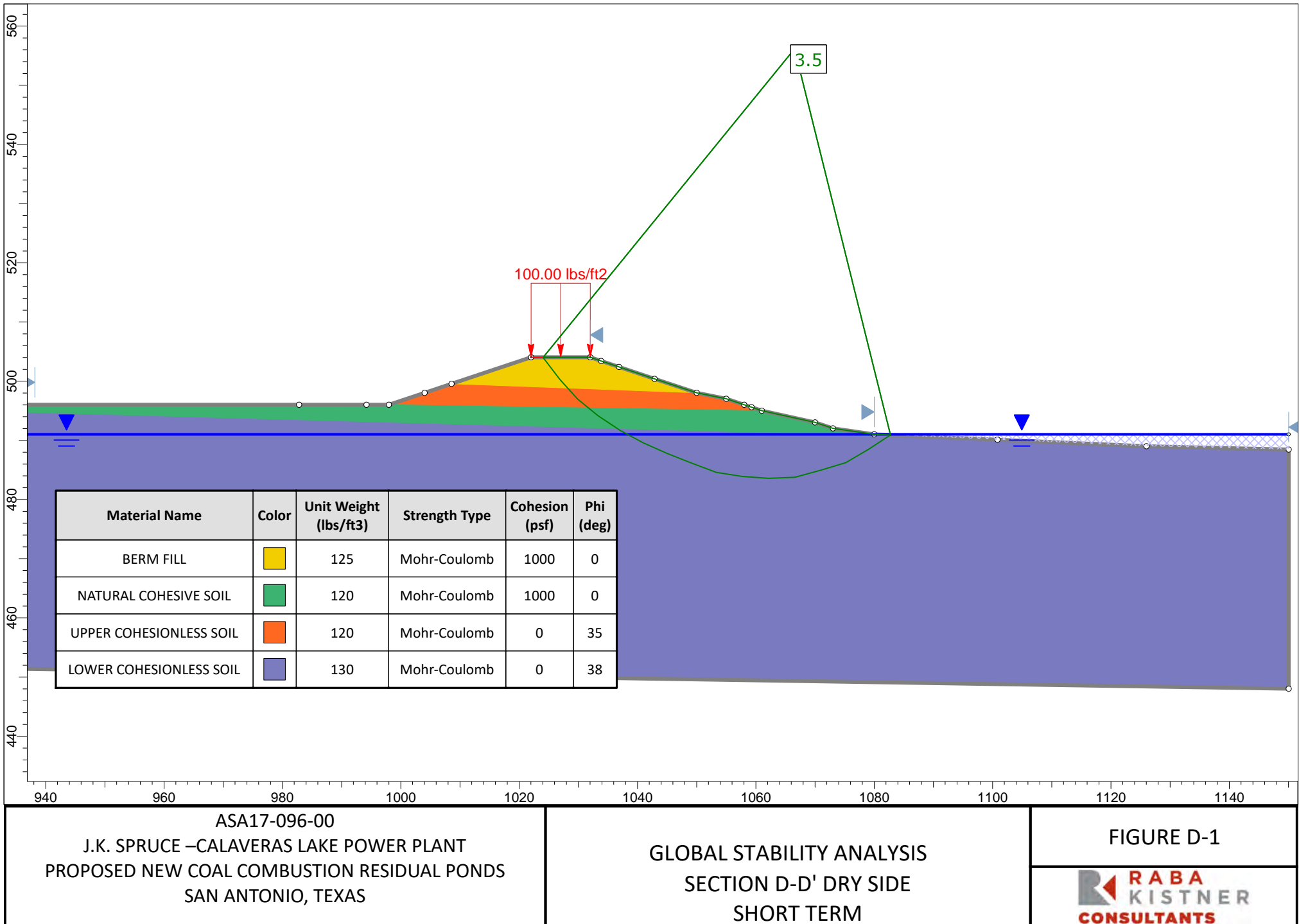
GLOBAL STABILITY ANALYSIS
SECTION C-C'
LONG TERM

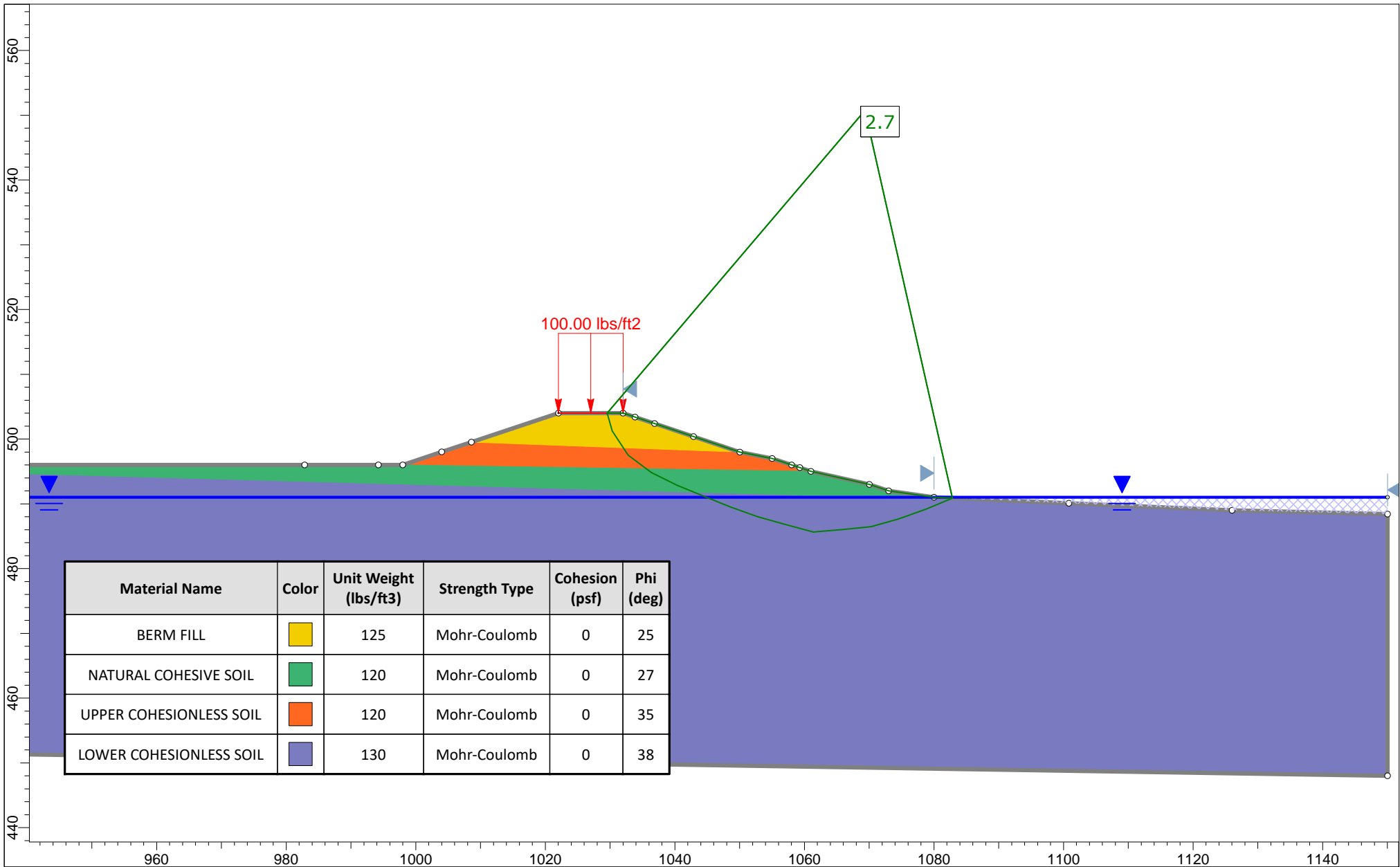
FIGURE C-4





ASA17-096-00 J.K. SPRUCE –CALAVERAS LAKE POWER PLANT PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS SAN ANTONIO, TEXAS	GLOBAL STABILITY ANALYSIS SECTION C-C' SEISMIC CONDITION	FIGURE C-5



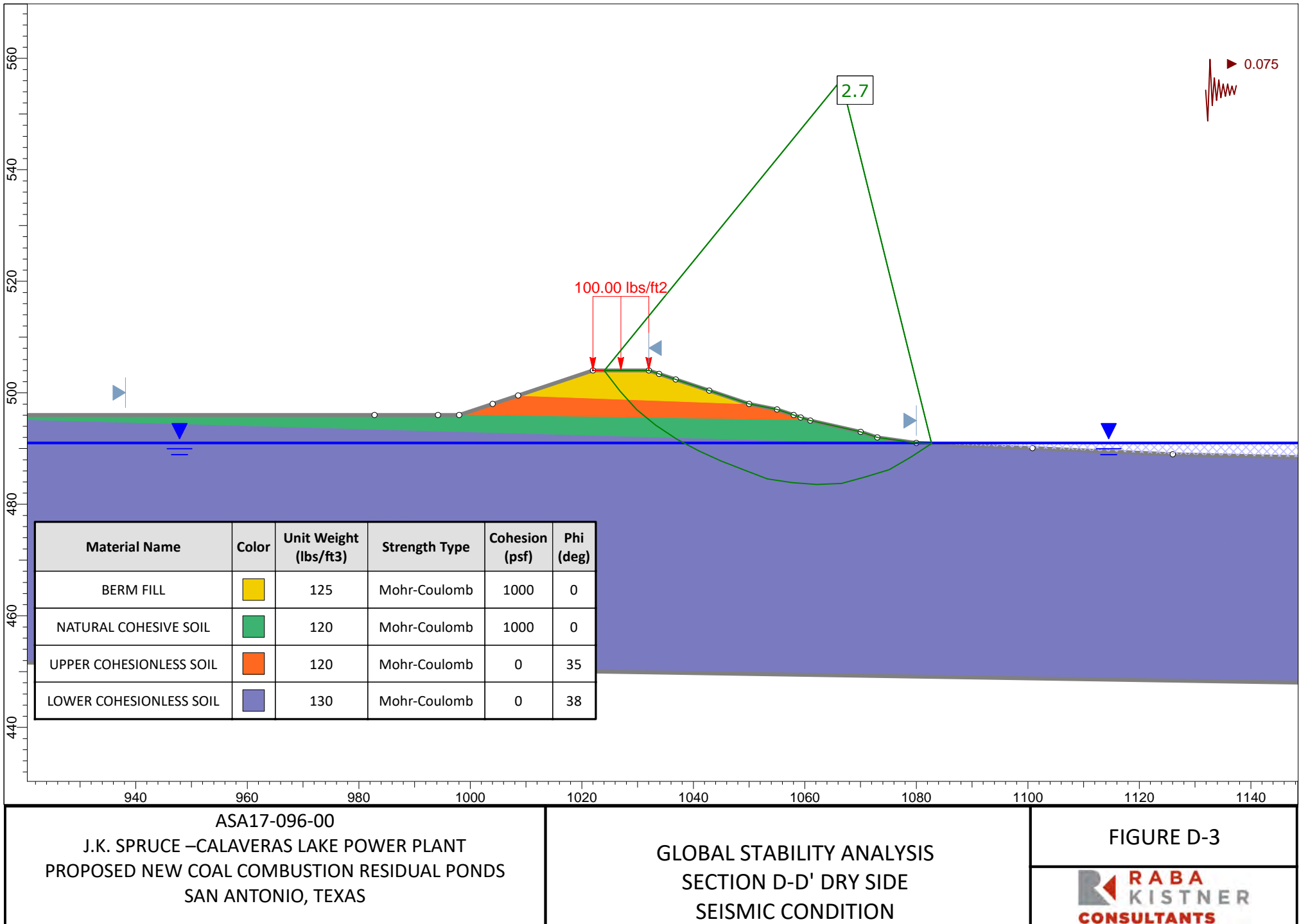


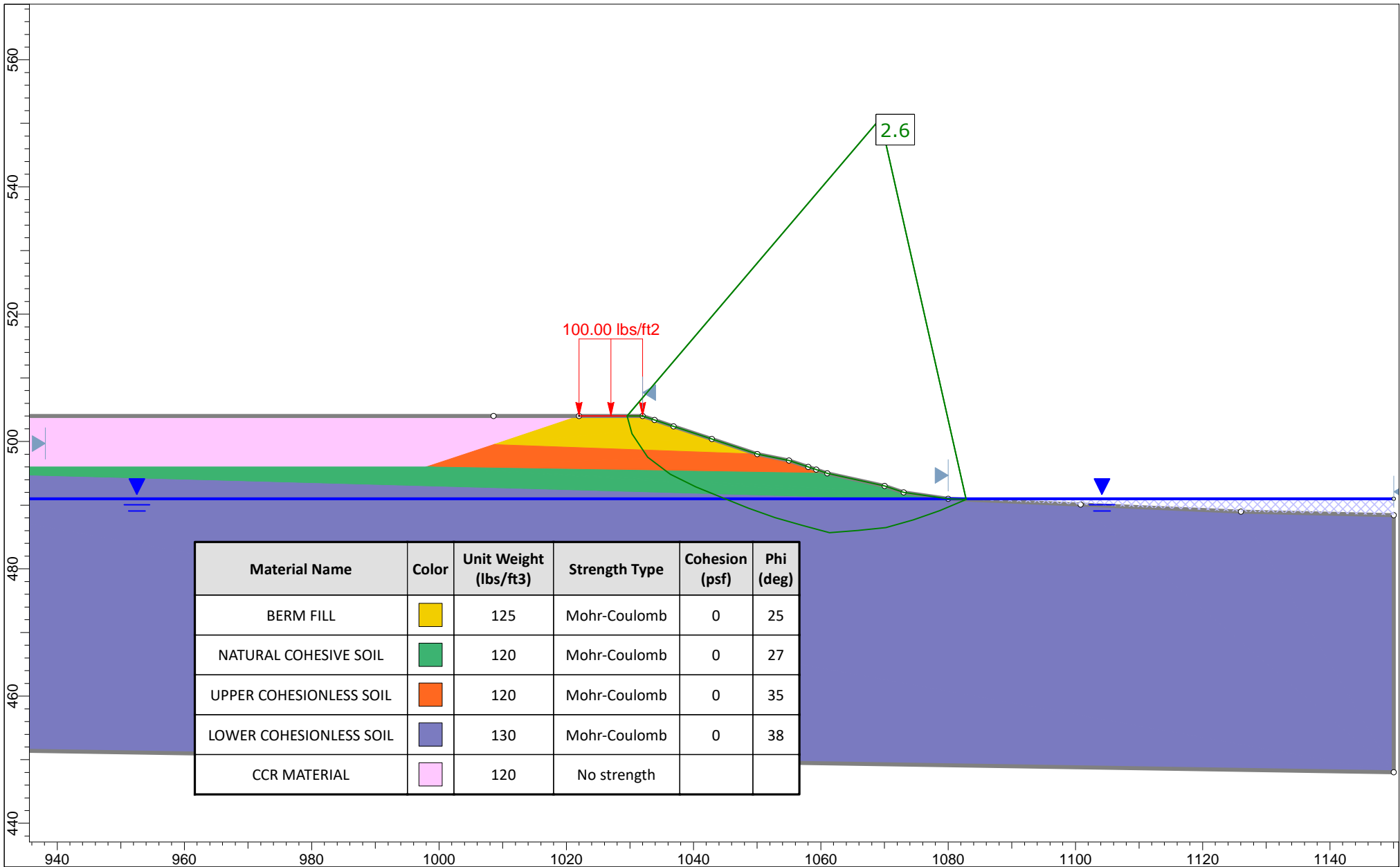
ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
SECTION D-D' DRY SIDE
LONG TERM

FIGURE D-2





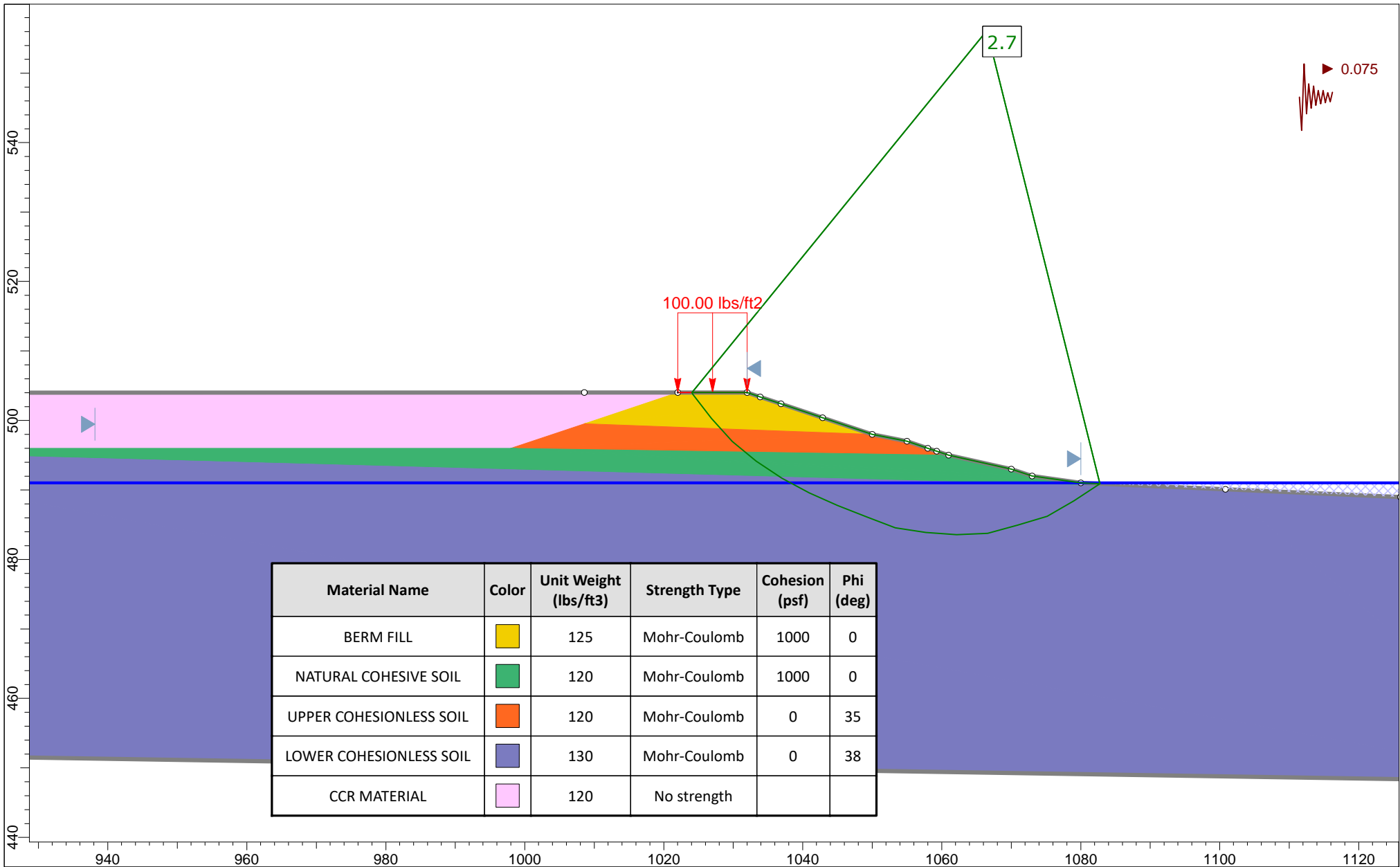


ASA17-096-00
J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
SAN ANTONIO, TEXAS

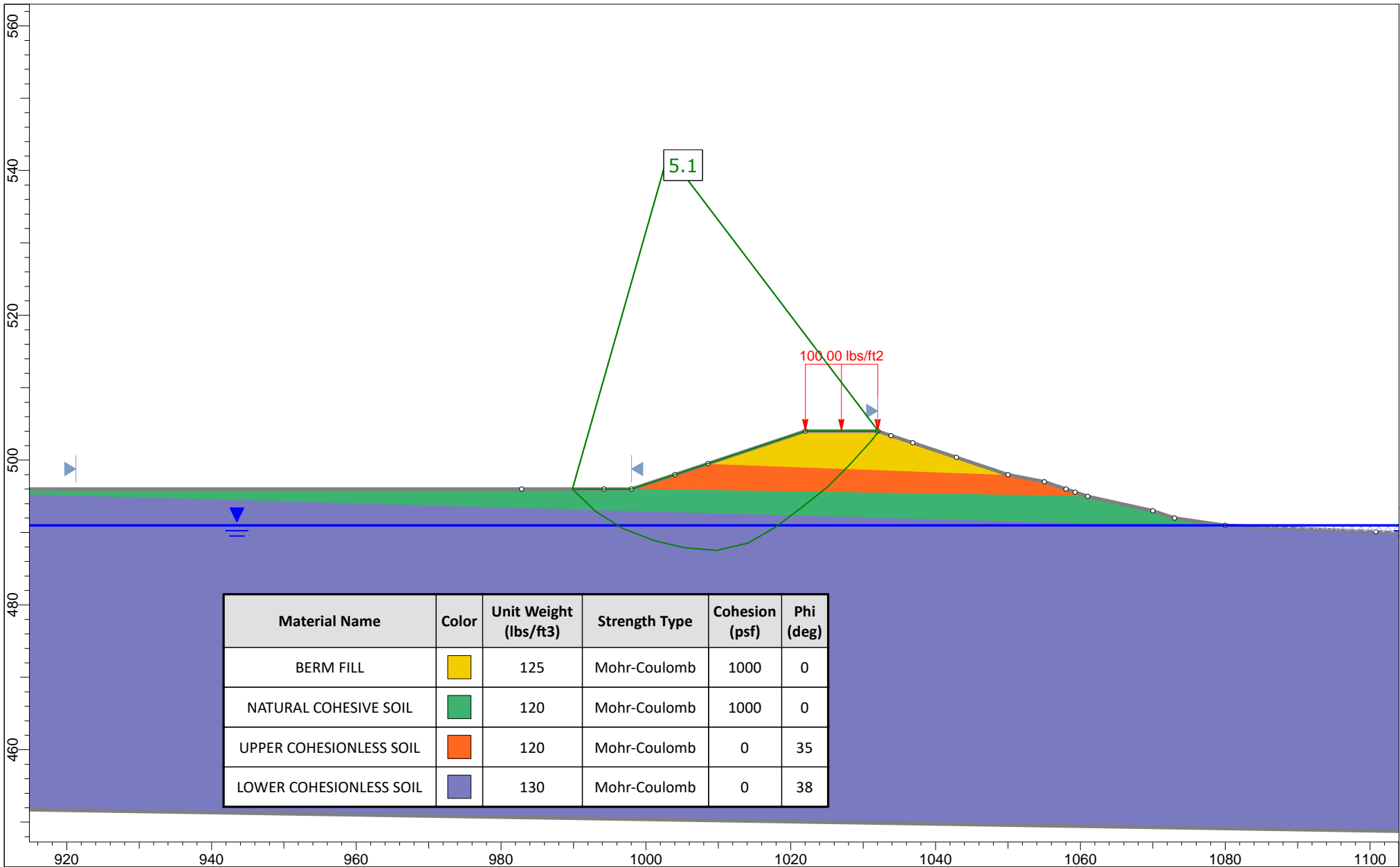
GLOBAL STABILITY ANALYSIS
SECTION D-D' DRY SIDE
LONG TERM

FIGURE D-4





<p>ASA17-096-00</p> <p>J.K. SPRUCE –CALAVERAS LAKE POWER PLANT</p> <p>PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS</p> <p>SAN ANTONIO, TEXAS</p>	<p>GLOBAL STABILITY ANALYSIS</p> <p>SECTION D-D' DRY SIDE</p> <p>SEISMIC CONDITION</p>	<p>FIGURE D-5</p> <p>RABA KISTNER CONSULTANTS</p>
---	--	--

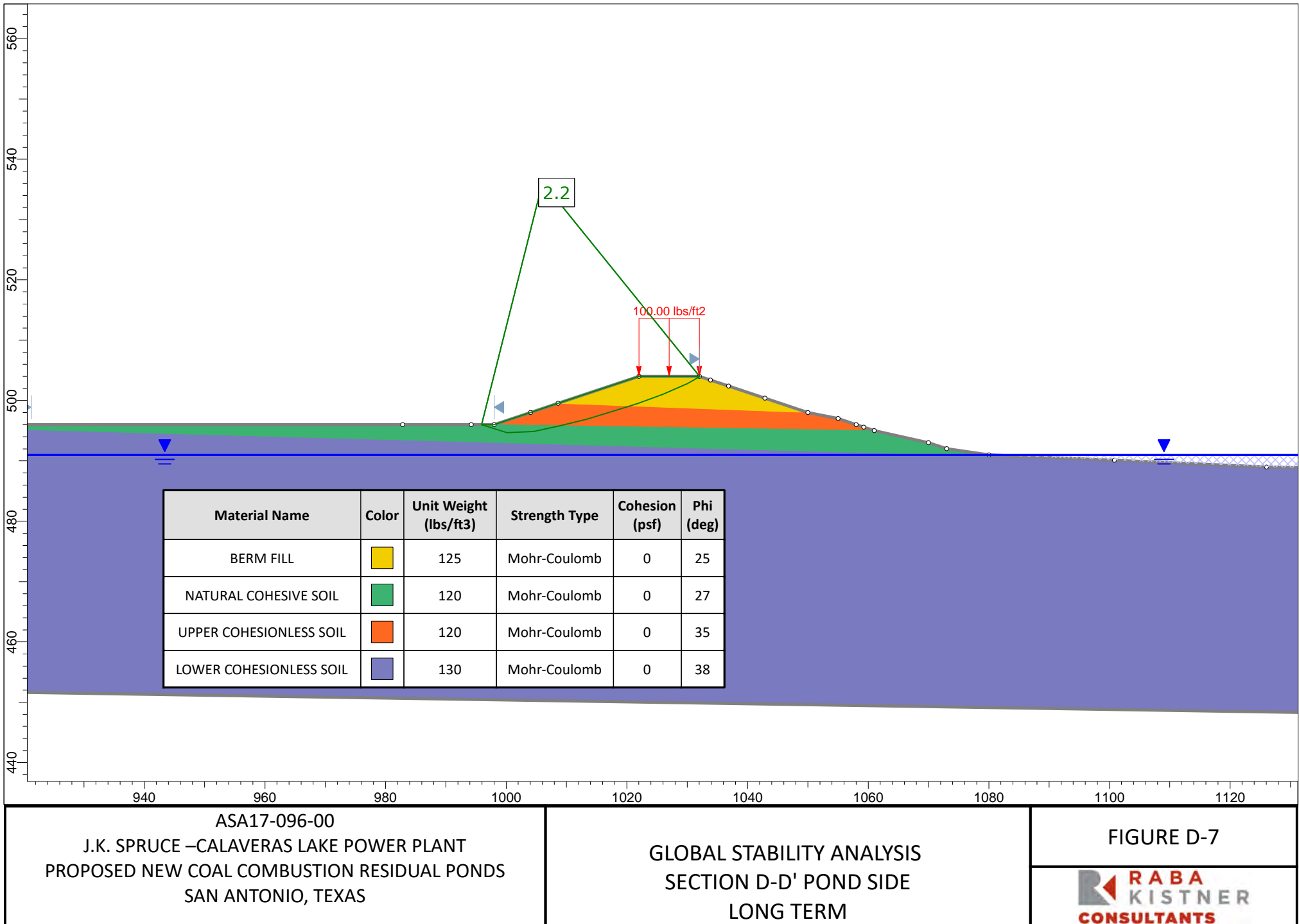


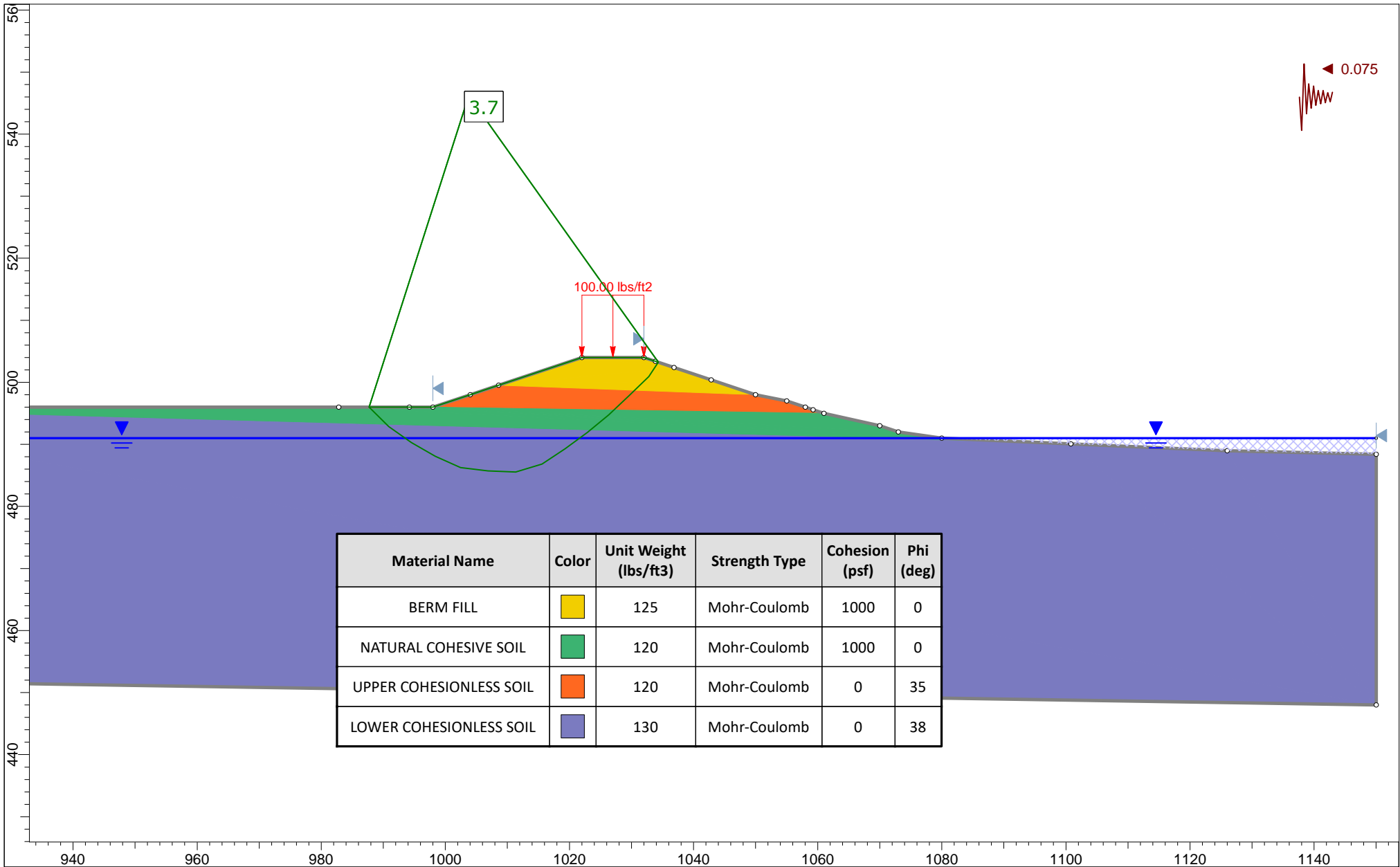
ASA17-096-00
 J.K. SPRUCE –CALAVERAS LAKE POWER PLANT
 PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS
 SAN ANTONIO, TEXAS

GLOBAL STABILITY ANALYSIS
 SECTION D-D' POND SIDE
 END OF CONSTRUCTION (SHORT TERM)

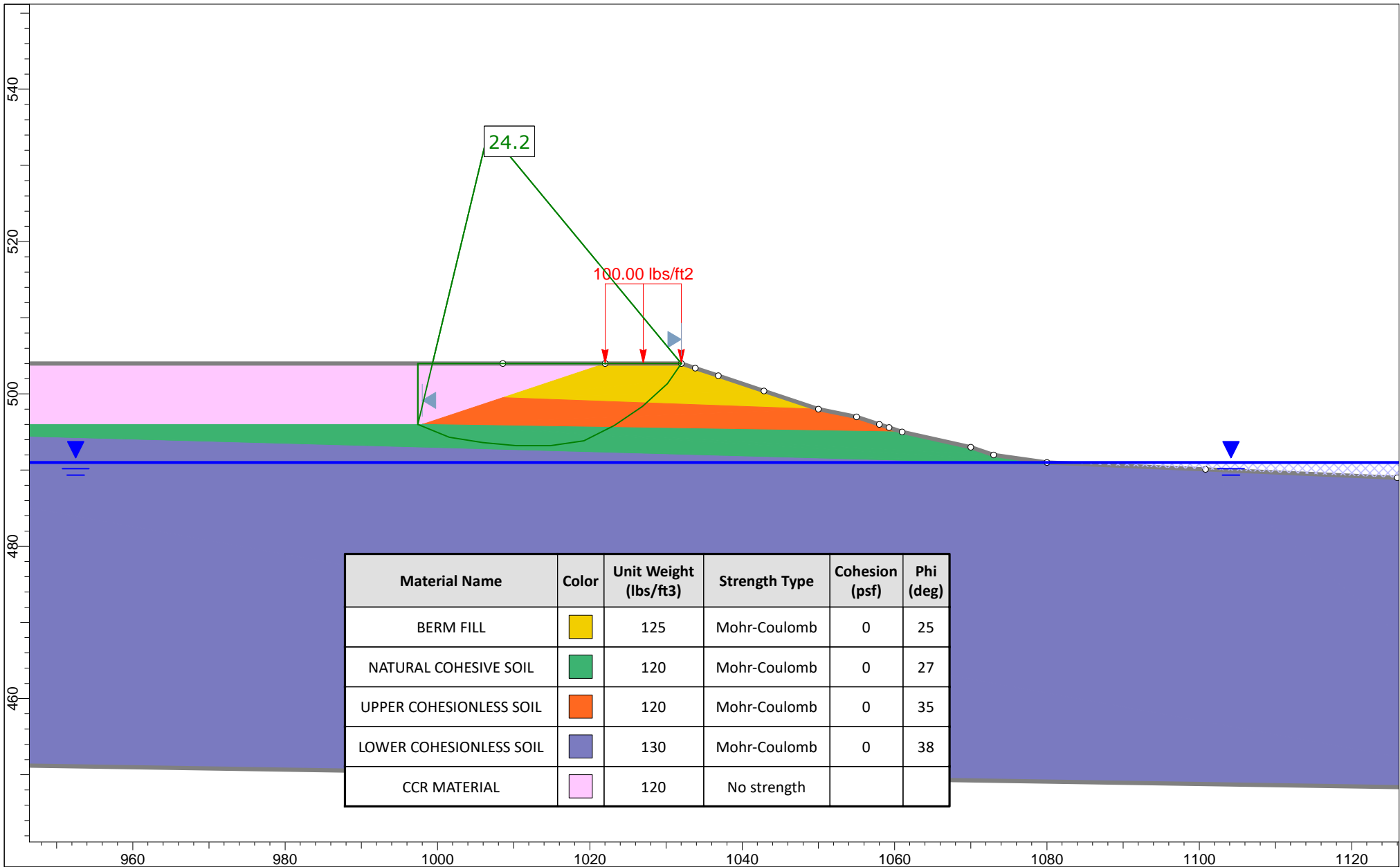
FIGURE D-6



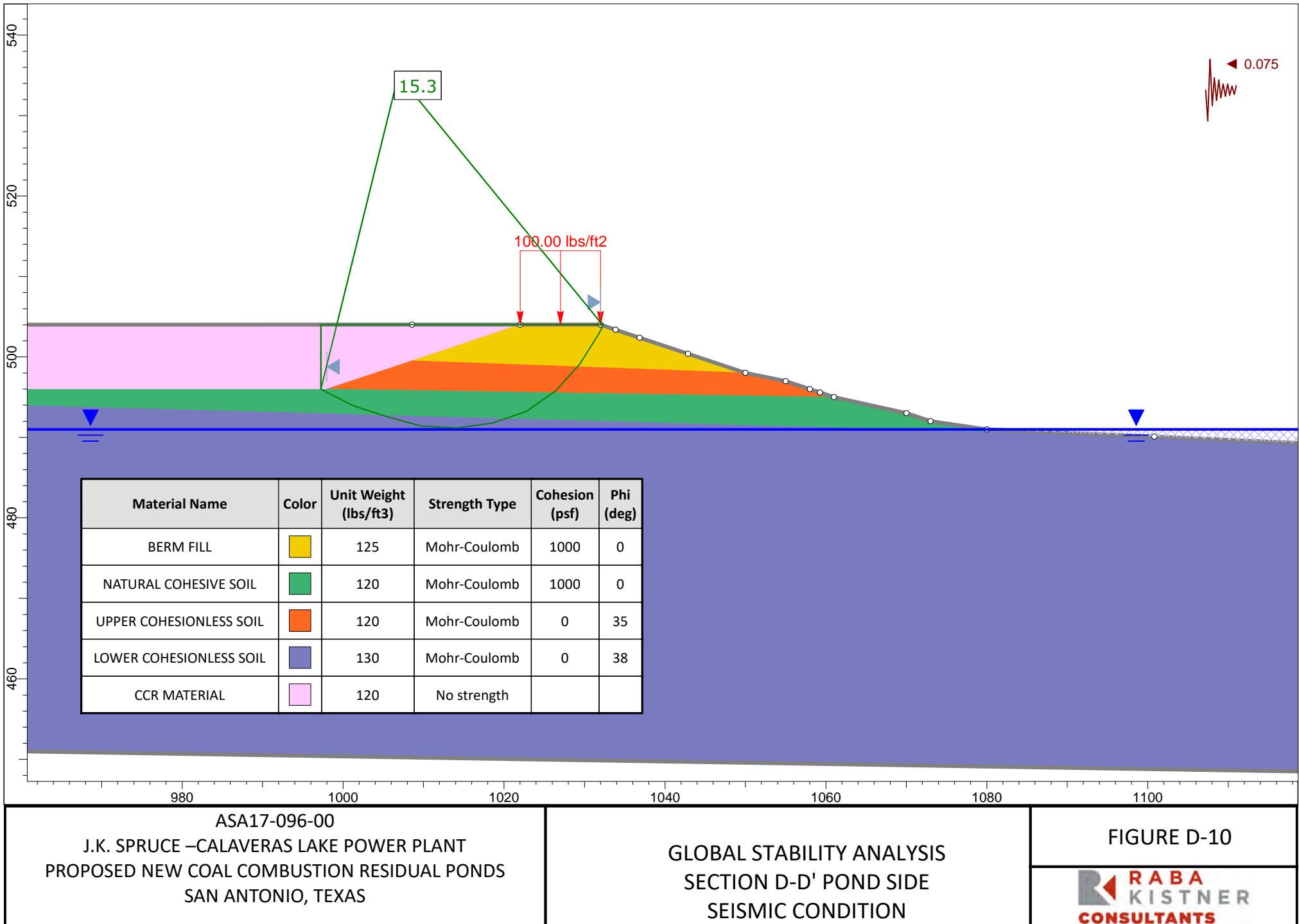




<p>ASA17-096-00</p> <p>J.K. SPRUCE –CALAVERAS LAKE POWER PLANT</p> <p>PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS</p> <p>SAN ANTONIO, TEXAS</p>	<p>GLOBAL STABILITY ANALYSIS</p> <p>SECTION D-D' POND SIDE</p> <p>SEISMIC CONDITION</p>	<p>FIGURE D-8</p>
		



ASA17-096-00 J.K. SPRUCE –CALAVERAS LAKE POWER PLANT PROPOSED NEW COAL COMBUSTION RESIDUAL PONDS SAN ANTONIO, TEXAS	GLOBAL STABILITY ANALYSIS SECTION D-D' POND SIDE LONG TERM	FIGURE D-9





GEOTECHNICAL ENGINEERING STUDY

FOR

**CALAVERAS GEOTECHNICAL SURVEY
J.K. SPRUCE POWER PLANT
SAN ANTONIO, TEXAS**



Project No. ASA20-044-00
September 24, 2020

Mr. Steven Dean, P.E., CFM
Pape-Dawson Engineers, Inc.
2000 NW Loop 410
San Antonio, Texas 78213

12821 W Golden Lane
San Antonio, TX 78249

PO Box 690287
San Antonio, TX 78269

P 210.699.9090
F 210.699.6426
TBPE Firm F-3257

WWW.RKCI.COM

**RE: Geotechnical Engineering Study
Calaveras Geotechnical Survey
J. K. Spruce Power Plant
San Antonio, Texas**

Dear Mr. Dean:

RABA KISTNER, Inc. (RKI) is pleased to submit the report of our Geotechnical Engineering Study for the above-referenced project. This study was performed in accordance with RKI Proposal No. PSA20-089-00, dated July 15, 2020. The purpose of this study was to drill borings within or near the proposed structure footprints, to perform laboratory testing to classify and characterize subsurface conditions, and to prepare an engineering report presenting foundation design and construction recommendations for the proposed structures, as well as to provide pavement design and construction guidelines.

The following report contains our design recommendations and considerations based on our current understanding of the project information provided to us. There may be alternatives for value engineering of the foundation and pavement systems, and RKI recommends that a meeting be held with the Owner and design team to evaluate these alternatives.

We appreciate the opportunity to be of service to you on this project. Should you have any questions about the information presented in this report, or if we may be of additional assistance with value engineering or on the materials testing-quality control program during construction, please call.

Very truly yours,

RABA KISTNER, INC.

Isaac Molina, P.E.
Project Engineer

R. Blake Wright, P.E.
Project Manager



RBW/IM/kv

Attachments

Copies Submitted: Above (Electronic)



GEOTECHNICAL ENGINEERING STUDY

For

**CALAVERAS GEOTECHNICAL SURVEY
J. K. SPRUCE POWER PLANT
SAN ANTONIO, TEXAS**

Prepared for

PAPE-DAWSON ENGINEERS, INC.
San Antonio, Texas

Prepared by

RABA KISTNER, INC.
San Antonio, Texas

PROJECT NO. ASA20-044-00

September 24, 2020

TABLE OF CONTENTS

INTRODUCTION	1
PROJECT DESCRIPTION	1
LIMITATIONS	1
BORINGS AND LABORATORY TESTS	2
GENERAL SITE CONDITIONS	2
SITE DESCRIPTION	2
GEOLOGY	3
SEISMIC COEFFICIENTS.....	3
STRATIGRAPHY	3
GROUNDWATER.....	4
FOUNDATION ANALYSIS	4
EXPANSIVE SOIL-RELATED MOVEMENTS	4
Overexcavation and Select Fill Replacement	5
FOUNDATION RECOMMENDATIONS	6
FOUNDATION CONSIDERATIONS.....	6
FOUNDATION OPTIONS	7
SITE GRADING.....	7
EXISTING FILL	7
DRILLED, STRAIGHT-SHAFT PIERS	8
Allowable Uplift Resistance.....	9
PIER SHAFTS.....	9
PIER SPACING	9
FLOOR SLABS	10
GRADE BEAMS.....	10
RIGID-ENGINEERED BEAM AND SLAB FOUNDATIONS.....	10
Allowable Bearing Capacity.....	11
BRAB Criteria	11
AREA FLATWORK.....	12
PERMANENT SLOPES.....	12
RETAINING STRUCTURES	12
LATERAL EARTH PRESSURES	13
Wall Backfill Compaction.....	14
Drainage.....	14
Retaining Wall Foundations	15

TABLE OF CONTENTS

EXCAVATION SLOPING AND BENCHING	15
FOUNDATION CONSTRUCTION CONSIDERATIONS	15
SITE DRAINAGE	15
SITE PREPARATION	16
ONSITE SOIL AND FILL	16
SELECT FILL	16
Select Fill Placement and Compaction	18
General Fill Placement and Compaction	18
SHALLOW FOUNDATION EXCAVATIONS	18
DRILLED PIERS.....	19
Reinforcement and Concrete Placement	19
Temporary Casing.....	19
EXCAVATION SLOPING AND BENCHING	19
EXCAVATION EQUIPMENT	20
VOID SPACE CONSIDERATIONS.....	20
Ventilation	20
Drainage.....	20
Carton Forms	21
INTERIOR WALLS	21
UTILITIES	21
PAVEMENT RECOMMENDATIONS	22
SUBGRADE CONDITIONS.....	22
DESIGN INFORMATION	22
RECOMMENDED PAVEMENT SECTIONS	23
Rigid Pavement Consideration.....	24
Flexible Pavement Consideration	24
SUBGRADE TREATMENT OPTION	25
PAVEMENT CONSTRUCTION CONSIDERATIONS	25
SUBGRADE PREPARATION	25
DRAINAGE CONSIDERATIONS.....	25
ONSITE SOIL FILL (PAVEMENTS).....	26
TREATMENT OF SUBGRADE.....	26
FLEXIBLE BASE COURSE.....	26
ASPHALTIC CONCRETE SURFACE COURSE.....	26
PORTLAND CEMENT CONCRETE	27

TABLE OF CONTENTS

CONSTRUCTION RELATED SERVICES	27
CONSTRUCTION MATERIALS TESTING AND OBSERVATION SERVICES.....	27
BUDGETING FOR CONSTRUCTION TESTING.....	28

ATTACHMENTS

Boring Location Map	Figure 1
Logs of Borings	Figures 2 through 14
Key to Terms and Symbols	Figure 15
Soil Analyses Results	Figure 16
Dynamic Cone Penetrometer (DCP) Test Results	Figure 17
Moisture-Density Relationship with CBR Results	Figure 18
Direct Shear Test Results	Figure 19
Important Information About Your Geotechnical Engineering Report	

INTRODUCTION

RABA KISTNER, Inc. (RKI) has completed the authorized subsurface exploration for the proposed facility at the J.K. Spruce Power Plant adjacent to Calaveras Lake in San Antonio, Texas. This report briefly describes the procedures utilized during this study and presents our findings along with our recommendations for foundation design and construction considerations, as well as for pavement design and construction guidelines.

PROJECT DESCRIPTION

To be considered in this study is a new pond located at the J.K. Spruce Power Plant in San Antonio, Texas. The pond will be approximately 3 acres in total area, separated by a wall to form 2 ponds of approximately 1.5 acres each. The depth of the pond is not known at this time. The pond will include the following structures/elements:

- A concrete separator wall to divide the pond into two cells;
- A concrete sump;
- Slab-on-grade foundations for electrical equipment shelter (estimated load of 40,000 lbs) and a transformer (estimated load of 6,000 lbs);
- Two clarifiers with associated foundations and personnel access structures (estimated load of 150,000 lbs each); and
- New driveway pavements to access the pond and equipment.

LIMITATIONS

This engineering report has been prepared in accordance with accepted Geotechnical Engineering practices in the region of south/central Texas and for the use of the Pape-Dawson Engineers, Inc. (CLIENT) and its representatives for design purposes. This report may not contain sufficient information for purposes of other parties or other uses. This report is not intended for use in determining construction means and methods.

The recommendations submitted in this report are based on the data obtained from 13 borings drilled at this site, our understanding of the project information provided to us, and the assumption that site grading will result in only minor changes in the existing topography at the new structure locations. If the project information described in this report is incorrect, is altered, or if new information is available, we should be retained to review and modify our recommendations.

This report may not reflect the actual variations of the subsurface conditions across the site. This is particularly true of this site with respect to the variable depth of fill materials. The nature and extent of variations across the site may not become evident until construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time of construction, it may be necessary to reevaluate our recommendations after performing onsite observations and tests to establish the engineering impact of the variations.

The scope of our Geotechnical Engineering Study does not include an environmental assessment of the air, soil, rock, or water conditions either on or adjacent to the site. No environmental opinions are presented in this report.

If final grade elevations are significantly different from grades discussed herein (more than plus or minus 1 ft), our office should be informed about these changes. If needed and/or if desired, we will reexamine our analyses and make supplemental recommendations.

BORINGS AND LABORATORY TESTS

Subsurface conditions at the site were evaluated by 13 borings drilled at the locations shown on the Boring Location Map, Figure 1. These locations are approximate and distances were measured using tape, angles, pacing, etc. The recent borings were drilled to depths ranging from 10 to 50 ft below the existing ground surface using a truck-mounted drilling rig. During drilling operations split-spoon (with standard penetration test) and relatively undisturbed Shelby tube samples were collected at the depths annotated on our boring logs.

Each sample was visually classified in the laboratory by a member of our Geotechnical Engineering staff. The geotechnical engineering properties of the strata were evaluated by natural moisture content, Atterberg limits, direct shear (Figure 19), and sieve analysis tests.

The results of all laboratory tests are presented in graphical or numerical form on the boring logs illustrated on Figures 2 through 14. A key to classification terms and symbols used on the logs is presented on Figure 15. The results of the laboratory and field testing are also tabulated on Figure 16 for ease of reference. The results of the Dynamic Cone Penetrometer (DCP) tests are presented on Figure 17. Moisture-Density Relationship (Proctor) and California Bearing Ratio (CBR) test results are also presented on Figure 18.

Standard penetration test results are noted as “blows per ft” on the boring logs and Figure 16, where “blows per ft” refers to the number of blows by a falling hammer required for 1 ft of penetration into the soil/weak rock. Where hard or dense materials were encountered, the tests were terminated at 50 blows even if one foot of penetration had not been achieved. When all 50 blows fall within the first 6 in. (seating blows), refusal “ref” for 6 in. or less will be noted on the boring logs and on Figure 16.

Samples will be retained in our laboratory for 30 days after submittal of this report. Other arrangements may be provided at the request of the Client.

GENERAL SITE CONDITIONS

SITE DESCRIPTION

The project site is within the J.K. Spruce Power Plant adjacent to Calaveras Lake in San Antonio, Texas. Existing structures include buildings to the north and east, and pavements to the south and west. The site is currently grass covered. The topography generally slopes downward toward the east with vertical relief of about 5 ft across the site.

GEOLOGY

A review of the *Geologic the Atlas of Texas, Austin Sheet*, indicates that this site is naturally underlain with soils/rocks of the Wilcox Group, which is composed of mudstone with varying amounts of sandstone and lignite. The Wilcox Group may weather to yellowish-brown clay, sandy clay, and sands.

The Wilcox Group grades downward into the Midway Group, which is composed of clay, silt, and sand, with some pebbles near its base. Glauconite is often encountered in these soils. Key engineering considerations for development supported on the soils/rock of this formation typically include the presence of possible water-bearing layers, very hard mudstone/sandstone layers, and the expansive nature of the soil.

SEISMIC COEFFICIENTS

The following information has been summarized for seismic considerations associated with this site per ASCE 7-16 edition.

- Site Class Definition: **Class C**. Based on the soil borings conducted for this investigation and our experience in the area, the upper 100 ft of soil may be characterized as very dense soil and soft rock.
- Risk-Targeted Maximum Considered Earthquake Ground Motion Response Accelerations for the Conterminous United States of 0.2-Second Spectral Response Acceleration (5% Of Critical Damping): **$S_s = 0.052g$** .
- Risk-Targeted Maximum Considered Earthquake Ground Motion Response Accelerations for the Conterminous United States of 1-Second Spectral Response Acceleration (5% Of Critical Damping): **$S_1 = 0.023g$** .
- Values of Site Coefficient: **$F_a = 1.3$**
- Values of Site Coefficient: **$F_v = 1.5$**
- Where g is the acceleration due to gravity.

The Maximum Considered Earthquake Spectral Response Accelerations are as follows:

- 0.2 sec, adjusted: **$S_{ms} = 0.068g$**
- 1 sec, adjusted: **$S_{m1} = 0.034g$**

The Design Spectral Response Acceleration Parameters (SA) are as follows:

- 0.2 sec SA: **$S_{Ds} = 0.045g$**
- 1 sec SA: **$S_{D1} = 0.023g$**

STRATIGRAPHY

Each stratum has been designated by grouping soils that possess similar physical and engineering characteristics. The boring logs should be consulted for more specific stratigraphic information. Unless noted on the boring logs, the lines designating the changes between various strata represent approximate boundaries. The transition between materials may be gradual or may occur between recovered

samples. The stratification given on the boring logs, or described herein, is for use by RKI in its analyses and should not be used as the basis of design or construction cost estimates without realizing that there can be variation from that shown or described.

GROUNDWATER

During drilling, groundwater was encountered in some borings, as presented in the following table.

Boring Identifier	Approximate Observed Groundwater Elevation During Drilling (ft, msl)
B-4	490
B-5	484
B-9	483
B-10	482

It is possible for groundwater to exist beneath this site at shallow depths on a transient basis, particularly in granular strata following periods of precipitation. Fluctuations in groundwater levels occur due to variation in rainfall and surface water run-off. The construction process itself may also cause variations in the groundwater level.

Based on the findings in our borings and on our experience in this region, we believe that groundwater seepage encountered during site earthwork activities and shallow foundation construction may be controlled using temporary earthen berm and conventional sump-and-pump dewatering methods. For excavations to depths greater than about 15 ft, provisions should be made to handle water entering excavations during construction. For deep foundation excavations, this could include the use of temporary casing to reduce groundwater seepage and sloughing of the in-situ soils.

FOUNDATION ANALYSIS

EXPANSIVE SOIL-RELATED MOVEMENTS

The anticipated ground movements due to swelling of the underlying soils at the site were estimated for slab-on-grade construction using the empirical procedure, Texas Department of Transportation (TxDOT) Tex-124-E, Method for Determining the Potential Vertical Rise (PVR). PVR values ranging from less than 1 to 2-1/4 in. were estimated for the stratigraphic conditions encountered in our borings. A surcharge load of 1 psi (concrete slab and sand cushion), an active zone of 10 to 15 ft, and dry moisture conditions were assumed in estimating the above PVR values.

The TxDOT method of estimating expansive soil-related movements is based on empirical correlations utilizing the measured plasticity indices and assuming typical seasonal fluctuations in moisture content. If desired, other methods of estimating expansive soil-related movements are available, such as estimations based on swell tests and/or soil-suction analyses. However, the performance of these tests and the detailed analysis of expansive soil-related movements were beyond the scope of the current

study. It should also be noted that actual movements can exceed the calculated PVR values due to isolated changes in moisture content (such as due to leaks, landscape watering, etc.) or if water seeps into the soils to greater depths than the assumed active zone depth due to deep trenching or excavations.

Overexcavation and Select Fill Replacement

To reduce expansive soil-related movements in at-grade construction, a portion of the upper expansive subgrade soils can be removed by overexcavating and backfilling with a suitable select fill material. PVR values have been estimated for overexcavation and select fill replacement to various elevations below the existing ground surface and are summarized in the table below. Recommendations for the selection and placement of select backfill materials are addressed in a subsequent section of this report.

Transformers (Area of Borings B-4 and B-5)	
Overexcavation and Select Fill Replacement Elevation (ft, msl)*	Estimated PVR (in.)
513	Less Than 1

*We recommend that existing fill be remediated if fill depths extend below the overexcavation and select fill replacement depth.

Discharge Sump (Area of Boring B-6)	
Overexcavation and Select Fill Replacement Elevation (ft, msl)*	Estimated PVR (in.)
510	Less Than 1

*We recommend that existing fill be remediated if fill depths extend below the overexcavation and select fill replacement depth.

Separator Wall (Area of Borings B-7 and 8)	
Overexcavation and Select Fill Replacement Elevation (ft, msl)*	Estimated PVR (in.)
512	Less Than 1

*We recommend that existing fill be remediated if fill depths extend below the overexcavation and select fill replacement depth.

Clarifiers (Area of Borings B-9 and 10)	
Overexcavation and Select Fill Replacement Elevation (ft, msl)*	Estimated PVR (in.)
510	Less Than 1

*We recommend that existing fill be remediated if fill depths extend below the overexcavation and select fill replacement depth.

Drainage Considerations When overexcavation and select fill replacement is selected as a method to reduce the potential for expansive soil-related movements at any site, considerations of surface and subsurface drainage may be crucial to construction and adequate foundation performance of the soil-supported structures. Filling an excavation in relatively impervious plastic clays with relatively pervious select fill material creates a “bathtub” beneath the structure, which can result in ponding or trapped water within the fill unless good surface and subsurface drainage is provided.

Water entering the fill surface during construction or entering the fill exposed beyond the structure lines after construction may create problems with fill moisture control during compaction and increased access for moisture to the underlying expansive clays both during and after construction.

Several surface and subsurface drainage design features and construction precautions can be used to limit problems associated with fill moisture. These features and precautions may include but are not limited to the following:

- Installing berms or swales on the uphill side of the construction area to divert surface runoff away from the excavation/fill area during construction;
- Sloping of the top of the subgrade with a minimum downward slope of 1.5 percent out to the base of a dewatering trench located beyond the structure perimeter;
- Sloping the surface of the fill during construction to promote runoff of rain water to drainage features until the final lift is placed;
- Sloping of a final, well maintained, impervious clay or pavement surface (downward away from the structure) over the select fill material and any perimeter drain extending beyond the structure lines, with a minimum gradient of 6 in. in 5 ft;
- Constructing final surface drainage patterns to prevent ponding and limit surface water infiltration at and around the structure perimeter;
- Locating the water-bearing utilities, roof drainage outlets and irrigation spray heads outside of the select fill and perimeter drain boundaries; and
- Raising the elevation of the ground level floor slab.

Details relative to the extent and implementation of these considerations must be evaluated on a project-specific basis by all members of the project design team. Many variables that influence fill drainage considerations may depend on factors that are not fully developed in the early stages of design. For this reason, drainage of the fill should be given consideration at the earliest possible stages of the project.

FOUNDATION RECOMMENDATIONS

FOUNDATION CONSIDERATIONS

Review of the borings and test data indicate the factors discussed below will affect foundation design and construction at this site.

- Potential to encounter buried utilities and localized fills;
- Remediation of uncontrolled fills;
- Potential to encounter groundwater seepage;

- Sloughing of granular materials during excavation; and
- Potential for moderate-to-heavy foundation loads for the proposed improvements.

FOUNDATION OPTIONS

The following recommendations are based on the data obtained from our field and laboratory studies, our past experience with geotechnical conditions similar to those at this site, and our engineering design analyses.

The following alternatives are available to support the structures:

- Drilled, straight-shaft piers;
- Rigid-engineered beam and slab foundations;
- Shallow footing foundations.

The owner may select from these foundation systems depending on the performance criteria established for the structures. Cost analyses have not been conducted for any foundation system and are beyond the scope of this study.

SITE GRADING

A site plan with topographic information developed by AECOM and dated March 30, 2020, was used in our evaluation. We have prepared all foundation recommendations based on the provided site plan, and the stratigraphic conditions encountered at the time of our study. If site grading plans differ from those discussed in this report by more than plus or minus 1 ft, RKI must be retained to review the site grading plans prior to bidding the project for construction. This will enable RKI to provide input for any changes in our original recommendations that may be required as a result of site grading operations or other considerations.

EXISTING FILL

It should be noted that fill materials were encountered in 5 of 11 borings all within the top 1 ft of the existing ground surface. RKI is not aware of any documentation of the placement and compaction methods utilized in placement of the fill. With any undocumented fill material, there is a risk of potential settlement, the magnitude of which is not possible to predict without additional information.

The fill materials generally consisted of granular soils. Based on our observations, the existing fill materials are likely suitable for the support of the proposed structures. However, due to the apparent variability in the materials and in the comparative strength of the materials, some degree of isolated settlement should be anticipated for structures supported on the fill materials. It is not possible to accurately quantify the magnitude of potential settlement due to uncertainties regarding fill placement methods and control. Thus, there will be a degree of risk regarding the performance of structures supported on fill. **The only means by which this risk can be eliminated is through complete removal and recompaction of the existing fill materials.**

For shallow foundations or ground supported floor slabs, fill removal and recompaction or overexcavation and select fill replacement is recommended. The fill should be free of vegetation, root mass, organic topsoil, and particles larger than 4 in. Thus, excessive differential settlement-related risks associated with undocumented/uncontrolled fill will be reduced.

For other ancillary flatwork, such as sidewalks and pavements, these risks will remain in areas where existing fill is encountered. The only way to eliminate risk is to completely remove and recompact the existing fill materials, spoiling any oversized, organic, or otherwise deleterious and/or degradable materials. If this is not considered feasible, and settlement related risk in areas of flatwork is tolerable to the owner, consideration can be given to partial removal of the fill material. As a minimum, existing fill materials should be thoroughly proofrolled to identify weak or compressible zones in the near-surface material.

Based on the current information, the lateral extent of the fill materials is not known. Consideration may be given to additional exploration utilizing test pits to try and determine the lateral extent, the depth, and constituents of the existing fill materials.

DRILLED, STRAIGHT-SHAFT PIERS

Drilled, straight-shaft piers may also be considered to support the proposed structures using the values presented in the following tables. The provided values are based on a factor of safety of 2 for skin friction and 3 for end-bearing with respect to the design shear strength. These values may be increased by 1/3 for transient load conditions. Based on the 50-ft maximum depth of exploration, pier depths should not extend below an elevation of 465 ft msl.

Straight Shaft Pier Capacities – Transformers and Electrical Equipment Shelter		
Elevation* (ft, msl)	Allowable Side Shear Resistance (ksf)	Allowable Axial End- Bearing (ksf)
513 to 501	Neglect	3.4
501 to 465	1.0	12.4

*These recommendations should be reviewed if final foundation elevations differ from existing grade by more than +/- 1 ft.

Straight Shaft Pier Capacities - Clarifiers		
Elevation* (ft, msl)	Allowable Side Shear Resistance (ksf)	Allowable Axial End- Bearing (ksf)
511 to 496	Neglect	3.0
584 to 569	1.0	12.4

*These recommendations should be reviewed if final foundation elevations differ from existing grade by more than +/- 1 ft.

Final shaft depths will be based on interpretation of conditions in the field at the time of construction. Due to the variable conditions at this site, RKI must be present at the time of pier construction to verify the field conditions are similar to those assumed in the preparation of our recommendations. For bid purposes, the

owner should anticipate that deeper piers will be required in some areas. Consequently, contractors bidding on the job should include unit costs for various depths of additional pier embedment. Unit costs should include those for both greater and lesser depth in both bedrock (i.e. sandstone) and soil.

Allowable Uplift Resistance

Resistance to uplift forces exerted on the drilled, straight-shaft piers will be provided by the sustained compressive axial force (dead load) plus the allowable uplift resistance provided by the soil. The resistance provided by the soil depends on the shear strength of the soils adjacent to the pier shaft and below the depth of the active zone. The allowable uplift resistance provided by the soils at this site may be estimated using 2/3 of the axial compressive side shear resistance provided in the *Straight Shaft Pier Capacity* tables. These values were evaluated using a factor of safety of 2.

Reinforcing steel will be required in each pier shaft to withstand a net force equal to the uplift force minus the sustained compressive load carried by that pier. We recommend that each pier be reinforced to withstand this net force or an amount equal to 1 percent of the cross-sectional area of the shaft, whichever is greater.

PIER SHAFTS

The pier shafts will be subject to potential uplift forces if the surrounding expansive soils within the active zone are subjected to alternate drying and wetting conditions. The maximum potential uplift force acting on the shaft may be estimated by:

$$F_u = 22 * D$$

where:

F_u = uplift force in kips; and
 D = diameter of the shaft in feet.

PIER SPACING

Where possible, we recommend that the piers be spaced at a center to center distance of at least three shaft diameters on-center for straight-shaft piers. Such spacing will not require a reduction in the load carrying capacity of the individual piers.

If design and/or construction restraints require that piers be spaced closer than the recommended three shaft diameters, RKA must re-evaluate the allowable bearing capacities presented above for the individual piers. Reductions in load carrying capacities may be required depending upon individual loading and spacing conditions.

FLOOR SLABS

Two alternatives are available to construct the floor slab systems for drilled pier foundations if chosen for the transformer and clarifier structures. The Owner may select the alternative best satisfying the required performance criteria.

Alternative No. 1: Floor slabs which have high performance criteria or which are movement sensitive in nature, should be structurally suspended because of the anticipated ground movements. A positive void space of at least 4 in., preferably more, should be provided between the slab and the underlying soils (see also *Void Space Considerations*).

Alternative No. 2: Floor slabs within the superstructure may be ground supported provided the anticipated movements discussed under the *Expansive Soil-Related Movements* section of this report will not impair the performance of the floor, frame, or roof systems.

If differential movements between the slab and the structure are objectionable, soil-supported floor slabs could be dowelled to the perimeter grade beams. Dowelled slabs that are subjected to heaving will typically crack and develop a plastic hinge along a line which will be approximately 5 to 10 ft inside and parallel to the grade beams. Slabs cast independent of the grade beams, interior columns and partitions should experience minimum cracking, but may create difficulties at critical entry points such as doors and may impact interior partitions that are secured to exterior walls.

We recommend that a vapor barrier comprised of polyethylene or polyvinyl chloride (PVC) sheeting be placed between the supporting select fill and the concrete floor slab.

GRADE BEAMS

For a deep foundation system, if chosen, we recommend that the grade beams interconnecting the piers be structurally suspended. A positive void space of at least 4 in., preferably more, should be provided between the soffits of grade beams and the underlying soils.

RIGID-ENGINEERED BEAM AND SLAB FOUNDATIONS

Rigid-engineered beam and slab foundations may be utilized for proposed structures, provided the selected foundation type can be designed to withstand the anticipated soil-related movements (see *Expansive Soil-Related Movements* and *Existing Fill*) without impairing either the structural or the operational performance of the structures. If a shallow foundation system is to be considered, we recommend that the existing fill be remediated and that the PVR reduction be utilized to reduce expansive soil-related movements.

Allowable Bearing Capacity

Shallow foundations founded on compacted native soil or select fill should be proportioned using the design parameters presented in the following table.

Minimum depth below final grade	18 in.
Minimum beam width	12 in.
Maximum allowable bearing pressure for grade beams	1,900 psf
Maximum allowable bearing pressure for widened beams	2,400 psf

The above presented maximum allowable bearing pressures will provide a factor of safety of about 3 with respect to the measured shear strength, provided that select fill is selected and placed as recommended in the *Select Fill* section of this report and the subgrade is prepared in accordance with the recommendations outlined in the *Site Preparation* section of this report.

BRAB Criteria

Beam and slab foundations are sometimes designed using criteria developed by the Building Research Advisory Board (BRAB). The recommended value for the Climatic Rating (C_w) for the project location is 16.

It should be noted that if the highest plasticity index (PI) value encountered in the subsurface profile occurs in the uppermost subsurface layer, BRAB criteria requires that this PI value be selected as the design PI. Such a standard design PI calculation/selection method does not allow the designer to account for the reduced expansion potential of a relatively thin, surficial clay veneer overlying a shallow less expansive formation. The BRAB design plasticity index, soil support index (C), and estimated unconfined compressive strength (q_u) presented in the following table may be utilized for the proposed structures. These design parameters apply for conditions encountered in our borings and for the grades existing at the time of our field exploration.

BRAB Criteria for Existing Site Conditions				
Improvement	Associated Borings	Parameters		
		Estimated Soil Unconfined Compressive Strength (q_u)	BRAB Design Plasticity Index	Soil Support Index (C)
Transformers, Electrical Equipment Shelter, and Clarifiers	B-4, B-5, B-9, and B-10	2,000 psf	20	0.94

The design criteria will change if a select fill building pad is constructed for the proposed structures. If site grading operations alter the thickness of the on-site soil beneath the residence, then the criteria for the residence should be re-evaluated for the appropriate slab design parameters. If any overexcavation and select fill replacement is performed, then RKI must be retained to revise our original recommendations that may be required as a result.

AREA FLATWORK

It should be noted that ground-supported flatwork such as walkways, courtyards, etc. will be subject to the same magnitude of potential soil-related movements as discussed previously (see *Expansive Soil-Related Movement* and *Existing Fill* sections). Thus, where these types of elements abut rigid structure foundations or isolated/suspended structures, differential movements should be anticipated. As a minimum, we recommend that flexible joints be provided where such elements abut the main structure to allow for differential movement at these locations. Where the potential for differential movement is objectionable, it may be beneficial to consider methods of reducing anticipated movements or to consider structurally suspending critical areas to match the adjacent structure performance.

PERMANENT SLOPES

The stability of permanent slopes depends on many factors, including the height and geometry of the slopes, the types of materials contained in the slopes, effects of groundwater, and any surface pressures present. In general, permanent cut and fill slopes, constructed at 3H:1V (3 horizontal to 1 vertical) have been observed to perform satisfactorily. Therefore, it is our opinion that slopes should be constructed at 3H:1V or flatter. Fill slopes should be constructed by extending the compacted fill beyond the planned profile of the slope and then trimming the slope to the desired configuration.

Cut slopes can be designed similar to fill slopes. However, the potential for sloughing and/or general slope failure increases with an increase in the steepness and depth of cut, particularly if low strength soil occurs in or near the base of the slope.

If steeper slopes are anticipated, global stability analysis of proposed slopes should be evaluated. Depending on the acceptable factor of safety for stability for long-term condition, steeper slopes may need to be reinforced to increase stability (such as tiebacks, helical anchors, deadmen, soil nails, or other reinforcement systems).

RETAINING STRUCTURES

Retaining walls may be required to accommodate potential grade changes near the pond areas. The following sections provide general information for evaluating lateral earth pressures, backfill compaction, drainage, and the footings for the retaining walls, if any.

Global stability analyses have not been performed. If required by the City of San Antonio Information Bulletin 171, RKI should be retained to evaluate the global stability of the proposed retaining walls and proposed slopes. A global stability analysis for any system requires details regarding the wall/slope type, backfill, surcharge loading, and the specific site topography at the section location. When this information is available, RKI can be retained to perform the global stability analysis. However, the internal stability of the proposed retaining wall(s) should be checked by the wall designer. The general recommendations provided herein may require modification once additional information becomes available.

LATERAL EARTH PRESSURES

Equivalent fluid density values for computation of lateral soil pressures acting on walls were evaluated for various types of backfill materials that may be placed behind the walls. These values, as well as corresponding lateral earth pressure coefficients and estimated unit weights, are presented in the following.

Back Fill Type	Estimated Total Unit Weight (pcf)	Active Condition		At-Rest Condition	
		Earth Pressure Coefficient, k_a	Equivalent Fluid Density (pcf)	Earth Pressure Coefficient, k_o	Equivalent Fluid Density (pcf)
Washed Gravel	135	0.29	40	0.45	60
Crushed Limestone	145	0.24	35	0.38	55
Clean Sand	120	0.33	40	0.5	60
Pit Run Clayey Gravels or Sands	135	0.32	45	0.48	65
Inorganic Clays of Low to Medium Plasticity (Liquid Limit less than 40 percent)	120	0.40	50	0.55	65
Onsite Soil	120	0.59	70	0.74	90

The values tabulated above under “Active Conditions” pertain to flexible retaining walls free to tilt outward as a result of lateral earth pressures. For rigid, non-yielding walls the values under “At-Rest Conditions” should be used.

The “At-Rest” condition is present when the wall is not allowed to move. Once the wall moves outward a short distance, it relieves part of the horizontal stress. The horizontal movement required to reach the active condition may be estimated by using $0.01 \cdot H$ (where H is the wall height). For example, for a 10 ft. tall wall, horizontal movements up to 1.2 inches may be required to develop the active condition. Once the soil attains the active condition, the horizontal stress in the soil (and thus the pressure acting on the wall) will be reduced. Features/structures directly behind the wall may experience settlements similar to the horizontal movements. Where these types of movements are objectionable, the retaining wall should be designed using At-Rest Conditions.

For the provided values to be valid for sand or gravel backfill, the backfill should be placed in a wedge extending upward and away from the edge of the wall at a 45-degree angle or flatter. If sand and gravel are to be placed within a steeper wedge, the values for Pit Run Gravels/Sands, or Inorganic Clays provided above should be used. Further, any soft soil on the excavation slope should be removed prior to placement of backfill.

The values presented above assume the surface of the backfill materials to be level. Sloping the surface of the backfill materials will increase the surcharge load acting on the structures. The above values also do not include the effect of surcharge loads such as loading from construction equipment, vehicular loads (such as 250 psf), future storage near the structures or other loading/surcharge conditions. Nor do the values account for possible hydrostatic pressures resulting from groundwater seepage entering and

ponding within the backfill materials. However, these surcharge loads and groundwater pressures should be considered in designing any structures subjected to lateral earth pressures.

The use of expansive clay soils as backfill against the proposed retaining structures is not recommended. Expansive soils generally provide higher design active earthen pressures, as indicated above, but may also exert additional active pressures associated with swelling. Controlling the moisture and density of these materials during placement will help reduce the likelihood and magnitude of future active pressures due to swelling, but this is no guarantee.

Wall Backfill Compaction

Placement and compaction of backfill behind the walls will be critical, particularly at locations where backfill will support adjacent near-grade foundations and/or flatwork. If the backfill is not properly compacted in these areas, the adjacent foundations/flatwork can be subject to settlement.

To reduce potential settlement of adjacent foundations/flatwork, the backfill materials should be placed and compacted as recommended in the *Select Fill* section of this report. Each lift or layer of the backfill should be tested during the backfilling operations to document the degree of compaction. Within at least a 5-ft zone of the wall backside, we recommend that compaction be accomplished using hand-guided compaction equipment capable of achieving the maximum density in a series of 3 to 5 passes. Thinner lifts may be required to achieve compaction.

Drainage

The use of drainage systems is a positive design step toward reducing the possibility of hydrostatic pressure acting against the retaining structures. Drainage may be provided by the use of a drain trench and pipe. The drain pipe should consist of a slotted, heavy duty, corrugated polyethylene pipe and should be installed and bedded according to the manufacturer's recommendations. The drain trench should be filled with gravel (meeting the requirements of ASTM D 448 coarse concrete aggregate Size No. 57 or 67) and extend from the base of the structure to within 2 ft of the top of the structure. The bottom of the drain trench will provide an envelope of gravel around the pipe with minimum dimensions consistent with the pipe manufacturer's recommendations. The gravel should be wrapped with a suitable geotextile fabric (such as Mirafi 140N or equivalent) to help minimize the intrusion of fine-grained soil particles into the drain system. The pipe should be sloped and equipped with clean-out access fittings consistent with state-of-the-practice plumbing procedures.

As an alternative to a full-height gravel drain trench behind the proposed retaining structures, consideration may be given to utilizing a manufactured geosynthetic material for wall drainage. A number of products are available to control hydrostatic pressures acting on earth retaining structures, including Amerdrain (manufactured by American Wick Drain Corp.), Miradrain (manufactured by Mirafi, Inc.), Enkadrain (manufactured by American Enka Company), and Geotech Insulated Drainage Panel (manufactured by Geotech Systems Corp.). The geosynthetics are placed directly against the retaining structures and are hydraulically connected to the gravel envelope located at the base of the structures.

Weepholes may be considered along the length of the proposed basement structures, if desired, in addition to one of the two alternative drainage measures presented above. Based on our experience, weepholes, as

the only drainage measure, often become clogged with time and do not provide the required level of drainage from behind retaining structures.

Retaining Wall Foundations

Footings may be designed using the parameters provided in the section titled *Allowable Bearing Capacity*. To reduce the potential for differential settlement, we recommend extending the retaining wall foundations as may be necessary to bear on similar foundation materials along the length of any walls.

EXCAVATION SLOPING AND BENCHING

If utility trenches or other excavations extend to or below a depth of 5 ft below construction grade, the contractor or others shall be required to develop a trench safety plan to protect personnel entering the trench or trench vicinity. The collection of specific geotechnical data and the development of such a plan, which could include designs for sloping and benching or various types of temporary shoring, are beyond the scope of the current study. Any such designs and safety plans shall be developed in accordance with current OSHA guidelines and other applicable industry standards.

FOUNDATION CONSTRUCTION CONSIDERATIONS

SITE DRAINAGE

Drainage is an important key to the successful performance of any foundation. Good surface drainage should be established prior to and maintained after construction to help prevent water from ponding within or adjacent to the structure foundations and to facilitate rapid drainage away from the foundations. Failure to provide positive drainage away from the structure can result in localized differential vertical movements in soil supported foundations and floor slabs, which can in turn result in cracking in the sheetrock partition walls, and shifting of ceiling tiles, as well as improper operation of windows and doors.

Current ordinances, in compliance with the Americans with Disabilities Act (ADA), may dictate maximum slopes for walks and drives around and into new buildings. These slope requirements can result in drainage problems for buildings supported on expansive soils. We recommend that, on all sides of the building, the maximum permissible slope be provided away from the building.

Also to help control drainage in the vicinity of the structures, we recommend that roof/gutter downspouts and landscaping irrigation systems not be located adjacent to the foundation. Where a select fill overbuild is provided outside of the floor slab/foundation footprint, the surface should be sealed with an impermeable layer (pavement or clay cap) to reduce infiltration of both irrigation and surface waters. Careful consideration should also be given to the location of water bearing utilities, as well as to provisions for drainage in the event of leaks in water bearing utilities. All leaks should be immediately repaired.

Other drainage and subsurface drainage issues are discussed in the *Expansive Soil-Related Movements* section of this report and under *Pavement Construction Considerations*.

Furthermore, as discussed in a previous section of this report, it has been our past experience that shallow groundwater seepage may be encountered within the existing or remediated fill at the project site or

within granular stratus. We recommend that any drainage related issues be thoroughly addressed by the design team.

SITE PREPARATION

Site preparation for this project will include removal of old foundation systems and utilities, if any. The requirements for specific areas will depend on the depth, size and loading of the facilities that must be constructed following any demolition activities. These activities and operations should be carefully considered and monitored to make sure that old foundation elements and abandoned utility lines do not result in post construction maintenance issues, problems, or allow influx of groundwater seepage.

Structure areas and all areas to support select fill should be stripped of all vegetation, root mass, organic topsoil, pavement section, utilities, structures, and associated backfill. Existing utilities and associated backfill, extending into excavations, be plugged/capped to reduce the potential for groundwater influx. We recommend all existing fill under proposed structures be remediated. Partial remediation under pavements may be considered, see *Existing Fill*. Furthermore, as discussed in a previous section of this report, we recommend that one of the PVR reduction options be utilized to reduce expansive soil-related movements to within acceptable structural and operational tolerances, or structurally suspended.

Exposed subgrades should be thoroughly proofrolled in order to locate weak, compressible zones. A fully-loaded tandem wheeled dump truck or a similar heavily-loaded piece of construction equipment should be used for planning purposes. Proofrolling operations should be observed by the Geotechnical Engineer or their representative to document subgrade condition and preparation. Weak or soft areas identified during proofrolling should be removed and replaced with suitable, compacted on-site clays, free of organics, oversized materials, and degradable or deleterious materials.

Upon completion of the proofrolling operations and just prior to fill placement or slab construction, the exposed subgrade should be moisture conditioned by scarifying to a minimum depth of 6 in. and recompacting to a minimum of 95 percent of the maximum density as determined by TxDOT Test Method TEX-114-E or ASTM D698. The moisture content of the subgrade should be maintained within the range of optimum moisture content to 3 percentage points above optimum moisture content until permanently covered.

ONSITE SOIL AND FILL

The use of onsite expansive soils may be considered for general fill (outside of the structure footprints), if the potential vertical movements in excess of those discussed previously will not adversely impact either the structural or operational tolerances for the proposed improvements for which this material is being considered.

If existing soil and/or fill can be processed in order to meet the select fill requirements, then consideration can be given to using the material onsite as select fill.

SELECT FILL

Recommendations for preferred select fill materials are provided below.

Imported Crushed Limestone Base – Imported crushed limestone base materials should be crushed stone or gravel aggregate. We recommend that materials specified for use as select fill meet the TxDOT 2014 Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, Item 247, Flexible Base, Type A or B, Grades 1-2 or 3.

Recycled Materials – Recycled materials (i.e. concrete) are a viable alternative to crushed limestone to be used as fill, provided the recycled material is determined to be environmentally acceptable. We recommend that the recycled concrete material meet the requirements of TxDOT Item 247, Paragraph 2.13.2.1. prior to hauling to the site.

Recycled material may be used as fill if deleterious materials can be separated (i.e. rebar, soil, wood, metal, plastic, piping, conduit, etc). Oversized rubble should be processed to a well-graded material similar to the *Imported Crushed Limestone Base* with a maximum particle size of 4 inches. Rubble larger than 4 inches in any dimension should be discarded or processed to the maximum dimension. Care should be taken when placing the fill that the larger pieces are not concentrated in a manner such that voids develop between nested pieces; a sufficient quantity of fines should be provided to reduce this risk.

Recommendations for alternative select fill materials are provided below.

Granular Pit Run Materials – Granular pit run materials should consist of GC, SC & combination soils (clayey gravels), as classified according to the Unified Soil Classification System (USCS). Alternative select fill materials shall have a maximum liquid limit not exceeding 40, a plasticity index between 7 and 20, and a maximum particle size not exceeding 4 inch. In addition, if these materials are utilized, grain size analyses and Atterberg Limits must be performed during placement at a rate of one test each per 5,000 cubic yards of material due to the high degree of variability associated with pit-run materials.

Low PI Materials – Low PI materials should consist of CL clays, as classified according to the Unified Soil Classification System (USCS). Alternative select fill materials shall have a maximum liquid limit not exceeding 40, a plasticity index between 7 and 20, and a maximum particle size not exceeding 4 inch. In addition, if these materials are utilized, grain size analyses and Atterberg Limits must be performed during placement at a rate of one test each per 5,000 cubic yards of material due to the high degree of variability associated with these materials.

If the above-listed materials or alternative select fills are being considered for bidding purposes, the materials should be submitted to the Geotechnical Engineer for evaluation at a minimum of 10 working days or more prior to the bid date. Failure to do so will be the responsibility of the contractor. The contractor will also be responsible for ensuring that the properties of all delivered alternate select fill materials are similar to those of the pre-approved submittal. **It should also be noted that when using alternative fill materials such as *Granular Pit Run* or *Low PI Materials*, difficulties may be experienced with respect to moisture control during and subsequent to fill placement, as well as with erosion, particularly when exposed to inclement weather. This may result in sloughing of beam trenches and/or pumping of the fill materials.**

Granular Pit Run or Low PI Materials will be very susceptible to small changes in moisture content and to disturbance from foot traffic during the placement of steel reinforcement in beam trenches, particularly in periods of inclement weather. Disturbance from such foot traffic and from the accumulation of excess water can result in losses in bearing capacity and increased settlement. If inclement weather is anticipated at the time construction, consideration should be given to protecting the bottom of foundation excavations by placing a thin mud mat (layer of flowable fill or lean concrete) at the bottom of trenches immediately following excavation. This will reduce disturbance from foot traffic and will impede the infiltration of surface water. The side slopes of beam trench excavations may also need to be flattened to reduce sloughing in cohesionless soils. All necessary precautions should be implemented to protect open excavations from the accumulation of surface water runoff and rain.

Soils classified as CH, MH, ML, SM, GM, OH, OL and Pt under the USCS are not considered suitable for use as select fill materials at this site.

Select Fill Placement and Compaction

It is recommended that select fill be placed in loose lifts not exceeding 8 in. in thickness and compacted to at least 98 percent of maximum density as determined by ASTM D698. The moisture content of the fill should be maintained within the range of 2 percentage points below to 2 percentage points above the optimum moisture content until final compaction. For low PI and granular pit-run materials, the moisture content of the fill should be maintained within the range of optimum to plus 3 percentage points above the optimum moisture content until final compaction.

General Fill Placement and Compaction

The remaining fill (such as parking lot areas or green spaces) may be compacted to at least 95 percent of maximum dry density as determined by ASTM D698. The moisture content of the fill should be maintained within the range of optimum to plus 3 percentage points above the optimum moisture content until final compaction.

SHALLOW FOUNDATION EXCAVATIONS

Shallow foundation excavations should be observed by the Geotechnical Engineer or their representative prior to placement of reinforcing steel and concrete. This is necessary to verify that the bearing soils at the bottom of the excavations are similar to those encountered in our borings and that excessive loose materials and water are not present in the excavations. If soft pockets of soil are encountered in the foundation excavations, they should be removed and replaced with a compacted non-expansive fill material or lean concrete up to the design foundation bearing elevations.

It should also be noted that some of the soils at this site are gravelly/sandy and cohesionless in nature; consequently, these soils will be very susceptible to small changes in moisture content and to disturbance from foot traffic during the placement of steel reinforcement in beam trenches, particularly in periods of inclement weather. Disturbance from such foot traffic and from the accumulation of excess water can result in losses in bearing capacity and increased settlement. If inclement weather is anticipated at the time construction, consideration should be given to protecting the bottoms of beam trenches by placing a thin mud mat (layer of flowable fill or lean concrete) at the bottom of trenches immediately following

excavation. This will reduce disturbance from foot traffic and will impede the infiltration of surface water. The side slopes of beam trench excavations may also need to be flattened to reduce sloughing in cohesionless soils. All necessary precautions should be implemented to protect open excavations from the accumulation of surface water runoff and rain.

DRILLED PIERS

Each drilled pier excavation must be examined by an RKI representative who is familiar with the geotechnical aspects of the soil stratigraphy, the structural configuration, foundation design details and assumptions, prior to placing concrete. This is to observe that:

- The shaft has been excavated to the specified dimensions at the correct depth established by the previously mentioned criteria;
- The shaft has been drilled plumb within specified tolerances along its total length; and
- Excessive cuttings, buildup and soft, compressible materials have been removed from the bottom of the excavation.

Due to the presence of high blow count materials including, but not limited to, sandstone, high-powered, high-torque drilling equipment should be anticipated for drilled pier construction at this site (see also *Excavation Equipment*).

Reinforcement and Concrete Placement

Reinforcing steel should be checked for size and placement prior to concrete placement. Placement of concrete should be accomplished as soon as possible after excavation to reduce changes in the moisture content or the state of stress of the foundation materials. No foundation element should be left open overnight without concreting.

Temporary Casing

Groundwater seepage was observed in the test borings at elevations ranging from 482 to 490 ft at the time of our subsurface exploration. Groundwater seepage and/or side sloughing is likely to be encountered at the time of construction, depending on climatic conditions prevalent at the time of construction. Therefore, we recommend that the bid documents require the foundation contractor to specify unit costs for different lengths of casing that may be required.

EXCAVATION SLOPING AND BENCHING

If utility trenches or other excavations extend to or below a depth of 5 ft below construction grade, the contractor or others shall be required to develop a trench safety plan to protect personnel entering the trench or trench vicinity. The collection of specific geotechnical data and the development of such a plan, which could include designs for sloping and benching or various types of temporary shoring, are beyond the scope of the current study. Any such designs and safety plans shall be developed in accordance with current OSHA guidelines and other applicable industry standards.

To assist in preparing an excavation safety plan, we have classified the soils encountered at this site based on the data collected during this study. The natural soils encountered at this site are classified as Type C soils under current Occupational Safety and Health Administration (OSHA) regulations pertaining to excavations. In excavations penetrating these soils, the sloping and benching schemes specified for Type C soils under the OSHA regulations require that the excavation sidewalls be sloped no steeper than 1.5:1 (horizontal:vertical).

EXCAVATION EQUIPMENT

Our boring logs are not intended for use in determining construction means and methods and may therefore be misleading if used for that purpose. We recommend that earth-work and utility contractors interested in bidding on the work perform their own tests in the form of test pits to determine the quantities of the different materials to be excavated, as well as the preferred excavation methods and equipment for this site.

VOID SPACE CONSIDERATIONS

If the structurally suspended floor system described as Alternative No. 1 under the *Floor Slab* section of this report is selected, several special design issues should be considered for the resulting subfloor void space. These issues are discussed below.

Ventilation

Observations by members of our firm of open crawl spaces have indicated a need for adequate subfloor ventilation. Such ventilation helps promote evaporation of subgrade moisture which may accumulate in spite of special surface and subsurface drainage features. As a minimum, free flowing passive vents may need to be installed along the perimeter beam to provide cross ventilation. If structural configurations will limit the free flow of air through passive vents, forced air, power vents should be installed. All vents should be designed such that they will not allow the drainage of surface water into the void space.

A minimum clearance of 4 in. has been recommended between both the grade beams and floor slab and the underlying finished subgrade. Such a minimum clearance is also recommended between the subgrade and any utilities which may be suspended from the underside of the floor. This clearance will allow swell-related subgrade movements without damaging the utilities. It is recommended that the utility clearance not be provided by the addition of narrow trenches running parallel to and immediately below the utilities, unless proper slopes and drainage outlets are provided to prevent ponding of water in the trenches.

Drainage

As discussed throughout this report, positive drainage is a key factor in the long term performance of any foundation. This is not only critical around the perimeter of the structure, but also in any subfloor void spaces. Surface drainage should be established that will direct water away from and will prevent water from ponding adjacent to piers. This positive drainage should be maintained both prior to and after construction.

Compaction control of the backfill around the perimeter of the structure following the placement of soil retainer blocks is critical to the drainage away from the foundation following construction. Materials for the

backfill around the perimeter of the structure should be the onsite soils. These materials should be compacted in uniformly thin lifts (8-inch maximum loose thickness) to at least 90 percent of the maximum dry density as determined by ASTM D698. These soils should be placed and compacted at optimum to plus 3 percent above optimum moisture content. Compaction by hand operated mechanical tampers will help to avoid damage to the soil retainer blocks. Following backfilling operations the soil retainer blocks should be checked to see that they have not been broken or collapsed during the compaction operations. Any soil retainer blocks that are broken or collapsed should be repaired or replaced.

Carton Forms

When carton forms are used to form subfloor void spaces, the forms often get wet or sometimes absorb water from humid air. This can result in collapse of the forms during the placement of concrete, thus diminishing the design void space. Conversely, if the carton forms are too strong and do not decompose sufficiently with time, they may not collapse as soil heave occurs, resulting in heave damage to the floor slab. Where there is sufficient moisture to cause the appropriate deterioration after construction, there may be a resulting moisture problem in the floor slab as a result of poor ventilation and the accumulation of condensation within the resulting unventilated void space. The lack of ventilation may also result in increased soil movements that will diminish the design void space. For these reasons, we recommend that where possible, consideration be given to methods other than the use of carton forms to form the recommended void space beneath floor slabs. If project specifics require the use of carton forms, then as a minimum, care should be taken to ensure that the carton forms are designed for use in the project location, and that carton forms are properly stored, protected, and installed during construction.

INTERIOR WALLS

It is not uncommon for cracking to occur in interior partition walls that are supported by a “floating” floor slab and structurally tied to either an interior column or an exterior wall supported by deep foundations. This should be taken into account during the design phase of the project if a “floating” slab foundation is used to support the proposed structure.

UTILITIES

Utilities which project through slab-on-grade, slab-on-fill, “floating” floor slabs, or any other rigid unit should be designed with either some degree of flexibility or with sleeves. Such design features will help reduce the risk of damage to the utility lines as vertical movements occur. These types of slabs will generally be constructed as monolithic, grid type beam and slab foundations or as a “floating” floor slab described as Alternative No. 2 under the *Floor Slab* section of this report.

Our experience indicates that significant settlement of backfill can occur in utility trenches, particularly when trenches are deep, when backfill materials are placed in thick lifts with insufficient compaction, and when water can access and infiltrate the trench backfill materials. The potential for water to access the backfill is increased where water can infiltrate flexible base materials due to insufficient penetration of curbs, and at sites where geological features can influence water migration into utility trenches. It is our belief that another factor which can significantly impact settlement is the migration of fines within the backfill into the open voids in the underlying free-draining bedding material.

To reduce the potential for settlement in utility trenches, we recommend that consideration be given to the following:

- All backfill materials should be placed and compacted in controlled lifts appropriate for the type of backfill and the type of compaction equipment being utilized and all backfilling procedures should be tested and documented.
- Curbs should completely penetrate base materials and be installed to a sufficient depth to reduce water infiltration beneath the curbs into the pavement base materials.
- Consideration should be given to wrapping free-draining bedding gravels with a geotextile fabric (similar to Mirafi 140N) to reduce the infiltration and loss of fines from backfill material into the interstitial voids in bedding materials.

PAVEMENT RECOMMENDATIONS

Recommendations for both flexible and rigid pavements are presented in this report. The Owner and/or design team may select either pavement type depending on the performance criteria established for the project. In general, flexible pavement systems have a lower initial construction cost as compared to rigid pavements. However, maintenance requirements over the life of the pavement are typically much greater for flexible pavements. This typically requires regularly scheduled observation and repair, as well as overlays and/or other pavement rehabilitation at approximately one-half to two-thirds of the design life. Rigid pavements are generally more "forgiving", and therefore tend to be more durable and require less maintenance after construction.

For either pavement type, drainage conditions will have a significant impact on long term performance, particularly where permeable base materials are utilized in the pavement section. Drainage considerations are discussed in more detail in a subsequent section of this report.

SUBGRADE CONDITIONS

We have assumed the subgrade in pavement areas will consist of recompacted onsite soils or fill, placed and compacted as recommended in the *Select Fill* section of this report. Based on laboratory California Bearing Ratio (CBR) test results, DCP results, and our experience with similar subgrade soils, we have assigned a design CBR value of 5 for use in pavement thickness design analyses.

DESIGN INFORMATION

The pavement section recommendations were prepared using the 1993 "Guide for the Design of Pavement Structures" by the American Association of State Highway and Transportation Officials (AASHTO). We have based our analysis on the following design parameters. **The Project Civil Engineer should review anticipated traffic loading and frequencies to verify that the assumed traffic loading and frequency is appropriate for the intended use of the facility.**

Pavement Design Parameters	Flexible Pavement	Rigid Pavement
Performance Period	20 years	
Design Traffic, 18-kip Equivalent Standard Axle Loads (ESALs)		
Light Duty	85,000 ⁽¹⁾	77,500 ⁽³⁾
Heavy Duty	292,400 ⁽²⁾	209,300 ⁽⁴⁾
California Bearing Ratio (CBR)	5.0 ⁽⁵⁾	
Initial Serviceability Index	4.2	4.5
Terminal Serviceability Index	2.0	
Overall Standard Deviation	0.45	0.35
Reliability	70	
Modulus of Subgrade reaction (k-value)	-	100 pci
28-day Concrete Modulus of Rupture	-	550 psi
28-day Concrete Elastic Modulus	-	4,000,000 psi
Load Transfer Coefficient	-	4.2
Drainage Coefficient	-	1.0
Roadbed Soil Resilient Modulus	7,500 psi	-

⁽¹⁾Approximately equivalent to 4 tractor-trailer trucks per day.

⁽²⁾Approximately equivalent to 16 tractor-trailer trucks per day.

⁽³⁾Approximately equivalent to 2 tractor-trailer trucks per day.

⁽⁴⁾Approximately equivalent to 7 tractor-trailer trucks per day.

⁽⁵⁾The CBR was assigned based on our laboratory CBR test results, DCP test results, and our experience with similar soils.

RECOMMENDED PAVEMENT SECTIONS

Pavement sections recommended for this site are as listed in the table below.

Pavement Type	Flexible Pavement		Rigid Pavement	
Traffic	Light Duty	Heavy Duty	Light Duty	Heavy Duty
Portland Cement Concrete (in.)	-	-	5	6
Asphaltic Concrete Surface Course (in.)	2	3	-	-
Flexible (Granular) Base (in.)	8	8	-	-
Lime/cement Treated Subgrade (in.) ⁽¹⁾	6 ⁽¹⁾	6 ⁽¹⁾	6 ⁽¹⁾	6 ⁽¹⁾

⁽¹⁾Cement or lime treated soils may be used as a working or construction platform only to help facilitate construction over clay or cohesionless subgrades, and considered as an **option** to enhance pavement performance. Consideration may also be given to incorporating geogrid at the bottom of the flexible base to enhance pavement performance.

Rigid Pavement Consideration

We recommend Jointed Plain Concrete Pavement (JPCP) be utilized for the rigid pavement sections. JPCP typically does not require distributed steel, micro- or macro-fibers, or any other “reinforcing” material. The following recommendations are based on ACI 330R-08 “Guide for the Design and Construction of Concrete Parking Lots.”

Typical joint types in JPCP include: control (contraction) joints, isolation joints (sometimes called expansion joints), and construction joints. The recommended joint spacing is 30 times the thickness of the slab up to a maximum of 15 ft. The length of a slab or panel should not be more than 25% greater than its width. For pavements with a thickness of 7 in. or greater, dowels may be required along all control joints. Tie bars may be required at the first longitudinal joint from the pavement edge to keep the outside edge from separating from the pavement.

Isolation joints are used to separate concrete slabs from other structures or fixed objects within or abutting the paved area to offset the effects of expected differential horizontal and vertical movements. Such structures include, but are not limited to, buildings, light standard foundations, and drop inlets. Isolation joints are also used at “T” intersections to accommodate differential movement along the different axes. Isolations joints are sometimes referred to as expansion joints. However, they are rarely needed to accommodate concrete expansion so they are not typically recommended for use as regularly spaced joints.

We recommend a jointing layout plan be established and reviewed by all parties prior to construction. We also recommend avoiding jointing lines which create angles of less than 60 degrees, “T” joints, and interior corners.

Proper curing of the concrete pavement should be initiated immediately after finishing. All control joints should be formed or sawed to a depth of at least 1/4 the thickness of the concrete slab and should extend completely through monolithic curbs (if used). Sawing of control joints should begin as soon as the concrete will not ravel, preferably within 1 to 3 hours using an early entry saw or 4 to 8 hours with a conventional saw. Timing will be dictated by site conditions.

Flexible Pavement Consideration

Based on our experience, the reported flexible pavement sections often perform adequately; however, maintenance or an overlay is generally needed sooner than would be required for a thicker design section. Consideration could be given to adding additional asphalt (i.e. an additional 1 in.) or incorporating a geogrid below the flexible base. In our opinion, incorporating geogrid into the pavement section will enhance overall pavement performance and reduce the potential for cracking and maintenance in asphalt pavements.

Another option to help reduce the potential for cracking and maintenance in asphalt pavements is including reinforcing fibers, such as Forta-Fi®, into the Hot Mix Asphalt (HMA). These are options and are not required. The geogrid reinforcement should conform to TxDOT Type 2 geogrid, or an approved substitute. If geogrid or reinforcing fibers are used in the provided options, we do not recommend reducing the report sections without further discussion with the design team.

SUBGRADE TREATMENT OPTION

Some of the soils at this site are either plastic or cohesionless and can be difficult to work with, particularly during periods of inclement weather. To provide a suitable, weather-resistant working surface for construction activity, the upper 6 in. to 8 in. of the subgrade soils may be treated with hydrated lime or cement. This is an **option** and is **not** required as part of the pavement thickness design presented above. We do not recommend that the treated subgrade be considered as a structural pavement component. Recommendations for treatment are provided in the section of this report entitled *Treatment of Subgrade*.

PAVEMENT CONSTRUCTION CONSIDERATIONS

SUBGRADE PREPARATION

Areas to support pavements should be stripped of all vegetation and organic topsoil and the exposed subgrade should be proofrolled in accordance with the recommendations in the *Site Preparation* section under *Foundation Construction Considerations*.

After completion of the proofrolling operations and just prior to flexible base placement, the exposed subgrade should be moisture conditioned by scarifying to a minimum depth of 6 in. and recompact to a minimum of 95 percent of the maximum density determined from the TxDOT Tex-114-E or ASTM D698. The moisture content of the subgrade should be maintained within the range of optimum moisture content to 3 percentage points above optimum until permanently covered.

DRAINAGE CONSIDERATIONS

As with any soil-supported structure, the satisfactory performance of a pavement system is contingent on the provision of adequate surface and subsurface drainage. Insufficient drainage which allows saturation of the pavement subgrade and/or the supporting granular pavement materials will greatly reduce the performance and service life of the pavement systems.

Surface and subsurface drainage considerations crucial to the performance of pavements at this site include (but are not limited to) the following:

- 1) Any known natural or man-made subsurface seepage at the site which may occur at sufficiently shallow depths as to influence moisture contents within the subgrade should be intercepted by drainage ditches or below grade French drains.
- 2) Final site grading should eliminate isolated depressions adjacent to curbs which may allow surface water to pond and infiltrate into the underlying soils. **Curbs should completely penetrate base materials and should be installed to sufficient depth to reduce infiltration of water beneath the curbs.**
- 3) Pavement surfaces should be maintained to help minimize surface ponding and to provide rapid sealing of any developing cracks. These measures will help reduce infiltration of surface water downward through the pavement section.

ONSITE SOIL FILL (PAVEMENTS)

As discussed previously, the pavement recommendations presented in this report were prepared assuming that onsite soils will be used for fill grading in proposed pavement areas. Existing fill remediation is recommended to control settlement, see *Existing Fill*. We recommend that onsite soils be placed in loose lifts not exceeding 8 in. in thickness and compacted to at least 95 percent of the maximum density as determined by TxDOT Tex-114-E or ASTM D698. The moisture content of the fill should be maintained within the range of optimum water content to 3 percentage points above the optimum water content until permanently covered. We recommend that fill materials be free of roots and other organic or degradable material. We also recommend that the maximum particle size not exceed 4 in. or one half the lift thickness, whichever is smaller.

TREATMENT OF SUBGRADE

Lime or cement treatment of the subgrade soils, if utilized, should be in accordance with the TxDOT Standard Specifications, Item 260 or Item 275, respectively. A sufficient quantity of hydrated lime or cement should be mixed with the subgrade soils to reduce the soil plasticity index to 20 or less. Based on our experience with similar soils, we recommend that at least 4 percent hydrated lime or cement treatment by weight be used to increase the pH of the subgrade clays to 12.4 or higher. For construction purposes, we recommend that the optimum lime or cement content of the subgrade soils be determined by laboratory testing with representative samples of the subgrade materials being used for this project. Treated subgrade soils should be compacted to a minimum of 95 or 98 percent of the maximum density at a moisture content within the range of optimum moisture content to 3 percentage points above the optimum moisture content as determined by Tex-113-E.

We recommend that during site grading operations additional laboratory testing be performed to determine the concentration of soluble sulfates in the subgrade soils. If present, the sulfate in the soil may react with calcium-based stabilizers such as lime or cement. The adverse reaction, referred to as sulfate-induced heave, has been known to cause cohesive subgrade soils to swell in short periods of time, resulting in pavement heaving and possible failure.

FLEXIBLE BASE COURSE

The flexible base course should be crushed limestone conforming to TxDOT Standard Specifications, Item 247, Type A, Grade 1-2. Base course should be placed in lifts with a maximum thickness of 8 in. and compacted to a minimum of 95 percent of the maximum density at a moisture content within the range of 2 percentage points below to 2 percentage points above the optimum moisture content as determined by Tex-113-E.

ASPHALTIC CONCRETE SURFACE COURSE

The asphaltic concrete surface course should conform to TxDOT Standard Specifications, Item 340, Type C or D. The asphaltic concrete should be compacted to a minimum of 92 percent of the maximum theoretical specific gravity (Rice) of the mixture determined according to Test Method Tex-227-F. Pavement specimens, which shall be either cores or sections of asphaltic pavement, will be tested according to Test Method Tex-

207-F. The nuclear-density gauge or other methods which correlate satisfactorily with results obtained from project roadway specimens may be used when approved by the Engineer. Unless otherwise shown on the plans, the Contractor shall be responsible for obtaining the required roadway specimens at their expense and in a manner and at locations selected by the Engineer.

PORTLAND CEMENT CONCRETE

The Portland cement concrete should have a minimum 28-day compressive strength of 4,000 psi. A liquid membrane-forming curing compound should be applied as soon as practical after broom finishing the concrete surface. The curing compound will help reduce the loss of water from the concrete. The reduction in the rapid loss in water will help reduce shrinkage cracking of the concrete.

CONSTRUCTION RELATED SERVICES

CONSTRUCTION MATERIALS TESTING AND OBSERVATION SERVICES

As presented in the attachment to this report, *Important Information About Your Geotechnical Engineering Report*, subsurface conditions can vary across a project site. The conditions described in this report are based on interpolations derived from a limited number of data points. Variations will be encountered during construction, and only the geotechnical design engineer will be able to determine if these conditions are different than those assumed for design.

Construction problems resulting from variations or anomalies in subsurface conditions are among the most prevalent on construction projects and often lead to delays, changes, cost overruns, and disputes. These variations and anomalies can best be addressed if the geotechnical engineer of record, RKI is retained to perform construction observation and testing services during the construction of the project. This is because:

- RKI has an intimate understanding of the geotechnical engineering report's findings and recommendations. RKI understands how the report should be interpreted and can provide such interpretations on site, on the client's behalf.
- RKI knows what subsurface conditions are anticipated at the site.
- RKI is familiar with the goals of the owner and project design professionals, having worked with them in the development of the geotechnical workscope. This enables RKI to suggest remedial measures (when needed) which help meet the owner's and the design teams' requirements.
- RKI has a vested interest in client satisfaction, and thus assigns qualified personnel whose principal concern is client satisfaction. This concern is exhibited by the manner in which contractors' work is tested, evaluated and reported, and in selection of alternative approaches when such may become necessary.
- RKI cannot be held accountable for problems which result due to misinterpretation of our findings or recommendations when we are not on hand to provide the interpretation which is required.

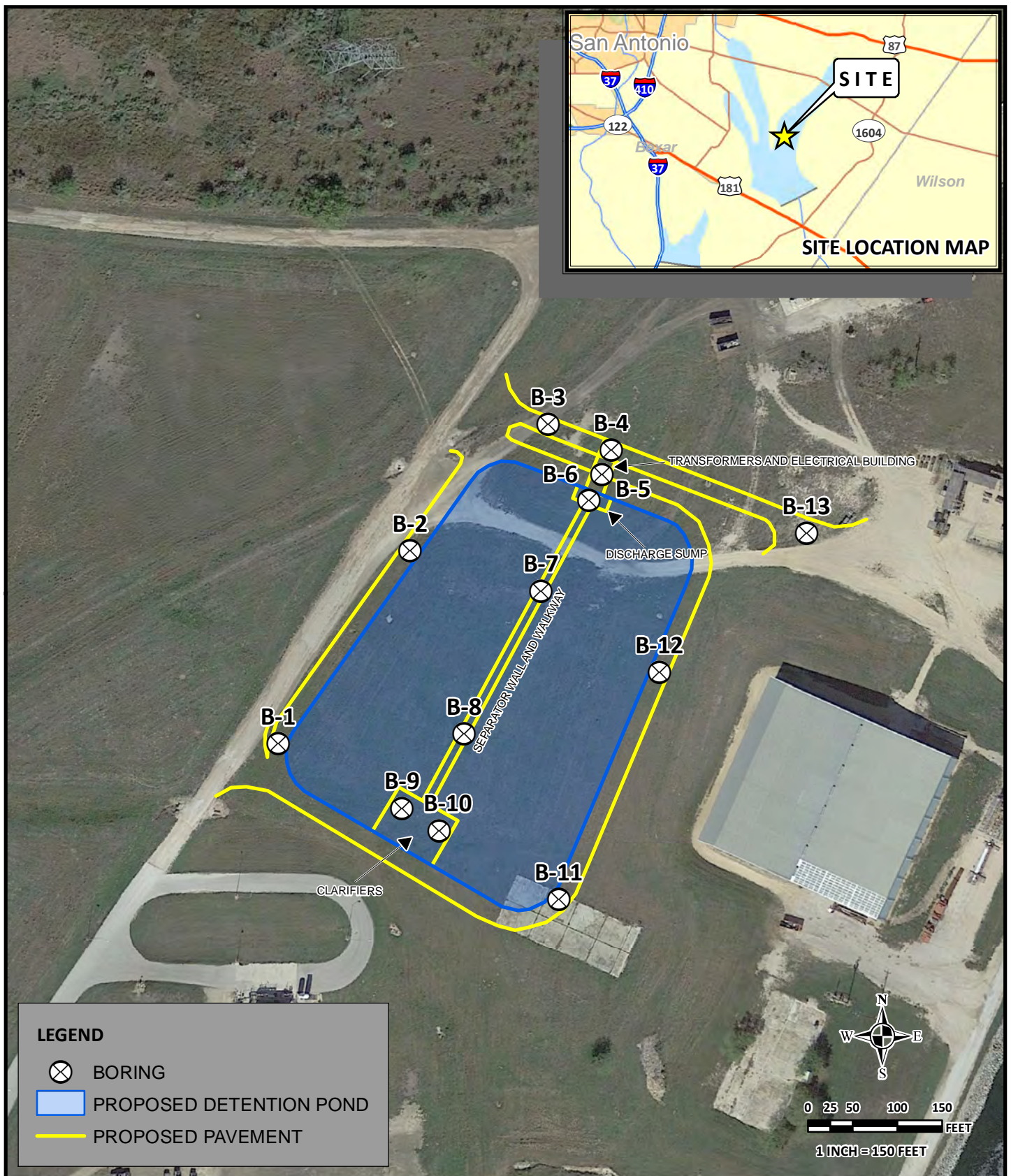
BUDGETING FOR CONSTRUCTION TESTING

Appropriate budgets need to be developed for the required construction testing and observation activities. At the appropriate time before construction, we advise that RKI and the project designers meet and jointly develop the testing budgets, as well as review the testing specifications as it pertains to this project.

Once the construction testing budget and scope of work are finalized, we encourage a preconstruction meeting with the selected contractor to review the scope of work to make sure it is consistent with the construction means and methods proposed by the contractor. RKI looks forward to the opportunity to provide continued support on this project, and would welcome the opportunity to meet with the Project Team to develop both a scope and budget for these services.

* * * * *

ATTACHMENTS

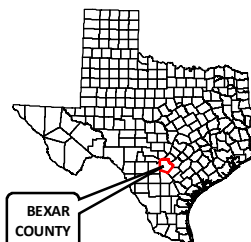


12821 West Golden Lane
 San Antonio, Texas 78249
 (210) 699-9090 TEL
 (210) 699-6426 FAX
www.rkci.com
 TBPE Firm Number 3257

SOURCE: Aerial Photography Obtained from Google Earth Pro - 2019

BORING LOCATION MAP

CALAVERAS GEOTECHNICAL SURVEY J.K. SPRUCE POWER PLANT SAN ANTONIO, TEXAS



PROJECT No.:
 ASA20-044-00

ISSUE DATE:	09/03/2020
DRAWN BY:	KRB
CHECKED BY:	IM
REVIEWED BY:	RBW

FIGURE

1

LOG OF BORING NO. B-1
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664500.53; E 2186398.74

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0													
						PLASTIC LIMIT				WATER CONTENT				LIQUID LIMIT					
						10 20 30 40 50 60 70 80													
5			FILL: GRAVEL, Silty, Medium Dense, Brown and Tan	30	50/10"	●	×										2	33	
			SAND, Silty, Medium Dense, Brown																
			CLAY, Reddish Brown, Stiff to Very Stiff, with ferrous stains	13			●												
				20		●	×			×								33	
			SAND, Silty, Clayey, Medium Dense, Tan, with sand seams	14		●	×	×										7	31
			CLAY, Very Stiff, Reddish-Brown and Gray, with ferrous stains	23			●												
15			SAND, Silty, Clayey, Very Dense to Medium Dense, Light Gray, with ferrous stains			●													
20				24		●											32		
			Boring Terminated																
25																			
30																			
35																			
DEPTH DRILLED: 20.0 ft			DEPTH TO WATER: DRY			PROJ. No.: ASA20-044-00													
DATE DRILLED: 7/30/2020			DATE MEASURED: 7/30/2020			FIGURE: 2													

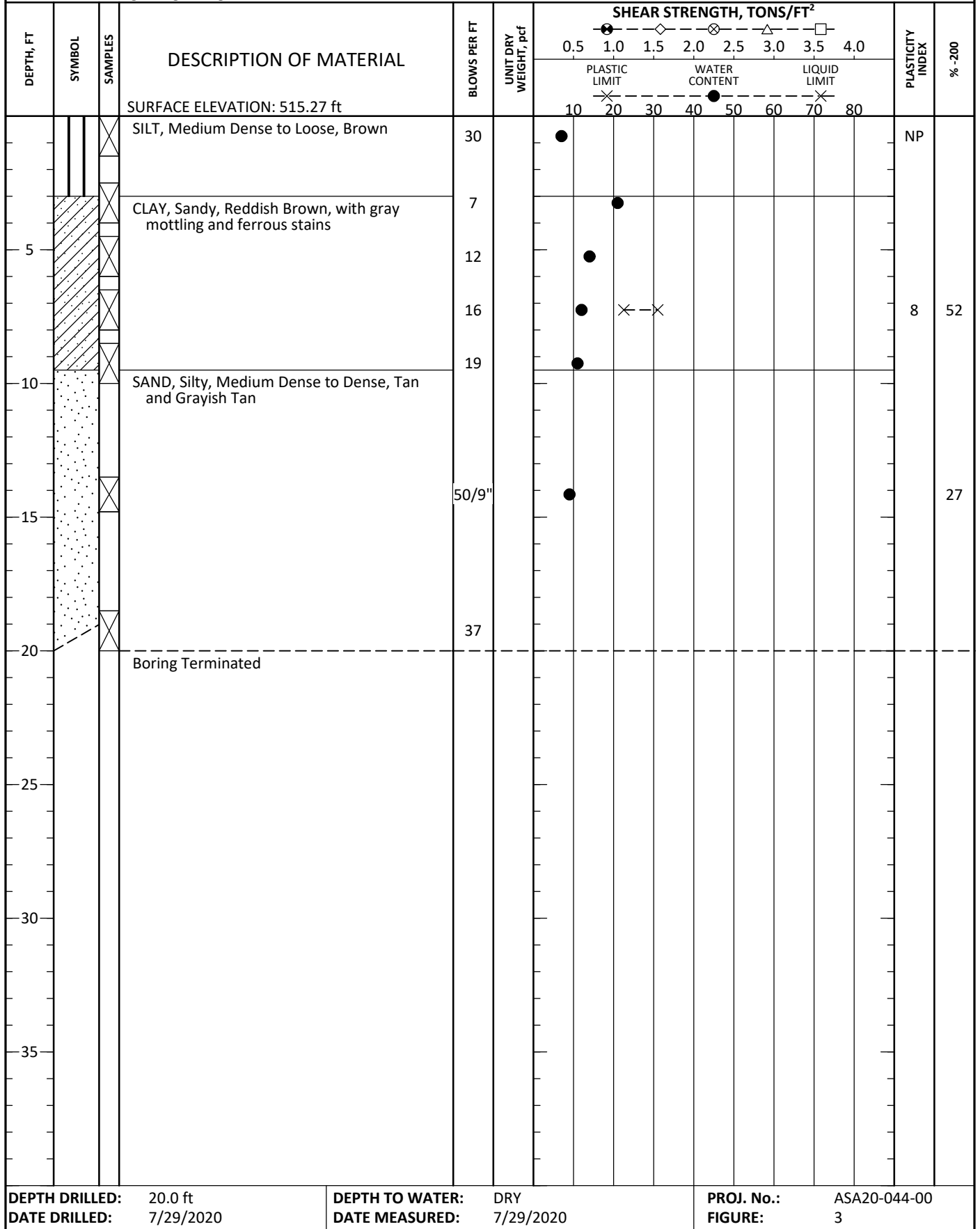
NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-2
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664707.14; E 2186527.09



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 20.0 ft	DEPTH TO WATER: DRY	PROJ. No.: ASA20-044-00
DATE DRILLED: 7/29/2020	DATE MEASURED: 7/29/2020	FIGURE: 3

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas



DRILLING

METHOD: Straight Flight Auger

LOCATION: N 13664866.46; E 2186692.50

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²							PLASTICITY INDEX	% -200	
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0									
						PLASTIC LIMIT		WATER CONTENT			LIQUID LIMIT				
			SURFACE ELEVATION: 515.21 ft			10	20	30	40	50	60	70	80		
			FILL: SAND, Silty, Brown and Dark Gray, with gravel	24											
			SAND, Silty, Medium Dense to Loose, Brown												
5			CLAY, Stiff, Reddish Brown, with sand	9											49
				11										29	
			SAND, Medium Dense, Reddish Brown	10											
10				14											
			SAND, Silty, Dense, Tan, with ferrous stains												
15				31										NP	28
			- becomes gray below 16 ft												
20				40											47
			Boring Terminated												
25															
30															
35															
DEPTH DRILLED: 20.0 ft			DEPTH TO WATER: DRY	PROJ. No.: ASA20-044-00											
DATE DRILLED: 7/30/2020			DATE MEASURED: 7/30/2020	FIGURE: 4											

LOG OF BORING NO. B-4
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664824.62; E 2186764.51

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0											
						PLASTIC LIMIT			WATER CONTENT				LIQUID LIMIT				
						10	20	30	40	50	60	70	80				
			SURFACE ELEVATION: 513.09 ft														
			FILL: SAND, Silty, Medium Dense, Dark Brown, with gravel	13											21		
			SAND, Silty, Loose, Reddish Brown, with dark brown seams	8											23		
5			CLAY, Sandy, Silty, Stiff, Reddish Brown - with black stains to 7 ft	9													
				110										7			
10			SAND, Clayey, Medium Dense, Reddish Brown	24											34		
			SAND, Very Dense, Tan to Grayish Tan, with ferrous stains	50/10"													
15				50													
20			CLAY, Tan, with ferrous stains	50													
			CLAY, Sandy, Hard, Tan	45											57		
25			DRILLER'S NOTE: WATER encountered at 23 ft	50/7"													
30				50/8"													
35				50/11"													
DEPTH DRILLED: 49.4 ft			DEPTH TO WATER: 26 ft			PROJ. No.: ASA20-044-00										FIGURE: 5a	
DATE DRILLED: 7/29/2020			DATE MEASURED: 7/29/2020														

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-4
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664824.62; E 2186764.51

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% -200
						0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0				
			SURFACE ELEVATION: 513.09 ft			<div style="display: flex; justify-content: space-between;"> <div> PLASTIC LIMIT X X X X X </div> <div> WATER CONTENT ● </div> <div> LIQUID LIMIT X X X X X </div> </div>											
45		X	SAND, Dense to Very Dense, Gray, Brown, and Dark Brown, with ferrous stains	33													
50				50/5"													
			Boring Terminated														
55																	
60																	
65																	
70																	
75																	

DEPTH DRILLED: 49.4 ft	DEPTH TO WATER: 26 ft	PROJ. No.: ASA20-044-00
DATE DRILLED: 7/29/2020	DATE MEASURED: 7/29/2020	FIGURE: 5b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-5
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664804.06; E 2186757.52

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0											
						PLASTIC LIMIT WATER CONTENT LIQUID LIMIT											
SURFACE ELEVATION: 512.79 ft						10 20 30 40 50 60 70 80											
5			BASE MATERIAL (2 in.)	26									12	31			
			SILT, Sandy, Dark Gray, with trace gravel														
			SAND, Medium Dense to Loose, Reddish Brown														
			SAND, Clayey, Reddish Brown, with ferrous stains														
			SAND, Dense to Very Dense, Tan, with ferrous stains														
10													12	31			
15				50/11"									12	31			
20			- with gray silt and silty clay seams from 20 to 25 ft	31									12	31			
25				50/10"									12	31			
30			DRILLER'S NOTE: WATER encountered at 29 ft	50/9"									12	31			
35				50/7"									12	31			
DEPTH DRILLED: 49.3 ft			DEPTH TO WATER: 22 ft			PROJ. No.: ASA20-044-00											
DATE DRILLED: 7/29/2020			DATE MEASURED: 7/29/2020			FIGURE: 6a											

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-5
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664804.06; E 2186757.52

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0													
						PLASTIC LIMIT				WATER CONTENT				LIQUID LIMIT					
						10	20	30	40	50	60	70	80						
			SURFACE ELEVATION: 512.79 ft																
			CLAY, Sandy, Very Stiff to Hard, Light Gray, with ferrous stains																
45			- with dark gray below 45 ft	21											59				
50			Boring Terminated	50/4"															
55																			
60																			
65																			
70																			
75																			
DEPTH DRILLED: 49.3 ft			DEPTH TO WATER: 22 ft			PROJ. No.: ASA20-044-00													
DATE DRILLED: 7/29/2020			DATE MEASURED: 7/29/2020			FIGURE: 6b													

SURFACE ELEVATION: 512.79 ft

CLAY, Sandy, Very Stiff to Hard, Light Gray, with ferrous stains

21

- with dark gray below 45 ft

50/4"

Boring Terminated

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 49.3 ft	DEPTH TO WATER: 22 ft	PROJ. No.: ASA20-044-00
DATE DRILLED: 7/29/2020	DATE MEASURED: 7/29/2020	FIGURE: 6b

LOG OF BORING NO. B-6
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664772.98; E 2186738.39

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% -200						
						0.5		1.0		1.5		2.0		2.5				3.0		3.5		4.0	
						PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT													
			SURFACE ELEVATION: 512.68 ft			10	20	30	40	50	60	70	80										
			BASE MATERIAL (6 in.)	21																			
			FILL: SAND, Silty, Dark Gray, with gravel																				
			SAND, Silty, Medium Dense, Reddish Brown																				
5			CLAY, Sandy, Stiff, Reddish Brown	17																			
				12																			
				14																			
				10																			
15			SAND, Clayey, Dense, Tan, with ferrous stains	43																			
20			SAND, Silty, Dense, Gray, with clay and ferrous stains	48																			
			Boring Terminated																				
25																							
30																							
35																							
DEPTH DRILLED: 20.0 ft			DEPTH TO WATER: DRY			PROJ. No.: ASA20-044-00																	
DATE DRILLED: 7/30/2020			DATE MEASURED: 7/30/2020			FIGURE: 7																	

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-7
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664677.95; E 2186684.56

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% -200
						0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	0.5	1.0		
			SURFACE ELEVATION: 512.72 ft														
			FILL: SILT, Dense, Gray, with gravel	32												NP	
			SAND, Silty, Medium Dense, Reddish Brown														
5			CLAY, Sandy, Stiff, Reddish Brown, with ferrous stains	23													21
				9													
				12													
10				14												19	
			SAND, Dense, Tan, with ferrous stains	49													
15																	
				42													
20			Boring Terminated														
25																	
30																	
35																	
DEPTH DRILLED: 20.0 ft				DEPTH TO WATER: DRY				PROJ. No.: ASA20-044-00									
DATE DRILLED: 7/30/2020				DATE MEASURED: 7/30/2020				FIGURE: 8									

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas



DRILLING

METHOD: Straight Flight Auger

LOCATION: N 13664520.77; E 2186596.21

[illegible]











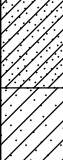






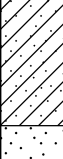










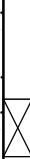





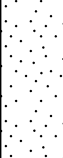


NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-9
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664428.32; E 2186524.83

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% -200						
						0.5		1.0		1.5		2.0		2.5				3.0		3.5		4.0	
						PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT													
			SURFACE ELEVATION: 511.19 ft			10	20	30	40	50	60	70	80										
5			SAND, Silty, Medium Dense, Tan	22																			
				19																			
				12																			
																							
																							
10			CLAY, Sandy, Stiff, Tan and Light Gray	12																			
																							
15			CLAY, Sandy, Stiff to Hard, Reddish Brown, with sand																				
																							
20			SAND, Medium Dense to Very Dense, Tan and Light Gray, with ferrous stains																				
				29																			
				47																			
25			- clayey seams below 25 ft																				
30			DRILLER'S NOTE: WATER encountered at 28 ft	50/11"																			
35				50/11"																			
				40																			
DEPTH DRILLED: 50.0 ft			DEPTH TO WATER: 28 ft			PROJ. No.: ASA20-044-00																	
DATE DRILLED: 7/30/2020			DATE MEASURED: 7/30/2020			FIGURE: 10a																	

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-9
 Calaveras Geotechnical Survey
 J.K. Spruce Power Plant
 San Antonio, Texas



DRILLING METHOD: Straight Flight Auger

LOCATION: N 13664428.32; E 2186524.83

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						<div><div><div>0.51.01.52.02.53.03.54.0</div><div><div><div><div>●</div><div>◇</div><div>⊗</div><div>△</div><div>□</div></div><div>PLASTIC LIMIT</div><div>WATER CONTENT</div><div>LIQUID LIMIT</div></div><div><div><div>×</div><div>×</div><div>×</div></div><div>1020304050607080</div></div></div></div></div>													
			SURFACE ELEVATION: 511.19 ft																
			SAND, Medium Dense to Very Dense, Tan and Light Gray, with ferrous stains <i>(continued)</i>																
45		⊗		34															
50		⊗		24															
			Boring Terminated																
55																			
60																			
65																			
70																			
75																			
DEPTH DRILLED: 50.0 ft			DEPTH TO WATER: 28 ft			PROJ. No.: ASA20-044-00													
DATE DRILLED: 7/30/2020			DATE MEASURED: 7/30/2020			FIGURE: 10b													

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-10

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas



DRILLING

METHOD: Straight Flight Auger

LOCATION: N 13664415.18; E 2186568.33

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²										PLASTICITY INDEX	% -200						
						0.5		1.0		1.5		2.0		2.5				3.0		3.5		4.0	
						PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT													
			SURFACE ELEVATION: 509.56 ft																				
			SILT, Sandy, Medium Dense to Loose, Reddish Brown	26																			
			SAND, Clayey, Medium Dense, Reddish Brown, with gray mottling	8															54				
5																							
				16															36				
10			SAND, Dense, Tan, with ferrous stains																				
				40																			
15			- sandstone from 15.5 to 16.5 ft																				
				48																			
20			CLAY, Hard, Brown and Light Gray, with ferrous stains and sand																				
				50/9"															10				
25			SAND, Very Dense to Dense, Tan																				
			DRILLER'S NOTE: WATER encountered at 28 ft																				
30			- with clay seams to 40 ft																47				
				ref/5"																			
				50/10"																			
35																							
				32																			
DEPTH DRILLED: 50.0 ft			DEPTH TO WATER: 28 ft			PROJ. No.: ASA20-044-00																	
DATE DRILLED: 7/31/2020			DATE MEASURED: 7/31/2020			FIGURE: 11a																	

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-10

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas



DRILLING

METHOD: Straight Flight Auger

LOCATION: N 13664415.18; E 2186568.33

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²								PLASTICITY INDEX	% -200	
						0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0			
			SURFACE ELEVATION: 509.56 ft			<div style="display: flex; justify-content: space-between;"> <div> PLASTIC LIMIT X X X X X X X X X X </div> <div> WATER CONTENT • </div> <div> LIQUID LIMIT X X X X X X X X X X </div> </div>										
			SAND, Very Dense to Dense, Tan (<i>continued</i>)	40												
45																
			CLAY, Sandy, Hard, Brown to Dark Brown, with ferrous stains	46												70
50			Boring Terminated													
55																
60																
65																
70																
75																

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 50.0 ft
DATE DRILLED: 7/31/2020

DEPTH TO WATER: 28 ft
DATE MEASURED: 7/31/2020

PROJ. No.: ASA20-044-00
FIGURE: 11b

LOG OF BORING NO. B-11

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas



DRILLING

METHOD: Straight Flight Auger

LOCATION: N 13664330.40; E 2186703.75

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						<div><div><div>0.51.01.52.02.53.03.54.0</div><div><div>PLASTIC LIMIT</div><div>WATER CONTENT</div><div>LIQUID LIMIT</div></div></div></div>													
						<div><div><div>1020304050607080</div><div><div>×</div><div>●</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div>×</div><div></div></div></div></div>													

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED: 20.0 ft
DATE DRILLED: 7/30/2020

DEPTH TO WATER: DRY
DATE MEASURED: 7/30/2020

PROJ. No.: ASA20-044-00
FIGURE: 12

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas



DRILLING

METHOD: Straight Flight Auger

LOCATION: N 13664578.44; E 2186816.01

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²				PLASTICITY INDEX	% -200
						0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0					
						PLASTIC LIMIT		WATER CONTENT			
SURFACE ELEVATION: 508.04 ft						10 20 30 40 50 60 70 80					
			SILT, Clayey, Brown BASE MATERIAL (2 in.)	22							
			SAND, Silty, Reddish Brown CLAY, Stiff to Very Stiff, Reddish Brown, with ferrous stains	8							49
5				17							
				18							
			SAND, Silty, Dense, Tan, with ferrous stains	49							
10			Boring Terminated								32
15											
20											
25											
30											
35											
DEPTH DRILLED: 10.0 ft			DEPTH TO WATER: DRY			PROJ. No.: ASA20-044-00					
DATE DRILLED: 7/30/2020			DATE MEASURED: 7/30/2020			FIGURE: 13					

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. B-13

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas



DRILLING

METHOD: Straight Flight Auger

LOCATION: N 13664738.20; E 2186975.35

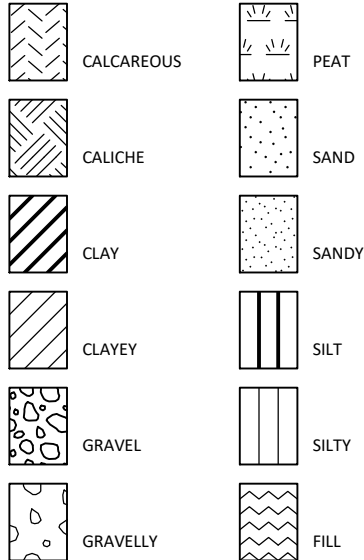
DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WEIGHT, pcf	SHEAR STRENGTH, TONS/FT ²												PLASTICITY INDEX	% -200
						<div><div><div>●◆⊗△▢</div><div>0.51.01.52.02.53.03.54.0</div><div>PLASTIC LIMITWATER CONTENTLIQUID LIMIT</div><div><div>×</div><div>×</div></div></div></div>													
						<div><div><div>×</div><div>×</div></div><div>1020304050607080</div></div>													
			SURFACE ELEVATION: 506.24 ft																
			BASE MATERIAL (18 in.)																
			CLAY, Stiff to Firm, Brown to Reddish Brown	12														29	
				7															
5				8															
			SAND, Silty, Very Dense to Dense, Light Gray, with ferrous stains	50/11"															
				44														NP	31
10			Boring Terminated																
15																			
20																			
25																			
30																			
35																			
DEPTH DRILLED: 10.0 ft			DEPTH TO WATER: DRY			PROJ. No.: ASA20-044-00													
DATE DRILLED: 7/30/2020			DATE MEASURED: 7/30/2020			FIGURE: 14													

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

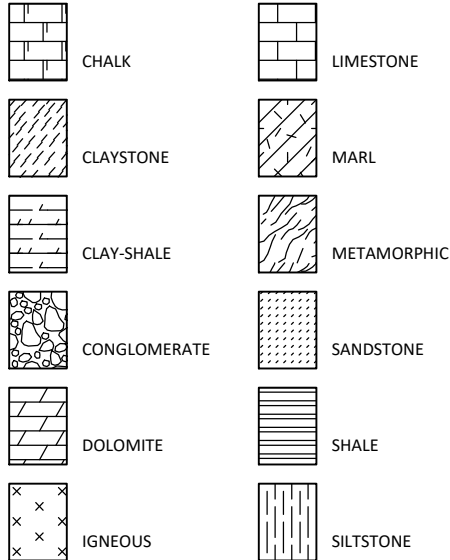
KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

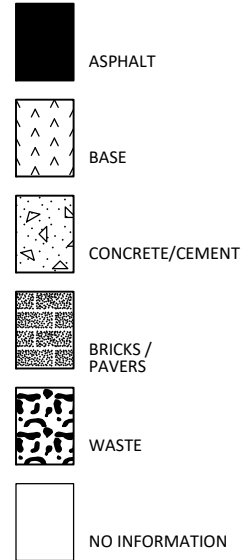
SOIL TERMS



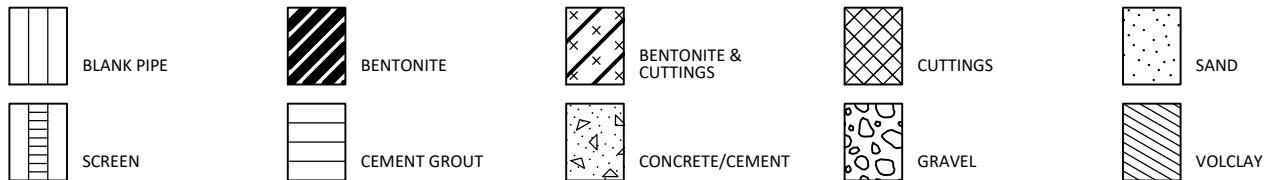
ROCK TERMS



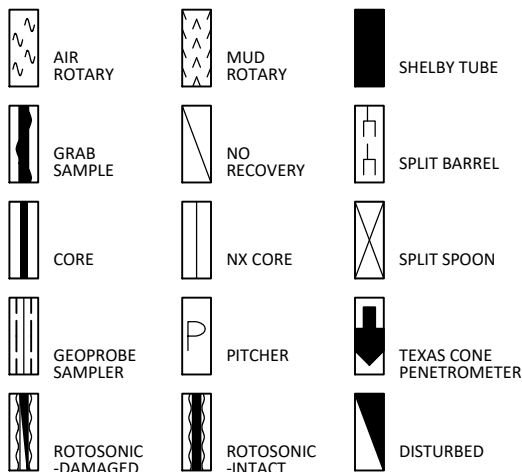
OTHER



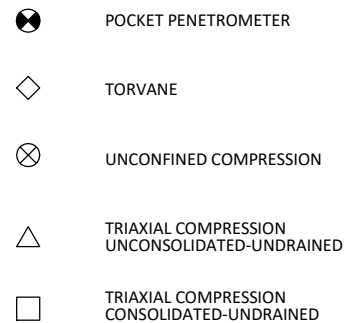
WELL CONSTRUCTION AND PLUGGING MATERIALS



SAMPLE TYPES



STRENGTH TEST TYPES



NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. ASA20-044-00

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY

COHESIVE STRENGTH

PLASTICITY

<u>Penetration Resistance Blows per ft</u>	<u>Relative Density</u>	<u>Resistance Blows per ft</u>	<u>Consistency</u>	<u>Cohesion TSF</u>	<u>Plasticity Index</u>	<u>Degree of Plasticity</u>
0 - 4	Very Loose	0 - 2	Very Soft	0 - 0.125	0 - 5	None
4 - 10	Loose	2 - 4	Soft	0.125 - 0.25	5 - 10	Low
10 - 30	Medium Dense	4 - 8	Firm	0.25 - 0.5	10 - 20	Moderate
30 - 50	Dense	8 - 15	Stiff	0.5 - 1.0	20 - 40	Plastic
> 50	Very Dense	15 - 30	Very Stiff	1.0 - 2.0	> 40	Highly Plastic
		> 30	Hard	> 2.0		

ABBREVIATIONS

B = Benzene	Qam, Qas, Qal = Quaternary Alluvium	Kef = Eagle Ford Shale
T = Toluene	Qat = Low Terrace Deposits	Kbu = Buda Limestone
E = Ethylbenzene	Qbc = Beaumont Formation	Kdr = Del Rio Clay
X = Total Xylenes	Qt = Fluvial Terrace Deposits	Kft = Fort Terrett Member
BTEX = Total BTEX	Qao = Seymour Formation	Kgt = Georgetown Formation
TPH = Total Petroleum Hydrocarbons	Qle = Leona Formation	Kep = Person Formation
ND = Not Detected	Q-Tu = Uvalde Gravel	Kek = Kainer Formation
NA = Not Analyzed	Ewi = Wilcox Formation	Kes = Escondido Formation
NR = Not Recorded/No Recovery	Emi = Midway Group	Kew = Walnut Formation
OVA = Organic Vapor Analyzer	Mc = Catahoula Formation	Kgr = Glen Rose Formation
ppm = Parts Per Million	EI = Laredo Formation	Kgru = Upper Glen Rose Formation
	Kknm = Navarro Group and Marlbrook Marl	Kgrl = Lower Glen Rose Formation
	Kpg = Pecan Gap Chalk	Kh = Hensell Sand
	Kau = Austin Chalk	

PROJECT NO. ASA20-044-00

RABAKISTNER

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

SAMPLING METHODS

RELATIVELY UNDISTURBED SAMPLING

Cohesive soil samples are to be collected using three-inch thin-walled tubes in general accordance with the Standard Practice for Thin-Walled Tube Sampling of Soils (ASTM D1587) and granular soil samples are to be collected using two-inch split-barrel samplers in general accordance with the Standard Method for Penetration Test and Split-Barrel Sampling of Soils (ASTM D1586). Cohesive soil samples may be extruded on-site when appropriate handling and storage techniques maintain sample integrity and moisture content.

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-in.-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

FILE NAME: ASA20-044-00.GPJ

9/3/2020

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-1	0.0 to 1.5	30	6	21	19	2	SM		33		
	2.5 to 4.0	13	17								
	4.5 to 6.0	20	12	48	15	33	CL				
	6.5 to 8.0	14	10	28	21	7	SC-SM		31		
	8.5 to 10.0	23	22								
	13.5 to 14.8	50/10"	11								
	18.5 to 20.0	24	11						32		
B-2	0.0 to 1.5	30	7	NP	NP	NP	ML				
	2.5 to 4.0	7	21								
	4.5 to 6.0	12	14								
	6.5 to 8.0	16	12	31	23	8	ML		52		
	8.5 to 10.0	19	11								
	13.5 to 14.8	50/9"	9						27		
	18.5 to 20.0	37									
B-3	0.0 to 1.5	24	5								
	2.5 to 4.0	9	13						49		
	4.5 to 6.0	11	16	45	16	29	CL				
	6.5 to 8.0	10	15								
	8.5 to 10.0	14	17								
	13.5 to 15.0	31	10			NP	SM		28		
	18.5 to 20.0	40	23						47		
B-4	0.0 to 1.5	13	4						21		
	2.5 to 4.0	8	7						23		
	4.5 to 6.0	9	15								
	6.5 to 8.0		17	32	25	7	CL-ML	110		0.45	UC
	8.5 to 10.0	24	17						34		
	13.5 to 14.8	50/10"	13								
	18.5 to 20.0	50									
	23.5 to 25.0	45	24						57		
	28.5 to 29.6	50/7"									
	33.5 to 34.7	50/8"									
	38.5 to 39.9	50/11"									
B-5	43.5 to 45.0	33									
	48.5 to 49.4	50/5"									
	0.0 to 1.5	26	6								
	2.5 to 4.0	14	7								
	4.5 to 6.0	9	18								
	6.5 to 8.0		17	32	20	12	SC		31	1.75	PP
	8.5 to 10.0		16							1.13	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA20-044-00

RABAKISTNER

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

FILE NAME: ASA20-044-00.GPJ

9/3/2020

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-5	13.5 to 14.9	50/11"	12								
	18.5 to 20.0	31									
	23.5 to 24.8	50/10"	22						41		
	28.5 to 29.8	50/9"									
	33.5 to 34.6	50/7"									
	38.5 to 40.0	44									
	43.5 to 45.0	21	21						59		
B-6	48.5 to 49.3	50/4"	30								
	0.0 to 1.5	21	4								
	2.5 to 4.0	17	6						21		
	4.5 to 6.0	12	16								
	6.5 to 8.0	14	13	30	14	16	CL				
	8.5 to 10.0	10	14								
	13.5 to 15.0	43	15						29		
B-7	18.5 to 20.0	48	13						31		
	0.0 to 1.5	32	13	NP	NP	NP	ML				
	2.5 to 4.0	23	5						21		
	4.5 to 6.0	9	21								
	6.5 to 8.0	12	12								
	8.5 to 10.0	14	14	32	13	19	CL				
	13.5 to 15.0	49	13								
B-8	18.5 to 20.0	42									
	0.0 to 1.5	14	7								
	2.5 to 4.0	21	1			NP	SM		20		
	4.5 to 6.0	9	17								
	6.5 to 8.0	16	13	41	14	27	CL				
	8.5 to 10.0	25	12								
	13.5 to 15.0	41	12						35		
B-9	18.5 to 20.0	22									
	0.0 to 1.5	22	6								
	2.5 to 4.0	19	2								
	4.5 to 6.0	12	12								
	6.5 to 8.0		11	33	13	20	SC		41	2.25	PP
	8.5 to 10.0	12	22	44	19	25	CL				
	13.5 to 15.0		13	35	14	21	CL		60	2.25	PP
	18.5 to 20.0	29	13								
	23.5 to 25.0	47	22								
	28.5 to 29.9	50/11"	20								
	33.5 to 34.9	50/11"									

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA20-044-00

RABAKISTNER

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

FILE NAME: ASA20-044-00.GPJ

9/3/2020

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
B-9	38.5 to 40.0	40									
	43.5 to 45.0	34	24								
	48.5 to 50.0	24									
B-10	0.0 to 1.5	26	1						54		
	2.5 to 4.0	8	5							2.25	PP
	4.5 to 6.0		16								
	6.5 to 8.0	16	12	35	15	20	SC		36		
	8.5 to 10.0		24							2.25	PP
	13.5 to 15.0	40	11								
	18.5 to 20.0	48									
	23.5 to 24.8	50/9"	22	39	29	10	CL				
	28.5 to 28.9	ref/5"	27						47		
	33.5 to 34.8	50/10"									
	38.5 to 40.0	32	19								
	43.5 to 45.0	40									
	48.5 to 50.0	46	23						70		
	1.0 to 2.5	9	16	30	21	9	SC		44		
	2.5 to 4.0	6	19						60		
B-11	4.5 to 6.0	4	25								
	6.5 to 8.0	13	17								
	8.5 to 10.0	28	15	26	20	6	CL-ML				
	13.5 to 15.0	23	11								
	18.5 to 20.0	44	22	35	23	12	CL				
B-12	0.0 to 1.5	22	2								
	2.5 to 4.0	8	16	69	20	49	CH				
	4.5 to 6.0	17	11								
	6.5 to 8.0	18	11								
	8.5 to 10.0	49	13						32		
B-13	1.0 to 2.5	12	13								
	2.5 to 4.0	7	16	44	15	29	CL				
	4.5 to 6.0	8	16								
	6.5 to 7.9	50/11"	14								
	8.5 to 10.0	44	11	NP	NP	NP	SM		31		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial

PROJECT NO. ASA20-044-00

RABAKISTNER

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

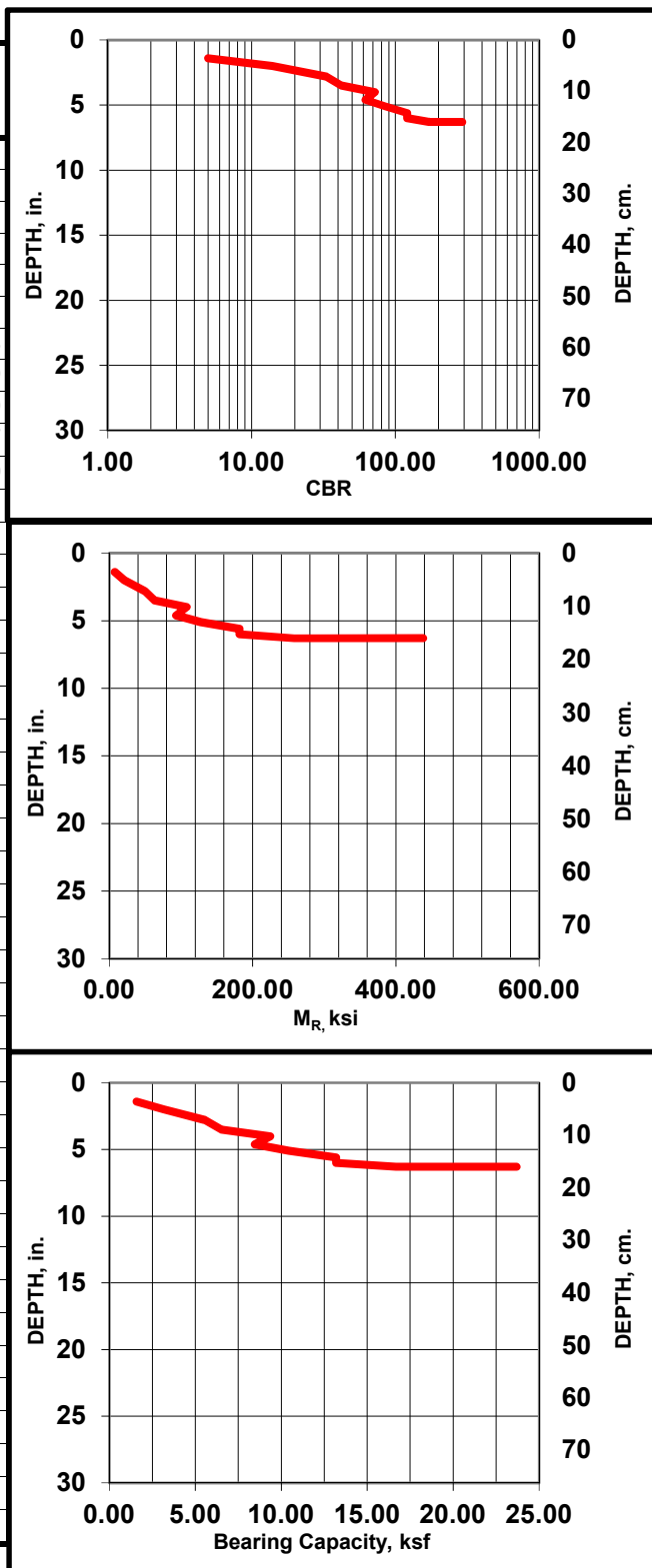


Figure 17a

Calaveras Geotechnical Survey
J.K. Spruce Power Plant
San Antonio, Texas

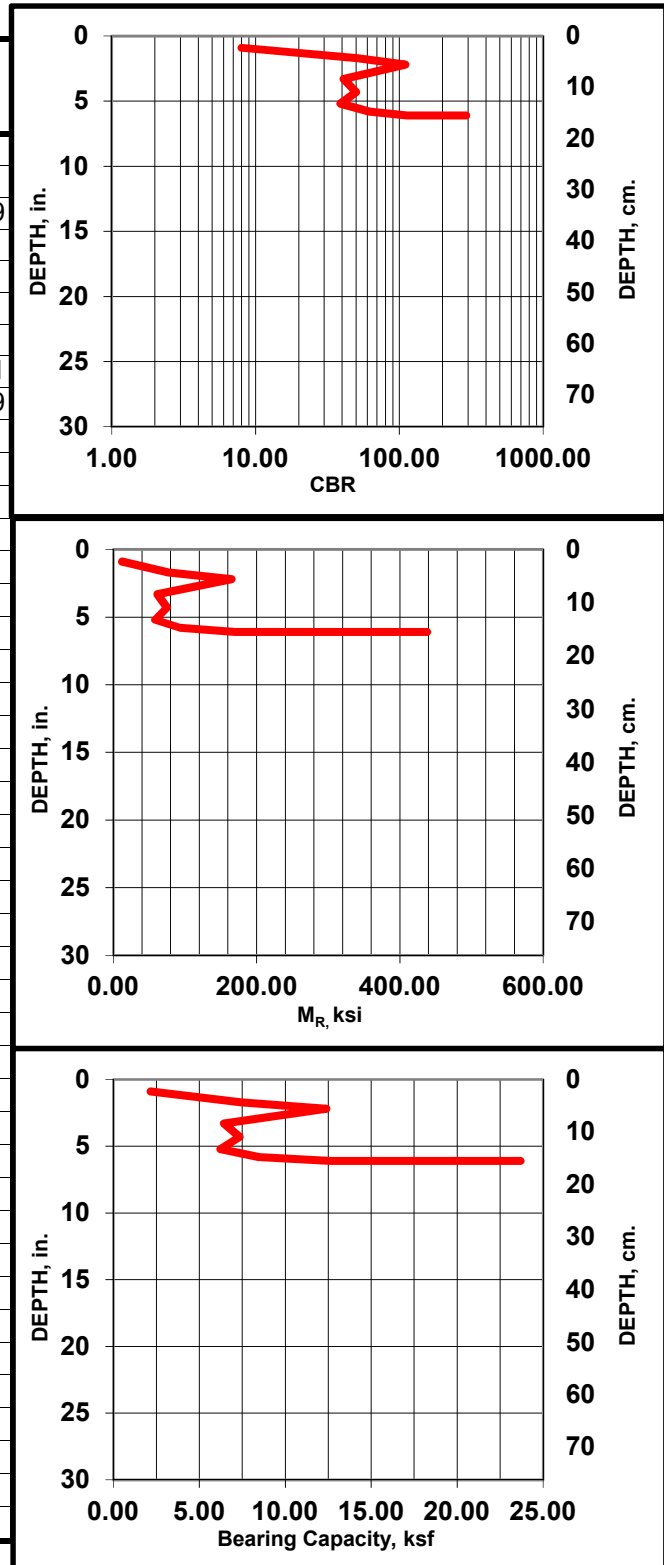


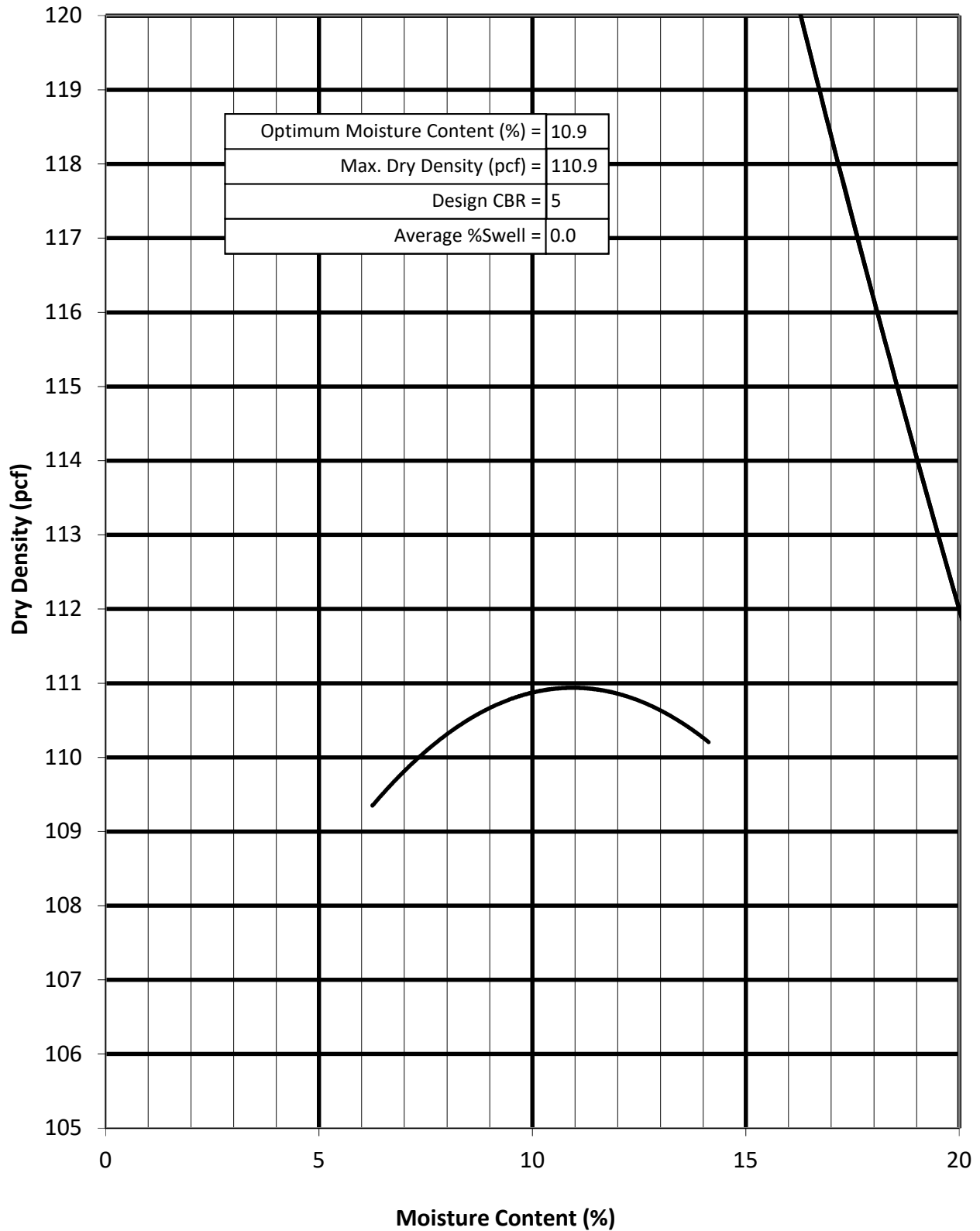
Figure 17b

MOISTURE-DENSITY RELATIONSHIP CURVE (ASTM D698)

Calaveras Geotechnical Survey

J. K. Spruce Power Plant

San Antonio, Texas



9/4/2020

ASA20-044-00

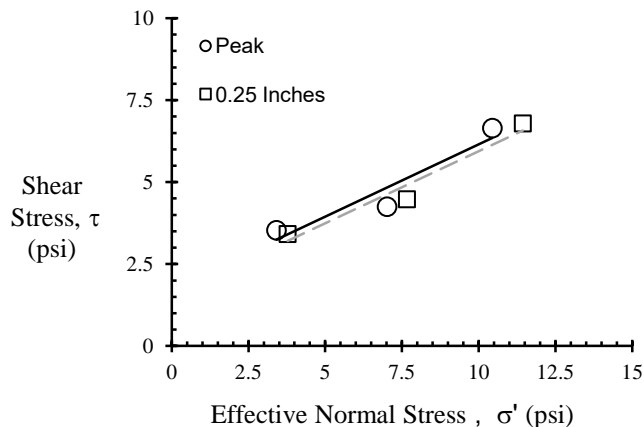
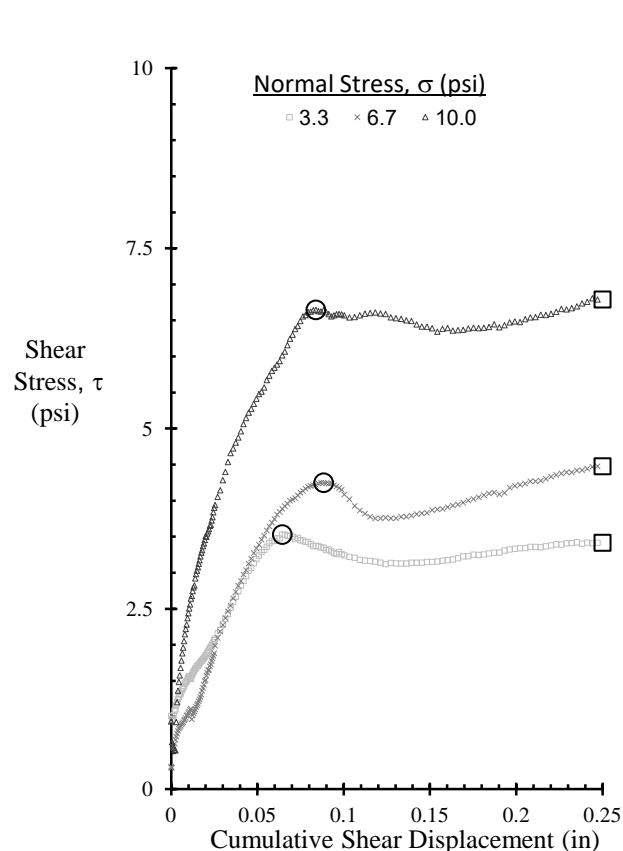
Figure 18

RABAKISTNER

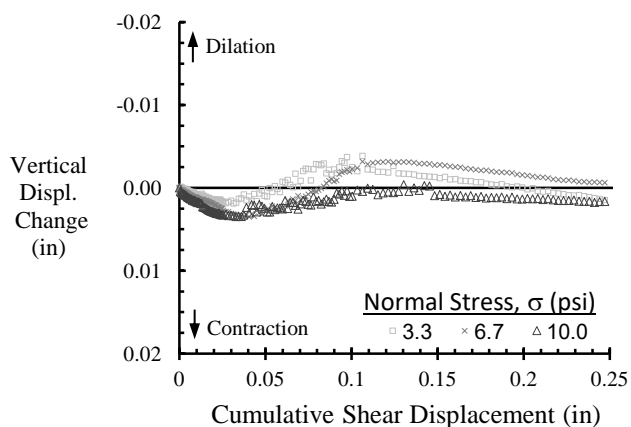
Direct Shear of Soil Under Consolidated-Drained Conditions

Client: Raba Kistner Consultants
 Project: Calaveras Geotechnical Survey
 Sample: B-5, S-5, (6.5-8)

TRI Log#: 58149.1
 Test Method: ASTM D3080



Note: Area Correction Has Been Applied



Specimen Number		1	2	3
Initial Condition	Diameter, in	2.50	2.50	2.50
	Height, in (before consol)	1.00	1.00	1.00
	Water Content, %	16.8	16.2	16.4
	Saturation, %	74.8	69.9	70.0
	Dry Density, pcf	104.9	103.7	103.1
	Void Ratio	0.61	0.62	0.63
Consolidation Stress, σ' (psi)		3.3	6.7	10
Post-Consol	Height, in (prior to shear)	0.99	0.97	0.96
	Dry Density, pcf	106.0	106.4	107.5
	Void Ratio	0.61	0.60	0.58
Displacement rate (in/min)		1E-04		
Final Water Content, %		21.6	19.9	20.7
Peak	Normal Stress, σ' (psi)	3.41	7.02	10.45
	Shear Stress, τ (psi)	3.53	4.25	6.65
	Secant Friction Angle, Degrees	46.0	31.2	32.5
	Displacement (in)	0.06	0.09	0.08
	ϕ'_d , degrees	23.8		
	c'_d , psi	1.7		
0.25 Inches	Normal Stress, σ' (psi)	3.77	7.66	11.44
	Shear Stress, τ (psi)	3.42	4.48	6.79
	Secant Friction Angle, Degrees	42.1	30.3	30.7
	ϕ'_d , degrees	23.7		
	c'_d , psi	1.5		

Note: The intact soil sample was extruded and specimens were prepared using a trimming turntable. A specific gravity of 2.70 was assumed for weight-volume calculations.

Jeffrey A. Kuhn, Ph.D., P.E., 8/21/20

Analysis & Quality Review/Date

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

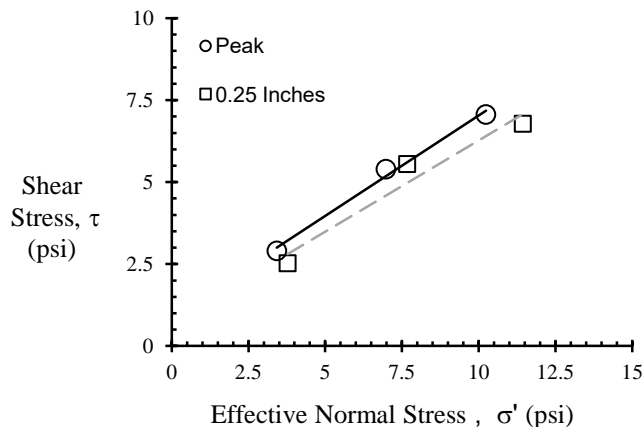
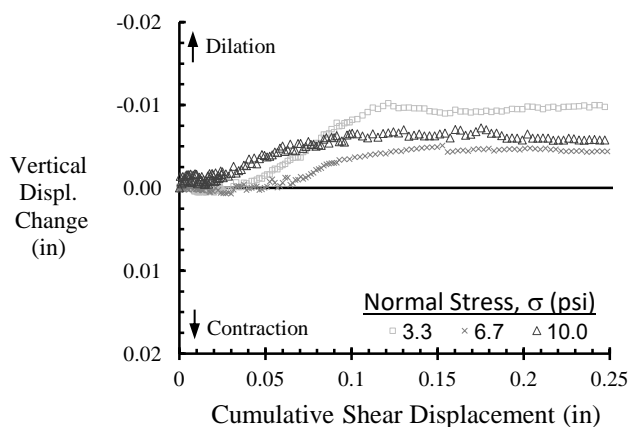
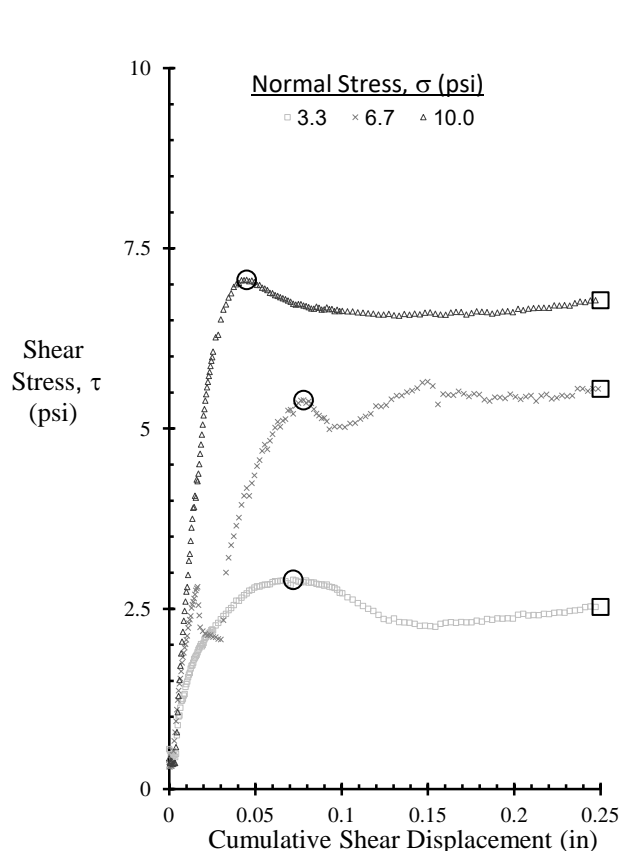
TRI ENVIRONMENTAL, INC.

9063 BEE CAVES RD. - AUSTIN, TX 78733 - USA | PH: 800.880.TEST OR 512.263.2101

Direct Shear of Soil Under Consolidated-Drained Conditions

Client: Raba Kistner Consultants
 Project: Calaveras Geotechnical Survey
 Sample: B-9, S-5 (6.5-8)

TRI Log#: 58149.2
 Test Method: ASTM D3080



Note: Area Correction Has Been Applied

Specimen Number		1	2	3
Initial Condition	Diameter, in	2.50	2.50	2.50
	Height, in (before consol)	1.00	1.00	1.00
	Water Content, %	10.1	9.1	12.1
	Saturation, %	46.3	47.6	65.5
	Dry Density, pcf	106.2	111.2	112.3
	Void Ratio	0.59	0.51	0.50
Consolidation Stress, σ' (psi)		3.3	6.7	10
Post-Consol	Height, in (prior to shear)	0.99	0.97	0.95
	Dry Density, pcf	107.6	114.2	118.0
	Void Ratio	0.58	0.49	0.44
Displacement rate (in/min)		1E-04		
Final Water Content, %		19.0	20.1	19.1
Peak	Normal Stress, σ' (psi)	3.43	6.98	10.23
	Shear Stress, τ (psi)	2.90	5.39	7.06
	Secant Friction Angle, Degrees	40.3	37.7	34.6
	Displacement (in)	0.07	0.08	0.04
	ϕ'_d , degrees	31.5		
	c'_d , psi	0.9		
0.25 Inches	Normal Stress, σ' (psi)	3.77	7.67	11.44
	Shear Stress, τ (psi)	2.53	5.55	6.78
	Secant Friction Angle, Degrees	33.8	35.9	30.7
	ϕ'_d , degrees	29.1		
	c'_d , psi	0.7		

Note: The intact soil sample was extruded and specimens were prepared using a trimming turntable. A specific gravity of 2.70 was assumed for weight-volume calculations.

Jeffrey A. Kuhn, Ph.D., P.E., 9/3/20

Analysis & Quality Review/Date

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

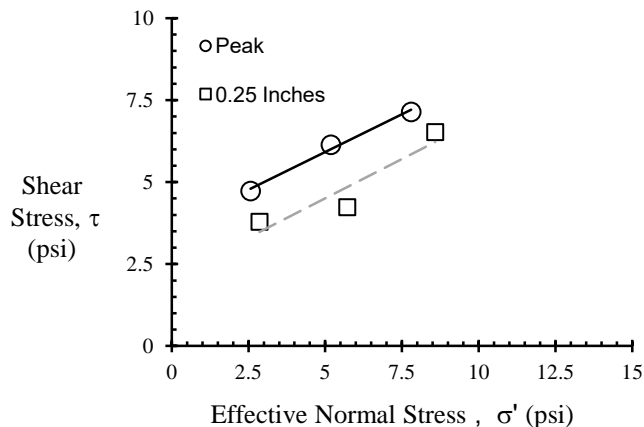
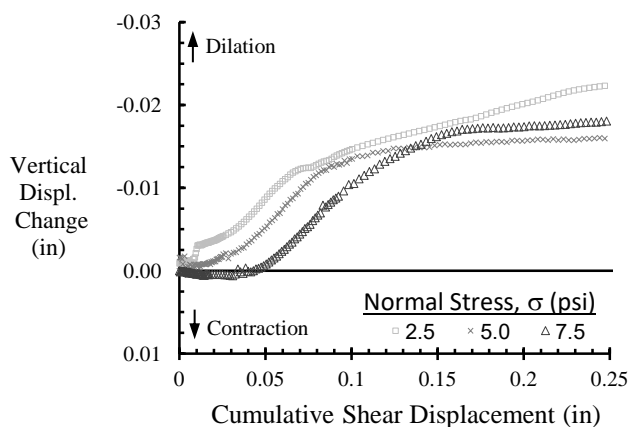
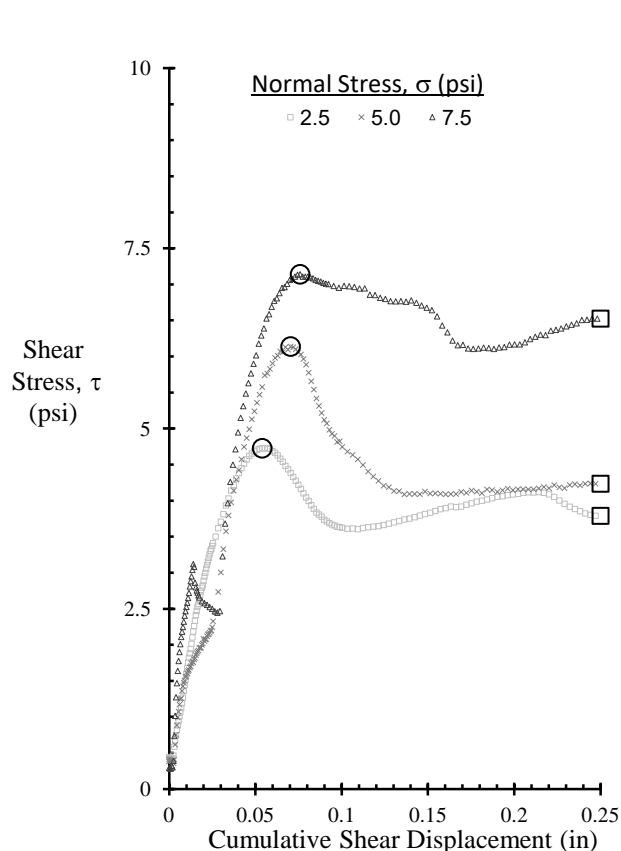
TRI ENVIRONMENTAL, INC.

9063 BEE CAVES RD. - AUSTIN, TX 78733 - USA | PH: 800.880.TEST OR 512.263.2101

Direct Shear of Soil Under Consolidated-Drained Conditions

Client: Raba Kistner Consultants
 Project: Calaveras Geotechnical Survey
 Sample: B-10, S-4 (4.5-6)

TRI Log#: 58149.3
 Test Method: ASTM D3080



Note: Area Correction Has Been Applied

Specimen Number		1	2	3
Initial Condition	Diameter, in	2.50	2.50	2.50
	Height, in (before consol)	1.00	1.00	1.00
	Water Content, %	15.4	15.4	13.5
	Saturation, %	78.4	77.2	68.2
	Dry Density, pcf	110.2	109.4	109.9
	Void Ratio	0.53	0.54	0.53
Consolidation Stress, σ' (psi)		2.5	5	7.5
Post-Consol	Height, in (prior to shear)	1.00	1.00	0.99
	Dry Density, pcf	110.2	109.7	111.1
	Void Ratio	0.55	0.55	0.53
Displacement rate (in/min)		1E-04		
Final Water Content, %		20.3	20.3	17.1
Peak	Normal Stress, σ' (psi)	2.57	5.19	7.80
	Shear Stress, τ (psi)	4.73	6.14	7.14
	Secant Friction Angle, Degrees	61.5	49.8	42.5
	Displacement (in)	0.05	0.07	0.08
	ϕ'_d , degrees	24.8		
	c'_d , psi	3.6		
0.25 Inches	Normal Stress, σ' (psi)	2.86	5.72	8.58
	Shear Stress, τ (psi)	3.79	4.23	6.52
	Secant Friction Angle, Degrees	53.0	36.5	37.2
	ϕ'_d , degrees	25.6		
	c'_d , psi	2.1		

Note: The intact soil sample was extruded and specimens were prepared using a trimming turntable. A specific gravity of 2.70 was assumed for weight-volume calculations.

Jeffrey A. Kuhn, Ph.D., P.E., 8/14/20

Analysis & Quality Review/Date

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

TRI ENVIRONMENTAL, INC.

9063 BEE CAVES RD. - AUSTIN, TX 78733 - USA | PH: 800.880.TEST OR 512.263.2101

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910

Telephone: 301/565-2733 Facsimile: 301/589-2017

e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2015 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, or its contents, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document as a complement to or as an element of a geotechnical-engineering report. Any other firm, individual, or other entity that so uses this document without being a GBA member could be committing negligent or intentional (fraudulent) misrepresentation.

ENGINEERING • ENVIRONMENTAL • INFRASTRUCTURE • PROJECT CONTROL

Austin, TX

► San Antonio, TX

Lake Worth, FL

Brownsville, TX

Houston, TX

Lincoln, NE

Dallas, TX

McAllen, TX

Salt Lake City, UT

Freeport, TX

New Braunfels, TX

Mexico